PROCEEDINGS

OF THE

ASSOCIATION OF

PROVINCIAL LAND SURVEYORS

OF ONTARIO

AT ITS SIXTH ANNUAL MEETING HELD AT TORONTO,
ON MARCH 10TH, 11TH, AND 12TH.

1891.

The Seventh Annual Meeting will be held in Toronto, on Tuesday, 23rd of February, 1892.

PRINTED FOR THE ASSOCIATION

BY

C. BLACKETT ROBINSON, 5 JORDAN STREET,
TORONTO.

NOTICES.

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

Each member is requested to add to his business card the following: "*Member of the Association of Provincial Land Surveyors of Ontario.*"

Members can be supplied with copies of the Proceedings for 1887, 1888, 1889 or 1890 by remitting fifty cents to the Secretary.

Copies of the Constitution will be sent upon receipt of three cent stamp.

PATRONIZE OUR ADVERTISERS.

PREFACE.

To the Members of the Association of Provincial Land Surveyors of Ontario :

THE Proceedings of the Association at its Sixth Annual Meeting are herewith presented.

The registered attendance at this meeting was in advance of that of last year, and great interest was taken in the subjects under discussion.

Prominent among the matters brought before the meeting were "Affiliation with the Association of Dominion Land Surveyors," and "Incorporation of the Provincial Land Surveyors of Ontario." A very satisfactory arrangement was reached in the Affiliation question, and definite steps were taken on the subject of Incorporation.

A careful perusal of the Papers and discussions will be attended with much interest.

A number of new members have recently joined our ranks, and it is specially requested that all members will endeavour to impress non-members with the importance of the benefits to be derived from connection with the Association.

Respectfully submitted on behalf of the Executive Committee.

A. J. VANNOSTRAND,
Secretary.

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ASSOCIATION OF

PROVINCIAL LAND SURVEYORS

OF ONTARIO.

ORGANIZED 23RD FEBRUARY, 1886.

Officers for 1891-92.

PRESIDENT.

Villiers Sankey, P.L.S., Toronto.

VICE-PRESIDENT.

Elihu Stewart, P.L.S., Collingwood.

SECRETARY-TREASURER.

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

COUNCILLORS.

M. J. Butler, P.L.S., Napanee.
H. B. Proudfoot, P.L.S., Toronto.
M. Gaviller, P.L.S., Barrie.

BANKERS.

Imperial Bank of Canada.

STANDING COMMITTEES.

LAND SURVEYING.— A. Niven (Chairman), H. J. Browne, Thos. Fawcett, M. Gaviller, P. S. Gibson, C. F. Miles, L. B. Stewart.

DRAINAGE.—J. C. Macnabb (Chairman), Lewis Bolton, A. G. Cavana, J. Robertson, B. J. Saunders, C. F. Miles, M. Gaviller, D. S. Campbell.

ENGINEERING.—G. B. Abrey (Chairman), C. F. Aylsworth, T. O. Bolger, H. D. Ellis, J. Galbraith, T. H. Jones, R. S. Sherman, James Warren, H. J. Bowman, H. K. Wicksteed.

LEGISLATION.—W. R. Aylsworth (Chairman), O. J. Klotz, A. Niven, J. Dickson, G. B. Kirkpatrick, Willis Chipman, C. Unwin, W. Ogilvie, Jos. Cozens.

ENTERTAINMENT.—F. L. Foster (Chairman), Chas. Murphy, H. D. Ellis, G. B. Abrey, T. B. Speight, H. B. Proudfoot, W. A. Browne.

PUBLICATION.—John McAree (Chairman), H. L. Esten, H. J. Browne, F. L. Foster, Willis Chipman.

INSTRUMENTS.—W. Ogilvie (Chairman), W. S. Drewery, Thos. Fawcett, F. L. Blake, W. A. Browne.

PROGRAMME OF THE

ASSOCIATION OF PROVINCIAL LAND SURVEYORS OF ONTARIO

AT ITS SIXTH ANNUAL MEETING HELD IN TORONTO,
MARCH 10TH, 11TH AND 12TH, 1891.

PROGRAMME.

Tuesday, March 10th—Morning, 9.30 o'clock.

Meeting of Executive Committee.
Meeting of Standing Committees.
Reading of Minutes of Previous Meeting.
Reading of Correspondence.
Report of Secretary-Treasurer.
Appointment of Auditors.

Afternoon, 2 o'clock.

President's Address.

Report of Committee on Land Surveying and Question Drawer, Land Surveying and Legislation.

Paper—"Practical Working of the Ditches and Watercourses Act," R. Coad, P.L.S., Glencoe, Ont.

Paper—"Difficulties in the Survey Act," P. S. Gibson, P. L. S., Willowdale, Ont.

Paper—"Reminiscences of a Canadian Land Surveyor," Jos. Kirk, P.L.S., Stratford, Ont.

Announcements by Committee on Entertainment, F. L. Foster, P.L.S., Chairman, Toronto, Ont.

Evening, 7.30 o'clock.

Paper—"Crown Surveys," James Dickson, P.L.S., Fenelon Falls, Ont.

Paper—"Compass Lines," John McAree, D.T.S., Toronto, Ont.

Paper—"Bridge Abutments and Foundations," James Warren, P.L.S., Kincardine, Ont.

Paper—"Railway Location," H. K. Wicksteed, P.L.S., Brantford, Ont.

Wednesday, March 11th—Morning, 9.30 o'clock.

Report of Executive Committee on Incorporation.

Paper—"Incorporation," J. P. B. Casgrain, P.L.S., Montreal, Que.

Paper—"Micrometer Measurements," H. B. Proudfoot, P.L.S., Toronto, Ont.

Discussion of "Boundary Commissioners Scheme."

Afternoon, 2 o'clock.

Discussion on Affiliation with Association of Dominion Land Surveyors.

Paper—"Does the Passing of an Act of Parliament always do justice?" A. Niven, P.L.S., Haliburton, Ont.

Paper—"Country Practice," C. Fraser Aylsworth, P. L. S., Madoc, Ont.

Visit to School of Practical Science and Observatory.

Evening.

Annual Dinner at Walker House.

Thursday, March 12th—Morning, 9.30 o'clock.

Paper—"Descriptions," M. Gaviller, P.L.S., Barrie, Ont.

Paper—"The Reclaimed Lands of Kent County," J. C. Macnabb, P.L.S., Chatham, Ont.

Paper—F. L. Blake, P.L.S., Meteorological Office, Toronto, Ont.

Paper—"The Kincardine Water Works," H. J. Bowman, P.L.S., Berlin, Ont.

Question Drawer—"Drainage."

Report of Committee on Drainage, James Robertson, P.L.S., Chairman, Glencoe, Ont.

Afternoon, 2 o'clock.

Report of Committee on Engineering, Willis Chipman, B.A.Sc., Chairman, Toronto, Ont.

Report of Committee on Legislation, W. R. Aylsworth, P.L.S., Chairman, Deseronto, Ont.

Report of Committee on Publication, John McAree, D.T.S., Chairman, Toronto, Ont.

Report of Committee on Instruments, J. W. Tyrrell, P.L.S., Chairman, Hamilton, Ont.

Report of Committee on Entertainment, F. L. Foster, P.L.S., Chairman, Toronto, Ont.

Unfinished Business.

Election of Associate Members, Junior Members, and Honorary Members.

Nomination of Officers.

Appointment of Scrutineers—Ballot of 1891.

New Business.

Adjournment.

Full discussion after each Paper and each Report.

ASSOCIATION OF
PROVINCIAL LAND SURVEYORS
OF ONTARIO.

MINUTES OF THE SIXTH ANNUAL MEETING,

MARCH 10TH, 11TH AND 12TH, 1891.

The Association met at 11 a.m., on March 10th, in the Library of the Canadian Institute, 58 Richmond Street East, Toronto.

The Association was called to order by the President, Villiers Sankey, Esq.

Moved by A. J. VanNostrand, seconded by Willis Chipman: That the minutes of last meeting, as printed in the Proceedings, be confirmed as read. Carried.

The Secretary-Treasurer, Mr. VanNostrand, then presented his Annual Report.

Moved by A. J. VanNostrand, seconded by A. Niven: That the Report of the Secretary-Treasurer be received and adopted, and that the financial statement be received and referred to the Auditors for their report. Carried.

Moved by Mr. Dickson, seconded by Mr. Gaviller: That Messrs. Aylsworth and Fawcett be the Auditors for the current year. Carried.

The meeting then adjourned.

AFTERNOON SESSION, 2 P.M.

The President in the Chair.

The President read the correspondence received with reference to affiliation with the Association of Dominion Land Surveyors and also the proposed scheme of affiliation.

The President then read his annual address.

Moved by Mr. Aylsworth, seconded by Mr. Niven: That the thanks of the Association are due and are hereby tendered to the President for his address. Carried.

The report of the Committee on Land Surveying was then presented by the Chairman of the Committee, Mr. Niven, which, after discussion, on motion of Mr. Niven, seconded by Mr. Dickson, was received and adopted.

Mr. Kirk's paper on "Reminiscences of a Canadian Land Surveyor" was read by the Secretary, owing to the absence through illness of the author.

Moved by Mr. Niven, seconded by Mr. Speight: That Mr. Kirk's paper be received, and the thanks of the Association be tendered to him. Carried.

Mr. Jas. Warren then read his paper on "Bridge Abutments and Foundations," which, after discussion, was received and the thanks of the Association tendered to him.

Mr. Gaviller read his paper on "Descriptions."

Moved by Mr. Niven, seconded by Mr. Abrey, that the paper by Mr. Gaviller be received, and that the thanks of the Association be tendered to him. Carried.

The meeting adjourned at 5 o'clock p.m.

Evening Session, 7.30 p.m.

The President in the Chair.

Mr. Jas. Dickson read his paper on "Crown Surveys."

Moved by Mr. Gaviller, seconded by Mr. Miles: That Mr. Dickson's paper be adopted, and the thanks of the Association be tendered to him. Carried.

Mr. Foster, Chairman of the Entertainment Committee, then announced that the annual dinner would take place at the Walker House, on Wednesday evening, at 7.45.

The meeting adjourned at 9.45 p.m.

WEDNESDAY MORNING SESSION, 9.30 A.M.

The Vice-President, Mr. E. Stewart, in the Chair.

Mr. Coad read his paper on "Practical Working of the Ditches and Watercourses Act."

Moved by Mr. Gaviller, seconded by Mr. W. R. Aylsworth: That the paper of Mr. Coad on "Practical Working of the Ditches and Watercourses Act" be received and adopted, and that a vote of thanks be tendered Mr. Coad. Carried.

Mr. J. P. B. Casgrain then addressed the meeting with reference to Incorporation.

Mr. Butler read Mr. Wicksteed's paper on "Railway Location" in the absence of the writer.

Moved by O. McKay, seconded by Willis Chipman: That the paper of H. K. Wicksteed be accepted and printed in the Proceedings, and that the thanks of the Association be tendered him for his excellent paper. Carried.

The meeting adjourned at 12.45 p.m.

Afternoon Session, 2 p.m.

The President in the Chair.

Mr. Dennis, President of Association of Dominion Land Surveyors, and other members of the deputation, then addressed the meeting on the subject of Affiliation of the two Associations.

Moved by Willis Chipman, seconded by James Dickson: That the matter of Affiliation be referred to a Special Committee, composed of the President, the Secretary, Messrs. P. S. Gibson, A. Niven, M. J. Butler, F. L. Foster and E. Stewart, to confer with the deputation from the Dominion Association and report to-morrow (Thursday) morning. Carried.

The discussion *re* Incorporation was then continued.

Moved by W. R. Aylsworth, seconded by James Dickson: That it is desirable to have the Provincial Land Surveyors of the Province of Ontario incorporated as a body corporate and politic, and that this Association take steps to have an Act therefor prepared and passed with as little delay as practicable. Carried.

Moved by James Dickson, seconded by H. D. Ellis: That the following be a Committee to wait upon the Attorney General and the Commissioner of Crown Lands, and ascertain their views on Incorporation, and that this Committee draft a Bill for Incorporation, a copy of such draft to be sent to each of the members of the Profession now practising: Messrs. Stewart, Gibson, Sankey, VanNostrand, Chipman, Niven, Kirkpatrick, Unwin, Dickson, Butler, Aylsworth, Passmore, Klotz, Webb, Casgrain, T. O. Bolger. Five to form a quorum. Carried.

Moved by Mr. Gaviller, seconded by Mr. Dickson: That a vote of thanks be tendered to Mr. Casgrain for the trouble he has taken in the matter of Incorporation, and for the very clear manner in which he has presented the subject. Carried.

Moved by A. J. VanNostrand, seconded by J. Dickson: That the Committee on Incorporation be empowered to retain a lawyer for the purpose of drafting a Bill of Incorporation and seeing it through the Legislature. Carried.

The meeting adjourned at 4.20 p.m. for the purpose of visiting the School of Science and Observatory.

THURSDAY MORNING SESSION.

The President in the Chair.

Mr. J. C. Macnabb read his paper on "Reclaimed Lands in Kent County."

Moved by Mr. Aylsworth, seconded by Mr. E. Stewart: That the paper by Mr. Macnabb be received and printed in the Proceedings, and the thanks of the Association be tendered to him. Carried.

Mr. P. S. Gibson then read his paper on "Difficulties in the Survey Act."

Moved by Mr. Butler, seconded by Mr. Speight: That Mr. Gibson's paper be accepted, and that the thanks of the Association be tendered him. Carried.

The Auditors' Report was then read by Mr. Aylsworth.

Moved by Mr. Aylsworth, seconded by Mr. Butler: That the report of the Auditors be received and adopted. Carried.

The meeting adjourned at 12.45 p.m.

AFTERNOON SESSION, 2 P.M.

The President in the Chair.

Mr. H. J. Bowman read his paper on "Kincardine Water Works."

Moved by E. Stewart, seconded by M. J. Butler: That the paper read by Mr. H. J. Bowman be received, and that a vote of thanks be tendered him. Carried.

An invitation was received from the Royal Canadian Academy of Arts.

Moved by E. Stewart, seconded by A. J. VanNostrand: That the invitation of the President and Council of the Royal Canadian Academy of Arts be received, and that the thanks of this Association are due for the same. Carried.

The President then read the Rules and Regulations *re* Affiliation with Association of Dominion Land Surveyors as prepared and submitted by the Committee appointed for that purpose.

Moved by Mr. Gibson, seconded by Mr. Dickson: That this scheme of Affiliation be adopted. Carried.

Moved by Mr. Aylsworth, seconded by Mr. Niven: That this Association hereby instruct the Executive Committee to appoint five delegates as per Rules and Regulations for Affiliation as adopted. Carried.

Mr. Dennis, President of Association of Dominion Land Surveyors, addressed the meeting, and returned thanks for himself and deputation for the cordial manner in which they had been received. Mr. Sankey, President of the Provincial Land Surveyors' Association, replied on behalf of this Association.

Moved by Mr. Coad, seconded by Mr. Macnabb: That the report of the Committee on Drainage, also the Question Drawer and answers, be taken as read and printed. Carried.

The Report of the Committee on Engineering was then read by the Chairman, Mr. Chipman.

Moved by Mr. Gibson, seconded by Mr. Butler: That the Report of the Committee on Engineering be adopted. Carried.

The following verbal report by Mr. Aylsworth, of the Committee on Legislation, was received and adopted: The Committee, having no matters yet matured ready for legislation, have no report to make.

The report of the Committee on Publication was read by the Chairman, Mr. McAree.

Moved by Mr. McAree, seconded by Mr. Niven: That the report of the Committee on Publication be adopted. Carried.

Moved by F. L. Foster, seconded by A. J. VanNostrand: That the report of the Committee on Entertainment be taken as read and printed in the Proceedings. Carried.

The question of Registrars' fees being taken up, it was moved by Mr. Stewart, seconded by Mr. Dickson: That the matter of Registrars' fees be referred to the Committee on Legislation. Carried.

Moved by A. Niven, seconded by A. J. VanNostrand: That the paper on "Country Practice" by Mr. C. F. Aylsworth be taken as read and printed in the Proceedings, and that the thanks of the Association be tendered Mr. Aylsworth. Carried.

New business was then taken up, Mr. Gibson speaking as follows: With reference to our School of Practical Science, my impression is that a Provincial Land Surveyor should be allowed to enter the School of Science without taking the matriculation examination.

The following resolution was then carried:—

Moved by P. S. Gibson, seconded by T. B. Speight: Resolved, that, in the opinion of this Association, any person holding a certificate as a Provincial Land Surveyor should be entitled to be admitted to the School of Practical Science without being required to pass a matriculation examination, and that a copy of this resolution be forwarded to the authorities of the University by the Secretary of this Association.

The President then read a letter from Mr. L. B. Stewart, of the School of Practical Science, giving a list of books required to prepare for examination for Provincial Land Surveyor.

Moved by A. J. VanNostrand, seconded by H. J. Bowman: That any omissions or clerical errors in the record of proceedings of this meeting now in the hands of the stenographer and Secretary be corrected by the Committee on Publication before being printed. Carried.

The following report of the Executive Committee with regard to the compass and chain sent in by Mr. Currie was then read by the President:—

Your Committee beg leave to report as follows: That said compass and chain be purchased by this Association for the sum of ten dollars and to remain the property of this Association. That the Secretary be instructed to inquire if the Toronto School of Science would take charge of same as a curio for exhibition.

Signed, E. STEWART.
M. GAVILLER.

The report was adopted.

An adjournment for five minutes was made at 4 o'clock, after which the nomination and election of officers for the ensuing year took place.

NOMINATION AND ELECTION OF OFFICERS.

Moved by Mr. Aylsworth, seconded by Mr. Gibson: That the President and Vice-President be re-elected by acclamation. Carried.

The President—I may say I did not suppose that you were going to elect me for a second term, although it is true that the two previous Presidents have held the office for two years consecutively. I don't believe monopoly will do the Association any good, and I think it may do it harm. At the same time, personally, I am satisfied to do whatever is going to advance the interests of the Association, otherwise I should have very great reluctance, indeed, in standing in anybody else's way. But I shall defer to the wishes of the Association and accept it again for another year, tendering you my sincere thanks for the honour you have conferred on me for the second time, and also for the very hearty way in which the Association Committees have stood by me, or rather have stood by the Association and by each other. I thank you very sincerely.

Moved by Mr. Gibson, seconded by Mr. Aylsworth: That the Secretary-Treasurer, Mr. VanNostrand, be re-elected for the ensuing year. Carried.

Mr. VanNostrand—I thank you, gentlemen, for this mark of confidence in returning me to the office.

The following were then nominated for Councillors: Messrs. Proudfoot, Gaviller, Jones, Dickson, H. J. Bowman, M. J. Butler, Ellis, Unwin, Gibson, Macnabb, Speight, Aylsworth.

Messrs. Gibson and Speight afterwards withdrew their names.

Mr. Aylsworth nominated Messrs. Speight and Foster as scrutineers. Carried.

VOTES OF THANKS.

Moved by Mr. Aylsworth, seconded by Mr. Niven: That the Secretary be paid the usual fee of $40 for his services, and that the thanks of the Association be tendered to Mr. VanNostrand for the attention he has given to the business of the Association. Carried.

Moved by C. F. Miles, seconded by A. Niven: That the thanks of the Association be tendered to Professor Galbraith for the interest he has taken in the Association, and for his kindness in conducting the members of the Association through the School of Science yesterday; also that the thanks of the Association be given to Prof. Carpmael for his kindness in showing the members through the Observatory. Carried.

Moved by Mr. Macnabb, seconded by Mr. Miles: That the thanks of this Association be given to Mr. Robertson for his services as Chairman of the Committee on Drainage. The report contains the valuable results of much trouble in collection. Carried.

Mr. Dickson—I move that the President do now leave the Chair and that Mr. Gibson take it. Carried.

Moved by Mr. Dickson, seconded by Mr. Niven: That a hearty vote of thanks be tendered the President, Mr. Sankey, for the very able manner in which he has performed the duties of the Presidency for the last year. Carried.

The meeting was then declared closed. 4.30 p.m.

MEMBERS IN ATTENDANCE AT SIXTH ANNUAL MEETING.

Abrey, Geo. B.
Aylsworth, Wm. R.
Butler, M. J.
Bolton, Lewis.
Bowman, H. J.
Browne, H. J.
Browne, W. A.
Casgrain, J. P. B.
Cavana, A. G.
Chipman, Willis.
Coad, R.
Dickson, James.
Drewry, W. S.
Ellis, H. D.
Esten, H. L.
Fawcett, Thos.
Foster, F. L.
Galbraith, John.
Gaviller, M.
Gibson, P. S.
Kirkpatrick, G. B.
Klotz, O. J.
Laird, R.
Lumsden, H. D.
McAree, John.
McCulloch, A. L.
McKay, Owen.
Macnabb, J. C.
Miles, C. F.
Murphy, C. J.
Niven, Alex.
Ogilvie, Wm.
Proudfoot, H. B.
Ross, Geo.
Sankey, Villiers.
Speight, T. B.
Stewart, E.
Stewart, L. B.
Tyrrell, J. W.
Unwin, Chas.
VanNostrand A. J.
Warren, Jas.
Wheelock, C. R.

RESULT OF ELECTIONS.

President .....Villiers Sankey.....(by acclamation).
Vice-President.....Elihu Stewart.....(by acclamation).
Secretary-Treasurer .....A. J. VanNostrand .....(by acclamation).

Councillors.—M. J Butler, H. B. Proudfoot, M. Gaviller.

I declare the above named Councillors elected.

A. J. VANNOSTRAND,
Secretary-Treasurer.

Certified correct.

(Signed) F. L. FOSTER,
T. B. SPEIGHT,
Scrutineers of Ballots.

REPORT OF SECRETARY-TREASURER.

MR. PRESIDENT,—The following report is herewith submitted as the business of the Association from February 25th, 1890, to March 10th, 1891:—

The number of paid-up members on the roll is the same as at the commencement of our last annual meeting, but a number of others are in arrears for only the past year, so that, on the whole, our membership may be considered slightly in advance of that of 1889–90.

We have lost, by death, one active member during the year—Mr. Hugh Wilson, of Mount Forest—one of the oldest land surveyors in the Province and a member of this Association ever since its organization.

A full meeting of the Executive Committee was held in Toronto on April 12th, 1890, in order to strike the Standing Committees and make necessary arrangements respecting the publication of the report of proceedings of the Fifth Annual Meeting.

A meeting of the Executive and Standing Committees was held in Toronto on December 23rd, for the purpose of transacting the business of committees for the current year. It was then arranged that a circular should be issued by the Executive Committee to collect a list of cases of the classes which the proposed Boundary Commissioners' Act would have benefited. As a result of this circular we have the names and particulars of quite a number of cases of that description.

The following circulars have been issued by the direction of the Executive Committee during the past year:—

No. 26—Ballot for Officers for 1890-91.
No. 27—Explanation respecting Ballot.

No. 28—Respecting Advertisements in 1890 Proceedings.
No. 29—Requesting Papers for Sixth Annual Meeting.
No. 30—To Collect Statistics of Recent Drainage Works.
No. 31—To Collect Information for Boundary Commissioners' Scheme.
No. 32—Requesting Contributions for Question Drawer.
No. 33—Notifying Members of Adjournment of Sixth Annual Meeting.
No. 34—Programme for Sixth Annual Meeting.

Correspondence was entered into with the officers of a number of incorporated professions and copies of their several Acts of Incorporation with suggestions from the originators in order to facilitate the framing of the draft of an Act of Incorporation of this Association.

The railway companies were applied to for reduced rates to members attending this meeting, but it was found that the number of members required in order to obtain a reduction was much in excess of our usual attendance of members travelling by rail.

Accompanying this report is a statement of the financial transactions of the Association from February 25th, 1890, to March 10th, 1891.

All of which is respectfully submitted.

A. J. VANNOSTRAND,
Secretary-Treasurer.

STATEMENT OF RECEIPTS AND EXPENDITURES OF THE ASSOCIATION OF PROVINCIAL LAND SURVEYORS OF ONTARIO FROM FEBRUARY 25TH, 1890, TO MARCH 10TH, 1891.

1890.	RECEIPTS.		
To Balance on hand 20th February, 1890			$25 00
" Fees, 1 Active Member for 1887, at $3		$3 00	
" " 2 Active Members for 1888, at $3		6 00	
" " 10 Active Members for 1889, at $3		30 00	
" " 92 Active Members for 1890, at $3		276 00	
			315 00
" Advertisements for 1890			65 50
" Proceedings sold, 2 copies, at 50 cts			1 00
Total			$406 50

1890.	EXPENDITURES.	
By Postage		$20 35
" Stationery and Printing Circulars, etc		14 10
" Printing Proceedings and Engraving for same		178 15
" Express, Cartage, Packing, etc., in exchanges		20 15
" Duties paid		8 60
" Rental of Rooms for Fifth Annual Meeting		12 00
" Amount granted Stenographer for Fifth Annual Meeting.		35 00
" Amount granted Secretary-Treasurer for 1889-90		40 00
" Balance		78 15
Total		$406 50

1891.	RECEIPTS.		
To Balance from 1890			$78 15
" Fees, 4 Active Members for 1890, at $3		$12 00	
" " 3 Active Members for 1891, at $3		9 00	
			21 00
" Advertisements for 1890			13 00
Total			$112 15

1891.	EXPENDITURES.		
By Postage			$4 00
" Printing Circulars Nos. 31, 32 and 33		$7 00	
" Printing Circulars Nos. 29, 30 and 34		11 75	
			18 75
" Balance			89 40
Total			$112 15

A. J. VANNOSTRAND,
Secretary-Treasurer.

March 10th, 1891.

REPORT OF AUDITORS.

We hereby certify that having examined the above accounts of Receipts and Expenditures, together with the vouchers therefor, we find the same to be correct.

W. R. AYLSWORTH,
THOS. FAWCETT,
Auditors.

March 11th, 1891.

REPORT OF COMMITTEE ON LAND SURVEYING.

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

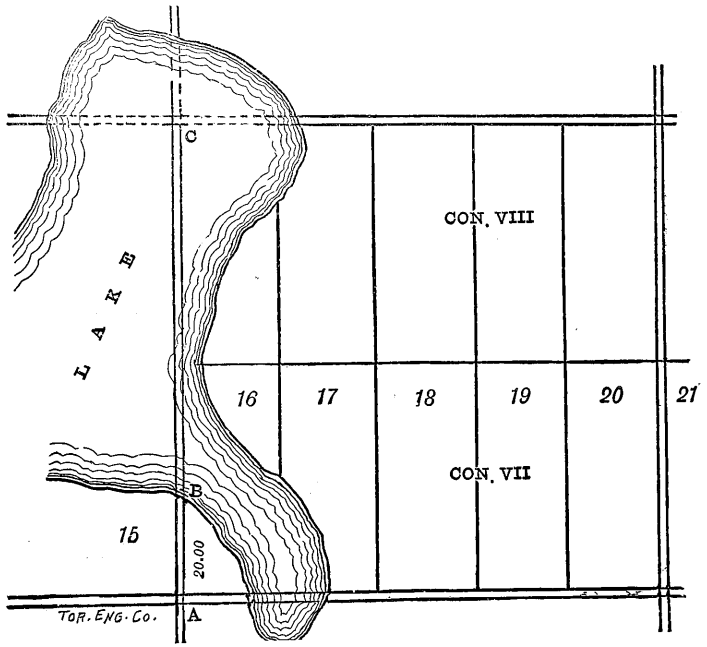
1. Several questions in surveying have been referred to your Committee, which questions and the answers are annexed hereto.

2. Your Committee would suggest that members, in submitting questions as to surveys in townships, should state the name of township, as this would enable your Committee to examine instructions under which such surveys were made and assist them in coming to a proper conclusion.

3. Your Committee would impress upon the Legislative Committee the importance of taking some steps for the amendment of the Surveyors' Act regarding village surveys, and the plans for registration in connection therewith, and also that the matter of the revision of the Ditches and Watercourses Act be attended to.

Respectfully submitted.

A. NIVEN,
Chairman.



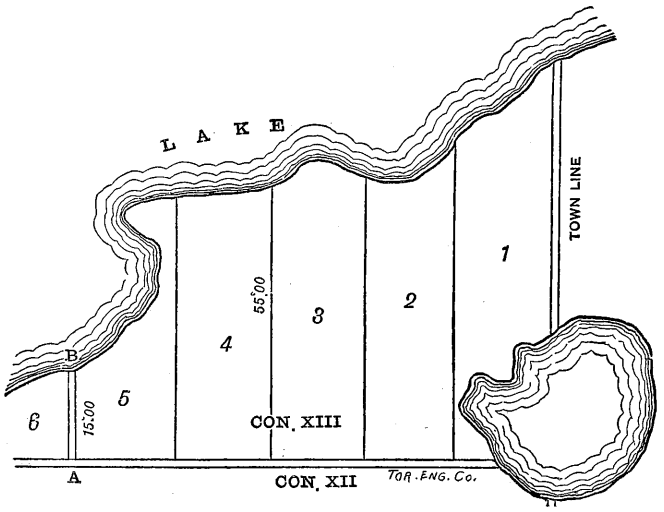
Question 1.—The bearing of A B is found to be N. 20° 10′ W. C is found by measuring along concession line on ice, and the bearing of a straight line A C is found to be N. 21° 15′ W. The bearing of this side-road in original plan is N. 20° 51′ 40″ W.

On what course should line between lots 18 and 19 be run ?

Answer.—See Section 52 Surveyors' Act.

Question 2.—There is an original post at A, and the bearing of A B can be satisfactorily obtained as the blazed line is visible. The distance from A to B is 15.00. The bearing of A B is found to be N. 20° 20′ W., and the bearing shown on original plan is N. 20° 51′ 40″ W.

On what course should line between lots 3 and 4 be run?



Answer.—In this case the base line is the town line, not A B. For bearing see Section 52 Surveyors' Act.

Question 3.—In a township, part of which is an island, the west or governing line was not located, being in a lake; but at the time of the original survey the line between lots 1 and 2 was run and marked through the concession to the proper depth thereof, and measurements made from it for the parts in the other concession. The line between lots 9 and 10 on the east side of the island was run through said concession and properly marked, but neither of these lines was mentioned in the notes of the original survey. The east boundary of the township was run originally and is on dry ground. The east and west sides of the township are intended to be parallel and on the same bearing, as also are the lines between the lots that were run as mentioned above.

In this case must the east boundary be taken as the governing line and the others between lots ignored? This is a single front township.

Answer.—If no governing side roads run and shown in field notes, east boundary must govern.

Question 4.—On the north boundary of a township, bounded by a lake, posts were planted at the time of the original survey to show the limits of the lots. Some of these posts are still in existence, and lines were run from them to the south. Several years after the posts on the lake shore were planted, a new base line was run by the Government 1¼ miles back from the lake and posts planted on it, and lines run from the posts so put down to the lake, but which did not meet the posts at the lake shore, jogs of several rods occurring.

Is this to be treated as a double front concession ?

QUESTION RE WIDTH OF ROADS.

"No Council shall lay out any road or street more than 100 feet nor less than 66 feet in width, except where an existing road or street is widened, nor unless with the permission of the council of the county in which the municipality is situate, but any road, when altered, may be of the same width as formerly, and no highway or street shall be laid out by any owner of land of a less width than 66 feet without the consent of the municipality." (Section 545 of Municipal Act.)

Question 5.—Is there anything in above section to prevent a town council paying money to an owner of land in consideration of his laying out a *forty foot* street through his property and registering a plan thereof with resolution of town council attached consenting thereto. If not, what is the use of the first part of the above section where it requires permission from county council where town council lays out street less than 66 feet in width ?

Answer.—In case of the town being connected with the county, and town council wishing to lay out a street less than 66 feet wide, they must get consent of county council.

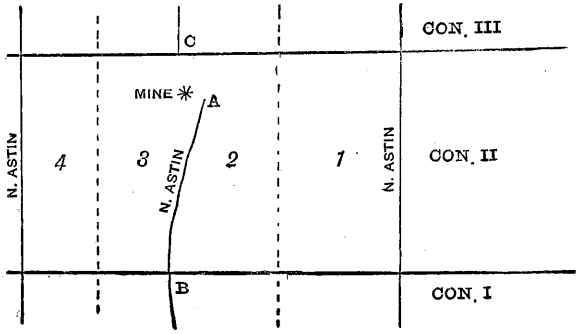
Question 6.—Suppose a proprietor or owner of a property in lands and that he has occasion to be absent perhaps out of the country, having been placed in circumstances that make it impossible for him to return for over ten years, and naturally feeling in his own mind during this time that his title to his own property is all right :

But in the mean time another person takes possession of the whole or a part of the said property, makes a fence around it, and has quiet and peaceable possession and occupation of it for over ten years :

Query.—Does that give him a clear title to the said property that he has thus taken possession of without leave or liberty ?

Question 7.—Line A B surveyed as shown on sketch. Mine located at *. C A B shown on notes as having been run all way through the concession and bearing given as North Asty.

Required.—On which lot is the mine located, the line not having been surveyed on the ground between A and C and only having been surveyed on the ground between A and B ?



DISCUSSION.

Question 1.

Mr. Dickson—I think the law is so plain that there is no necessity of taking up time in discussing it.

Question 2.

No discussion.

Question 3.

Mr. Aylsworth—I don't know that your answer gives any more light than the question. I think you read that the line between one and two or thereabouts was actually run on the ground but was not mentioned in the field notes. I am inclined to think that where there are lines run on the ground, although a man was not instructed to do it if he did do it and parked them out and it can be proven that they are lines, that we have no right to ignore them, and I am not so clear as the Committee appears to be that the east boundary in that case should be taken.

Mr. Dickson—Was the surveyor instructed to run those lines ?

Mr. Niven—The question does not give us the information.

Mr. Dickson—I don't think any lines should govern in any township unless they are instructed to be run.

Mr. Gaviller—If he had been instructed to run them and did not show them in his field notes would not his field notes have been returned by he Crown Lands Department for correction ?

Mr. Kirkpatrick—There is the township of Smith—I don't know whether that is the township to which that refers or not—but it is one the sides of which are broken by lakes and rivers. Now, that was run about 1821 or 1822. I had a case the other day where they were asking for the field notes, and I find that when the surveyor came to the river Otonabee he then struck through the concessions and ran one of the side lines giving the field notes on it, and as soon as he got up there he commenced to run the other concession, but as far as I can find out he was not told to do that in his instructions; he ran them merely for his own convenience. I don't think myself that the bearing of that side-line would prevail by which the others should be run. The Act provides how concessions broken on both ends should be run. I should suppose that line would of course hold for that particular line, but I am not at all sure in my mind that it would act as a governing line, because it says expressly how certain lines shall be run. Then take the township of Scugog; there is a great deal of trouble there very often. It was run out originally, but it has been flooded since and has become an island. The original plan gives the bearings, and the posts are there no doubt, but the trouble is there is about ten feet of water on them. I should be inclined to think that that line would only govern its own line, not the rest of the township. We assume that the instructions are on record, and there was nothing said as to running these proof lines. Of course if he is instructed to run these proof lines then they will be all right; but we must assume, although he does not say so, that the instructions make no mention of these proof lines and they were probably run for his own convenience.

Mr. Niven—This is the view that the Committee took, that they were ordered to be run and if run were not returned, consequently we cannot accept them as governing.

Question 4.

Mr. Dickson—The township of Somerville, in the county of Victoria, was surveyed a good many years ago, and by the original survey the lots were bounded on the river shore. I think the original survey was made in 1835 or thereabouts, and somewhere about 1856 or 1857 there was a re-survey of the township made by Mr. Reid, of Peterboro', and in his report he said that he found a number of the posts on the river shore had been washed away. I have, and I know that all the surveyors have, treated that as double fronted concession.

Mr. Aylsworth—I don't think that it makes it a double fronted concession; I think it is simply a matter of possession by these posts along the lake. But there is hardly enough information given for the Committee or for us to find upon, because we don't know under what authority the posts were planted along the lake.

Mr. Niven—How far would you run down from post to post to get the centre of the double fronted concession in a case of the kind Mr.

Dickson mentioned. The dividing lines between the upper and lower halves of the concession would not be straight lines.

Mr. Dickson—Divide the centre between post and post.

The President—That would depend somewhat on the way the lots were patented, I presume.

Mr. Ross—I think it would be likely that the lots were patented and sold from the lake at first. I know in the case of Wainfleet the posts were planted along the Welland river.

Mr. Kirkpatrick—In that case in Somerville I think it was Mr. Keating ran out the front concession along the river and planted posts eleven chains eleven links, I think, every post. Then Mr. Reid in surveying the township afterwards, I don't think he did it under instructions, but he reported that he could not find all the posts planted along the lake shore on account of them being washed away, and he found that it would be much handier if he planted them on the rear line at the same distance, and he did plant them apparently in his field notes the same distance exactly as they were planted on the other. His idea was that he was planting them to take the position of the original posts, but I hardly think these posts should govern, because I remember thinking at the time that there were no instructions given to him to plant these posts; the original posts were there and they were the posts by which the lots were settled and sold. I don't think the Government by the mere act of the Department giving instructions to plant those posts could override what the parties had originally bought. I don't think those posts would hold as against the original ones.

Mr. Dickson—That is the posts in the rear?

Mr. Kirkpatrick—Yes; because Mr. Reid gave it as his candid opinion that he thought they were less likely to be washed away, and his whole idea was that he was merely supplementing, making it easy to find the original posts. I don't know, however, of any case decided in the courts about it.

Mr. Dickson—The great difficulty to settle was, the first settlers of the township settled along the river shore, and went by these posts. Then afterwards a number came in and took possession of the rear half of the lots and they went by the rear posts, and they thoroughly believed that those posts should govern. I remember reading Mr. Reid's report, and the interpretation put upon it by Mr. Kirkpatrick is exactly the same as I put upon it.

Mr. Aylsworth—It appears to me from the information that that would be a case where special legislation would be required to establish those lines. I doubt very much, even if that rear line were run and posted under instructions from the Crown Lands Department, whether it would supersede or override the posts and marks along the front that were planted before the patents were issued. In the Township of Hungerford, in the County of Hastings, a difficulty arose. I

think it was the front of the first four concessions were run out, and a single row of posts planted on the blazed line. Then the work ceased. After a while another surveyor was sent on, and he began between the 5th and 6th and ran a line and planted both sides of it. The question came up, was the 5th a double fronted concession? After many suits it was finally held that that was a double fronted concession, the line between 5th and 6th having been run under due authority and posts planted; that we had to respect those posts and draw the lines half way through the concession.

Question 5.

Mr. Ellis—How is it that if it is a town it has not got a town council? What would the county council have to do with a town supposing it was properly incorporated?

Mr. Niven—That is the case all over Ontario. The town of Lindsay sends representatives to the county council, and on the other hand St. Mary's is a separate institution.

Mr. Aylsworth—A town, if it chooses, may after it becomes a town separate from the county for municipal purposes.

The President—A similar case to the one mentioned occurred here in the town of Parkdale. The question arose as to whether the municipal council of Parkdale could open a street of their own wish less than sixty-six feet wide without permission from the county council, and it was finally decided that they had to get that permission. The only point as far as I know at present undecided is this, should the by-law of the council of the minor municipality be ratified by the by-law of the county council. Undoubtedly a private individual goes to the nearest municipality—that is the minor municipality—and asks their permission to open a road of less width than sixty-six feet. Under the new Registry Act he cannot register his plan without having that permission endorsed on the plan. There are a great many cases in point where, if a township wishes to close road allowances and dispose of them, and the proper formalities having been gone through, you will find, as a rule, that lawyers will advise the matter to be brought before the county council and a ratifying by-law passed. Clearly the minor municipality has the right to grant the privilege to a private individual, but I think they cannot exercise that power themselves without getting the permission of the senior municipality.

Mr. Aylsworth—There is nothing in the Municipal Act requiring this sanction to the individual of the minor municipality to be brought before the county council.

Question 6.

Mr. Aylsworth—There are a good many exceptions, as you are aware, in respect to getting a title by possession in the period of ten years, and I am very strongly of the opinion that it is necessary for the

owner to know, before the time of the possession begins to run against him, that they are in possession. I don't believe that without that knowledge, or a reasonable chance for him to get it, the possession holds against him.

Mr. Esten—Unless he had it for forty years. I find a case on that very point: if the owner did not know that he was in possession unless he had it for forty years ten years would not go for anything at all.

The President—How would it be in the case of land being owned by a minor?

Mr. Aylsworth—Then it does not commence to run until he can assert his rights. But I don't think it is a proper question to discuss here; it ought to have gone to Ogoode Hall.

The President—Mr. Esten, will you give us just sufficient data of that case to state in our proceedings? It might be a good precedent.

Mr. Esten—I shall be most happy to; I have the case. A petitioner, claiming by length of possession against the patentee of the crown, failed to show that the patentee or his heir had any knowledge of such possession. It was held that he must show possession for forty years, or such knowledge.—*Re* Linet, 3 Chy. Cham. 230—Taylor, Referee.

Question 7.

No discussion.

REPORT OF DRAINAGE COMMITTEE.

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

We have not been together since our last annual meeting, although a meeting of all standing committees was called by the Executive at the Crown Lands Department, Toronto, for Tuesday, the 23rd day of December, 1890. There was only one member of our committee present.

Although not together, we have had some correspondence among ourselves, but not much has been done except attempting to carry out a suggestion put forth by the Drainage Committee of last year—"To try and gather some statistics as to the amount of drainage work being done in Ontario"—and in this attempt, we regret to say, we have been only partially successful; however, the results which we give further on may not be uninteresting to those who are engaged in this branch of the profession.

As this was only an experiment, we did not attempt to cover the whole Province but such parts as in our opinion would be doing

drainage work, chiefly the counties in Western Ontario and occasional townships in the more easterly parts. We prepared a circular letter, asking twelve questions. We hereto annex a copy of letter:—

ASSOCIATION OF PROVINCIAL LAND SURVEYORS.

Office of Secretary-Treasurer,

TORONTO,

To , Clerk of the Township of .

DEAR SIR,—The Association of Provincial Land Surveyors of Ontario at their last annual meeting deeming it advisable to collect some statistics as to the amount of drainage being done annually throughout the Province, passed a resolution that the Committee on Drainage prepare a circular asking for certain information in drainage matters, and send the same to the clerks of the various municipalities where drainage work is being or has been performed.

The Association would therefore esteem it a favour if you would kindly answer the following questions and return to the undersigned as early as possible, and not later than the 1st of February, 1891:—

1. How many new drains were laid out in your township during the year 1890, under the Municipal Drainage Act?
2. What was the aggregate length of such drains? Rods.
3. What was the estimated cost of such drains?
4. What number of acres of land was assessed for the cost of construction of the same?
5. How many drains were enlarged, cleaned or extended?
6. What was the aggregate length of such?
7. What was the estimated cost of such enlarging, cleaning and extending?
8. What number of acres of land were assessed for same?
9. How many drains were laid out under the Ditches and Watercourses Act?
10. What was aggregate length of same?
11. What was approximate number of acres drained by same?
12. Do the farmers in your township do much tile draining, and give approximate estimate of the amount done during 1890?

Send your replies to JAMES ROBERTSON, P.L.S., Glencoe, Ont.

A copy of this letter we sent to the clerk of the various townships, and out of about one hundred and thirty-five or one hundred and forty distributed we received replies to only thirty-five, or about twenty-five per cent.; and we are of opinion that many of those not heard from are municipalities that do the largest amount of work, and the clerk found that to answer the questions at all approximately entailed considerable work, and so did not reply. We here give statement of results:—

STATEMENT SHOWING DRAINAGE IN PARTS OF ONTARIO DURING 1890.

NOTE.—The numbers at the heads of the columns correspond with the questions on circular letter.

No. of Townships	COUNTY.	1	Rods. 2	$ 3	No. of Acres. 4	No. 5	Rods. 6	$ 7	No. of Acres 8	No. 9	Rods 10	No. of Acres. 11	12
1	Wentworth	..	.....	.....	.....	..	.....	.....	.....	..	.....	... ..	
2	Oxford	..	.....	.....	.....	..	.....	.....	.....	1	58	50	Quite a number.
2	Leeds and Grenville	..	.....	.....	.....	..	.....	.....	.....	1	210	75	Large quantities.
4	Welland	3	1290	1294	475	3	1043	2176	2400	9	2470	1500	None of any consequence.
2	Perth	..	.....	.....	.....	1	43	53	1040	10	2832	329	A good deal of lumber—tile on increase.
7	Middlesex	4	2276	3998	3157	5	3509	6178	9362	27	6608	4767	A good deal of tile.
7	Huron	..	.....	.....	.....	..	.....	.....	.....	17	2210	1090	Lumber—tile on increase.
3	Lambton	10	5025	9410	9135	5	4580	8461	15025	11	2000	2120	Good deal in parts.
4	Kent	17	9061	11021	18200	19	15562	20336	46253	19	7636	3845	A great deal in parts.
3	Essex	5	6080	8862	13150	5	2536	2979	6408	2	480	600	Very little.
		39	23732	34585	44117	38	27273	40183	80488	97	24504	14376	
			74.1 miles				85.2 miles				76.6 miles		
			Average 1.9 miles				Average 2.2 miles				Average .79 mile		

Or in all 174 drains, making a length of 236 miles, and costing (allowing $1.00 per rod as average cost of award drains) = $99,272.00.

With this guide, there was, in our opinion, about $400,000 spent in drainage under the Municipal Drainage Act, and Ditches and Watercourses Act, during the year 1890, in Ontario.

We might say that in our opinion the results as here given may represent about one-third or one-fourth of that actually done. In addition to these smaller schemes there are some more extensive ones, begun probably in 1889 and completed in 1890, and some originating in 1890 and still under consideration.

Although the attempt to collect statistics in this matter has not been altogether encouraging, we would recommend that it be tried again, and that the township surveyors be also asked to furnish statement of work done by them for the several municipalities under their charge, and that letters of inquiry be sent to every township in the Province.

Last spring, being an unusually wet one, there was probably more than an ordinary amount of drainage work done, chiefly in the direction of enlarging old drains under the Municipal Drainage Act, and of making new ones under the Ditches and Watercourses Act.

We would bring before your notice the great amount of dissatisfaction which exists with regard to the costly operations of appeals under the Municipal Drainage Act, especially when corporations are brought in conflict. The expense of arbitration as at present frequently runs up to and over one hundred dollars per day, and the arbitration continues for a week or more.

It has been suggested that a Board of Arbitrators be formed of two surveyors acting with the County Judge, to make a decision that would be final, or perhaps it might be arranged that such matters be referred to the proposed Boundary Commissioner for settlement. No doubt any such proposed amendment of the Act would meet with the opposition of the lawyers in the Legislature, and it is doubtful if it ever could be carried through. However this might be, it is high time that some less costly method should be adopted by which these matters might be settled.

Again, we would point out the necessity for the Drainage Act being simplified so it would say what it means, and not leave so much room for diversity of opinion by engineers, lawyers and others that have anything to do with it. It is very complicated, and as one of our prominent drainage lawyers recently remarked of it: "The more you read it the more you find there is in it."

It should undergo a thorough boiling down process.

The following are the drainage cases reported during the year 1890: —(*See schedule.*)

We here give amendments of 1890 to the Municipal Drainage Act, and the Ditches and Watercourses Act. (*See schedule.*)

All of which is respectfully submitted.

JAMES ROBERTSON,
Chairman.

Glencoe, 26th February, 1891.

Decided Cases, 1890.

Municipal Drainage Act.

NAME OF CASE.	WHERE REPORTED.	REMARKS.
In *re* Sweetman *vs* Township of Gosfield.....	26 Can. Law J'rn'l, p. 380.	Drainage By-law. Motion to quash.
Re McCormick and Corporation of Howard..	18 Ont. Reports, p. 260.	Drainage By-law. Motion to quash. Notice of intention to move must be given by actual applicant.
Re Townships of Harwick and Raleigh....	20 Ont. Reports, p. 154.	Arbitration and award.

Ditches and Watercourses Act.

Re Curtain, appellant, and Taylor, respondent.....	26 Can. Law J'rn'l, p. 600.	Scale of costs, maps and survey, etc.
Healy, appellant, and McDonald, respondent.....	26 Can. Law J'rn'l, p. 600.	Maintaining ditches, benefit to lands, etc.
Hepburn *vs.* Township of Orford.....	26 C. Law J'rn'l, p. 409. 19 Ont. Reports, p. 585.	Work not in accordance with award. Remedy and costs.
Beer *vs.* Stroud	19 Ont. Reports, p. 10.	Definition of Watercourse.

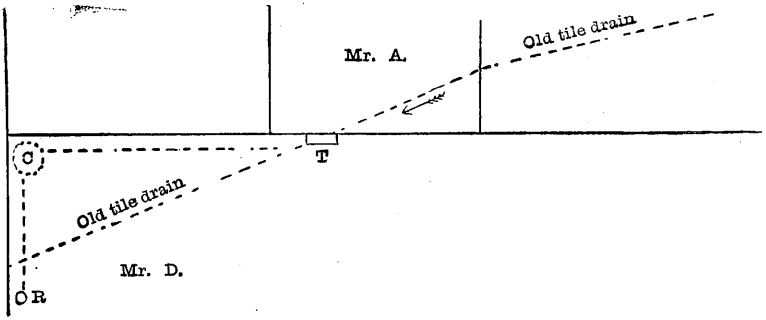
Amendments of 1890 to Municipal Drainage Act.

AMENDED BY		AMENDED.
53 Vic. p. 114, Cap. 50, Sec. 33		Sec. 569 of said Act is amended by adding Sub-Sec. 11 *a*. Relating to adjustment of assessment.
" " " " " 34		Sub-Sec. 15 of Sec. 569 amended. Relating to varying assessment on appeal.
" " 115, " " 35		Sec. 569 amended by adding Sub-Sec. 22. Relating to effect of withdrawal of petitions after signing.
" " " " " 36		Sec. 585 amended and Sub.-Sec. 2 added. Relating to covering drains.
" " " " " 37		Sec. 590 of the said Act amended.

Ditches and Watercourses Act.

" " 152, Cap. 67		An Act respecting the expense of County Court Judges under the Ditches and Watercourses Act.
" " 153, " 68		Sec. 11 of Ditches and Watercourses Act amended by adding Sub-Sec. 2 *a*. Relating to inspection of premises by Engineer.
" " " " 69		An Act to amend the Ditches and Watercourses Act as applied to Railways.

Question 1.—Mr. A makes requisition under the Ditches and Watercourses Act to have a ditch or drain constructed across Mr. D's property to take the water off his own lot. I examine the premises and the parties, and find that the old tile drain—shown on plan—was constructed twenty or more years ago by a former owner; that when it was working successfully it carried away all surface water and left Mr. A's ground dry. For ten years past—more or less continuously—water has been running over Mr. A's lot on the surface,

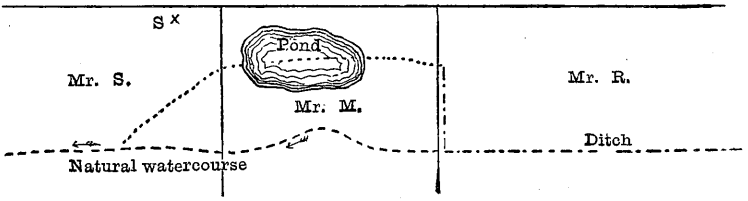


and supplying water for a trough at which Mr. D's stock came to drink. About six years ago Mr. D laid a level overflow pipe from the water trough to a cistern (c) from which he works a hydraulic ram for supplying his house and grounds with water. If I award that the old tile drain shall be opened up across Mr. D's land I would take the water away from Mr. D and render useless his expensive plant; and by leaving the water on the surface Mr. A's lot, which is valuable market garden property, is of no practical use.

How should I make my award?

Answer 1.—Make award to relieve Mr. A's property irrespective of the difficulty spoken of.

Question 2.—Mr. R makes requisition to have ditch extended across the lands of Mr. M and Mr. S under the provision of the Ditches and Watercourses Act. I attended at the locality, examined the premises



and took considerable evidence. I found by taking levels and from the evidence that the natural watercourse was in the position represented by the dashed line. I found a low swampy wet hole several

chains to the north of said natural watercourse, and that the water causing said swampy place trickled down from a running spring on a hill side. Mr. M wanted the watercourse diverted—as represented by the dotted line—so as to drain the wet place on his land, and Mr. S objected to having a second watercourse opened up across his place, especially as it would have to pass through comparatively high ground. I awarded that the natural watercourse should be slightly deepened through Mr. M and Mr. S's lands, but in an appeal from Mr. M the Judge altered my award, directing that watercourse be diverted as shown by the dotted line.

Which under the provisions of the Act is the proper way ?

Answer 2.—Would be a matter to be decided by the features met with such as comparative cost of the two routes. To avoid a second cut on Mr. S, run drain along line of Mr. S and charge to Mr. M.

REPORT OF COMMITTEE ON ENGINEERING.

MR. PRESIDENT,—Your Committee begs to report that we have secured for presentation at this meeting four papers on Engineering subjects, which will be found of interest and of value in future, for reference.

We would suggest that all members of this Association avail themselves of the advantages of enrolling themselves as associate members of the Canadian Society of Civil Engineers.

WILLIS CHIPMAN.
Chairman.

REPORT OF PUBLICATION COMMITTEE.

Of the Report for A.D. 1890, 800 copies were printed ; of which there were devoted to exchanges with kindred societies the following : To the Michigan Society, 135 copies ; Illinois, 100 copies ; Iowa, 110 copies ; Arkansas, 105 copies ; Indiana, 70 copies ; Ohio, 110 copies ; School of Practical Science Engineering Society, 100 copies.

From each of the above societies we received in exchange from 100 to 110 copies. The printing of our Annual Report of Proceedings has hitherto been done by one firm, viz., C. Blackett Robinson, Jordan Street, Toronto, their prices being as low as those of any other firm who could do the work. The obtaining orders for our advertising columns has been a matter of considerable anxiety to the successive Publication Committees, and it occurs to the present Committee that effective assistance in this department could be rendered by our

members generally, by informing the secretary of parties who would be likely to advertise with us. We venture to suggest that each member make a note of this, and be on the lookout to help the funds of the Association in this way. Nearly every branch of engineering and surveying is practised by some member or other of our Association, and collectively there must be a large number of persons in trade who would find it advantageous to their business to advertise in our publication.

Respectfully submitted on behalf of the Committee,

JOHN MCAREE,
Chairman.

Toronto, March 12, 1891.

REPORT OF COMMITTEE ON ENTERTAINMENT.

MR. PRESIDENT,—The Entertainment Committee for 1890-91 have to report as follows:—

The accommodation and locality of the place of meeting of the Association for the last two years having given general satisfaction, the same arrangement with the Canadian Institute as before was carried out this season, and the meetings were held in the comfortable and well-fitted library of that institution.

In consequence of the Dominion elections being held on the 5th of March, 1891, the yearly meeting of the Association called for the 24th of February was postponed till the 10th, 11th and 12th of March.

On the evening of the 11th the fifth annual dinner of the Association was held at the Walker House, and was generally pronounced a success both in manner and matter of entertainment. The former was thought to be in a great measure due to your able Chairmanship, and that of the Vice-Chairman, Mr. E. Stewart.

The festivities were graced by the presence of the following invited guests of the Association: Mr. Aubrey White, Assistant Commissioner of Crown Lands; Mr. Kivas Tully, C.E.; Mr. Wm. Armstrong, C.E.; Prof. C. Carpmael, Astronomer; Messrs. W. S. Drewry, D.T.S., and J. S. Dennis, D.T.S., of Ottawa; Mr. E. B. Ryckman, Barrister, and Mr. W. A. Sherwood, Artist. The private guests were Mr. Blezard, M.P.; Mr. J. Loughrin, M.P.; Messrs. Canniff and W. I. Mackenzie. Those seated numbered forty-six.

Some excellent speeches were delivered by the following gentlemen in reply to the toasts set opposite their names, after that of "The Queen" being duly honoured: "The Ontario Legislature," Messrs. Blezard and Loughrin; "The Association of D. L. Surveyors," Messrs. Dennis, Ogilvie and Klotz; "The Canadian Institute," Prof. Carpmael; "The Osgoode Legal and Literary Society," Mr. E. B.

Ryckman; "Association of Architects," Mr. Kivas Tully; "The Quebec P. L. S. Association," Mr. J. P. B. Casgrain; "The School of Practical Science Engineering Society," Mr. T. R. Deacon; "The Canadian Society of Civil Engineers," Prof. Galbraith and H. D. Lumsden; "The Crown Lands Department," Messrs. A. White and G. B. Kirkpatrick; "The Press," Messrs. Fawcett, Smith, Curran, Snetsinger and Radford. The speeches were interspersed with songs by Messrs. Armstrong, Radford, Niven, Klotz and Foster; and stories by Mr. Ogilvie and others. The singing of "Auld Lang Syne" by the company in the good old-fashioned style concluded an enjoyable evening.

After the adjournment of the meeting on the afternoon of this day (11th), an invitation from Profs. Galbraith and Carpmael was accepted by a number of our members, and a visit to the School of Practical Science and the Toronto Observatory was made. Much that was new and interesting and instructive was pointed out and explained by Profs. Galbraith and Carpmael in their respective departments.

After adjournment on the afternoon of the 12th a visit was paid to the Gallery of the Ontario Society ot Artists in response to the invitation of the President and officers of the Royal Canadian Academy of Arts, and a pleasant hour spent in viewing the paintings and statuary on exhibition by members of that Association.

We have again to thank the Toronto surveyors for their assistance in making our entertainments successful.

All of which is respectfully submitted.

On behalf of the Committee,

FRED. L. FOSTER,
Chairman.

AFFILIATION.

Mr. Dennis, President of the D. L. S. Association, addressed the meeting as follows in relation to the matter of Affiliation with the Association of Dominion Land Surveyors :—

MR. PRESIDENT AND GENTLEMEN,—On behalf of the deputation from the Dominion Land Surveyors' Association I have to thank you very much for the kind way in which you have received us. As you know, we have come here for the purpose of laying before you this scheme for the affiliation of the two Associations. The question of affiliation was suggested to your Association somewhat over a year ago; and at that time, or shortly previous to that time, I had submitted to our Association a memo. having in view the affiliation of all associations of land surveyors in Canada. My object was to further the interests of the profession and to strengthen our hands individually and collectively. At that time the memo. was submitted

to your Association and received some consideration at the hands of your executive, and we appointed a committee to meet your Association at its last meeting. However, the committee, from unavoidable causes, were unable to be present, and nothing further was done; and the matter remained in that state, when I prepared rules to govern the affiliation of the Associations, a copy of which was forwarded to your Association. Our object in coming before you now is to have this scheme discussed and concurred in as far as you may see fit. As the correspondence and this scheme of affiliation has already been read to you, you will have gathered an idea of what our intention is.

As you all know, there are to-day in Canada five associations of land surveyors, that is with the one lately formed in British Columbia. My object in initiating this idea was in as far as possible to arrange that there should be held a convention at which the members of all these associations should be present; that, instead of doing as we do now, holding individual meetings at the headquarters of the different associations, we should hold, annually or biennially or triennially, as may be agreed upon, a convention of the whole. I don't suppose it will be necessary to advance any facts in support of the statement that a convention of all the land surveyors, or a convention of the affiliated associations of land surveyors in Canada would be a more representative and influential body than any of our individual meetings are. The interests of surveyors throughout the country are identical in many ways, each province having its own peculiarities which affect particularly its own association, but there is a general interest which affects us all as surveyors, and if we met in convention there is no doubt that the discussion of these questions which affect us all would be much better dealt with there than they could be as individual associations. I think that in a vast number of ways we would all be benefited. Our associations are most of them on a good footing, and splendid work has been done in the last few years; work which has had the effect of raising the standard of our profession and of our acquirements and enabling us to defend our rights; giving us a recognized standing as a profession instead of a trade, as we were called not very many years ago. The Associations in Quebec and Manitoba felt some diffidence about going into this scheme in consequence of their being incorporated societies, and they say it would be necessary to obtain very extensive amendments to their Acts of Incorporation to enable them to adopt the scheme; however, the question is still open, and in Quebec they are ready to adopt it if possible at all. But if we can accomplish affiliation between the Dominion Land Surveyors' Association and your Association, Mr. President, a great step will have been made in the direction of consolidating the whole. We have a strong association now of Dominion Land Surveyors, and I think we are doing a good work. The affiliation of these two will, in my opinion, benefit us both, and, therefore, we hope that if possithat end may be accomplished. My idea in regard to this was that, if acceptable to you, this scheme which we have drawn up, and which I should say was submitted to our Executive Committee before our last annual meeting and as amended by them was submitted to our

annual meeting lately held and was approved by the members then present, and this deputation was appointed for the purpose of coming here, submitting the scheme to you, and in as far as possible having it carried into effect. This deputation is authorized to meet your views as far as possible with regard to the necessary amendments to this scheme. Of course we, having drawn up this scheme, may have put our side of the question rather forcibly, and it may be necessary to consider some amendments, and if, as amended, it meets the views of both Associations the end would be accomplished.

DISCUSSION.

Mr. Klotz—I have thought over this matter a good deal, and it is not very clear in my mind that it is feasible; that it is desirable I admit, but as to its feasibility I am not very clear how it is going to be effected.

Mr. Drewry—In this scheme it is not intended that one Association shall interfere in the department of the other; the Dominion Association would not interfere in purely provincial affairs, but when any question comes up concerning surveyors as a whole then we can act together.

Mr. Gibson—In bringing pressure on the Government, for instance, then we act as a body?

Mr. Dennis—I think there is no question that advantages will accrue in this way; there are questions which arise all over the Dominion in all the provinces where surveying is being done which affect surveyors as a whole. We, as Dominion Land Surveyors, succeeded in fighting the battle of our fellow surveyors in British Columbia where the Government was employing men to make surveys who were not surveyors at all. We also succeeded in three or four other instances where surveyors as a whole were very intimately concerned. Last winter when a Bill was brought in to create a Geological Survey separate department, there was a clause put in that Bill which gave the members of the Geological Survey staff all the rights which we possessed; it gave them the right to make surveys anywhere and everywhere,—practically legislated them into our profession. We fought that question and we had the Bill amended, that clause being changed so that they would not be given powers that would interfere with the rights of surveyors throughout the Dominion. That affected the Provincial Land Surveyors as well as us, because it authorized them to go into Ontario or any other province and make surveys; it did not authorize them to run side lines and lines between lots, but it gave them rights which we have acquired under the law as surveyors. Now, questions of this kind are sure to arise in the future, and if we are a combined body of surveyors in Canada we will fight these battles much better than we do now fighting them individually. We don't ask any of the individual associations to give up anything of their autonomy or any of their particular rights. And I feel that the

voice of a convention of the affiliated associations of land surveyors of Canada would be listened to with very much more respect than it now is when it comes from the individual associations.

The President—I think it will be a move in the right direction, provided there are no very great difficulties in the way of carrying out the scheme. Take matters in the rowing world, for instance; the Amateur Association of Canada has affiliated a great number of clubs, and in that way the amateur rowing of Canada has come up to a very high standing. In football it is the same. I don't see that we would be put to any greater expense than we are now; the only difference, I presume, would be the awkwardness that might occur to some of the members of our Association in Ontario in going to Ottawa the year the Convention was held there, and similarly the Dominion Land Surveyors might find it inconvenient to come to Toronto, but these are only difficulties in detail. Unquestionably we would reap benefits by having papers on the broad question of surveying generally prepared and read at these joint conventions. Personally I feel that I would like to do all I can to have the thing carried out.

Mr. Ogilvie—I think, if the scheme of affiliation could be consummated the interchange of ideas between the members of the different associations would be worth a great deal. The greatest objection I have heard is the cost of travelling east to Ottawa and west to Toronto, but as the cost is not very great I don't think that is a very important objection. It would lend an increased importance to the profession, whereas now we are hardly known. Last winter when we were fighting the Geological Survey a great many people laughed at us and asked, Who are the surveyors? I think we could act much more forcibly in the way of law making and amendments than we do now.

Mr. Gibson—I think what we want is to have each province have its own association, and that the Dominion Association should be formed of representatives from each province. I believe if we attempt to make one association of all the provinces it will be a failure. The ideas are different, the law is different, and the practice is different to a greater or less extent. If a central association could be formed of representatives sent from each local association, and the expenses of these representatives paid I think it would be a very good scheme. But I am pretty well satisfied that if we attempt to have our meetings at Ottawa, Toronto, Halifax, Winnipeg, and Victoria and these places, the affair would end in a break-up, which I would be very sorry indeed to have occur.

Mr. Stewart—What Mr. Gibson has said is just what I have been thinking of as the proper way of carrying this out.

With regard to what has been said about the geological branch of surveys, and especially traverses of lakes it seems to me that they were trespassing on our ground.

Mr. Ogilvie—They wanted to create themselves into a topographical survey, and the misunderstanding was as to the word "topographical." They intended it in a very limited sense, but we said, If you do not intend it in an extended sense your heirs and successors may use it in that way; and the result was that they agreed to expunge the word "topographical." But as far as making surveys for their own purposes is concerned, we must concede that in view of their services to the public they must make some kind of a survey. It is not a public survey, it is not to be accepted in any sense in that way; but we were afraid that they might, having this word in their Act.

Mr. Stewart—Whatever is done the fact is that in these traverses of lakes the Geological Survey have within the last few years done some work which more properly belongs to surveying than it does to geology. I think they have devoted more time to the traverses of lakes than to the geological features of the country, and in that case I think we might insist on having a surveyor appointed on their staff.

Mr. Drewry—In that clause of the Geological Survey Act proposed they had power to make topographical and geological surveys coupled with the power to plant marks to perpetuate these surveys, and we fought that, so that now if they do traverse a lake they have no right to tie them in.

The matter was then referred to a committee.

The Association of Dominion Land Surveyors and the Association of Provincial Land Surveyors for Ontario having agreed to become affiliated, the following Rules and Regulations are adopted to govern the relations, meetings and all transactions of the affiliated Societies:—

RULES AND REGULATIONS.

1. The affiliation of the two Associations shall not interfere with the individuality or autonomy of either Association.

2. Each Association shall continue the issue of its annual report; the proceedings of the Convention of the affiliated Associations being published in manner hereinafter provided.

3. Each Association shall appoint a delegation of five members to represent it at the annual meeting of whichever Association is acting as the Convention meeting as hereinafter provided, the Committee formed of these delegations to be known as the Convention Committee. All matters of mutual interest between the two Associations to be decided by a majority of the votes of the said delegations. The chairman of the delegation of the Association at whose headquarters the Convention meets to be chairman of the above Convention Committee.

The proceedings of the Convention Committee shall be governed by the rules of parliamentary procedure, and a copy of the same furnished each Association, who may incorporate such portions of the proceedings as they may see fit in their annual reports. Each delegation to have five votes, either in person or by proxy. In case any member of the delegation finds it impossible to attend, his vote shall be exercised by the chairman of his delegation.

4. The Convention meetings shall commence in the year 1892, and shall be held each year thereafter. This meeting shall be called "The Convention of Canadian Land Surveyors." The first of these meetings shall be held in Ottawa, and the subsequent meetings shall be held in Toronto and Ottawa alternately.

5. The Convention Committee shall arrange the programme for the Convention, and all papers, reports, etc., which are sent to the two Associations, and which will be read at the annual meetings of Associations or appear in the reports of the Associations for the year in which the Convention is held, shall be submitted to the Convention Committee, and they shall select therefrom such papers, reports, etc., as they may consider proper to be read or presented to the Convention. All papers, reports, etc., shall, however, remain the property of the Association to whom they were originally submitted.

6. Nothing shall be presented to the Convention which properly pertains only to one Association, and all papers read and discussions by the Convention shall be such as interest or affect the profession of land surveying as a whole.

7. Each Association agrees to amend its constitution and by-laws where necessary, so as to bring these rules and regulations into effect.

8. Each Association agrees to say on the first page of their annual reports "Affiliated with the Association of Dominion Land Surveyors," or "Association of Provincial Land Surveyors for Ontario," as the case may be.

9. Each Association binds itself to admit any other Association of Land Surveyors in Canada to affiliation upon the acceptance by such Association of these rules and regulations.

10. Any proposed amendments to these rules and regulations after their acceptance by both Associations must be sent to the Secretary of each Association at least one month before the date of meeting of Convention, and such proposed amendments shall be set forth on the notices of Convention meeting.

11. All voting by the Convention Committee shall be an open or standing vote; a majority of the votes cast to decide questions.

12. Each Association agrees, and hereby binds itself to do everything necessary to strengthen the hands of the Convention Committee by supporting them in all matters which affect the profession of Land Surveying as a whole.

DISCUSSION WITH REGARD TO REGISTRARS' FEES.

The President—With regard to the fees charged in the Registry Offices for the inspection of a registered plan, as far as I can learn there is no actual legislation governing this point. The matter was brought to my attention last year, and, together with some members of the profession in Toronto, I waited upon Mr. Johnston, the Inspector of Registry Offices, and drew his attention to this point. In some offices I was credibly informed that the practice has been to charge twenty-five cents for each plan ; in others they claimed the right to furnish copies and charge certain fees. We contended that a surveyor should be permitted to examine and take what notes he pleased of a plan for ten cents if he did the work himself. He promised that the matter should receive attention at the meeting of this coming Legislature. I think it would be advisable in case such legislation be brought before the House this session that somebody on behalf of the surveyors should watch what they propose to do, and, if necessary, try and control it. It is hard to know what the registrars may do ; like the rest of the world I suppose they want to get as large fees as they can, and I think it would be in our own interest to watch any proposed legislation.

Mr. Miles—I never was charged anything at all in a registry office.

The President—But it is not a very pleasant thing to go into a registry office and be allowed these privileges as a matter of courtesy. It is a business transaction, and I think it ought to be settled on a business basis. We want to go in there and be able to say, We have a right to see this plan for so much.

Mr. Aylsworth—I think he has no right to allow any search to be made without the regular fees. I have usually paid twenty-five cents for seeing a plan and making a copy if I desired to do so.

Mr. Gibson—Ten cents is the legal limit.

Mr. Aylsworth—Is there any authority for that ? Our President says there appears to be no fixed rate.

The President—Mr. Johnston told me that. The objection he raised was this, and I think it may have been fairly raised by some registrar, he did not believe it was in the interests of the public to hand a plan to anybody who came in and asked for it. Supposing he begins and makes a copy of it ; he pins tracing paper over it and so on, and might perhaps keep it an hour or two, and somebody else might come and want to see it. That was the objection I had to meet.

Mr. Gibson—Surveyors must have the plans ; they can't do their business if they don't have exact copies of them.

The President—I think it would be well to appoint some one to watch any legislation of this kind that may be going on at this session of Parliament.

Mr. Bowman—With regard to the appointment of registrars, the custom has been to appoint some politician who probably knows nothing at all about the business. Now, I think there should be some movement made to have those who know something about registry offices appointed as registrars. It should be a regular salaried position to which a man could have a chance of rising. If a surveyor wanted or chose office work, there should be some probability of his getting up to the top of the ladder through time. The fees are altogether out of proportion to the work that is done, and I think surveyors should have the preference.

Mr. Aylsworth—Perhaps when we are incorporated we will have more influence with the Government. It is a matter under the consideration of the Legislature to fix a salary for registrars and sheriffs and have all the fees of the office funded. My impression is that that would be better than the present system.

PRESIDENT'S ADDRESS, 1891.

GENTLEMEN OF THE ASSOCIATION OF PROVINCIAL LAND SURVEYORS OF ONTARIO:—

We are once more permitted to meet together in health, strength and the enjoyment of those faculties which have been bestowed on us, for which may we all truly thank God.

I have much pleasure in welcoming you to this our Sixth Annual Meeting, and hope that, like those meetings which have gone before, this one may prove instructive and useful and be another firm step in our upward course. I have to record the loss the profession and our Association has sustained in the death of the late Mr. Hugh Wilson, who died Nov. 7th, 1890, in his 61st year. Born at Lachute, Que., in his younger days he had to earn his living. After fourteen he was articled by Capt. Quinn, of Lachute, as apprentice to R. F. Andrews, of Montreal, to learn the trade of mathematical instrument-making at $4 per month and board. After five years, ill health made him give up business and he went to the lumber shanties for the winter. Then he became a student at Rockwood Academy and finally at Toronto University College. He took his P.L.S. in 1858, and became a member of the Board of Examiners about 1867, and, in 1874, a Fellow of the Geological Society of London, Eng. Mr. Wilson spent eighteen seasons on Mining and Government Surveys on the north shores of Lakes Huron and Superior, and enjoyed the reputation of being among the best posted men in the country as regards the resources of that region.

On considering what form my address should take, I have thought it would not be out of place, now that we are six years old, firstly, to

invite you to take a retrospect of what our Association has done in the past; secondly, to enquire what there is still for it to do.

On looking over our Proceedings of the last five years, one cannot but feel considerable satisfaction at the very creditable showing these five Reports make, and certainly, to every surveyor in the Province, they must afford a very interesting and useful volume; but it is deeply to be regretted that it is not to be found on every book-shelf. While on the subject of our Report, would it not be well for us to consider the adoption of a uniform binding for our Reports, say in volumes of five years each? No doubt, a considerable saving might be made by having a large number done in the same style and at the same time. I want, however, to look a little closer and see what these Reports contain and what subjects are dealt with. I find some forty papers have been presented on various subjects, including Land Surveying, Bridging, Road-making, Drainage, Instruments, etc., etc. Our Standing and other Committees have also made valuable reports on the same and similar subjects. All of which have been the outcome of considerable personal labour on the part of those who prepared the papers and of concerted effort on the part of the Committees from whom the reports have come.

During the first years of our existence the Survey Act was revised and the standard of examination was raised, which, with the kindly assistance of the Hon. The Commissioner of Crown Lands and the Board of Examiners, became law. The laws on drainage were also under careful consideration, and certain amendments were obtained. In the matter of Registered Plans, this Association has laid down certain conditions as to their preparation and to the amount of survey necessary, which are greatly to the point, but which might reasonably be even further extended.

The Boundary Commission has also been taken up, and it is to be hoped that a matter of so much importance will not be dropped by this Association until it be fully demonstrated that no good is to be looked for from it. For my own part, I would say that I look for the very greatest good and much satisfaction to the public at large from a scheme such as Mr. Ogilvie has outlined, not only in matters of survey, whether public or private, but also in matters of drainage and of local improvements where disputes arise. Many other matters of technical importance have come before us. Instruments, ancient and modern, have been exhibited, from an old compass and quadrant of last century to the modern solar transit, the Lugeal micrometer, and the rolling planimeter, with steel tapes and bands in considerable variety.

We must not overlook our exchanges. They now amount to —, being with the Associations of Ohio, Illinois, Michigan, Indiana, Arkansas, etc., etc. They form in themselves a most valuable addition to any surveyor's library, and at a cost of not more than the ordinary subscription to our own Association.

Nor has the past been entirely forgotten; in several of our President's addresses, and in other papers, much of the past history of our profession, and consequently of this country, has been brought again to the light of day—a history of which we may justly feel proud—a

history of the lives and doings of our predecessors which we may well imitate. But beyond all this, gentlemen, our Association has done something which, to my mind, is worth all the rest put together; it has brought us together, man to man, and face to face; it has brought us to know each other, to know the sound of each other's voices, and has created a bond of Fellowship which must raise us in our own and in the estimation of everyone else

Now, let us inquire what is still to be done. There are still a few more surveyors in the Province to be brought into our Association. I think we can show them just and good reasons for joining, and surely no one having once joined will seriously think of leaving. Some, no doubt, cannot always manage to attend our meetings. Do not, therefore, let those of us who do attend, look down upon, or think less of those who are not so fortunate, but let us try and make our Reports all the more attractive.

We have several important matters still incomplete. The Boundary Commission is to come up at this meeting. The proposed affiliation of the various Associations of the Dominion is to be discussed. It comes to us this year in the form of a deputation of the Dominion Land Surveyors' Association, from Ottawa, in which, I am glad to see, are some of our own members. I would bespeak for them a hearty welcome and a fraternal and courteous consideration of what they come to propose.

Though much has been done in the Survey and Drainage Acts, they cannot, I think, be considered yet as quite perfect and are quite important enough to be made subjects to be referred to Special Committees to report upon. The papers on these subjects by Messrs. Gibson and Coad, to be read at this meeting, will, no doubt, prove valuable additions to the information we already have.

The most important subject, however, which is to come before us, is that of Incorporation. It is one, the consideration of which is the natural result of association. In other Provinces, it has already been inaugurated; in some of these where incorporation came first, association naturally followed and I cannot but think that whichever one comes first the other is sure to follow, be it sooner or later. A paper on this subject will be presented by our eloquent *confrère*, Mr. J. P. B. Casgrain, who, being a member of the Incorporated Society of Quebec and of the Association of Ontario, will be able to put the matter in a practical and clear manner before us. This is, I have said before, a most important subject, and its adoption or rejection should not be hastily or carelessly gone into, as it will inevitably be a turning-point in our career.

In conclusion, I wish to thank the officers and committee-men with whom I have been associated this year, particularly the Secretary, Mr. A. J. VanNostrand, who has worthily filled the place of our first Secretary, Mr. Willis Chipman.

Finally, gentlemen, I would invite your attention to the various matters to be brought before you, trusting that your deliberations may successfully lead to the building up and establishment of our profession on a sure and permanent foundation.

PAPERS.

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

PRACTICAL WORKING OF THE DITCHES AND WATERCOURSES ACT.

By RICHARD COAD, P.L.S.,
Glencoe, Ont.

LAST year the Committee on Drainage made some suggestions as to certain sections of the Ditches and Watercourses Act that were not good, or might be improved by amendment, and I have heard opinions expressed by lawyers, as well as members of our own profession, that this Act from one end to the other is bad, and unworkable in some cases. Be this as it may, the object of the Act is a good one, and as it is one of the ways or methods provided by means of which individuals may the better drain, improve and cultivate their lands, we must accept it as it is till we get something better, and in this paper I will endeavour to set forth a small part of my experience in working under it, commencing from the time the engineer receives the notice (Form C), mentioned in Sec. 8 of the Act, from the municipal clerk.

On receipt of the notice or requisition for the drain, I mark on it the date, and appoint the day for attending at the locality, within the time limited by Sec. 6, and endorse the same upon the notice, and send to the clerk the requisite notice of such appointment, and at the same time (although not required so to do) I always send a similar notice to the individual calling the engineer out, as many of the persons who make use of this Act do not have a daily mail, and many of the township clerks are similarly situated, and by the time the clerk receives the notice from the engineer, and the applicant from the clerk, it is often too late to give the proper notice to the individuals interested, and it has frequently happened that I have arrived at the place and been unable to proceed with the examination and survey from this cause.

On arriving at the ground, I always ascertain if the *formalities* as to preliminary meeting, notices, etc., have been carried out to the letter, and, if everything is regular up to that time, I proceed to make a preliminary examination of the locality and ascertain how many owners' lands the ditch will require to be extended through, and thus

see if the requisition is sufficiently signed for the carrying out of the scheme. According to the reading of the Act, Sec. 6 and Sub-Sections, the clerk should not file the requisition unless sufficiently signed; but as the application is generally written out by the applicant himself, who is usually not very well posted on the Act, and probably guided by an old copy of it, without amendments, it is often very difficult for the township clerk to know whether the requisition is a proper one or not, and he invariably sends the copy on to the engineer, and the engineer can only determine by an examination of the locality. The engineer cannot be too particular in seeing that all the steps taken by the applicant have been in accordance with the course laid down, and that every step laid down has been followed, as there is usually one, if not more, persons on every drain of this kind who is ready to cause trouble, if the slightest inducement is offered. The judgments on decided cases mentioned in the report of the Drainage Committee of last year also show the importance of this. If the proceedings so far have not been regular, I point this out and direct the parties where they have erred, and the preliminaries in part or in the whole must be gone through in the regular way before the survey is proceeded with. If everything has been regular, I next hear what the parties have to say, in accordance with Sec. 8, and generally find that to get through this part of the programme in a satisfactory manner is more difficult and often takes longer than making the survey. Usually the smaller the job the greater is the amount of quarrelling and jangling to be done over it on the part of the neighbours interested; and in many cases it does not take long to ascertain that the cause of the engineer being called out is not for the purpose of procuring the better drainage of land on the part of the applicant, but that he is at variance with his neighbour from some cause far remote from drainage, and this means is taken up in hopes that he can in some way get the start of him as it were.

I have found, however, that in many cases there are some points rather difficult to decide as to what is best to be done, and as many of the parties are not at all acquainted with the Drainage Act and the engineer's duties under it, and they will tell him that if he does *so* and *so*, they intend to appeal against the award. I always make it a point to take a copy of the Ditches and Watercourses Act with me, and when points arise, as to where the people have a wrong impression of the Act, engineers' duties, etc., I read to them the sections relating thereto. I always try to have the people understand what the engineer's duties are in the matter, and then let them see by what I do that I intend to follow out the course as laid down as nearly as I can, and intimate to them that if they wish to appeal to the county judge when the award is made out, that they have that privilege and are quite at liberty to do so, so far as I am concerned. Where I have done this, I have had few or no appeals, as people are not generally slow to see that the engineer understands what his duties are in the matter and that he intends to carry them out.

I always listen to what each interested individual has to say in the matter, however unimportant it may seem to me at the time, as the

person who has anything to tell in the matter usually thinks it of the utmost importance, and is very necessary to a proper solution of the case. Be this as it may, it relieves him to express what he knows or does not know in the matter and does the engineer no harm. Where there is more than usual jangling and difference of expressed opinion it may be well for the engineer to examine the parties on oath, and reduce the evidence to writing as he is authorized to do. I have never done so, however, as it is usually inconvenient to do this and would in many cases be a waste of time, but in some cases I have no doubt it would have a salutary effect, and be the shortest way to dispose of the preliminary talk if it serves no other purpose, and allows of the work of survey to be proceeded with. I might here say that I always rely upon my own examination and levels of the locality rather than upon any evidence given on any point that may have a bearing on the case.

When the drain in question is to be a long one there is generally only the one course which can be followed, and *drainage* is generally the object sought; but with short drains it frequently happens that one of two outlets may be chosen, probably one on the applicant's own land by a little deeper digging, than by another course through his neighbour's land. I always take the view that where a man can get an outlet on his own place with a reasonable amount of labour he has no right to bother his neighbour about it, when his neighbour is opposed to it. I have sometimes, where there was a dispute over two routes, made a survey of both, and after considering the advantages and disadvantages of each, after figuring the same up, have decided in the office which one to adopt, and made the award in accordance therewith.

Methods of making the survey have been fully described in previous papers by members of this Association, I will therefore not enlarge upon this part of the subject.

When the drain is located I make my examination of the lands for the purpose of ascertaining the amount of benefit to be derived by each parcel that will be effected by the proposed work; and in doing this I am assisted very much by the fifty-rod limit of benefit set forth in Sub-Sec. 2 of Sec. 8 of the Act, and while many farmers and lawyers and even engineers doubt the justness of this limit, yet it defines the engineer's duties in this respect very closely and much simplifies the apportioning of the work. Again, I always maintain that the intention of this Act is not for the purpose of carrying out large drainage schemes as some would attempt under it, and the introduction of the fifty-rod limit in 1887 clearly points this way.

I generally find that where water is brought down from a considerable distance above the land of the person applying for the drain, as is often the case, that the applicant and parties below are of the opinion that those parties up the drain can be made parties to the award. This, of course, is a mistake, and if the engineer does not want to leave in the minds of the parties impressions that he has peculiar ideas of apportioning a ditch, he should be careful to point out how he is limited in this respect to fifty rods. I might here say

that the case just referred to is one which causes a great deal of trouble, and I have failed as yet to apply the Act to the case in a satisfactory manner, as the parties owning higher lands will throw their water down upon the lower and frequently more level lands and will not sign a requisition or assist in any way to carry it off. There is often sufficient fall from the upper to the lower man's land to drain it by flooding the lower, but he cannot come at the upper parties further than the fifty rods for benefit, and in fact on account of the large fall on the upper land a drain on the lower land might benefit only a few rods within the meaning of the Act, while several hundred acres of land may send their waters down as is the case in many instances, and the lower man is powerless to do anything in the matter but dig a ditch through his own land sufficient to carry all this water, which in most cases is unjust, otherwise he must sustain damage, and then he may come upon the parties above for causing such damage by the proper course of law.

It sometimes happens that an individual having considerable low, flat land applies for an outlet, but wishes the survey to come only up to his line, saying that he will ditch on his own place himself, and while the construction of the ditch only to the line would perhaps, regarding strictly the fifty-rod limit, benefit those lands through which the ditch run more than the land of the applicant, yet by the applicant continuing the ditch across or partly across his land to drain some low swamp would receive much more benefit by the construction of the outlet part than the other parties, and he would have less to do. In such cases I consider the drain as continued up over or partly over the land of the applicant to the part to be drained, and then assess him for benefit so received within the fifty rods of this drain.

Again it sometimes happens that the engineer is called out where there is clearly no necessity for it as before intimated. When I find that such is the case, instead of setting the matter aside and awarding costs against the applicant as might seem right at first, I generally, if there be any excuse for a drain at all, make a survey and an award by which the applicant party pays expenses and does the bulk of the work; but I always make it a point to award a part, however small it may be, to the second party, as if all is awarded to be done by the applicant he will find that he has made nothing by his case, and the chances are that he will not do his ditch. And the object in giving a portion to the second party is to make him an *interested party* within Sec. 15 of the Act, and thus enable him to enforce the carrying out of the award if he so desires.

Another particular case where we were called upon to make an award may be interesting, and I mention it here as we were somewhat in doubt about it ourselves at first as to our power to act in the matter, but the case was appealed to the Judge who sustained the award, and the point may be of use to others under similar circumstances.

It was in a locality where the land is even on the surface with a uniform fall in a south-westerly direction, but the fall in a westerly direction was at the rate of about four feet per mile while that southerly was about one foot per mile. The main outlets for the locality

were large drains running in a westerly direction, constructed under the Municipal Drainage Act, one along the road in front of the lots and another through the lots, parallel with and about 140 rods back from the front.

The owner of the higher of two adjoining fifty acre farms called the engineer on to lay out a ditch along the line running north and south to the main outlets. He made a survey for three separate drains all along the line, one starting sixty rods back and running north to the outlet in front, another starting fifty-six rods north of the main outlet through the lots and running southward to it, another starting sixty-four rods south of and running northward to the main outlet. We awarded that each of these several drains should be dug by the parties on the upper and lower side, as we thought right. The man on the lower side appealed against the award, stating as one of his grounds of Appeal that the Act did not contemplate line ditches. The Judge visited the locality with the engineer, and as before stated sustained the award in its entirety and making appellant pay all costs.

Sub-Sec. 3 of Sec. 8 says that the engineer may by his award direct that any portion of such ditch or drain may be constructed as a covered drain, etc.; and while I am of the opinion with regard to the meaning of this section expressed in the report of the last Drainage Committee, that the Act does not contemplate the enforcing of the putting in of tile or of covering a drain, I find in many cases that it is advisable to do so in parts of a drain, but I also find that it is best to have them put in by one man and not by the different persons at different times. It is frequently found when an upper-land man wants an outlet through the lower farm of his neighbour that the neighbour protests strongly against the cutting of an open drain through his well-kept fields, and insists that if an outlet must be obtained it must be under ground. In quite a number of such cases we have ordered that the parties above procure and distribute along the course of the drain on the land of the lower man a certain number of tile, and that he—the lower owner—put them in and maintain them. Of course the number of tile to be supplied by the upper parties will be greater than if they had to put them in and maintain them. However, in doing this as well as in awarding an open drain, the engineer must be careful to give all parties whose lands will in any way be effected by the keeping open of any such drain a portion of it to maintain, as it will be observed by Sub.-Sec. 4 of Sec. 4 that only an owner whose duty it is to keep any portion of such ditch or drain in repair can enforce the putting of any other part in repair.

It may be departing somewhat from the subject of this paper, but I have been asked how I examined or ascertained whether tile were put in in accordance with the award. To do this exactly would be a somewhat difficult task when not on the ground to see it put in, but our practice has been to dig down in a few places at irregular intervals to examine with what care they have been laid as to jointing, etc., and to use a steel rod marked off in feet and tenths which can be readily shoved down through the loose soil to the recently covered tile, measure the distance to the surface from the top of the tile,

and to this add the outside diameter of the tile, and add this sum to the reading of the rod held on the surface where the measurement was taken. This done at irregular intervals and compared with the grade line will enable a very good opinion to be formed as to whether they are properly put in or not.

As before stated, in my opinion the Ditches and Watercourses Act is not intended for large drainage schemes, as all such should be carried out under the Municipal Drainage Act, so that all parties may be dealt with justly, which cannot be the case in drains of any considerable length, or for the drainage of any considerable area, under the Ditches and Watercourses Act. Notwithstanding this some municipalities appear to have a great aversion to the Municipal Drainage Act, as they consider the extra expense in connection with carrying out any work under it as money thrown away, and they encourage and allow of the carrying out of all schemes, no matter how large, under the Ditches and Watercourses Act; and by so doing, and carrying on this system from year to year, we are necessarily getting some of the drains somewhat complicated, as may well be imagined. As at first a drain is asked for and an award made out, assessing as laid down by the Act, the next year, or perhaps the same year, other parties wish to make use of the drain and apply to the council, if they cannot get enough to sign the requisition, and a new award is made out. These last parties should of course enlarge the former drain—if insufficient—on account of the additional water brought to it, and the whole award must be changed. Again, another drain may be asked for with the first or second drain as an outlet. The awards again are effected, and so it goes. Each case of this kind must be determined on its own merits. If the first drain is to be enlarged by the entrance of the second drain, such enlargement should generally be made by the second parties, and the first parties should maintain as in the original award, or as may be set forth in the second award under the altered circumstances. When the drain as at first constructed is of sufficient size to carry the additional water of the second drain we sometimes award that the parties on the second pay so much money to the parties who constructed the first drain for the use of the same.

Another case that comes under our attention frequently is where the main outlets are constructed under the Municipal Drainage Act, and were sufficient for carrying the water brought down to them at first, but on account of altered circumstances, and getting somewhat out of repair, the drain gradually gets too small for the work required of it, and while in this condition some one applies for a drain under the Ditches and Watercouses Act for the drainage of a considerable area, the outlet to be into the main drain just described. The question that presents itself here is, Shall I lay out a drain that will cause the lands along the main drain to be further injured by the additional water? or shall I not make out an award at all, even although the parties applying for it may be parties assessed on the main drain? Of course I do not consider it advisable to continue the award drain over the municipal drain to enlarge it. Each of such cases must be

determined by itself, and in some instances where the additional water would be considerable and the parties along the main drain are opposed to its entrance I have not made out an award, but have recommended the parties to apply for an enlarging of the main drain first, or to get up a petition and carry out their scheme for drainage to a different outlet, where this is practicable, under the Municipal Drainage Act. Sometimes, where the additional water would not be large, I have made out the award, and as before recommended the outlet drain to be enlarged, which the parties may have done within a reasonable length of time, and the damage sustained in the meantime, if any, will be small.

In the matter of inspecting and letting uncompleted parts of drains, there is frequently some feeling not the best between the party requesting the inspection to be made and the person whose part is requested to be inspected. Those who have had experience in this matter know that often it is the case that a person who does not have his own portion completed in accordance with the award complains of some other part, generally lower down, and requests the engineer to have the same completed. I never consider that I am limited to the part complained of, and when I receive a proper notice to inspect any part I try to ascertain by letter whether there is *any doubt* as to the drain not being finished. If I am satisfied that such is the case I send out the requisite notices with instructions as to posting up, etc., to the party requesting the inspection. By doing this we save the expense of one trip to the delinquent persons. In our notices of letting the work, we always advertise that we will let the *uncompleted parts* of drain, etc. We have a regular printed blank form which we fill out for each particular case. Since adopting the method of advertising the *uncompleted* parts we have had much more satisfactory results than by specifying particular parts, as many who perhaps had made tolerably fair work of their parts but left it some slack, wonder if their portion is not included in those to be let, and they see that it does not before the engineer arrives. Where there is any doubt, before posting notices as to whether the drain is completed or not, we always make an inspection. Quite often when parts are complained of as not completed we write the delinquent party, intimating that his portion is complained of and that if it is not completed within a specified time we will be obliged to sell the work. This often has a good effect, and additional expense is avoided. We always have a contract drawn up and signed by the contractor, sometimes with a bond to insure the completion of the work within a reasonable time. Occasionally, for satisfactory reasons, we extend the time for completing the work by the party to whom it was awarded, generally in such cases requiring a bond to insure such completion.

A somewhat peculiar case came under our care some time ago, where an individual called for a drain where it was necessary to continue the same through a piece of land still held by the Crown, and which would be largely benefited and improved by its construction. We could not see how any part would be done that would be awarded against the lot. Fortunately the piece of land was small, and conse-

quently the ditch through it short and light, and we awarded it to be done by the parties above. Whether this was the proper course to adopt or not we are not prepared to say, but in this particular case it was the easiest way out of the difficulty and all went well.

On this same drain another point of interest has arisen, and, so far as we know, is still in dispute. The drain ran lengthwise through a lot owned by a person whom we will call "A," there being 144 rods of drain on the lot, of which A had to open up and maintain as his share for benefit a distance of 80 rods. He, instead of making an open drain as set forth in the award, put in tile without the consent of the engineer, and these tile prove defective or insufficient and impede the free flow of the water, and cause damage to the lands above the tile. While the tile is in the ground a railway company comes along and buys this whole lot and build their road through it and over the tile (not knowing it is there), and make their sewer-pipe culvert on the surface of the ground some three feet above the drain tile. Then the circumstances of the case are these: The railway company own the whole lot formerly owned by A. Their culvert through the track is not suited to the drainage of the land. The tile through their property put in by A is insufficient, and the lands above the head of the tile are damaged by the water impeded by the tile. What course is to be adopted to get the matter in proper shape? is the question I would like answered by this Association. We have requested the railway company to take up the tile and fix the culvert, but they may not do it.

I would just suggest, before concluding, as all who have had any considerable experience in these matters must know, that it is not now considered necessary to follow the natural watercourse in laying out a drain, as has generally heretofore supposed to be the case. The shortest, cheapest and best outlet, with the greatest amount of benefit, is the object to be aimed at, and to this the engineer is sole arbitrator; and if he shows good judgment in these matters his award will seldom be disturbed by a fair minded judge.

These are some of the points that have come up with many others during our practice, and although we may not have dealt with some of them as others might, I think I am justified in saying that our results have been tolerably satisfactory, and we think the Ditches and Watercourses Act. although by no means a perfect one, when not abused serves a useful end, and many farmers are materially benefited through its existence.

I would kindly ask of the members of this Association a full discussion on this subject.

DISCUSSION.

Mr. Gaviller—In regard to cross-examining witnesses under oath, my experience has been that it is better always to examine them under oath in order to provide against any appeal that may come up. I would make it a practice to take the evidence down, read it over to the parties and have them sign it right at the time. To what extent do you allow cross-examination, or do you allow it at all?

Mr. Coad—I don't like parties wanting to give evidence to think that I would at all like to shut them out from giving that evidence; and it saves a great deal of time often to let them have their say. That is the way I usually do, supposing they have any material evidence to offer, *e. g.*, if a man says, I will swear the water runs in this direction, and this is the way the drain ought to go, I let them say all they have to say, and then I take the levels and find out how it stands, and let them know what I find upon it.

Mr. Aylsworth—Under this Act, can an engineer legally order a drain to be cut through a ridge, where the work can be done much cheaper and make a better job, than by following the course of the water? Have there been any decided cases in that? It appears to me reasonable, if, by a small expenditure, you could cut a short ditch through a ridge and drain land just as well, this course should be followed; but I have always hesitated about that, because before this Act was enforced the courts forbade that sort of thing being done.

Mr. Coad—We have always thought it best to carry water to the nearest outlet, even if that were not the natural outlet; that is, if the cost were within reason. In a case I had a man called us out and we found the course he laid down was the natural watercourse, but it was in the suburbs of a village and ran through people's orchards, gardens, etc., and we told the man we did not feel disposed to carry it in that direction, when by taking it through a cut of three feet or so the drain would be shortened by about one-half and be dumped into a gully at the back of his farm, and we laid out the drain accordingly. He appealed to the county judge; the principal point in the appeal was that the natural course had not been followed, but the judge said he did not consider that any appeal at all. He said, I often set aside awards because the engineer follows the natural watercourse, and he ridiculed the idea that an engineer should follow the natural watercourse, if his judgment shows that it is not in the interest of the parties, and if a more efficient and shorter outlet could be obtained on a man's own land. He was very decided about that, that if a man can get any outlet at all on his own property, he has no right to bother his neighbour. In a case where it extends beyond the limits of one man's land, you would have to be very careful to get an outlet that would give better satisfaction than the natural outlet, because people would be more arbitrary.

Mr. Ross—With regard to maintenance, would you make the maintenance different to the way the work was performed in the first place? I understood you to say you awarded parties to maintain so that they would have an interest in it.

Mr. Coad—That is where we put in tile.

Mr. Ross—Is there any authority in the Act for that?

Mr. Coad—The way the Act is, we consider we have not exactly authority to award a man to put in tile at all; it says you may put in tile, you might recommend that tile be put in. I think that is one section in the Act that should be changed. I think the section in the

Act should be changed also about making it compulsory for a man to maintain a drain that he opens.

Mr. Ross—We have got to take the Act the way it is.

Mr. Coad—Of course, we invariably make a man maintain a drain that he opens up where it is an open drain. About putting in tile, a great many people would prefer to have tile in, and probably we infringe a little on what the law really lays down. We just simply tell the parties that, if they appeal about the matter, it may be found to be wrong, but they don't generally appeal.

Mr. Bolton—I have adopted the method of making the parties through whose lands the drain passes maintain the drain after it has been completed, with the exception that the party above is to supply any tile that may become defective. As to awarding a closed drain, I think, by the reading of the Act, the engineer is empowered to do it.

Mr. Coad—If you read the whole of the Section, you cannot say that he shall; I think it would be over-reaching our authority.

Mr. Gaviller—In cases where it would not be a fair division to have the maintenance allotted to the party who dug the drain, or a large part of it, it would be far more just to allot the maintenance to some other person. (Reads from Act.)

Mr. Coad—I think that clause in the Act makes it imperative that, if a man open up a certain piece of drain, he shall maintain it. I think that is wrong. Supposing a man up a stream has to dig twenty or thirty rods on his neighbour's land down stream, that neighbour may be an arbitrary sort of a man and may make it his business to turn in cattle, sheep and hogs and keep them in that field because his neighbour has to keep it open; whereas, if a man had to maintain on his own land, nine times out of ten it would be more just.

Mr. Taylor—In case of a house drain, digging from a cellar for instance, would you consider that would come under the Ditches and Watercourses Act, there being no water on the surface?

Mr. Coad—I would not think it would come under the Act. There is no doubt that the person applying would require to do all the work extra over and above a fair depth of drain for the draining of the land.

Mr. Taylor—This man wants to lay a tile drain through his neighbour's land, and his neighbour forbids him going on with the drain.

Mr. Coad—I don't think it would come within the Act; but I think that Sec. 593 of the Municipal Act would apply.

Mr. Taylor—I was under the impression that an engineer was obliged to follow the natural watercourse, and in a case I had a short time ago I made my award in that way. The award was appealed against, and the judge directed that the course should be cut through a ridge, a shorter distance somewhat, leaving the expense about the same.

Mr. Coad—I think it is pretty generally the opinion of judges that when you go into a neighbour's land to construct a drain, you want to construct that drain as straight as possible, even if you go somewhat out of the natural watercourse, if it is to the advantage of that neighbour to have it so.

Mr. Ross—As regards the letting of uncompleted portions, has the engineer power to let one uncompleted portion without letting all the uncompleted portions?

Mr. Coad—I suppose he would. I think the Act means that, if any party on a drain complains of a piece not being completed, you can advertise that.

Mr. Ross—I have done so, but I don't know that it is strictly right. Sometimes you cannot complete the upper parts of a drain until the lower part is completed. I don't think we have authority to let one part without letting the whole.

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

DIFFICULTIES IN THE SURVEY ACT.

By P. S. GIBSON, B.Sc.; C.E.; M.Sc. (Univer. of Mich.),
Willowdale.

(1) We may first mention those difficulties which naturally occur in reading any statute, and which have given rise to the understanding that the true meaning of an Act of Parliament is not known until a case under it has been carried to the Court of Appeal or the Supreme Court, or likely to the Privy Council. So that our law, like the British Constitution, is founded on the decisions of our higher courts and precedents. And we have thus to acknowledge the astounding fact that our most profound statesmen, after having prepared and passed a statute (aided by their Parliamentary supporters and Her Majesty's loyal Opposition), do not know what it means, nor does any one else, until some litigious person, often with more money than sense, for the benefit of the public at large, and more particularly for the benefit of the legal fraternity, puts a case through the mazes of the High Court of Justice, so called.

When to the above we have added the decennial consolidation of Public Acts, we have often confusion worse confounded. The original statutes, aided by their preambles, most persons with a reasonable education may have the conceit to think they understand, but when revised and consolidated it is almost a hopeless task, and even our legal lights do not, we think, indulge in such reading as a pastime. Another peculiarity and difficulty which it may be well to mention is, that while the surveyor must be well versed in the law and precedure relating to surveys, and in actual practice is invested, we might say, with all the powers of the judge, jury and counsel, and is expected to exercise all these combined powers and duties with such profundity and exactness that his work in the field will stand law, yet when in the witness-box he is *not allowed to give an opinion* as to the meaning of the statutes by which he made his survey.

The difficulties in reading "consolidated" statutes would not be so great if the statutes were *really consolidated*, and not, as often done, compiled. A proper consolidation would not be simply dropping the preamble, often the key to the statutes, and omitting parts actually repealed, but those parts of the statutes or amendments relating to the same subject should be brought together, and often by re-writing consolidate two or more sections into one; to meet this idea, it would be necessary to employ experts versed in the matter treated of in each statute, and not leave the work to lawyers alone,

who, however well up in legal forms, terms and phraseology, yet cannot be expected to have a proper and the necessary knowledge of the subject treated of under our statutes without which it is impossible to make a proper consolidation.

(2) Another difficulty is in determining in particular cases whether there is a statutory rule for making the survey, and this is sure to occur in the most important cases, since in simple cases there can likely be no difference of opinion; but where the Act is not clear, or is ambiguous, or does not really apply, there is room for litigation.

When to the above is added the want of a proper knowledge, in some cases, of the statutes on the part of surveyors, where they could by reasonable application be informed, it can be readily understood that serious consequences may arise, as surveyors are required to make surveys according to law, failing which they are liable to damages, cases of which have occurred in the Province. Again all boundaries legally established under any ordinance or Act remains good and valid notwithstanding the repeal of such Act or ordinance, so any Provincial Land Surveyor, in making surveys in the older townships, should make himself familiar, not only with the statutes in force in his own time, but also at former dates.

(3) In municipal surveys the question arises whether surveys made under the directions and orders of the Commissioner of Crown Lands are true and unalterable, as in the case of original surveys by the Crown; and it is a surprise to some surveyors that such a survey by themselves is sometimes set aside by the court or ignored by another surveyor; and more of a surprise if they cannot get their pay for the want of a Crown Lands Department certificate.

The same difficulty occurs in cases of the old Boundary Commission surveys. A surveyor meeting with monuments planted under the Boundary Commission, and using them as true and unalterable monuments, as in case of original surveys by the Crown, to locate other boundaries from, is sometimes surprised to find his surveys set aside and the Boundary Commission work treated about the same as an ordinary arbitration survey.

Under the municipal surveys a question might arise whether the council of a city, town or village can apply to the Government to have the angles of town lots fixed as in case of angles of township lots? Again, is the Act clear that in all cases concession lines can be defined?

(4) In the case of aliquot parts of lots the law seems clear, but when we come to apply it to double front concessions there seems to be a strange anomaly, as a half lot may sometimes have acres more than the other if ends are different and sometimes the same area.

(5) In the case of re-surveys of town lots the law says the surveyor shall follow the same rules as when making surveys in townships. The question arises do surveyors actually do so? How often do surveyors get off course of the base or governing line and run lines between lots? How often do surveyers in cities take the stakes on

the opposite side of roads as the best evidence as to a lost stake? When do surveyors enquire whether there is a governing line at the end of the range of lots from which they number? When do they make enquiry as to proof lines or ask whether the work should be done under the law regulating the surveys of single fronts, double fronts, or sections, and in taking aliquot parts of lots do they enquire if the survey is to be done under the Act for single fronts, double fronts, or sections, and do they often enquire whether the fronts of the blocks have been run, or whether they would come under the law regulating the surveys of alternate concessions or cases where the concession lines are lost or obliterated, and do surveyors keep the law as to administering oaths to each and every person they examine, and filing the same?

(6) In running lines between lots it is necessary to find the course of certain governing lines. At first sight it might appear that the governing line, if crooked, should govern, and only by referring to a different part of the Act is the case made clear. Sometimes in getting up the governing line it is found partly cut off by a lake or river, or only partly run, and sometimes it is difficult to say which are the front and rear ends of the governing line and in some cases to say when to use a proof line and to say what is a proof line and when it should be used in preference to the front of the concession, and in case of alternate concessions how you would run lines when both ends of concession are bounded by a lake or river, etc., and no proof line.

(7) A difficulty sometimes occurs in defining the front of a concession, as in the case of the three concessions from the Bay in the township of York, and only by reference to the early surveys can they be determined.

(8) In the amendment to make a post on opposite side or centre of a concession road the best evidence in certain cases the expression "alternate concessions" does not appear to convey a clear idea.

(9) Sec. 61 of the Act is an illustration of a consolidation hiding the meaning of the Act, and a casual reader might wonder why it was inserted. This section applies, I believe, more particularly to townships which in the original surveys had the side lines of lots only run and not the concession lines, and was intended to regulate the manner of surveying the concession road allowances, but it would require a good deal of study to make such intention out of this section.

(10) In preparing plans of town lot subdivisions is it strictly legal for the name of a firm to be put to the surveyor's certificate? One member of a firm cannot give evidence as to surveys done by other members of the firm and the wording of the Act does not seem to justify the use of the name of the firm.

(11) A question might arise as to re-surveying town lots which were actually not staked out on the ground, or only partially so, and as to the re-surveys of town lots which in the deeds are described as starting at specific distances from some angle of the block or section, which is not an uncommon thing in deeds of subdivisions of lots before 1868.

(12) Surveyors are sometimes surprised to find that evidence taken by themselves or other surveyors, and produced by them from the Registry Office, is not presentable in court. The Statute is clear as to the duty of the surveyor to take evidence under oath from every person he examines as to boundaries, etc., and provides for the same being filed in the Registry Office and being produced in court. The difficulty arises partly from the defective character of the affidavits, many of which bear on the face of them clear evidence that they are not prepared with a view to determine the actual facts but to prove in a one-sided manner some boundary or post. Surveyors cannot be too strongly impressed with the idea that the position they hold as Government surveyors is a responsible one, and in doing their work they should be governed by a high sense of honour, and their characters should be above suspicion.

(13) Among the difficulties met with by surveyors none likely give rise to so much unsatisfactory surveying and litigation as surveys in cities, towns and villages, and it must necessarily continue so until the matter is taken up by each corporation and a complete plan of each of such cities, towns and villages made as partially provided for under the Statute, and boundaries planted for reference and to fix original angles, etc., and to govern future surveys, and the whole then established by Act of Parliament.

Special Acts of Parliament are common for townships under which stone monuments are planted at the angles of blocks and other points which form a basis for future surveys without much trouble or fear of litigation.

(14) In this paper I have merely made suggestions as to some of the difficulties in the Act, as I found, should I enter into a discussion in detail of the many points, this paper would be unreasonably long, as it appears to be growing now. So I shall only add that I am of opinion the Act should be re-written under the supervision of a committee of surveyors from different parts of the Province assisted by a Government law clerk, so that instead of being a maze to the profession generally and a stumbling block to the student it might be made reasonably clear. But as the Survey Act is not much worse than many of the older Acts which have been consolidated and re-consolidated, I suppose a re-written Act is too much to be hoped for.

REMARKS OF MR. GIBSON IN ADDITION TO HIS PAPER ON "DIFFICULTIES IN THE SURVEY ACT."

(*Clause 1.*)

With reference to this subject of reading the Statutes, I asked a lawyer: "How do you manage in reading the Statutes?" He said: "I never dream of reading up an Act unless I go away back to the first Act." The difficulty with surveyors very often is that they have not a complete library of the Statutes. I myself have attempted to get up such a library for my own personal benefit, but it is impossible

for every surveyor to do that; and if they had a library it is a question whether they would go into it and study it up as thoroughly as they should do. I know of a case in the Court of Chancery; I was called as a surveyor on the matter, and I met a Q.C. from Hamilton, and he said: What is the meaning of such and such a section of the Act? I said: If you get me the original Act I will soon show you. He got the Act, and I said: Will you please read that preamble? And he said: Oh, I see how it is now. Very often the preamble is the key to the whole thing. What is the meaning of "Consolidation"? It is supposed "to make it clear and plain," whereas the fact is, those parties who consolidate these Acts don't understand them, and very probably they simply compile them. Take the Survey Act, passed previous to 1800. From that date it has been consolidated and re-consolidated, enacted and re-enacted, until now it is almost a jumble, and it is a burden for a person to read it. At one time I was under the impression it would be as well to let it alone, for it will give us more business—I think that is the lawyers' idea.

(*Clause 2.*)

I think there is a case in which that matter was brought up—the case of Stafford *v.* Bell. The courts tell us distinctly that a surveyor making a mistake in making a survey, and the matter comes up in that way, it is not a question often of how you made the survey, but whether the law applies at all—is there a statutory rule for it. In that case the court ruled that there was no statutory rule for that class of surveys.

(*Clause 3.*)

It was supposed at one time among us that every municipal survey made by the Crown was binding, the same as the original surveys by the Crown; but now that won't answer, because cases have been decided against us.

If you are ordered to make a survey of a certain line in accordance with the law, and if it can be shown that you have not complied with the law, your survey is set aside at once. In the same way with a municipal survey. If you have not taken the proper evidence it will be set aside at once. Where I know the law does not apply, I have often refused to make such surveys.

It is the impression that if they have a Boundary Commission survey to work upon, they can base their work upon it. I have had cases myself of that kind that I have ignored; they were governing so far as they related specifically to a certain thing, but you could not use them to work upon. Take, for instance, in the township of York. There was a disputed line where it was decided by an arbitration. The question came up whether that would govern or not. Of course it will govern if it is found that the evidence that the arbitrators acted on was good and sufficient. It is our duty to refer to the evidence that has been filed, and see that it is good and sufficient to rule; and if it is simply a compromise, it is only binding so far as it relates to that line.

In making municipal surveys the question might arise in relation to stakes whether they are Crown stakes or planted by private individuals; and you would require to look carefully before you would proceed. It is a question of the wording of the Act.

And then as to the question of whether the Municipal Act will apply to all concession lines. For instance, if you want to define concession lines between two points, and there is only one point in that concession that is not obliterated, or there may be the whole line there until you come to the last half mile, the common practice is on the supposition that the best evidence that can be got of a line is the production from two well defined points.

(*Clause 4.*)

For instance, a lot on the one front is a chain wider than on the other. The Statute says you are to chain through, and give equal depths to each. Supposing you buy the north half of the lot, you get half of the area of the whole lot; but in case you take the east or west, you don't get the half area.

Mr. Dickson—In one case of a lot wider at one end than the other, a party wanted to purchase the east half of the lot from the Crown Lands Department; and I made the plan showing that, and it was returned as not being correct; it did not give half the lot, and I had to send in an amended plan. They wanted equal areas.

Mr. Aylsworth—They could only do that in case the whole lot was patented: if one end had been patented, then it was out of their power to deal with it.

Mr. Stewart—In regard to aliquot parts of lots I think it states that the lines shall be run so and so parallel to the division line. Now, in some cases the last lot is wider perhaps in the rear than it is in front, and it has been my practice to give equal areas.

Mr. Gibson—The Statute says that you shall chain the two sides, take half the depth, and draw a straight line between them in double fronts.

Mr. Stewart—You shall run parallel with the governing line. The law says you must chain through, plant a stake in the middle on either side, and a straight line between those shall define it. I am not speaking of a double fronted concession, I am speaking of one of these sectional surveys. I suppose there is no doubt that half means half the area. Half the area is what we are to give. Now how are you going to do that? Are you going to chain the front and rear and take half, or are you going to make up the area by giving more on one end?

Mr. Gibson—I think then it depends upon how the description reads in case of the last lot in a single front concession or section.

Mr. Stewart—Just the ordinary description.

Mr. Gibson—It is a defective description then.

Mr. Stewart—I contend that the Act does not apply to dividing up of aliquot parts of lots. I would like to know of any authority showing that the Act refers to aliquot parts of lots.

Mr. Gibson—There is where the defective description comes in. Parties purchasing should see to having a proper description. If I were given a case like that I would run it both ways. From 1819 to 1829 the surveys of the double fronts were made, then there was another Act passed in 1849 saying how it should be divided; that was a long while after these surveys had been made by the Crown, and questions sometimes arise under what Act was a survey made.

Mr. Davis—Double fronts were supposed to be discontinued in 1829, but they were not. I came across a case in the township of Puslinch where in 1835 your father laid out several concessions.

Mr. Gibson—I believe there is a list in the Crown Lands Department showing what are supposed to be run as double fronts. Double fronted concessions are those in which the stakes have been planted on both sides of the road; and they certainly make plenty of work for surveyors and lawyers.

(*Clause 6.*)

In surveying along one side of a street, how often do surveyors take the stake on the opposite side as the best evidence of a lost stake? Yet that appears to be the law; you are to follow the same rules and regulations in making a survey of town lots as township lots. I think myself that the law should be changed with reference to making surveys of town lots; because the rules do not apply. Up to a few years ago there was no actual statutory rule for surveying town or city lots. I was asked in court one day about it, and I said, strictly speaking there is no practical rule for re-surveying town lots where surveys have been made by private individuals; the law is clear as to where the Crown subdivided it.

(*Clause 10.*)

It is a common practice to sign the name of the firm isn't it? but the form of the certificate is "I."

Mr. Foster—We sign the name of the firm to a certificate.

Mr. Gibson—Is the Statute clear that you have to say "Unwin, Foster & Proudfoot" on the plan?

Mr. Foster—I don't think it is, but there is nothing against it. The three members of the firm would be responsible, I presume.

Mr. Gibson—It is not the responsibility, it is the legality. How is it in the Land Titles Office?

Mr. Foster—By the individual; that is the rule with Mr. Scott. He always rules that it should be signed by the individual surveyor who has made the survey, and I think it is more correct to do so in every case.

The President—I may say that when this new certificate first came in it was the practice amongst the firms in Toronto to sign the plan strictly "I," and for probably a year at least after the certificate was amended the firms in Toronto signed "I"; that is, the individual member who made the survey signed the plan. But in the last year or two the old form has drifted back, and you find that the firm signs its firm name. Some people have an idea that in a firm of three or four they have three or four times the security for the correctness of the survey when the firm name is signed.

Mr. VanNostrand—It very often happens that a piece of work comes in in the spring and is not completed until fall; one member may attend to it in the early part of the year and another in the later part. Lawyers sign half a dozen members of a firm and I think they should allow us to reciprocate.

Mr. Gibson—The matter should be arranged so that there could be no question about it. The name of the firm governs the individual anyway; as Mr. VanNostrand says, two of them may have made the survey.

(*Clause 12.*)

In regard to these affidavits, if the person is dead and you present these to the courts, they will say, Oh, it is just a got up affair, and they won't take it; and yet we are compelled by law to take the evidence.

Mr. Foster—Does not the law make that evidence necessary and acceptable to the Court?

Mr. Gibson—They won't take it. The fact is the affidavit is a certain kind of *ex parte* evidence; there is no cross-examination to show that the facts were got at properly. I had a case where evidence was produced in court as to these points and they would not take it.

Mr. Butler—Is not a surveyor supposed to take the evidence of the opposite side too?

Mr. Gibson—Yes, he should do it. As to negative evidence, you will find that laid down in the decisions.

Mr. Gaviller—He has to come to a conclusion, and I presume he would take all the evidence to satisfy himself.

Mr. Gibson—He should draw the affidavit in such a way as to satisfy other people as well as himself. If you are in Manitoba and your evidence is required in court, a commission is appointed to examine you. The questions are drawn up and submitted to the other side, and they go over them all and see if they are all right, and those questions are submitted then by a lawyer in Winnipeg and they have to be answered pro and con, and those questions are submitted to the court with the answers and taken down as evidence.

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

CROWN SURVEYS.

By JAMES DICKSON, P.L.S., I.C.L.S.,
Fenelon Falls.

THE subject upon which I have been requested to write a paper, viz., "Crown Surveys," is a somewhat delicate one for an Inspector of Surveys to take up, as it will be necessary not only to remark on the manner in which such surveys ought to be made, but also to mention a few of the inaccuracies and errors I have met with in the field.

It is not my intention to make this paper a long one, but confine myself to a few examples of how some members of our profession do their work, and then, very briefly, point out the manner in which Crown Surveys ought to be made.

I think you will all agree with me that the first object a surveyor should have in view is to keep up the standard of his profession. And no matter whether the commission he may have on hand is great or small, no matter whether the survey is of little or much importance, it should be his ambition to do it as accurately as possible. It should be his ambition to show the public that accuracy is within the compass of possibility. And leave everything behind him done in such a manner that there could be no room for either doubt or trouble in the future. Were this object always held in view there would be no necessity for any government to appoint an Inspector of Surveys.

I presume that it is not necessary to take up your time with a recapitulation of Departmental Instructions, as many of you have had experience in making such surveys, and no doubt those who have not are perfectly familiar with all the details.

I believe every person will agree with me that if there is any survey which should be made with perfect accuracy it is that of a new township, for to inaccuracy and ambiguity in original surveys are to be traced the beginning of most of those long and expensive law suits touching the ownership of lots and parts of lots which are almost constantly before our Superior Courts. During my own practice I have been engaged in a good many such cases, and I cannot recall a single instance in which there would have been room for either doubt or dispute had the original survey been correctly made.

Of course it is not to be expected that any surveyor, no matter how careful he may be, or how accurate his instruments, for as much depends on the integrity of his chainmen as on himself, and those he cannot have always under his eye, can cut up a township into 1,000 acre or 640 acre blocks, and have all his lines intersect at the exact

spot, but it is expected that every line will run straight from one intersection to another, and that the dimension of the lots and bearing of the lines in the field will be the same as those returned on the plan and field-notes.

Perfect accuracy is neither expected nor looked for, but perfect truthfulness is.

Some will say, Oh, the land is so poor there is no use in being too particular. To such I would simply reply, the quality of the land is something they have nothing whatever to do with in making the survey. Their duty is to carry out their instructions; that, and that alone, should be the only object in view. They should not lose sight of the fact that, although in many places the land is utterly worthless for agriculture, the recent discovery of valuable minerals has made it more than ever necessary that the surveys should be accurately made. In some of what seemed the most worthless townships has been found the most valuable nickel and copper mines perhaps in the world, and the surveys of some of the townships where those minerals have been discovered—but which were made before the inauguration of the present system of inspection—have been performed in such a loose manner that I predict, at no distant day, to hear of some of our legal friends reaping a rich harvest.

While discharging the duty of Inspector of Surveys I have been over a good many townships, and it has been my unpleasant duty to report a considerable percentage of bad work. It has been a matter of no small astonishment to me that some surveyors should leave so many errors, both of omission and commission, behind them, when they have been duly warned that their surveys would be inspected after they left the field before their accounts would be closed. While I find the greater part of the work now well done, there are still some who seem to think the Inspector will only go over the lines as a matter of form, and either not see, or wink at, irregularities, or, in other words, that he is either a knave or a fool. Such men should bear in mind the Inspector has a reputation to maintain; that he has been sent out at considerable expense, the Department having confidence in his integrity to report everything exactly as he finds it; that he must be no respecter of persons; that, while it may be in the interest of the contractor to slight his work, or leave some of his lines not run at all, to the Inspector it makes not the slightest difference whether the work is well or ill done, his pay and thanks are the same. The only difference it makes to him is this, where the lines are well opened and fallen timber, which must have obstructed the view, cut, his work is much lighter than where he is constantly either climbing over logs or parting brush, perhaps laden with snow or rain, which ought to have been removed when the survey was being made.

I shall now give a few specimens of what I have met with in the field, which were not laid down either in the field notes or in the plan.

I have found lines run straight to within a short distance of those they were intended to intersect, then suddenly bend either to the right or left, sometimes in the form of a bow, in order to strike the post; when, had they been run out straight, they would have struck from

ten links to five chains to one side—lines in which there were scarcely ten consecutive chains straight.

I have found the whole four posts at an intersection made of trees. A man could stand at any one of them, pay out forty links of the chain, and touch the other three. The post on one side of a concession line within twenty links of the guide post, that on the opposite side eighty links distant, the three upwards of ten feet out of a straight line, some posts standing at almost any angle with the line except the correct one, others tossed off the line, not even set up; bearing trees sketched in the notes for every post, whole blocks without a single bearing tree marked in the field, numbers of the lots not even posted; one line run up to another, end there, and start off on the opposite side at from a few links to several chains to one side, only one of them posted; a post instead of standing at an intersection planted on the concession line as much as two chains from it; in numerous instances, lines only partly run, others not even started; a block, which contained five lots on the plan, with six posted in the field; a side line start at lots 20 and 21 and strike the next concession line, 100 chains distant, at lots 25 and 26; lines start from each end of a block, and miss each other at an intermediate point by from a few links to six chains; beautifully proportioned triangles across and offsets around lakes, in the notes, where it was simply impossible to have got any such in the field at all; lines run from other lines on either side of a lake to the water, which, instead of striking at opposite points, would miss each other by as much as seven chains, and the water assumed to contain whatever the two added together lacked of making the full block; a carefully calculated triangle in the notes showing the water fifty chains wide, when by actual measurement it was found to be less than thirty; some lots which were returned twenty chains not eight chains, others as much too large.

I have found three separate lakes with high ridges between in the field which were returned as one, their combined acreage not half what the one was shown to contain; two lakes on the plan which were only one in the field, and a mountain which was returned a lake; a marsh on the plan where I found a mountain of bare rock, several hundred feet above the level of the surrounding country.

Streams in the field not on the plan, others on the plan but none in the field; and as many as seven streams all crossing the line at right angles in a distance of half a mile, which turned out to be only one small creek. I have found posts with holes in them a man could run his fist into; others made of poplar, with cedar and spruce trees of the proper size standing as near as the tree from which they had been cut. In some cases not a lake traversed in a whole township, their outlets not even shown; in others, while there had been a rough traverse made of the largest, the smaller not even sketched, no attempt whatever made to show either their size or shape.

I have found a whole township of 50,000 acres divided into 100 acre lots, each lot returned exactly twenty chains by fifty, and not three trees the size of a man's thigh cut in the whole township; where one could only follow the lines by keeping his eye constantly fixed on

the blazes, and those small, few, and far between, the hands almost constantly occupied in separating the brush in order to force the body through.

Need I ask any practical surveyor if such a survey could be even approximately correct? What chainmen could make correct measurements under such circumstances? Am I using too strong language when I say that a man who does his work in this manner is a disgrace to the profession?

In a good many townships, which are otherwise well surveyed, I find the line across the block next the boundary, on the side towards which the lines have been run, a mere trail; why is this? why should not this line be as well opened as any of the others?

In most cases where I have found angles in the lines they were very poorly opened, while in others there had been a good deal of work done. In the latter case, I attribute the errors to placing too much dependence on the magnetic needle, and not being sufficiently careful in taking back-sights, especially in thick swamps and going over knolls. In others which have been run by theodolite, to the instrument not being standing solid while crossing soft ground. In every case where the instrument cannot be made solid, posts should be driven into the ground, and the instrument set on them, then the surveyor can move around it without any danger of throwing it out of line.

In still other instances the errors are undoubtedly traceable to unskilled assistants and insufficient instruments. Some men even go so far as to use a small compass without a ball and socket attachment.

I would now briefly point out a few of the most important points to be observed by a surveyor in making a Crown Survey.

His instruments should be of the very best to be had, and both them and the chain kept in proper adjustment. If at all possible, an astronomical observation should be taken before commencing the survey, and check observations taken as frequently as circumstances will permit during its progress.

He should not hang his work on any other man's, assuming it correct, but should depend entirely on himself. By doing this, each man's work is a check on the other; if they are both correct they must agree, if not, and he knows he has done his correctly, he will then be in a position to confidently invite inspection without any fear of the result.

If he is running two parties, one of them at least should constantly use a theodolite, and too much care cannot be taken in back-sights. It is well to, at least, start all lines with the theodolite, and then, if proper care is observed in the back-sights and trees cut where a good back-sight cannot otherwise be had, local attraction will be a matter of secondary importance.

All triangulations should be made either with the theodolite or a box sextant. The compass should never be used to make a triangulation. The angles cannot be read close enough with the magnetic needle. Where the concession lines have been accurately established, a lake or river, crossed by a side-line, may be measured by micrometer,

but I do not think that a sufficiently accurate instrument with which to measure lakes on a concession line where the size of lots may be affected.

All streams, however small, should be carefully noted ; their width and apparent average depth. Their points of convergence or where they empty into lakes approximately shown on the plan by full lines where they intersect open lines, in other places by dotted lines. All springs should also be noted, also marshes and swamps laid down in their proper places, and the hills sketched in.

If one line does not intersect another at the expected point, if it is not over two chains out, leave it there, but return everything exactly as you find it, and change the bearing in order to have the error corrected at the next intersection. If it is over two chains out I think the line ought to be run over again, but under no circumstances should an angle be made in a line in order to have it strike a given point.

Every lake of over two or three acres area should be traversed, and its outlet and connection with another lake or river shown, if possible. It is not enough to simply show a body of water at a given point ; its shape and size should be accurately laid down. It is a great injustice to a settler to find that what he supposed was a one hundred acre lot has a number of acres of water, which he must either pay for or have a survey and plan of it made at his own expense, when such an outlay would have been avoided had the man who made the original survey simply done his duty.

All lines should be so opened out that an open line can be plainly seen at any point, no matter whether the bush is close or scattering, and every tree within a foot of it marked by three blazes—not a small piece of bark knocked off by one stroke of the axe, but a good, deep, broad blaze cut well into the timber at least nine inches long, which can be seen at a considerable distance. If the timber is scattering it is necessary to blaze trees at a greater distance. If this is adhered to there will be no danger of persons complaining that they cannot find lines while any of the timber near them remains standing.

The posts should be of the most durable timber to be had, not less than four inches square and three feet long, neatly made and marked —a ragged, ill-made or ill-marked post always looks bad—and firmly planted in the ground. A bearing tree, taken wherever obtainable, with a good-sized, smooth blaze on the side next the post, not at right angles to the line of the post, as I sometimes find them, and the letters "B. T." neatly cut thereon.

Wherever a live tree of six inches or more in diameter is standing within one foot of where a post is to be planted, I should say take it for one by all means. Cut neat blazes on it sufficiently large to hold the figures, but be very careful not to make them so large as to run any risk of killing the tree. Leave as much bark as possible untouched between the blazes. Do not cut the tree down and then dress the stump into a small post, as I have sometimes found. In one instance I found a poplar tree about ten inches in diameter taken for a post. It had been cut off three feet from the ground and the stump squared into a four inch post. Could anything be more absurd ?

In conclusion I would simply add that a very little additional outlay and a little more care exercised by the surveyor and his assistants in the field will make all the difference between a good survey and a bad one, and very materially tend to raise the standard of the profession in the estimation of the public.

DISCUSSION.

The President—There are a great many good points in the paper Mr. Dickson has just read, but I hope no member of this Association comes under his thumb with regard to some of the remarks he has made.

Mr. Kirkpatrick—I would like to emphasize one remark that Mr. Dickson made, that you are not to assume that all the Crown Surveys are made in that style. When these township surveys are left in that way the surveyor has to go back at his own expense, and very often finds it a very poor policy from a financial point of view, because he has to go back and go over the whole survey again, and then Mr. Dickson has to examine it over again. With regard to leaving lines un-run, some surveyors have told me that they honestly believed they were run, but they had left it to their assistant, and the assistant with the chain men, I suppose, sat down and had a pipe and said they had run the line and prepared field notes, which was really almost as much trouble as it would have been to run the line. That is the only way I can explain it, because the field notes are apparently accurate —creeks and everything else—and yet he reports that the lines are not run at all on the ground. When you get a Crown Survey be sure whom you get for an assistant; don't take the first greenhorn that comes along. Now, young surveyors should recollect that the thing will come back upon themselves at some future time, because it leaks out who the assistant is, and it will be a discredit to the surveyor all

Mr. Aylsworth—I am sorry to learn that during the last four years when the profession has made such rapid strides and with such perfection in instruments that Crown Surveys are being made in a manner so that it is possible for an Inspector to make such a report. But is the blame altogether to be laid on the surveyor? Years ago it was done by days' work, and then there was not the same object in slighting the work as now. There were difficulties in the old system but I am not sure but there are greater difficulties in the present system. Long before my time the surveys were given out by contract, and the result was they reported lines run that they had not run. Now, maybe better work would be done if they were paid by

Mr. Miles—In the North-west the requirement of the law is that all lines should close within fifty links in a six mile survey. In a township I surveyed a year before last I had to take several observations to check outlines, and they almost all checked within .005°. That is just about as close as it can be run; and very late this fall,

in December, I examined six contract surveys, about fourteen townships, and there is only one contract that did not come up to the requirements, and I thought perhaps it would be a very good idea if the Crown Lands Department had a similar limit in closing their lines across a township.

Mr. Chipman—This paper, I think, is a very opportune one, and it is something that interests the whole Association, whether they are participators in the Government surveys or not. I for one feel that there should be a revision of the instructions given to surveyors. Mr. Miles has pointed out that there should be a limit to the error allowed, and I have felt that as it is now there is no limit, we are supposed to do our work exactly correct, but that is an impossibility, especially in our northern country. There is another matter in which I think the instructions should be amended; and that is in the matter of traversing lakes. A surveyor goes in there and is paid so much an acre, but gets nothing for his lake traversing. I have found in some of my townships fifteen or thirty lakes, where we did not expect more than one or two, and it is rather discouraging work to know that we are supposed to traverse those lakes and get no payment. I think there should be extra payment for traversing. I think also the instructions should be amended in such a way that the plan when it is given in to the Crown Lands Office should bear some resemblance to the natural features of the country as they exist. And I think it should be the duty of the surveyor to trace all streams—the physical features should be correctly shown on the plan. There is another point that I don't feel I can agree with him on—running a straight line through from concession to concession and not making any bend in the line. Well, I believe in bending in to the post at the upper end. That is my practice. I have had no hesitation at all in making bends in alternate side-lines. I can't see the force in running them through and having two posts on the concession line. I would prefer seeing a bend in the side-line than having two posts at the north limit.

Mr. Dickson—I meant if you had a concession line run and your post at that concession line, and then if you came some distance from the last post you should not angle to strike that post but change the bearing of your line.

The President—You would leave one end of the lot small and the next large correspondingly. You want the field notes made to show what actually was done on the ground?

Mr. Dickson—Exactly.

The President—And as I understood, as long as the limit is within two chains let it be.

Mr. Dickson—That is a matter of opinion. Some would think, perhaps, if it is that much it should be run over again.

The President—As long as you give the man the right number of acres.

Mr. Miles—That shows my contention that there should be a certain limit of error in closing.

Mr. Kirkpatrick—A great many of these mistakes arise in running two parties.

(Discussion continued by the aid of diagram on blackboard.)

Mr. Dickson—I think the great trouble is in not taking back-sights.

Mr. Miles—Is a jog in an Ontario township permissible?

Mr. Chipman—If you follow out the instructions, if they could be followed out, there would be no jog.

The President—Could not some system be arrived at by running up a tier of blocks along the east boundary and check from the east boundary, or take a tier of blocks running from the south boundary; some such scheme as that would surely make the chain and theodolite check each other instead of running promiscuously the way some townships have been run. The cause of a good deal of the peculiar surveying that I have come across appears to be want of system in running out the original survey. Even if it doesn't come out to the exact eighty chains to each block, the field notes should show what the difference is. Then if there was a shortage in one block it might be corrected in the next.

Mr. Kirkpatrick—The instructions say where they shall commence, they shall run their lines north and west or east just as the lots number; they are also told to show the exact lines as they come out on the ground, to give them in the field notes whether they come out the exact distance or not; if one comes out 78 chains show it. In one case a surveyor went to the trouble of moving his 40 chain post to 39 to make them both 39. Now, there is no necessity for that, because we are selling the land, and it is no matter whether it is 320 acres or 325 if we know the fact that there is 325. But if there is 320 in one and 340 in the other and there is only 320 put down in each there is 20 acres unaccounted for. That is where the real trouble is; if surveyors would just send in what they find on the ground I don't think we would complain very much if it was two chains out. I have always maintained that two chains would be a legitimate amount to allow. As to what Mr. Miles says about closing, you must recollect that in this system there is really no closing line at the end because every block closes itself; every mile square is a little township in itself. And as to being paid by the day: it was at the urgent request of the surveyors themselves that the contract system was adopted, because it was preferred.

Mr. Niven—So far as the two systems are concerned I prefer to work under contract. So far as the accuracy of the work goes I can't run a line unless I get it right, and I think I do my work under contract just as well as I would paid by the day.

Mr. Dickson—I would be very glad to assume that in the majority of cases surveyors are not aware of it, and I daresay they are not, but there are some men who always do their work well, and others who do not. This matter of traversing lakes is a very important thing. It is not enough to sketch them, I think when a lake comes to be two or three acres it ought to be traversed and put in the returns. With regard to creeks it is surprising how few there are who really show the water connections. I remember one time going out to inspect a contract. On the plan there were hardly two lines the same bearing, the angles were shown in the plan, and I think that was one of the most beautifully performed surveys I ever travelled on in my life. There was not much difference in the angles but every one of them was shown. That is what I call a beautiful survey, much better than a beautiful plan. I maintain still that a great portion of the errors in running lines is because there is not sufficient care taken in back-sights.

Mr. Fawcett—I was just thinking of the difficulties that arise through the burning up of the posts. That matter came up in connection with the Dominion surveys last year, and they changed their system entirely. Their system now is to plant iron posts and build mounds in the woods; they have discarded the bearing trees all through Muskoka and Algoma too. After a fire runs over the country in many cases there is nothing left to show that a post has ever been there. I have known places where the country is so rocky that surveyors have, in order to fix up their posts, had to pile stones around them, and in some cases I have found those stones with a little piece of the post, and I think it would be a good plan to adopt in all that north country. If one of the posts could be established there would be something to go by, and a person would not have to go perhaps five or six miles before they could find any definite point. Another thing I might mention; Captain Bolton has made a survey of the Georgian Bay and has made a chart of it, and in connection with that survey he has made plans of his triangulation and established points. His triangulation has been made very carefully, and he has built up piles of stones in many places at his stations. The Crown Lands Department, I think, could get a copy of his charts showing the position of his stations, and perhaps they might be used in making mining surveys.

Mr. Kirkpatrick—I may say we have given Captain Bolton all our plans for the purpose of tying in his survey to our survey. About the iron posts: we have that in operation too, but you must remember that iron posts are pretty heavy to carry, and it is a very different thing putting them into a cart and carrying them on your back. Another thing I would like surveyors to remember is that it looks very poor in a report to say the posts are marked "as per instructions." If they would simply say how the posts were marked, giving the letters on these iron posts, it would be a vast improvement. These reports are published and Americans coming in find that a post is marked "as per instructions" when they don't know what the instructions are.

The President—There is no doubt a great deal in what Mr. Kirkpatrick has just told us about having all this in the field notes, but I think the remedy lies with himself: don't accept the field notes unless they are all put in.

Mr. Miles—I was surveying some coal limits near the Rocky Mountains a year ago last fall near the boundaries of the National Park, and as soon as I struck the line I went along a little distance and I found a post there marked so many miles and so many chains, and I immediately knew where I was.

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BRIDGE ABUTMENTS AND FOUNDATIONS.

By JAMES WARREN, P.L.S., A.M., CAN. SOC. C.E.,
Kincardine.

It frequently happens that the surveyor, on being appointed County Engineer, or when otherwise called on, has to do with bridge building, in its various details, such as preparing specifications for wooden bridges, or iron and wood combined, also for the piers and abutments for them. However well these designs may be carried out, there is another point that must be previously attended to before any bridge can be built, namely, the foundations for the abutments and piers for the bridge to rest on.

The foundations must be good, or, however well the abutments may be built, there is no safety as long as there is a bad or unsafe foundation. Where the ground in the locality is not of a nature to be safe to build on, it must be made safe by artificial means, a few of which I will try and describe. The first thing I would do, if the ground is soft, is to test by boring, which can be done by having a common three inch auger welded to an inch bar, with a handle so arranged to it that it can be moved up or down as required. By this means the kind of soil may be tested to the depth of twelve or fifteen feet and find out if within that depth there is a stratum hard enough to build on. If such cannot be found, then the foundation must be made secure by piling. Should it happen that where the abutment or pier has to be built is under water, or where water would run into it, it will be necessary to build a coffer-dam around the place in which the foundation has to be built, so as to prevent the water from coming in when carrying on the work. This may be done by driving piles made of timber sawn four inches thick and of such widths as can be got out of logs at command. These piles must be hewn wedge shape at the end, and also tapered to one side so as to cause it to follow close to the one already driven. The piles can be kept in line by having two wale timbers secured by bolts, so as to be four inches apart, and placed in the direction in which the dam has to be built. These timbers may be moved on as the work progresses, so that one set will be quite enough for any bridge abutment. After they are removed a wale timber must be bolted on inside and outside of the dam, especially if the foundation has to be deep. After the dam is completed, the next thing to do is to drive piles in the space included inside the dam, and of sufficient numbers to meet the requirement of the case. I will describe how I directed the founda-

tion to be prepared for the abutments for a bridge I had charge of some time ago. The dam was built as already described, having previously tested the kind of soil. I ascertained that there was a layer of hard-pan about fifteen feet below the surface of the water in the river. Then a test pile was driven so as to prove the depth and nature of the stratum. The pile on reaching the hard-pan would not yield a quarter of an inch from a blow of an 1,800 pound hammer falling twenty feet. This I thought quite secure, and had the rest of the piles driven thirty inches centre to centre, also driven in rows. The size of the piles was not less than twelve inches at the top end. The ground was now excavated to a depth of five feet below the surface of the water, after which the piles were sawn off evenly at the depth of four feet from the surface. The space inside the dam was filled with concrete made with water-lime and coarse gravel, and was well rammed down all around the piles. A timber 10x12 was laid on the top of the piles, and the space between and under the timber was also filled in with concrete, taking care to have the space under the timber well filled up. The whole space is now filled in even with the top of the timbers. A covering of plank of three inches thick was placed in two courses, laid crosswise, and each course spiked with 7-inch spikes to the timbers. The piles used were cedar, but sound straight timber of any kind may be used, say elm, beech, tamarac, etc., as long as the foundation is entirely under water.

The concrete used was made with water-lime from Thorold, the proportion being one of lime to three of gravel, well mixed and shovelled into place from wheelbarrows, and not allowed to fall to any depth, so as not to separate the lime and gravel. The whole trench or excavation should be filled up solid with concrete, and not leave any space outside the concrete for any other filling. On the foundation thus prepared the stone work was built.

If the ground is firm and solid, and away from any danger of wash, then if an excavation to the depth of three or four feet is made, so as to be below the frost line, a foundation may be safely built upon it; but would in any case advise a layer or bed of concrete to be placed in the bottom, say eighteen or twenty-four inches deep, and well packed into the space excavated. If the bottom is rock care must be taken to have it levelled, as any work built on a sloping foundation is unsafe, as the stone work may slide from the pressure of the earth behind the abutment. The whole bottom need not be quarried out to the same depth, but may be left in steps or benches, as long as each bench is level in itself. It may be somewhat paradoxical, but sand when dry is quite safe to build on, but care must be taken to have no water come near it, as then it will form into quicksand.

The stone work should be built of quarry stone, laid in courses of not less than ten inches thick, and each course all around should be of the same thickness. The footing course of the foundation should be twenty-four inches wider all around than the wall, and should be reduced in by, say, three courses of eight inches to the wall proper. The face should have a slope of not less than one inch in ten. The courses should be laid alternately in headers and stretchers, well

bedded in mortar made with water lime and sand in the proportion of one to three, well mixed together when dry, and should be used at once after its being worked up with water. Mortar of any kind should be thoroughly worked. Too much water is very injurious, as it takes too long to set, and it is not so apt to be well worked as when a less quantity of water is used. None of the mortar that is left over should be allowed to be used under any circumstances. The stone should be laid on their natural bed with the best side under, and should be wetted before laying, and when once laid and bedded should not be moved. If it has to be moved all the mortar must be cleaned off and a new bed made for it. The joints must be straight and not more than half an inch wide, and should not be less than twelve inches deep on the side of the stone into the wall. Care should be taken to have stone of a good and durable nature, that will not be ejected by frost or wet. Some of our limestone are apt to scale off, which makes the wall unsafe as well as unsightly. The joints should be neatly pointed with mortar prepared for the purpose.

There is another kind of foundation that I might mention that is sometimes used to very good advantage, and is much cheaper than stone work. A cylinder made of steel, say three or four feet in diameter, according to the size of the bridge, is sunk into the ground and driven as far as it will go, so as to be well below the water line. Piles are then driven inside the cylinder, so as to fill it up. The space between the piles is filled with concrete, so as to make a solid mass. This cylinder may be lengthened by having the plates flanged and well rivetted together. They must be well stayed by counter braces if they are over eight or ten feet above the ground. By having a proper cap made to fit on these tubes the bridge seat may be safely placed on them.

Iron piles may be also used, but care must be taken to have them well protected from ice jams or floating timber, as they will not stand any heavy strain when standing alone and unprotected.

DISCUSSION.

Mr. Warren—I may also state another matter that I intended referring to, that is cast-iron piling. These are used in the States largely in building bridges, but in our northern climate they would have to be very well protected from the ice. That was just the failure in a case lately. The piles were driven in the river, and there came a heavy freshet two weeks ago, and a jam of ice came against the bridge and carried it away bodily two or three hundred yards down the river. If these piles could be protected, they would make a very safe and cheap foundation. They are driven down till you come to a solid foundation, then there is a cap prepared to fit on top of them, and in order to protect them they are braced to make them secure. The Columbus Bridge Co. of Ohio manufacture them largely in the States.

Mr. Butler—What was the nature of the ground above the blue clay that your piles stood in when you sawed them off?

Mr. Warren—It was a clay soil, and we excavated all the loose earth out from around the piling until we came down to this clay.

Mr. Butler—The only danger with pilings is from scouring.

Mr. Warren—The concrete is down below the bed of the river. I should have mentioned we had Portland cement and we used a good deal of Thorold; in the concrete foundation and for a distance up we used Portland cement. These were mixed one to three for the concrete.

Mr. Butler—How about the stone in the cement?

Mr. Warren—It was coarse gravel; large coarse gravel.

Mr. Butler—I presume you recommend that for highway bridges specially?

Mr. Warren—Yes.

Mr. Butler—With regard to these cast-iron piles, I think, if there is a sufficient quantity of metal in them and well bonded together, it makes a very secure foundation; but when it is placed to sheer the the ice, I don't think that any form of piling is fit to stand at all. At a bridge down at the Bay of Quinte the piles are about 45 feet long, carrying masonry on top, and also protected by a guard round about the pile. This spring the line of least resistance to the ice, the motion of the ice, the expansion, was about parallel with the axis of the bridge. The result was the expansion of the ice shoved the piers bodily out of line, twisted them; but after they cut away the ice every one of the piers of that bridge sprang back to its place. So that in any case where you are subject to ice shoves, I think it is very dangerous, indeed, to trust to pile foundation.

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NOTES ON THE THEORY OF RAILWAY LOCATION.

By HENRY K. WICKSTEED.

PROBABLY no department of engineering has been more neglected, at any rate until very recently, than the theory of railway location. The older text-books which I used as a student, Rankine's and others, passed over the subject in the briefest and most indifferent way, apparently as something too simple or too unimportant to be worth considering, and devoted whole pages and chapters to exhaustive mathematical researches, bristling with algebraic signs and symbols. As to the exact pressure which might be brought to bear on a retaining wall or a masonry arch, and after bringing out the result in a long string of figures running into five places of decimals, they would generally wind up by telling us that under such and such conditions, which were quite within the range of possibility, these figures might be doubled, and then it would be only wise to multiply by a factor of safety of three or four, as the cement could not always be relied on to do what it was supposed it would do, and an earthquake might so shake up the whole business that the bond might be destroyed: in fine, that the data on which the calculations were based were quite indeterminate and the conclusions useless, and the following "empirical rule answers well in practice." The abstruse calculations gave, I have no doubt, a great deal of satisfaction to the authors, and as they had spent much time over them doubtless their consciences pricked them less for the drain which the purchase of their books was upon the meagre resources of the student, the price being generally in proportion rather to the number of pages than to the amount of information conveyed. A good effect the study of such works undoubtedly has in accustoming the student to such processes of reasoning—and no one has a greater respect for the higher mathematics than I,—but the practical results are often such as are by no means a safe guide in a great many cases, and the money saving effected almost infinitesimal. Coming down a little later in date we have "A Manual for Railway Engineers," by George L. Vose, who devotes several whole pages to this branch of his subject, and goes into calculations again based on erroneous assumed data as to the money value of a certain location with so many degrees of curvature, and so many feet of rise and fall, as compared with some other alternative location having different quantities of the same elements. The conclusions he arrived at were

certainly erroneous, but his book undoubtedly served a most useful purpose in pointing out the paramount importance of considering a location thoroughly, and what vast sums of money were involved. It has only been within the last few years that a great work has been published, devoted wholly to this branch, and reading it one cannot but wonder that some one had not before put in print some of the many simple and obvious but much ignored truths which it contains, during the construction of 130,000 miles of railway in America, and many more thousands in other English-speaking countries. Thousands of pages of comparatively unimportant researches such as I have mentioned had meantime been given to the world, and the results corrected by experience and revised in controversy had developed formulæ of real value to the constructing engineer. The science of engineering had in fact closely approximated to an exact science in many of its branches, yet in this particular department millions of dollars had been expended unnecessarily, squandered or left for other generations to pay in the shape of operating expenses, because of mistakes in location, repeated year after year, and on one railway after another. The reasons why such a state of things should have obtained so long are plain to see; the men who really excelled in this department were busy practical men who left little or no literature behind them, and their successors copied their works blindly, faults and excellences alike, and whether the conditions were the same in the new case as in the old or not. Again, there is little or no chance to lay down definite rules and formulæ, or for mathematical investigation, such as delighted the souls of the savants. Every road has an individuality of its own aside from that imparted by the topographical features of the country it traverses, and the governing conditions of one are different from another's. Some are built where money is plentiful; some where it is scarce. Some have traffic as heavy as they can well carry assured from the very opening, others must struggle along for years with very little. In some the preponderance of traffic is in one direction and some have it equal in both. Some make more revenue out of passenger traffic, and others from the carriage of freight. There are a thousand and one considerations which affect the proper location of a railway, and many of these can be estimated only, not ascertained with precision, beforehand by the engineer. Hence, judgment and common sense have more to do with the subject than mathematics, and the possession of these qualities is rarer than moderate dexterity in the manipulation of figures and symbols.

Another reason for the want of interest shown in the subject is that it rarely "pays" to do work of this kind well. Railway directors and presidents are seldom capable of distinguishing between good work and bad, and will blame the management for losses and failures in financial success which are really attributable to the location engineer. Even when they do realize that faults of location exist, they are quite unable to see whether they can be corrected, or whether they could have been eliminated in the first place, and it will take time and money to find out. And finally, even when it is proved that

a better line is to be had, it takes a lot of persuasion to induce them to abandon the one already extant and build the new, without actually doing which the proof is incomplete. Such things have been of late years done, and the results have been so favourable that the responsibility of the location engineer is getting to be better understood. But in weighing such matters, it must be remembered that the best location now will not necessarily be the best ten years hence. For the reasons given above, railway location has been left very much to young men of the profession not sufficiently matured in judgment and experience to build important works and without sufficient training to design them. I speak advisedly in these matters, because I was early turned out on to railway surveys myself, with only a college training, and, having a natural aptitude and liking for topographical studies, soon came to be considered a good hand, and was entrusted with and undertook, with the most o'erweening confidence in my own ability, the location of works of considerable magnitude, but which, in the light of riper experience and more extended study, I can see that I was no more competent for than I was to design the Forth bridge or the St. Clair tunnel. It is a comfort to me to look back and think that, bad as some of my work was, having from the start taken a warm interest in it and learned to love it for its own sake, and not merely for the sake of the pay which it brought, I read everything which I could lay hands on bearing on the subject, and soon acquired some ideas of my own as to the reasons for what I did. Some of them were very erroneous, but they were better than none at all, and being prevented from running into extremes by the restrictions of my chief, I made on the whole fewer mistakes than might have been expected, and no more than my contemporaries. Stephenson, the father of railway engineers, made some admirable locations and fitted his lines well to the topography of the country, the rolling stock then in use and the character of the traffic, and I have no doubt he spent many hours of labour and much thought upon them. The sudden birth of a great multitude of railway schemes, consequent on the success of the first roads in England, created a great demand for railway engineers, and hundreds of men who were only competent to handle instruments were pressed into service, and found for a time lucrative employment in locating new lines. Most of them were mere servile copyists, and reproduced the features of Stephenson's locations as far as they appeared on the surface, without enquiring into the reasons which led to their adoption. As the new conditions were generally similar to the old this plagiarism did on the whole less harm to the English railways than might have been expected, and taking into account the small value of labour and capital at the time they were built, the immense traffic which was almost certain to be secured so soon as the line was opened, and the high price which had to be paid for land damages; the peculiar features of English location, the flat curves, long straight lines, excessively heavy work and numerous tunnels in only moderately difficult country, were, perhaps, less worthy of condemnation than they appear to an American eye. It was when these men and their ideas were imported into this country

that the blunders became glaring and disastrous in a financial sense. They appear to have been impressed in some way with the idea that the excessive work of the English works must be avoided, if possible, that the comparatively thin traffic on a colonial road could not justify such unlimited expenditure of capital as they had been accustomed to. They located their lines and looked over their profiles to see how economy could be effected, and fixed on that means which made least work for themselves both of hand and brain. They substituted on the same profile steep undulating gradients for the long straight ones of Stephenson, retaining the line as it was, when the proper course would have been to determine the gradients from the preliminary survey, and so locate the line as to bring the amount of work within reasonable limits.

Meantime the early American engineers, with the independence and boldness which characterized them, and with no precedents to hamper them, thought out the problem for themselves and decided that as they had not capital enough at their disposal to carry them *through* the hills nor prospective traffic enough to pay interest on the capital even if they could get it, and further, that if they adopted such gradients as would carry them up one side and down the other with such work as they could afford, the whole of the prospective receipts would be swallowed up by the operative cost, wisely concluded that their only resource was to go *round* the hills, and adopted such curvature as would enable them to do so without getting too far from the surface with their projected grade-line. Instead of adapting the line to the rolling stock, they adapted the rolling stock to the line, and substituted the swivelling truck under their cars for the long, straight wheel-base of the English coach. This, I believe, was not an American invention, but one of Stephenson's own; but the fact remains that they were the first to bring it into general use. Some of the early American locations are, both in location and construction, the most perfect examples of the adaptation of means to an end which are extant in any country.

Smiles, in his "Lives of the Engineers," compares Stephenson with Brunel—the hard-headed north-countryman with the brilliant Frenchman—in something like these words: "Brunel's great ambition was to build the best railway that could be built. Stephenson paused to enquire whether it would pay." Brunel made his name famous and left monuments of his skill behind him. Stephenson did not only this but more: he made his fortune and that of his country. Brunel died in middle age, and the financial failure of his great steamship experiment had much to do with hurrying his decease. Stephenson enjoyed an honoured and prosperous old age. We must remember that while other engineering works are built for political, commemorative or æsthetic purposes, and an expenditure in them which will add to their beauty or majesty is always more or less justifiable and sometimes praiseworthy, railways are in a majority of cases commercial ventures pure and simple, and true economy is the only basis on which they can be successful. The earlier American engineers were less great than Stephenson in that they did not create, but they

showed by their works that they had grasped this great underlying principle of railway construction, they modified their railways to suit the conditions under which they were built, and they were great in being masters if not originators of their art. They, too, had their copyists and successors, men of the so-called American school, who had no more conception that the schools were only different because the one was built on a foundation which would not carry the other than Adam had; and some of them, too, found their way into Canada, and the result is that Canadian railways exhibit more blunders and afford better opportunities, perhaps, of studying "how not to do it" than those of any other country under heaven.

There are many charges against the revenue of a railway in operation which are grouped under two distinct heads. The interest on bonds and other securities, taxes, etc., which are known as the "fixed charges," and remain practically constant whether the railway is doing a good business or a poor one, and the "operating expenses," which rise and fall with the business and "gross earnings," though not necessarily in the same ratio. If anything remains after these charges are paid it goes to the shareholders in the form of dividends on stock. Roads doing a heavy business find the last series the heaviest drain on their earnings, while the roads with light traffic find the "fixed charges" the item which is hardest to meet at the end of the fiscal year. New railways in modern times have generally a light traffic to begin with, and must often fight hard for that little, hence the policy of Government aid in construction of such railways through undeveloped countries. The Government helps the railway and the railway pays back to the Government in aiding settlement and increasing subsequent revenue.

In such cases low first cost is generally imperative or the railway could have no existence whatever, and the locating engineer is compelled to choose a line which can be cheaply constructed in the first place, but he is by no means justified in assuming that the conditions which then exist will exist for all time, or that they may not be even entirely changed in a few years. Consequently he should endeavour to obtain such a line as will admit of a railway being built on it at low cost, but which is also susceptible of being afterwards altered into one of low operative expense with as little expenditure of capital as possible and with the abandonment of the minimum distance of the original line.

Some of these propositions are so simple and so exactly what every one knows or thinks he knows so well, that I feel half ashamed of offering them for your consideration. My justification must be in the violation of the conclusions to be drawn from them which is much more frequent than the observance. I can point out cheap roads doing a large business on heavy grades and consequently at terrible expense, which can only be improved by the complete reconstruction of miles of the original. On the other hand, I can show expensive ones doing a small business, and whose interest charges are eating them up, although they can haul cheaper and faster than their competitors. And lastly, worse than either, lines built at heavy cost

through comparatively easy country, which are more expensive to operate than cheaper ones would have been. I suppose the engineers who located them must have had some governing principle under which they worked, but so far as anyone studying their works now can judge, it was nothing more than to do as little as they possibly could and to plant as few stakes as possible.

To criticize in such a way is disagreeable, but if we wish to excel ourselves we must learn to avoid what is bad in others, as well as to imitate what is good—and having undertaken to explain what my views are, and what the views of the ablest men of the times are, it is impossible to avoid reflecting on those who have gone before.

There are three elements in location which are introduced in all works of the kind to a greater or less extent, in order to save first cost—distance, curvature, and gradients, or rise and fall. By distance I mean increased length, or distance over that of the air line. This is often confounded with the second, but erroneously, for while we cannot depart from the straight line and introduce curves without lengthening the distance we can often find two lines, the longer of which has less curvature than the shorter.

These three elements in location are almost always more or less interchangeable ; we can substitute any one, or any two, for the third, and all have a more or less prejudicial effect on operative economy, varying with the quantity and character of the traffic, as also with its direction.

For instance, a line with heavy undulating grades may be run over with little or no extra cost for locomotive power or loss of time by a fast express train, which gains speed and momentum sufficiently on the level to carry it to the top of the rising grade, while a few very sharp curves on a level track might seriously reduce the safe speed and increase the wear and tear. The heavier freight train, on the other hand, with which high speed is inadmissable, cannot acquire the necessary velocity, and sticks or "stalls" on the grade, while the curves would scarcely affect it at all.

Again, distance considered *per se* may be a serious item in the passenger business, where speed is the main object, while to the slowly-moving freight train which waits around on sidings and in yards for a large portion of its time, and with which cheapness of haul is of more consequence than speed, an extra mile involving two or three minutes more between stations is of little consequence, as compared with the number of freight cars which can be hauled away by one engine. While no general rule can be laid down for comparing the relative amount of harm, or the relative expense which is entailed, I think it can be proved that, in a majority of cases, distance does least, although it is probably that which is least made use of. Euclid, to the contrary, notwithstanding, the straight line is not always the shortest distance between two points in a railway sense—measured either in time by the express train, or by the cost per ton mile in the case of the freight. How often do we see the valley of some stream or river abandoned for a short cut across the hills, with sharp curves and heavy gradients reducing the possible train-load by one-half and increasing the wear

and tear by a serious percentage, when a little consideration would have shown that even the comparatively light express train could have run over the long line in the same or even less time than the shorter? But Euclid is right, after all, for the railway straight line does not take into account the vertical deflections and does not "lie evenly between the two points"—or, at least, not necessarily so. The error arises in the assumption that horizontal deflections from the straight are as hurtful as the vertical ones, which is very far from being the case.

Next, curvature has been unreasonably cold-shouldered off some of our lines on the score of danger, and, on the other hand, lavishly used on others, without sufficient cause, by men who located simply as they had been accustomed to do on some line on which they commenced their career, who act simply according to precedent.

Some will introduce 10° curves on the very smallest provocation, and to avoid an almost infinitesimal quantity of work, while others will avoid them as something quite unfit for use, except in a yard or on a branch line—and as ruinous to the reputation of any respectable road—yet, as far as cost of haul is concerned, a 10° curve is only equivalent to the same length of a 3 per cent., or 16 ft. per mile gradient. In speed, it is quite permissible to run trains over it at the rate of thirty miles and more per hour—and, for safety at such speeds, there is little or no difference between a 10° and a 4°. Lastly, the gradients are nearly always heavier than necessary—and the gradients are, from a financial point of view, the life and soul of the road, and fix, more than any other factor, the minimum rate at which it is profitable to haul freight or passengers. On the level, the resistance to traction is 6 lbs., or thereabouts, per ton; on a 1 per cent. grade it is 26 lbs., and on a 2 per cent., 46 lbs.—and the total weight of trains which can be hauled on each by the ordinary 45-ton engine, with 20 tons on the drivers is about 1,000 tons, 230 tons, and 130 tons, deducting the constant weight of engine and tender, the net weight of the train is 955, 185, and 85 tons, or in the ratio of 11.2, 2.2, and 1. Everyone realizes that a level road is a very good thing, and that heavier loads can be hauled on it than on a hilly one, but few, even among railway men themselves, realize how terrible the disproportion is. The new decapod engines, built for the purpose of taking the 30-car trains of the Grand Trunk Railway through the St. Clair Tunnel, with its 2 per cent. grades, could haul on the level 200 to 250 cars at the same cost per train mile. There are, of course, other things to be considered besides the cost of haul. Danger, especially, is urged against curvature, and loss of time against increased distance.

To the first argument it may be answered that some of the most appalling accidents in modern times have been due to gradients. Accidents to express trains occur because the reduced speed at the top of the grade and the consequent loss of time are a strong temptation to the driver to "let her out" on the succeeding down grade. The average speed between stations being fifty miles, if the minimum

falls to thirty the maximum must necessarily approach seventy, which is a speed by no means uncommon for short distances, as anyone can prove for himself, and by no means safe except upon the very best of track. Let us, too, always remember that while the centrifugal force on curves varies inversely as the radius it increases as the square of the speed—hence a 4° degree curve at seventy miles per hour is just about as dangerous as an 8° at fifty miles. Accidents, again, are not caused merely by derailments due to curvature and bad track but also by breakage of wheels, tires, and other moving parts to which there is much more liability at high speed than at low. To freight trains heavy grades are dangerous, owing to the increased difficulty in stopping on the down grade to avoid a danger ahead, to the "stalling" on the up grade owing to a "greasy" rail, or some other unfavourable condition where they are liable to be run into by a following express. Again, there is the danger due to "breakaways" and "runaways," cars running back to collision with a following train, or ahead into collision with the remainder of its own train which is, perhaps, coming cautiously back to pick it up. The tendency of a curve is to bring a train to rest no matter in which direction it is travelling. Hence two trains approaching to collision from opposite directions are much easier stopped on curved than straight line, compensating, to some extent, for the limiting of the field of view in the case of the curve, which is sometimes (not by any means invariably) an accompaniment and consequence of sharp curvature.

This obstruction of view by a curve is urged by some as a terrible drawback, but it may be remarked in reply that trains are getting more and more independent of extended outlook by the driver, and more dependent on train orders and on signals placed so far from the points they refer to that a train has time to attend to and obey the warning, even where it comes to within a few feet of them at full speed, and further, that the choice is not so often between a curve and a straight line as between a sharp curve and a flat one, and that a 1° curve will cut off the view in many cases practically as effectually as a 5° or a 10°.

For the loss of time due to distance I would say that the difference between an abominably crooked-looking line and a fairly straight one will seldom be found to amount to much more than 10 per cent. If the other conditions are such that the almost insensible increase in speed from forty-five miles to fifty miles per hour is practicable, as is often, very often, the case, there is no loss from this point of view at all.

The introduction of distance and curvature is also more likely to afford chances for after improvement than the adoption of heavy grades; take, for instance, the conditions I have sketched. In Fig. 1, for which Fig. 2 is the corresponding profile, A and B are two arbitrary points, one in a valley and the other on a plateau 495 feet above. By A E B the distance is eleven and a-half miles, and the rise can be distributed over nearly the whole, giving a maximum of

forty-five feet per mile. A D B is a line climbing the ascent at the rate of eighty feet per mile, and eleven miles in length altogether. At E is a short tunnel or very heavy cutting which we do not feel financially equal to taking out. Rather than be driven to building A D B it will often be better to see if, by the liberal use of curvature, we cannot round the bluff at C with more moderate work. If, then, at some future time we find that the traffic warrants the expense we can get a line within half-a-mile, or less than five per cent., longer than A D B by building only two miles of new line; while to reduce the grades on A D B to anything like the standard of A E B we should have to abandon the whole nine miles between the first and tenth mile posts. Even if the short cut at E be impracticable we may at any rate flatten the curvature and materially reduce the distance, as shown by the dotted line, fitting less closely to the topography and using the old roadbed for the greater part of the distance.

The lengthening in the distance by going through C makes it possible to flatten the grade to thirty feet to the mile, for the three miles between the fourth and seventh, which is precisely what is needed to compensate for the extra resistance of the sharper curvature to the upward bound trains. If 2° curves are the standard for the forty-five feet gradient we shall, therefore, be justified, as far as resistance is concerned, in freely introducing 10° curves on the temporary line. There are circumstances under which A D B would be the better line to adopt, even as a permanent line, but in a great majority A C B is undoubtedly the best, although I think that at any rate five years ago most engineers would have adopted the heavier grades. I know that in dozens of similar cases the heavier grades have been built upon.

The exceptional circumstances are where, somewhere on the same line, and not very far off, we are compelled to adopt 80 foot grades; and, on the principle that the whole is no stronger than its weakest part, if the train weight is limited at some particular point, we gain little by flattening grades at some other points. Again, it may be that all the traffic is from B to A, as in the case of a mineral road, and that the loaded trains are met by a 40 foot grade at some point beyond B. In this case we shall gain very little by flattening between A and B, except in so far as will equalize the resistance to the light trains to that experienced by the loaded ones. Again, there are some few cases, of which Mr. Wellington exhaustively treats, in which it would be preferable to keep an extra engine at A in order to help trains up to D, after which they would proceed by themselves, but the cases are very few in ordinary practice. As far as a general rule can be laid down it is that easy maximum gradients are what must be looked for first, last, and all the time, and that to obtain them we may freely introduce increased length and curvature, especially in such a form that they can be eliminated afterwards. Between the two the choice is not always so easy, but generally speaking curvature will be found to reduce the cost most in construction and to increase the cost of operation. Because the mere cost of rails and ties alone is generally

in the neighbourhood of $4,000 per mile even on our cheapest roads, and track laying and ballasting amount to nearly another thousand—$5,000 per mile will do a large amount of grading. On the other hand, once built, the longer line will often be, even if only a trifle better in grades and curvature, very much the more inexpensive in operation.

Curvature freely introduced will often reduce work to an enormous extent with very little increase in distance; and where such is the case, and the work *must* be reduced, use it liberally and don't be afraid of the radius. It is better to run a train slowly than not to run it at all; better, in a great majority of cases, to run a long train slowly than a short one fast. It it were necessary to retain a 4° standard the C.P.R. would hardly be built and running to-day, and if a shorter radius had been adopted on the Grand Trunk when it was first built it might now be hauling more cheaply, and might be free of a large portion of the great incubus of debt which it carries. Nor need the standard have been retained to the present day. One thousand dollars saved in the first instance and invested at five per cent. for the thirty years between 1855 and 1885 would then amount to $4,320, and the whole amount saved would have amounted to enough to rebuild the line to the highest standard, and very much better than it is to-day. A good deal of the prejudice which exists against curvature is no doubt due to the way in which curves generally are laid out, or rather, not laid out. With careless laying and centring, a curve which was originally a 4°, or intended for such, will often at points approach to double that pitch; and on the same principle mentioned above, that "the whole is no stronger than its weakest point," the curve might, as far as risk of derailment is concerned, be an 8° throughout. A discussion of such points as this is, however, quite foreign to the object of this paper, which, I fear, is already unnecessarily lengthy and wearisome. If I have even called attention to some of the general principles governing good location as distinguished from bad I shall have attained all that I hoped to do. The scope of the subject is immense, and if any of the Society find it as fascinating a study as I have done I beg to refer them for a most elaborate discussion and numerous examples to the work which I have already referred to, "The Economic Theory of Railway Location," by A. M. Wellington, not as merely the best, but as really the only treatise on the subject. To surveyors it is more interesting than most branches of engineering science, as their knowledge of the topography of the district they live in necessarily is or should be more accurate than that of any one else, and for this reason they are often called upon to make at any rate preliminary surveys for railways. For an estimate of comparative cost, and for the exact determination of the centre line on the ground, some knowledge and experience of construction is desirable, but a general route may be sketched out in most cases by any one with sufficient techical knowledge to accurately delineate on plan and profile the natural features of the country, and a sufficient insight into commercial statistics to enable him to foretell approximately the

character, volume and general direction of traffic, if he will think for himself on the lines suggested, and if he has, above all, sufficient patience and industry to make his examination thoroughly exhaustive, and not conclude, or lead others to conclude, that a fairly good line which he shows is necessarily the best which can be obtained. I think it may be said with perfect truth that no line was ever located yet which even closely approximated to its correct position. This is not merely because of carelessness, ignorance or indifference on the part of the engineer, but because sufficient time is seldom allowed him for the work, which is a work of time rather than of expense, and also because many of the elements which influence the selection are only approximately determinative, and while a shrewd man can make a tolerably close guess at the future of a railway, no man can foretell it accurately. Hence, location is a matter of judgment, rather than mathematics.

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COUNTRY PRACTICE.

By C. F. AYLSWORTH, Jr., D. and P.L.S.,
Madoc.

For undertaking to write upon the above subject I do not deem an apology necessary, because as a young member of the Association I have selected a subject which any older member of the Association could have handled in a more satisfactory manner. I merely selected the very general subject because I am not sufficiently posted on the details of any one of the special branches which enter into a country practice to give the Association anything new upon any one of those branches, and so in order to add my quota, such as it may be, towards advancing the welfare of the Association, I have selected a subject that when I cannot advance argument I can use abuse, and thereby avoid details.

There is not an old saying that will better describe the qualifications of a man pursuing a country practice in surveying and engineering for a livelihood (not for recreation or health) than "That he should know everything of something and something of everything."

He should be master of Land Surveying in all its details and the laws relating thereto. The writer cannot say that the public demand any hair-splitting precision, provided we can only convince society that we are endeavouring to dispense even-handed justice to all parties concerned. The "Ditches and Watercourses Act" is another important factor of the country practitioner. The writer has made awards on from fifty to one hundred ditches; he does not make the statement in a boastful sense, but he has never had an award appealed from yet. I always endeavour to get a knowledge of the men I am dealing with, and I seldom leave the neighbourhood of the ditch without effecting a settlement. When interested parties do not attend after being notified, I always make a point, if possible, to see them. He must be a very cantankerous man indeed, who will not allow his prejudice against fair play to be allayed to some extent after being once convinced that if there is one thing above another that the engineer prides himself upon, it is his love of justice. Bridge building, road construction, drainage for small villages, are also branches of the same calling. The country practitioner should also be sufficiently informed on railway building to enable him to make an exploratory survey of and give an approximate estimate at any rate of the cost of construction of the road-bed and appurtenances. But why recite further details? As I indicated before, a man should know something

of everything, if he would make his practice a success and keep starvation from the door.

I have frequently heard surveyors and engineers say that the practice of land surveying, etc., was so monotonous that it was a dead issue; the same old sing-song, day in and day out; but my limited experience has taught me that if I take enough interest in my chosen profession to make it a success, I also find the practice sufficiently exhilarating to suit my constitution. And last, but not least, how is the surveyor compensated for his services in comparison to the remuneration paid for the services of either the legal or the medical professions? Take for example, two neighbours living on adjoining farms; the one to the south, called Mr. Fleeced, has reason to believe that his neighbour to the north has enclosed some of his land, because the latter, for some malicious purpose or other, has moved his fence about five rods farther south on to the land of Mr. Fleeced, from where the old fence has stood unmolested and undisputed for the last thirty-five years. Mr. Fleeced straightway resents such liberties being taken with him and his property by consulting one of, if not the ablest lawyers in the county, an old and respected particular friend of his, who, after hearing Mr. Fleeced's recital of his grievance, says: "Yes, Mr. Fleeced, you have, in every particular, an unassailable case. It looks to me as though your neighbour, of whom I have never heard a good word spoken, is endeavouring to steal and defraud you of your rights as a natural born British subject, guaranteed to you by the British North American Act, subject, of course, in all such cases to the reservations contained in the preamble of the Jesuits' Estates Bill; although I do not advise you to get into law with your neighbour, still I am of opinion that, by placing your grievance at the feet of Her Majesty's jury, even-handed and unvarnished justice shall be meted out to you." "Well," says Mr. Fleeced, "although I am not as bountifully supplied with this world's goods as others, I am not going to allow that to deter me from vindicating my rights, so you may fire ahead with a suit." "Very well," says the lawyer, "but as you know it always takes money to run these things, perhaps it would be a good idea if you would give me a small retainer, in order to grease and start the wheels of justice revolving." "Oh," says Mr. Fleeced, "but I thought you would get your pay out of my neighbour, after you won the case; that you would get back my land and make him pay all costs." "That's all right," says the lawyer, "but I must have something to start the wheels of justice revolving, as I said before. So you have that fifty-acre lot there, free of all encumbrances; you had better just slip a little loan through on that; I am agent for loaning money, and we can arrange that matter in a few minutes." "All right," says Mr. Fleeced, "I know you will make good use of it, that you will expend it judiciously, and to the best advantage; I have always heard, though, that lawyers were pretty expensive luxuries." That matter arranged satisfactorily to the lawyer, he now says to Mr. Fleeced, "Of course you and I know that your neighbour has his fence upon your land, and has a large quantity of your land enclosed to be used to his advantage, but how are we to

convince the jury to that effect, excepting by you calling upon a provincial land surveyor? because the proper place for fence and possession is what is in dispute."

So Mr. Fleeced calls in the surveyor, who runs the side line and finds that Mr. Fleeced's contention is substantially correct; thus proving, in the opinion of the writer, that the surveyor is, in such cases, practically the arbiter.

What does the surveyor receive for such services?—ought to be pretty well paid one would think. But no; if he charges $20 in extreme cases, people generally say that he is extortionate; that it is downright robbery; and, in some cases, will insinuate that the surveyor will very soon become too opulent. And how does the lawyer fare? In the first place, as stated previously, he has the proceeds of a mortgage which he has induced his client to embellish his fifty-acre farm with, great or small, as the lawyer's conscience dictates. If the case is settled out of court, the financial situation remains as above; if the case goes on to trial, ten to one but the lawyer has a clear deed of the fifty acres.

Now my opinion is, that a man requires to have just as much natural ability to make a first-class and successful surveyor as another man must have to make a first-class and successful lawyer, although the latter profession may require faculties that the other does not, and *vice versa*.

If such be the case, how is it that society will smile on the lawyer after collecting such extortionate charges, and would frown on the surveyor who would be sufficiently courageous to charge even one-tenth of what the former does?

In this short article I shall not attempt to answer that question, any more than to state that I would like to see the two professions standing upon such an even and equable basis that when the suit that I have described above is settled, that the surveyor would retire from the fray with one-half that fifty acres and the lawyer the other half, and the former sufficient to boot to pay half expenses of dividing the lot.

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DESCRIPTIONS.

By M. GAVILLER, P.L.S.,
Barrie.

THE importance of knowing how to correctly draw a description of "a parcel or tract of land and premises" is made sufficiently prominent by the endless trouble to surveyors caused by the abortive attempts of the non-professional conveyancer and the large amount of litigation involved in deciphering obscure descriptions.

The description of a property should be so drawn that any qualified person could lay it out on the ground without doubt or dispute as to the position or content.

Let your description stand upon its own merits, and not be dependent upon the surrounding *private* surveys.

Have a definite point of commencement. Use no tree, building, stump or any object easily liable to destruction or removal.

Do not commence at "A," "B" or "C's" lot, or give distances more or less up to or along the boundaries of other properties stating "A," "B" or "C," as this may entail the survey of several properties beside that of the one described.

As it is indispensable for the drawing of a proper description that the use of the different terms should be understood, I have endeavoured to arrange, under different headings, rulings by good authorities.

The description of land in a deed is to be taken most strongly against the grantor, and must be construed according to the condition of things at the date of making the same. Marshall *vs.* Niles, 8 Con. 369; Ryan *vs.* Wilson, 9 Mich. 262.

The certain description must prevail over the uncertain in absence of controlling circumstances. A description is to be construed so as to make it effectual rather than void. 35 N. H. 121; 11 Con. 335.

When one part of a description is false and impossible, but by rejecting such false and impossible part a perfect description remains, such part should be rejected and the deed held good. Johnstone *vs.* Scott, 11 Mich. 232; Anderson *vs.* Baughman, 7 Mich 79.

Where description calls for land owned and occupied, the *actual* line of occupation is a material call to be considered in locating the lines of the land bounded therein. Fahey *vs* Marsh, 10 Mich. 239: Cronin *vs.* Gore, 38 Mich. 386.

When a distance is given to a post, if the point can be found it governs; if not, then in the absence of other controlling words, the distance governs.

Flagg *vs.* Thurston, 13 Pick. N. Y. 135.

When land is described as running a certain distance, by measure, to a known line, that line will control the measure and determine the extent of the grant. Not so if the line is obscure and not definitely fixed, and therefore likely to be looked upon by the parties as less certain than the measurement given.

Howell *vs.* Merill, 30 Mich. 282.

Cleveland *vs.* Flagg, 4 Cushing (Mass.), 76.

Where land is conveyed as beginning at and bounding land of "B," the point of beginning is the *true line* of "B's" land, and not the line of occupation as shown by a fence set up and maintained by "B" before and after the conveyance, with the consent of the owner of the lot conveyed, under the mistaken belief that such was the true line.

MORE OR LESS.

Domin'n Land Surveyors. 1889.

In case of description of survey under Dominion Lands Act, and where the monuments planted in such survey become "the original, true and unalterable ones," it has been held under good authority that the distance between these monuments should be given in such description as more or less, and more or less *not* to be used for measurements defining position of point of commencement in regard to formerly *established* point.

When in a description, not giving the length of any side, a definite quantity of land is conveyed, on the corner of an original lot, if the sides of such original lot are or are not at right angles, the sides of the described portion should be considered equal.

AREA.

Butler *vs.* Widger, 7 Con. N.Y., 723.

A conveyance by metes and bounds will carry all the land included within them, although it be more or less than is stated in the deed.

Remember that in township lots that are described in Crown patent as half lots, that the north half of the west half, or south half of the east half, may contain a different acreage to the north-west quarter or south east quarter.

Sections 36 and 43 of Ontario "Surveyors' Act" give directions how descriptions in Crown patents are to be construed, viz., that actual survey courses and lengths hold against courses and lengths given in any letters patent, grant or other instrument, and actual area ascertained by survey holds against quantities given in patent or grant purporting to be for any aliquot part of former survey.

Where boundaries are doubtful then quantity often becomes a controlling condition.

COURSES.

Baker *vs.* Talbott, 6 Mont. Ky., 182.

Linear measurement should be given the preference over angular measurement deduced from courses.

A course from corner to corner means *prima facia* a right line, but this may be explained by other matters in the case, to be a crooked or curved line; as following a ditch, hedge or stream. Jackson *vs.* Reeves, 3 Canis, N.Y., 293.

Northward or northerly means due north; when nothing is mentioned to show deflection of the course to east or west. Brant *vs.* Ogden, 1 Johns. N.Y., 156.

It is best to say northerly, southerly, easterly and westerly *along* the boundaries of township lots having original magnetic bearings, and not give those magnetic bearings.

In drawing descriptions of lands bordering on water, it is necessary to inquire into the local law of the Province or State in which the premises are situated.

HIGH AND LOW WATER MARK.

Where a sea or bay is named as boundary high water mark is always the line where common law prevails. United States *vs.* Pacheco, 2 Wallace, U.S., 587.

High water mark as to river with changeable river bed is held to be determined by river bed, and that only is river bed which the river occupied long enough to wrest it from vegetation.

In computing the number of acres in a survey, "from" "to" and with the bank of a stream mean to low water mark. Lamb *vs.* Ricketts, 11 Ohio, 311.

A boundary given in a description as a certain distance above the border of a river at high water mark is not ambiguous, and if disputed is to be fixed like any other fact by testimony and examination of the ground. Brester *vs.* Pitts, 59 Mich., 348.

BANK AND SHORE.

A bank is the continuous margin where vegetation ceases. McCullough *vs.* Wainright, 14 Pen St., 59.

The shore is the sandy space between the bank and low water mark.

A boundary on the bank of a river, referring to fixed monuments on the bank, limits the grant to the bank and excludes the flats.

A boundary on a stream and by or to a stream includes flats, at least to low water mark, and in many cases to the middle thread of the river. Thomas *vs.* Hatch, 3 Summer, U.S., 587.

A boundary, by the shore of a mill pond, takes to low water mark. Stevens *vs.* King, 76 Main 197.

When a post is planted at shore it is best to use the term adjoining, not at.

AREA.

A sale was made of the north half of a lot, which is bounded by a river; the river was not straight at this

point and the north line of the lot is longer than the south line. Held, that the north half must mean the north half in quantity divided from the remainder by an east and west line.

In compiling the above I am much indebted, amongst other authorities, to the rulings in the United States Courts, compiled in the new "Manual of Surveying," and our exchange reports from State associations.

DISCUSSION.

Mr. Gaviller—The question has been asked, whether rulings in the United States would hold in this country. I was informed by a lawyer that where the cases are similar undoubtedly their rulings would hold.

Mr. Abrey—In describing between two fixed points, would you call that "more or less" or describe it as absolute ?

Mr. Gaviller—The question where "more or less" came in was taken from a Dominion Land Surveyor's question, and I simply took it from their ruling. It was a case of a mining location, and the plan had been returned because "more or less" had not been put in. I think the less the term is used the better.

Mr. Abrey—Here in the city the surveyors are coming into conflict with the lawyers on that. They don't see why a measurement should not be precise.

The President—If the points are fixed, then what is the object of putting in "more or less" ?

Mr. Abrey—If I were describing between two centre walls I should certainly mark it "more or less," or between a street and a lane. I think it makes it true and correct, otherwise it would not be.

The President—It is easy to understand why a layman would naturally take objection to "more or less" where, as far as he knows, there is no cause for it ; but a layman does not understand that it is possible for the distance between two centre walls to be measured twice by the same person and not come out exactly the same, so a very technical surveyor, wishing to protect himself from any difficulty, adds the words "more or less," and he is perfectly right technically in doing it ; but it occurs to me that it is unnecessary to put the words in, because the points are there and they speak for themselves. The question with regard to centre walls comes up in this way : supposing the houses were burned down, you would have to refer back to the distances. No great injustice would be done, if that distance is within the limits of ordinary accuracy, either to the buyer or to the seller. But by putting the words "more or less" on the face of a description it gives a sounding of doubt as to the certainty of what is there, whereas it is simply a technical objection.

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THE RECLAIMED LANDS OF KENT.

By JOHN C. MACNABB, P.L.S.,
Chatham.

THE westerly portion of the County of Kent, adjoining Lake St. Clair, and extending from the Chenal E Carte to Baptiste Creek, is a low-lying and apparently valueless tract of marsh land, irregular in outline, differing in formation, and with but one feature, that of lake level, common to all of it. The marshes in the township of Dover on the north side of the River Thames have a "sand bottom," evidently having been formed from the driving in of sand by the westerly winds from Lake St. Clair, whilst those in the townships of Tilbury East and Raleigh, lying south of the river, sheltered from those winds, and at the foot of an extensive slope, from which they have received the erosion of ages, have a surface of alluvium and decaying vegetable matter, on a clayey subsoil, and are therefore better adapted for agricultural purposes than those in Dover, but doubtless when land values become such as to warrant the use of fertilizers to supply the lacking constituents of the soil, these also will be brought into cultivation. Up to within a few years ago all of this territory was allowed to stand, a natural preserve for water fowl, and a few fur-bearing animals; wild rice, interspersed with flags, and the coarser grasses grew luxuriantly and seemed to be at a first glance the only vegetation the tract was capable of producing, for in times of high water the whole area, comprising thousands of acres, was covered by the waters from Lake St. Clair and the River Thames. Upon a closer examination, however, as to the possibilities of converting portions of it into arable land, the conditions were found to be far more favourable than at first appeared, as the land itself was good, and the question of reclamation narrowed itself down to the permanent lowering of the water level, and the adoption of some means for the disposal of the rainfall; this has been devised and put in successful operation in three of the municipalities of the county, viz., the townships of Raleigh, Gore of Chatham and Tilbury East; and large areas have thereby been brought into cultivation. The areas are:—

Pike Drainage Works	2,500 acres.
Extension do.	2,000 "
Forbes	5,500 "
Skinner	5,000 "
Total	15,000 "

The scheme known as the "Pike Drainage Works" in the township of Raleigh has been chosen for purposes of this paper, as it was the initial work of the kind in this district, and one with which the writer is familiar. Mr. W. G. McGeorge, C. E., who designed the work, has contributed much of the information given herein relating to this scheme; also the plan and report of the Skinner Works. The accompanying plan shows the territory that has been reclaimed, with its system of interior drains, embankments, location of pumping station, flood-gate, etc., etc. The photographs were taken on the opening of the works, and show the marsh in its natural state.

The first examination of the marsh lands in Kent, with a view to draining them was made in 1869 by the late Thomas N. Molesworth, Esq., P.L.S., in his capacity of Chief Engineer of the Public Works of Ontario, who recommended dyking and pumping. Nothing was done under his report, as the scheme, which advised the treatment of the whole marsh, involved two or three municipalities and the co-operation of the Local Government, was allowed to drop. The municipalities at that time, having their attention fully occupied by the clamorous demands for upland drainage, lost sight of the fact that the work at the point of discharge governed all operations above that point. However, they have had their attention drawn to it in the last few years. In 1882 Mr. McGeorge received instructions from the Raleigh Township Council to examine and report upon a scheme which had for its object the reclamation of about two thousand five hundred acres of marsh lands in that township. The report was favourable, and as follows:—

"I beg to report that I have, in compliance with instructions received from your honourable body, made a survey for the purpose of draining and embanking the tract of land lying east of the town line between Tilbury East and Raleigh, and between said town line and the Drake Road, and between Jeannette's Creek and the River Thames. These lands will be greatly benefited by the works contemplated, and a large tract now unfit for cultivation owing to their low level will be reclaimed and rendered valuable. The works contemplated will consist of a drain and embankment along the town line road, as shown on the plan, from the River Thames to Jeannette's Creek, at its northerly side, and a drain and embankment along the northerly side of Jeannette's Creek, from said town line to line of road between Concessions 3rd and 4th, in Raleigh. These drains will be on the outer side of the embankment, excepting for a short distance from said Concession Road.

"It is contemplated that the work be done by a dredge, as better adapted to reach the more solid material best suited for the embankment; next, there will be a drain and embankment along the road between the 3rd and 4th Concessions from Jeannette's Creek to the Drake Road, and a drain and embankment along the Drake Road from the road between 3rd and 4th Concessions to the Great Western Railway. These drains will also be on the outer side of the embankment, to catch the waters from the higher lands and to convey them to Jeannette's Creek. The inner drain to convey the waters within the

territory to be drained to the pumping works will be the Johnson Drain enlarged and improved from the Drake Road to the diverted road; thence it will continue north-westward along the road to the road between Lots one and two; thence north-westward along this line to the Great Western Railway; thence westerly along said Railway to a culvert near the Tilbury and Raleigh town line; thence north-westerly parallel to the said town line to a point about twenty chains from the River Thames; thence south-westerly to the pumping works at said town line.

"These, together with the pumping works, which, in my opinion, is necessary to effectually accomplish the drainage of said lands, will constitute the system, which I trust will meet with your approval.

"The pumping works will comprise an engine house, a steam boiler and two engines, a water-wheel twenty-four feet in diameter and eight feet in width of blade, the necessary gearing, and a discharge sluice. I estimate the cost of the works to be as follows:—

DRAIN ALONG DRAKE ROAD AND 3RD AND 4TH CONCESSION ROAD.

From Station	0	to Station	10,	a distance of	60	rods, at	$1	50	per rod...	$90 00
"	10	"	20	"	60	"	1	50	" ...	90 00
"	20	"	30	"	60	"	1	50	" ...	90 00
"	30	"	40	"	60	"	1	50	" ...	90 00
"	40	"	50	"	60	"	1	50	" ...	90 00
"	50	"	60	"	60	"	1	50	" ...	90 00
"	60	"	70	"	60	"	1	50	" ...	90 00
"	70	"	80	"	60	"	1	50	" ...	90 00
"	80	"	90	"	60	"	1	50	" ...	90 00
"	90	"	100	"	60	"	1	50	" ...	90 00
"	100	"	110	"	60	"	1	50	" ...	90 00
"	110	"	120	"	60	"	1	50	" ...	90 00
"	120	"	125	"	30	"	1	50	" ...	45 00

JOHNSON DRAIN EXTENSION.

From Station	0	to Station	10,	a distance of	60	rods, at	$1	00	per rod ...	$60 00
"	10	"	20	"	60	"	1	00	" ...	60 00
"	20	"	30	"	60	"	1	00	" ...	60 00
"	30	"	40	"	60	"	1	00	" ...	60 00
"	40	"	50	"	60	"	1	00	" ...	60 00
"	50	"	60	"	60	"	1	00	" ...	60 00
"	60	"	70	"	60	"	1	25	" ...	75 00
"	70	"	80	"	60	"	1	25	" ...	75 00
"	80	"	90	"	60	"	1	50	" ...	90 00
"	90	"	100	"	60	"	1	50	" ...	90 00
"	100	"	110	"	60	"	1	50	" ...	90 00
"	110	"	120	"	60	"	1	50	" ...	90 00
"	120	"	130	"	60	"	1	50	" ...	90 00
"	130	"	140	"	60	"	1	50	" ...	90 00
"	140	"	150	"	60	"	1	50	" ...	90 00
"	150	"	160	"	60	"	1	50	" ...	90 00
"	160	"	170	"	60	"	2	00	" ...	120 00
"	170	"	180	"	60	"	2	00	" ...	120 00
"	180	"	190	"	60	"	2	00	" ...	120 00
"	190	"	200	"	60	"	2	00	" ...	120 00

DREDGE WORK.

From River Thames to a distance of 60 rods S. E. along the town line, at $13 per rod.....	$780 00
Along town line and Jeannette's Creek, 890 rods, at $10 per rod.....	8900 00
Making a total for excavating and embankment.....	$12575 00

To this add for engine house, engine and boiler, gearing, sluicing, pumping works, complete and in running order	$3000 00
Bridge at River Road	400 00
Bridge at Jeannette's Creek	400 00
	$3800 00
Surveying, estimating, etc	100 00
Assistants	30 00
Letting and superintending	200 00
Publishing By-law	50 00
Registering By-law and Debentures	3 00
Clerk's fees	250 00
	$4433 00
Making a total of	$17008 00

"This sum I assess as in the annexed schedule against the lands and roads benefited. The embankments, pumping works and internal drain to be kept in repair and maintained at the expense of the lands and roads within said embankment assessed for the construction of the works, said lands and roads paying in the same relative proportion as for construction.

"The sums in the last column of the annexed schedule are a special annual rate, necessary to run the machinery and keep up the pumping works.

(Signed) W. G. McGEORGE."

This report was adopted, and the contract awarded to the "Chatham Dredging and Contracting Company," who with their fleet of specially equipped dredges completed the work satisfactorily so that in the following year the owners began breaking up the land preparatory to cropping it. The reclamation in this instance was so thorough and complete that other schemes were advocated, three of which are in successful operation, viz.: the Forbes Drainage Works, and an extension of Pike Drainage Works, and the Skinner Drainage Works in the Gore of Chatham. Across the last mentioned the writer in 1884 ran a line for railway purposes and found it covered with water two feet in depth, now it is divided into farms and yielding good crops. The style of work adopted in these schemes for marsh land reclamation is of the simplest character, and consists of running a dredge cut around the territory embraced in the scheme, and with the excavated earth forming an embankment about seven feet in height, sixteen feet top, side slopes one foot horizontal to one foot vertical, the seven feet elevation is taken above ordinary lake level and the embankment is continued at that height till it runs out in the high land. A system of interior drains is constructed to conduct the rainfall to the point that has been selected for the site of the pumping station. Here a water-wheel, of the pattern as shown in the accompanying photograph of model, driven by steam power, throws the accumulating water up and out over the embankment. One wheel twenty-four feet in diameter completely controls an area of the extent of the Pike Drainage Works, so efficiently, in fact, that in years

of very wet springs farming operations are started inside the embankments a great deal earlier than in other parts of the township. As an additional precaution a relief or flood gate has been built in the embankment in the position as shown on the drawing, so that in the event of the water level at any time rising in the interior drains above that on the outside, an increased discharge would be possible without increased expenditure. Wood is used as a fuel, and the times and duration of pumping are determined by the rainfall of the season. A man in charge of the pump lives in an adjacent house, and is ready to "start up" at short notice. All of the work in the schemes mentioned has been done by the local company, who have the advantage of machines adapted to the work, manned by trained crews. The accompanying photograph shows the style of machine used in the dredging operations in this section. One beneficial feature of this work is, that the cut made to form the embankment also answers as an outlet for the upland drainage, though recent events show that these dredge cuts must be extended to the foot of the upland slope before injury from overflow will be prevented. The drainage works that have been constructed in this district for the past twenty years have improved the country in a marked degree. This accounts for the disappearance of the malarial fevers that were once so prevalent. The only territory remaining where much room for improvement exists is that tract of country adjoining Lake St. Clair, known as the Plains, and these by the pumping schemes described are gradually being brought into cultivation. As an indication of the improvement that has been effected the following amounts obtained from sales of reclaimed land at different dates may be given. In the Pike Drainage Works a block of 700 acres was purchased in 1882 for $4,500, and sold in 1888 for $20,000. The west half Lot 1, Con. 3, 100 acres, was purchased in 1880 for $227, and sold in 1890 for $1,594; in the township of Tilbury East, Lot 13, Con. 1, 102 acres, was purchased in 1884 for $400, and was sold in 1887 for $1,000; 100 acres of Lot 13, Con. 3, was purchased in 1881 for $300, and sold in 1888 for $1,100. A large amount of work yet remains to be done about these marshes, though some of them in the vicinity of St. Anne's and Walpole Islands will be held for many years as fishing and shooting preserves by the clubs that have patented them for that purpose. As they are mostly in the sand area agriculturists will be satisfied that it should be so. In connection with the marsh land drainage a cut has been spoken of extending from Baptiste Creek to Lake Erie, to act as an overflow channel in times of freshet; the distance is thirteen miles. With a cut of twenty-three feet at the summit, or an average cut of about ten feet throughout, such a work though expensive would absolutely control the waters which now flood the unprotected portions of the Plains; the scheme as yet is only in embryo. The large area of lands reclaimed on Peele Island should be mentioned herein. About one-half of the island has been embraced by a system of artificial drainage such as has been described, and as this is the most southerly point of Ontario the land is very valuable for fruit raising, all our finer fruits ripening there to perfection. These reclamation

schemes are simple and effective and not at all costly, the first cost being the only serious expenditure, as the cost of operation and maintenance is light. In a few years this whole area that has been so long a wilderness will be brought into cultivation, and contributing to the support of prosperous and happy homes.

DISCUSSION.

Mr. Stewart—Do they contemplate irrigation in connection with these drains?

Mr. Macnabb—If it is necessary they can irrigate it by this floodgate.

Mr. Bowman—What is the capacity of that water-wheel?

Mr. Macnabb—I cannot give you that; but it is such that it will empty the system of drains in twenty-four or thirty hours.

Mr. Bowman—Is it operated by an ordinary stationary engine?

Mr. Macnabb—Yes.

Mr. Bowman—Is it considered better than a centrifugal pump for that purpose?

Mr. Macnabb—I think so; it is cheaper, I fancy, and would throw a great volume of water.

Mr. Bowman—It seems to me that in a rough wheel of that kind there would be a great deal more friction and power lost than in a finished centrifugal pump of approved design.

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THE KINCARDINE WATER-WORKS.

By HERBERT J. BOWMAN.
Supt. Water-works, Berlin.

At the last annual meeting of this Association, the writer in a paper on "Water-works for Towns and Villages" gave some general principles connected with their design and construction, and will now take up a particular case, the works at Kincardine, Ont.

The town has a population of about 3,000, and is situated where the little river Penetangore empties into Lake Huron. Various attempts, without success, were made to have the people sanction the passage of a by-law to raise money to build a system of water-works for the town. As none of these schemes met with the approval of the property owners, the council finally contracted with Moffett, Hodgkins & Clarke, of Syracuse, N. Y., to build and maintain a system of water-works, the town to pay an annual rental of $2,100 for its fire protection, water for street sprinkling, and for public buildings and schools.

The Kincardine Water Works Company was formed under the Ontario Joint Stock Companies Act, and the works were commenced towards the end of May, 1890, and completed in four months and accepted by the town council.

The supply, being from Lake Huron is unlimited, but during the stormy weather in spring and fall the water is muddy for more than a mile from shore, probably on account of the proximity of the Goderich clay banks, and also on account of the muddy water from the river. To lay an inlet pipe out far enough into the lake to insure a supply of clear water at all times would therefore have been an economic impossibility in connection with a system of water-works for a town of this size. Therefore, the writer determined upon the excavation of a filtering basin along the lake shore, and from this an abundant supply of clear water is obtained at all times.

This basin is seventy-five in length by sixteen feet in width and has a maximum depth of about twelve feet below lake level. The sides are timbered up with four-inch plank kept in place by 8x8 stringers and cross-beams, and the whole is covered over.

In case of emergency, when the tell-tale in the pump-room would show that the water in the filtering basin was nearly exhausted, as after continuous pumping for a large fire, water may be admitted direct from the lake through a ten-inch inlet pipe laid for that purpose. This inlet pipe extends out 430 feet into the lake where a depth of ten

feet of water is reached, and is made up of cast iron pipe with the ordinary bell and spigot joints, except that to prevent any undue strain on the joints and to allow the line of pipe to conform to the irregular slopes of the lake bottom about every fifth joint was made flexible. The bells of these flexible joints are hollowed out, and the spigots so constructed that when the joint is poured with lead a ball and socket joint is made exactly similar to that of a surveyor's compass. The usual method of laying a pipe of this kind under water is to construct a float made of empty barrels supporting a suitable frame work. This float would carry about sixty feet of pipe, and this having been lowered into place the float is towed to shore for another load. To lay over 400 feet by this method would have been a tedious job taking several days to finish, and as Lake Huron cannot be depended upon to stay calm for more than a few hours at a time, the writer determined to put the whole length of the inlet pipe together at once. It was found that if the ends of the pipe were plugged and the water kept out it possessed sufficient buoyancy to carry about half its own weight, and a lot of 12x12 dry cedar timber being available, the remainder of the weight was easily carried by placing a line of these timbers on each side of the pipe and binding it with rope to 4x6 scantling laid across and spiked to the timbers. In a shallow part of the river the pipe was thus put together length by length and shoved out into deeper water, where it was bound to the timbers. When it was all joined together and both ends plugged it was towed down the river, out through the harbour and up along the shore to the pumping station, where the crib at the outer end was loaded with as much stone as it would carry without sinking. The pipe was then towed into position, and a few planks being removed the shore end was shoved inside the cofferdam which extended from the filtering basin out into the lake till a depth of about five feet of water was reached. The work of cutting off the floats now began at the shore end, and in a few minutes the pipe was lying in its place on the bottom of the lake. The crib at the outer end was afterwards loaded down with stone lowered upon it from a scow.

The pump house is of brick, having 15-inch hollow walls, and contains a boiler-room, 43x25 feet, with concrete floor. The pump-room is 22x24 feet, with walls plastered, wainscoting and ceiling of white pine and maple floor. There is telephone connection with the town central office, and the engineer's residence was built by the company, close at hand, and is an eight room house of modern design.

The water is pumped by a compound duplex pumping engine, manufactured by the Osborne Worswick Co., of Hamilton, Ont. The high pressure steam cylinders of this pump are 12 inches in diameter, and low pressure cylinders 18 inches, water plungers 10 inches, and stroke nominally 12 inches. The actual discharge is about 15 gallons (U.S.) per stroke, or, at 60 strokes per minute, a discharge of 900 gallons per minute, or a maximum capacity of about 1¼ million gallons per day. This pump, during the Underwriters' Association test of the works, kept up four good fire streams over 100 feet high, in the business part of the town. There is a Fisher automatic regulator on

the steam supply pipe, so that when the pump is once started it may be set at any desired pressure, which will be maintained with great uniformity, and without danger to the pipe system, when hydrants are shut off or turned on again.

Steam is supplied by a return tubular boiler, 60 inch diameter and 16 feet in length, having sixty-four tubes of $3\frac{1}{2}$ inch diameter. This boiler was made by Hunter Bros., Kincardine. A small feed pump for the boiler, and a Wainwright heater, complete the equipment of the pumping station.

The water is pumped through a 10 inch force main to a steel standpipe of 16 feet diameter and 100 feet in height, situated in the highest part of the town, which is about 90 feet above lake level—fortunately in a thickly populated district, so that no extra length of main was required to reach it. The standpipe is made up of twenty courses of boiler plate, each building five feet, and the first course is half an inch thick.

The distribution system embraces about four miles of mains of 4, 6, 8 and 10 inches in diameter. The pipe is cast iron, nearly all Canadian, and cast vertically in lengths of 12 feet. However, a few carloads were American pipe, and most of the 4 inch was Scotch pipe cast horizontally in lengths of 9 feet.

There are twenty-four Ludlow valves placed throughout the system, so that if any repairs to mains are required only short lengths need be shut off, and thus the inconvenience to consumers reduced to a minimum. For the use of the fire department there are thirty-four double delivery Ludlow fire hydrants, placed, as a rule, at street intersections.

On the completion of the works they were officially tested by Mr. James Warren, P.L.S., on behalf of the town of Kincardine, the mains being subjected to a pressure of 115 pounds per square inch for one hour without showing any defect in any part of the system, and Kincardine claims to have, for its population, one of the most efficient systems of water-works on this continent.

DISCUSSION.

Mr. Stewart—What is the population of Kincardine?

Mr. Bowman—About 3,000. The works cost about $35,000, standpipe and all. The standpipe is in the highest part of the town.

Mr. Butler—Have you many of these four-inch mains?

Mr. Bowman—Quite a number in the outskirts. The mains are located at one side of the street.

Mr. Gibson—Do the consumers pay directly to the company?

Mr. Bowman—Yes; and $2,100 paid by the town. They are built by a private company. The same firm have works in Belleville. The firm is in Syracuse, N.Y., formerly of Watertown. The first works they built here were in Cornwall, the next in Belleville, the next in Berlin, and then in Cobourg. They extended the Berlin works to Waterloo this year, and built in Kincardine and Ingersoll. On the other side they have a great many, from South Carolina to Dakota—in all, about fifty different works that they control.

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INCORPORATION.

MR. J. P. B. CASGRAIN.

I WANT it clearly understood before I begin to address you on this subject that I am not here of my own accord; I was asked to come here, as your President said, by a telegram I received yesterday from the Executive Committee. This telegram reads thus: "Executive earnestly request your attendance at meeting with or without paper." The fact of my having no paper to read before you to-day is because my time has been taken up—and many of us I dare say have the same story to tell—with the elections; and the time between this and the elections was too short to enable me to complete the rather lengthy paper which I was asked to prepare. However, if you will bear with me, I will try and give you the views that I hold on this subject

It is useless for me, before beginning, to emphasize the many benefits we have derived in Quebec from this incorporation, and which I believe you will also obtain in Ontario. If we follow the evolution which is marking the advancement in art and learning we observe a general tendency towards the principles of association. We know that the lawyers a long time ago applied to the Legislature for an Act of Incorporation, and we find to-day that they have the undeniable right to admit whom they please into their profession, holding their own examinations and establishing what the qualifications of a candidate must be before he is admitted to the practice of law. The doctors, following in the footsteps of the lawyers with an Act of Incorporation, are now dictating very rigorously the conditions, qualifications and the number of years of study in colleges and universities, after which they will admit one to the practice of medicine. We see these two professions, together, guarding most jealously the rights they have thus acquired, and if there has been advancement in those professions it is due in a great degree to the fact of their having Acts of Incorporation. Now, that there has been advancement in the profession of Land Surveying no one will deny. We all know that the old days of the variable compass are passed, leaving us the precise theodolite: we all know that the old elastic chain has been discarded for the solid steel tape, and "Polaris," once our predecessors' only guide, has now many bright rivals in the dark blue sky. But we must not suppose that there is now no room for advancement and improvement in our profession.

We have, as you know, in Quebec some five or six years ago had a Bill passed for Incorporation. This Bill, which I have here, has

been amended from time to time, and it is now what we think, as far as surveyors are concerned, almost as perfect as we can desire. Some two years ago the civil engineers of the Province wanted an Act of Incorporation giving them some of the privileges now solely enjoyed by the land surveyors. The land surveyors opposed this Bill of Incorporation, and when the civil engineers came before the Legislature they had not only to contend with an ordinary opponent, but the surveyors, each of them in their own counties, had influenced their members as much as they could against it. They met in Quebec, and the Association had there a President and Secretary able to write and address the members of the Committee of the House with the whole Association at their back. The consequence was that the Member who introduced this Bill had not even a seconder for his motion, and our contentions were sustained. It shows the force of incorporation. Had the surveyors had no organized system the consequence would have been that a Bill of Incorporation might have been granted, perhaps not giving to the engineers all they asked for but part of it, and we would have lost so much thereby.

Now, the Provincial Land Surveyors of Ontario have formed themselves into an Association to which most of the practising surveyors belong; I myself have belonged to it ever since I have been a P. L. S. in Ontario, but this Association has no legal existence. We pay almost as large an annual subscription as we would if our Association were incorporated. To make the thing a little more clear here is just a simple enunciation of the powers that are given to societies that are incorporated, and this is a right that is given to almost any association. Revised Statutes, Article 4086, reads:—

POWERS OF CORPORATION.

"4086. The corporation has full power:

1. To acquire and possess moveables and immoveables and enjoy the same, provided the value thereof does not exceed twenty thousand dollars;

2. To pass by-laws, not inconsistent with the provisions of this section, for the:

a. Government, discipline and honour of its members;

b. Management of its property;

c. Maintenance of the corporation by levying contributions or otherwise;

d. Election of a board of management;

e. Examination and admission of candidates to the study or practice of the profession;

f. Establishing fees for professional services in connection with land surveying.

3. To pass all other by-laws which may be deemed necessary for the proper working of the corporation." 52 V. c. 41, s. 2.

The enunciation of these rights shows the immense power our Association would have if we were incorporated. These are given to

almost any incorporated body. We are not asking anything that would not be granted to anybody else who would ask for it.

To commence at the beginning: the maintenance of discipline and honour of members. On that subject the Board of Management sit as a court of justice, and if one surveyor should commit any act against another surveyor in a professional way for which he might be made accountable, a complaint in writing is made in the proper form and certified before a Justice of the Peace, or before the President or Vice-President, and due action will be taken upon this, and the Board, sitting as a court of justice, will hear the case, the accused being allowed to come there represented by counsel. These offences would be such as appropriating another surveyor's notes, divulging professional secrets, etc. The Board hear the case, and if, in their judgment, the accused is guilty, they have the power to impose a fine of $100 or suspension for two years, and this suspension is such that if a surveyor is suspended and his name struck off the roll he is no longer a surveyor for the time being. You see the mere fact of the surveyors having to themselves the maintenance of their own dignity and honour is also a great advantage. All deliberations of the Board are perfectly secret. Since their incorporation only two surveyors have been tried before the Board, and only one of these found guilty, and it was a case of giving a pupil a certificate that he had served three years when the pupil had not actually served that time. This was considered a serious offence, and we have the right to suspend a surveyor for such misdemeanour.

We have the power of passing by-laws not inconsistent with the Act. Those I have here number 214, every one of which is designed and calculated to better the profession. By our Act we have the power to enforce these by-laws; of course I will not attempt to explain them, but they give the Board of Management virtually control, for the time being, of the Association.

If there is really a desire on the part of the surveyors of Ontario to become incorporated, I may explain how we commenced in the Province of Quebec. We were not in as good a position as you are, because we had no association, no officers, but we assembled a number of surveyors together—we were not as numerous as we are here to-day,—and we decided to first frame an Act of Incorporation. This was a very serious work, and it took us no less than a couple of years before we could get this Act drafted and presented to the Legislature; but after we got it before the House there was no further trouble. We retained the services of a good lawyer, who gave it a suitable form to receive the sanction of the House, and our Act was duly passed. From time to time we have had it revised. When once we were incorporated there was a general meeting of all surveyors in Quebec, and the first move was the appointment of a board of management to draft by-laws, and a board was appointed numbering fifteen. The reason for this large number is that surveyors are often called away; the quorum is only seven. This board is elected, by ballot, for three years; and once this board is elected the other members have virtually no control over the affairs of the Association.

The Board meet the same day and select a president, two vice-presidents, secretary-treasurer and syndic. If there is any examination to be held five members of the Board are selected to act as examiners, and these examiners are only appointed just at the time of the examination, so that nobody can know who the examiners will be. Of course it often happens that the same member will be re-appointed, but any pupil who goes and studies with a surveyor thinking that that member will be an examiner will very often find himself mistaken. The examiner must be perfectly free from and have no connection whatever with a candidate; and furthermore the examiners do not know whose papers they are correcting. The answers are all written in ink on papers bearing the seal of the corporation, and these papers are all put into a large envelope, and together with these papers in the large envelope is placed a smaller envelope in which there is a piece of paper bearing the name and address of the candidate. Both envelopes are carefully sealed. The President takes out every paper and marks the same number on every one of these papers and on the smaller envelope, and they are kept by the President until the end of examination. At the end of the examination the large envelopes are marked with the number of points that the candidate has obtained, and at the end of the session the small envelope is opened and the Board sees to whom the paper belongs. And then the examiners themselves do not admit a pupil, they simply report to the Board that such and such paper has retained so many points, and it is the Board that actually opens the smaller envelopes. But if a candidate has failed in any particular subject, and there is no use in his continuing his examination, the small envelope is opened by a special resolution of the Board, to see to whom the paper belongs, and this candidate is told that it is useless for him to continue his examination any longer. All the answers of candidates for examination are kept in the archives of the Association, and they could be immediately produced if the Board deemed it expedient.

In addition to sitting as a court of justice and conducting examinations, the Board of Management has also the framing of new by-laws. Before the Board of Management can send a by-law for the approval of the Association outside it must be approved by a two-thirds majority in the Board. Then it is sent out by letter to every member with a ballot attached to it, and if it receives a majority of the votes of the corporation it is adopted.

The preparing of the questions for examinations is a very important matter, and is left to the examiners. When the five members of the Board are appointed as examiners then they have to prepare these questions. The sittings commence at nine o'clock in the morning and continue till twelve at noon; then from two until five. During a sitting four or five questions are given on each subject, the same questions being given to everybody. One of the examiners sits in the room. At twelve or five o'clock the candidates should have worked out these questions; and if one has not completed his papers then they are taken from him and he is considered as having failed on those he has not answered; but the questions put are always such

as can be answered in the allotted time. The examiners correct these papers as they come in, so that the result of the examination is known very shortly after the last paper has been answered. We have also on certain questions such as mineralogy and geology the right of our by-laws of retaining the services of the professors of the universities. Questions of history, geography, etc., are put by professors of Laval University, so that students cannot take issue as to the competency of the examiners on such special matters. We have also the right to demand an oral examination. If a candidate has gone through the written examination, and if the Board has reason to suspect that something is not exactly right, then they can submit him to an oral examination.

As to paying the surveyors who attend, the members of the Board receive $4.00 a day besides their actual travelling expenses. The examiners, when they sit as examiners, do not receive the $4.00 a day but get $6.00 a day according to the tariff and their travelling expenses. It amounts to the members of the Board to about $100 a year. We do not make any money out of it, but it pays a member for his time.

The expenses in connection with the administration of the Association are not high. We simply pay per annum a subscription of $4.00 to get all the benefits of incorporation, and we now have at our credit in the bank over $2,000, besides a great number of books and tables and all the necessary appliances for holding meetings and examinations, and we are looking forward in the near future to being able to make a material reduction in the yearly $4.00. Part of the funds are raised by the fees paid by the candidates. The fees paid by the candidates are very much the same as the fees paid here. $1.00 for coming up for examination ; $4.00 certificate admission to study ; $2.00 for passing indentures, etc. ; $20.00 being admitted to study ; $20.00 to be admitted to examination for practice ; $20.00 more to get a diploma ; and if a candidate fails, $5.00 for any subsequent examination. So there is quite enough money generally to defray the expenses of the session. It is only in cases where there would only be one or two candidates that there would be any shortage.

It has been the duty of the Board to raise as much as possible the standard of the profession by making the questions not what you might call hard, but raising them somewhat and getting a straight answer from the students. Whispering, talking to one another, or copying is very strictly guarded against, and the minute a candidate is caught in the act he is immediately dismissed from the examination.

About the collection of dues, the law gives us the right to make by-laws and to levy contributions as I told you. We have put the annual contribution at $4.00, and the surveyors thrroughout the province who do not wish to belong to the Association have to state in writing to the President that they do not wish to practise, that they have gone to some other avocation and that they will claim none of the advantages of the corporation. In that case their name is left off the roll, and they cannot act as surveyors. All those who do not give

this notice are charged with the $4.00, and any one who after the 1st of January has not paid, his name is simply handed over to our attorney, who collects it. And we can not only collect the actual yearly contribution, but we can also collect the arrears. We pay from $200 to $400 a year to our President, who lives near the office and can attend there daily. The Secretary receives $100. If a surveyor in any part of the Province wants information on any subject, all he has to do is to write to Quebec and he gets an answer immediately. If a surveyor finds that an engineer is doing some surveying work in his neighbourhood. he at once notifies the President in Quebec, and the syndic goes at once to the place and enters a suit immediately against the offender. There are in Montreal some very good clients of mine who threatened me with bringing down a surveyor from Toronto, but I told them that he had better bring a very good instrument, so that it might be held as security for the costs of the suit of illegal practice.

Now, with regard to the advantages, there is everything to gain and nothing to lose. Supposing incorporation were to take place, no better qualified people in Ontario to act as members of the new Board could be found than those who are now members of the old Board. They have always carried on examinations before and they could keep on doing it; and, besides that, surveyors could, if they liked, alter any of the questions or programmes that are put now. They would have full control over that.

Now, I may have omitted a great many things, but if there is any question any member would like to ask I would be only too glad to answer it.

DISCUSSION.

Mr. Ogilvie—How is the tariff regulated?

Mr. Casgrain—The law gives us the right to make a tariff, and I have here a copy of the tariff which we have a right to collect in a court of justice. Land surveyors have a right to charge a fee of $6 for a day's work or *fraction of a day*, the regular day's work being six hours. Besides that, after a regular day's work, they have a right to charge $1 for each additional hour employed in the practice of their profession; and they have a right to charge for all sums paid for board and expenses at current rates. For each boundary mark they have a right to charge $1 besides the other fees stipulated, and I have put as many as thirty-two boundaries in one survey. Why we charge for these boundaries is, we are responsible, and we have no right to put down a boundary anywhere without in the description giving the exact locality where this boundary is and its astronomical bearing. For a description, $2.50, if it does not contain over 400 words; if it is more than 400 words and takes the shape of a report, we have a right to charge $2.50 for the first 200 words, and for each additional 100 words, 50 cts. For a copy of a description or report, $1; for every 100 words over 400, 20 cts. additional. For making a copy of a plan, we charge at the rate of $1 an hour, and keep our own time.

Mr. Ogilvie—Can you make it a misdemeanour if any member of the Association works for less than the tariff?

Mr. Casgrain—It is almost impossible to prevent a man from working for nothing if he chooses to do so, but if you make your bill according to this tariff you have a right to sue and collect your money for it.

Mr. Dickson—In case of a surveyor coming in and working against another surveyor—working for less—what would you do?

Mr. Casgrain—When you are incorporated you avoid that a great deal; it will raise the standard of the profession. We have had one surveyor working for another for less than the tariff, but for outside people we have had no such complaints.

Mr. Miles—What proportion of the surveyors attended your preliminary meeting?

Mr. Casgrain—I don't think they were as numerous as we are here to-day, between 20 and 25.

Mr. Chipman—How many surveyors have you on your rolls?

Mr. Casgrain—We have all the surveyors in the Province now, about 141.

Mr. Butler– Is there any particular form of study recommended, such as the School of Science?

Mr. Casgrain—There is a special provision for those who have gone through a course of applied sciences and have graduated in the Province. They save two years on their term; instead of serving three years, they only serve one.

Mr. Ogilvie—With reference to legislation, is it not a fact that any legislation affecting the land surveyors is submitted to them for approval before being taken into the House?

Mr. Casgrain—No; any Member is free to bring in a Bill regarding surveying without heeding our Association, but before it would be passed it would certainly be submitted to our Association, or to the Board.

Mr. Foster—Is the scale of prices that has been adopted in advance of the former ones?

Mr. Casgrain—Yes. Before we were incorporated the tariff was $4 a day; it is now $6.

Mr. Foster—Does that bind the members to that tariff?

Mr. Casgrain—We have never had any complaint of anybody charging less than the tariff. Every member of the Association is to-day, financially speaking, in a better position than he was before the passing of that law. I have been asked by a member if the Government in Quebec offered any opposition to our incorporation, and I say assuredly not. The Government was quite willing to part with that part of its powers and delegate them to the incorporation.

Mr. Gibson—Are you called Government Surveyors down there?

Mr. Casgrain—We are called Provincial Land Surveyors.

Mr. Abrey—In regard to outsiders, are their rights not taken away by this Act?

Mr. Casgrain—I don't see there was any right taken away from them. Those who don't want to pay the contribution have simply to notify the Secretary or President of their intention not to practise as land surveyors, and their names are immediately taken off the roll.

Mr. Gibson—If any of these men are unwilling to come into this Association is their standing affected in any way by your incorporation?

Mr. Casgrain—Certainly, for they cannot practice. At first there were some who said they did not see any use in the Act of Incorporation, but it has been decided that no surveyor can get out of paying his dues, and they have all come in. Another thing that helps us is, that the Commissioner of Crown Lands gives no work to a surveyor who has not paid his dues. The law says that those who are entitled to practise in the Province of Quebec are those only whose names appear on the roll published yearly by the Association, and who are in good standing. Supposing you give notice to-day that you do not intend to practise, and some years after you give notice that you want to join again, nothing would be charged against you for the time you have not practised.

Mr. Gibson—Supposing you made a survey during that time would it be legal?

Mr. Casgrain—No; not according to the Act. It is exactly on the same principle as if a lawyer appeared before a judge and he had not paid his dues; no judge will hear his case.

Mr. Gibson—And if I afterwards paid my fees, then would it be legal?

Mr. Casgrain—No; you must pay them before.

Mr. Dickson—Then you are not licensed by the Government but by a board appointed by yourselves?

Mr. Casgrain—Yes.

Mr. Dickson—I think it would be very unfair if a man has a license from the Government to practise and that Act says, in the face of his diploma, unless you pay $4 a year you cannot practise as a land surveyor.

Mr. Foster—As I understand it the Government delegates its power to appoint surveyors to the incorporated Society.

Mr. Chipman—I can't agree with Mr. Dickson in thinking it is a hardship for a member of the profession to have to pay $4 a year into the Association when by so doing he is putting $10 or $20 into the other pocket. Our Association is putting from $5 to $100 a year into every surveyor's pocket that is practising in Ontario; and the fifty or sixty of them who have not seen fit to join our Association I think can now afford to join our incorporation. They may think we are interfering with vested rights, etc., but I am surprised to find those who have spoken in that strain speaking in that way. I think we are doing them a kindness—putting money into their pockets.

Mr. Gibson—This Association would have the privilege of fixing the fees?

Mr. Chipman—Yes; subject to the approval of the Lieutenant-Governor, I suppose. There is nothing unreasonable in that; that is what every profession does. I don't mean to say that the Quebec Act will suit our case exactly; I think it might be improved on, but I think we are now in a position to go on with incorporation. Other professions are encroaching on this profession; the legal profession is encroaching on every profession; and if we don't become incorporated I think our Association will have a very struggling existence.

Mr. Aylsworth—I supposed that the object of the organization of this Association was, when the proper time came, to get incorporation, and I believe it would not only be to the interest of the profession but to the interest of the province as well.

Mr. Kirkpatrick—As far as I am personally concerned I think it would be the very best thing the surveyors could do. Of course I don't know what the Government's idea would be in the matter, but you all know that the Government give $400 towards the expenses of the Board of Examiners every year; that of course they would be freed from, and that might be something from a Government point of view.

Mr. Gibson—I look upon it as something of an experiment. There are no surveyors in the world who have the standing of the Provincial Land Surveyors of Ontario; and there are many holding good positions in the States who got them simply from the fact that they had a P.L.S. certificate from Ontario; and what would our standing be after having lost our position as Government surveyors? You speak of medical men and lawyers, but you must remember that they are a great body of men with immense influence compared with what we have; but whatever the Association says, I say. If we do get incorporation let us not lose our status as Government surveyors.

Mr. Kirkpatrick—At present we are licensed by a Board of Examiners appointed by the Government. If the Association is incorporated they will have power to appoint their own Board of Examiners, and we would just simply be changing from one board to another I quite agree with Mr. Gibson in saying, make haste slowly. I don't think it would be possible to do anything this session, but it might be possible to do something next year. In the interval let all the surveyors be sent a copy of this Act, and let all the members of this Association use their influence, so that in that way the opposition would be minimized which would come next year, and I think there would be no difficulty it getting it carried out.

Mr. Chipman—As to the point raised by Mr. Gibson about P.L.S., I don't see anything in the Act of Incorporation to prevent their adding P.L.S. to their names; all they have to do is to pay their fees and practise. A man can be a P.L.S. and not practise; he is in a state of static equilibrium, as it were.

Mr. Ross—I don't think it would be at all creditable to hold back in this matter. Incorporation is the order of the day among other bodies. In Manitoba, where there only a few surveyors, they are incorporated, and this chief province of the Dominion should not wait till all the other provinces are ahead of us.

APPENDIX.

REMINISCENCES OF A CANADIAN LAND SURVEYOR.

BY JOSEPH KIRK, STRATFORD.

WHEN quite a boy, and before coming to Canada, I was placed under the tuition of a gentleman named Robert Crompton, a duly authorized land surveyor in Ireland, resident in the City of Londonderry, for the purpose of learning the art of land surveying. I first commenced a course of mathematics, and after a while commenced the field practice of surveying in different parts of the country where our services were required on different estates. Have done a good deal of surveying on the Earl of Abercorn's estate, in the north of Ireland. Many a night I have slept in a hut on a bed of rushes in the heather mountains of old Ireland.

Emigrated to Canada in the year 1829, under the impression, I suppose, like many others, that I could at once enter on the practice of my profession, but soon found that if I wanted to practise land surveying here I must serve a term of three years under an authorized Provincial Land Surveyor, which for different reasons I could not at that time undertake. Then obtained a position in a mercantile and lumbering supply establishment, owned by Messrs. Bernard & Rainville, in the village of By-Town, then a little French village of two or three hundred inhabitants, now the City of Ottawa. The building of the Rideau Canal was just then commenced under the management of Col. By and a corps of Royal Sappers and Miners recently sent out from England. Very soon the inhabitants of the village began to increase as the work of the canal went on, and the village became a town. Remained in my position until the year 1840, when an opportunity offered for me to indenture myself to a Provincial Land Surveyor for Upper Canada, named John Robertson. In the course of my practice under him he obtained the survey of several lumbering limits on the Ottawa River and some of its tributaries, namely, the Madawaska and the Bon-Chere. Our first work was on the Ottawa, much further up the river than any lumbering operations heretofore, being above the Roche à Capitaine and Deux Rivieres where I wintered; snow being from two to two and a half feet deep in the woods all the winter, we travelled on snowshoes and prosecuted our

work all the winter. I might just mention an incident that occurred when going up in the previous fall. I had three bark canoes, laden with provisions, blankets and cooking utensils, etc., and, as all voyageurs in bark canoes well know, had to stop at the foot of all portages going up, and carry everything across the portage to the head of the rapids. On this occasion the carrying distance was about a quarter of a mile, and for my part I took up the paddles and some other light things and proceeded over the portage About halfway there was a rising ground, and on nearing the head there I met a large bear browsing on what are called "Labrador berries." This plant we often make tea of, and very good, too. However, Mr. Bear lifted up his head very leisurely and looked at me. I, being afraid to retreat, looked directly at him for about three minutes, when he turned round and walked slowly away, to my great satisfaction and relief. My canoe men in the meantime were busy arranging the goods to carry them over the portage on their backs.

I might add another incident. I had occasion to travel about twelve miles along the York branch of the Madawaska River on the ice, it being in the winter, and when nearing the head of a rapid there is a turn in the river. I noticed at this bend in the river, as I thought at the moment, about half a dozen of Indian dogs coming around the bend towards me, and expected to see the Indians every moment, as it is a very common thing when Indians are travelling to have their dogs with them. After a few minutes I thought it strange that no Indians were making an appearance, when immediately I heard a noise behind me, and a deer was coming full run right in my tracks, and after it three or four wolves. The deer came to within about twenty feet of me, when it made a sudden bound off the river and into the woods (the river being only about three rods wide) and the wolves after it, accompanied by those I first saw. I then saw through the wolf arrangement. Those which I thought were Indian dogs at first were wolves, showing that a pack of wolves starting a deer back in the woods they will divide themselves, and one-half will run to the adjacent rapids on the river, and the other half will run the deer to the river, where they are sure to meet and the deer is killed at once. When a deer is hunted it is sure to make for the nearest rapids. I was quite alone and had no weapon except a small hand axe in my belt, with which I was determined, if attacked, to fight to the last. But all the wolves pursued the poor deer and left me, I suppose, for a more convenient time. Then I made my way with all speed, about one mile more, to where my men were at work clearing out a line, and so escaped being killed by the wolves.

These incidents, though not coming exactly under the head of surveying, show some of the risks, dangers and difficulties that are to be met with, and so I thought it proper to mention them. But I have diverged from my canoe trip so much that I must now return. Our canoe-loading being all carried to the head of the portage, we got the canoes loaded again and proceeded as before to our destination, where the surveying work commenced. The manner in which the surveys of lumbering limits were performed in those days was, for the limit to

commence at a certain known point on the river; then find the magnetic course or average bearing of the river for some miles; then at a right angle from this course or line run one mile back from the river; thence, parallel with the river line, three miles; thence at a right angle with last line to the river, blazing the trees throughout. Thus was each limit defined.

After completing my instructions here I was ordered to the Madawaska and the Bon-Chere Rivers. My first work was on the York branch (a tributary of the Madawaska), then to Round Lake on the Bon-Chere, where I made similar surveys. The parties who made square red pine timber first in these regions were Peter Aylen and Messrs. Wells & McCrea. I spent twelve months in these sections of country, and was not in a house or covering of any kind except my blankets, and in case of rain or wet weather made a camp composed of poles and hemlock brush. The above places were far beyond any settlement or inhabitants at that time (1841) except Indians, and at certain points a Hudson Bay fort, as it was called, composed of a small log shanty, about twelve feet square, and a couple of Frenchmen or halfbreeds, with stuff to trade with the Indians for furs.

After this I came down to By-Town and the surrounding country in the townships of Nepean, Gloucester, etc., and had a good deal of practice in ordinary surveying, running lines, etc., until my three years were expired. I then proceeded to the seat of Government, which was then in the City of Kingston, Sir Charles Bagot being Lieutenant-Governor. After passing my examination as a surveyor successfully, I received my license to practise on the 16th of February, 1843. Proceeding to Stratford, then a very small place, I was soon employed by the Canada Company in drawing copies of the original plans of each township in the Huron District in duplicate, one copy for the Company's office in London, England, and the other for their office in Canada, besides surveying several town plots, namely, Mitchell for the Canada Company, Clinton for Isaac Rattenbury, Poole and Trowbridge for the Government, and more recently many townships in Manitoba and the North-West. I have been a member of the first Association of Provincial Land Surveyors, Civil Engineers and Architects of Ontario during its existence (see report of meeting appended), and of our own present Association since its commencement six years ago, and now believe I am nearly the oldest practising Provincial Land Surveyor in the Province of Ontario.

The following meeting was held on the 5th day of May, 1873:—

"PROVINCIAL LAND SURVEYORS' MEETING.

"A meeting of surveyors from different counties in Western Ontario was held on the 5th instant, at the Revere House, London, when an organization was effected under the title of 'The Surveyors' Association of Western Ontario,' and the following officers were appointed:—Mr. B. Springer, of London, President; Mr. Kirk, of Stratford, Vice-President; Mr. T. W. Dyas, of London, Secretary; and Mr. Wm. McMillan, Treasurer.

"They decided to recommend the following scale of prices to the consideration of the Surveyors of Ontario:—

"Field and office work, $8 per day and all expenses.

"Astronomical observations, $5 each.

"Descriptions, minimum price, $2.

"Time to be charged from leaving office until return.

"A day to be eight hours.

"Moved by Mr. A. Macdonald, of Chatham, seconded by Mr. J. H. Jones, of Sarnia, and resolved, that the next meeting be held in London, on the 12th day of May, when this tariff will be discussed, and that all surveyors in Ontario be invited to become members of the Association."

OBITUARY.

SINCE our Sixth Annual Meeting a break in the ranks of membership has been caused by the death of Mr. A. C. Webb, D.L.S. and P.L.S., who passed over to the great majority on the morning of May the 29th, after an illness of several months.

Mr. Adam Clark Webb was born in the Township of Cramahe, near Colborne, on August 9th, 1840. His father, the late Thomas Webb, was a native of the County of Cavan, Ireland, and emigrated to Canada in the early part of this century. A pioneer of the County of Northumberland, he rose to a position of influence and wealth. Mr. A. C. Webb, the youngest of the family, after completing a course at Victoria College, Cobourg, became articled to the late Richard Brown, P.L.S., and received his commission as Provincial Land Surveyor in 1864. He then attended the Royal Military College at Kingston for military instruction, and in 1866 formed the first volunteer company organized in Brighton. Eminently fitted in all respects for a soldier, he remained a member of the 40th Battalion, and rose to the rank of Lieutenant-Colonel, which position he recently resigned owing to the pressure of his duties as a surveyor. His fine physique, thrilling voice and genial disposition will long be remembered in the regiment.

Mr. Webb was one of the first surveyors entrusted with professional work in the North-West Territories, being in command of the surveying party whose operations were peremptorily ended by Louis Riel at the commencement of the Rebellion of 1869. During the seasons of 1871-'72-'78-'79-'80-'81-'83-'84-'85 and '86 he was employed by the Dominion Government on the more important surveys of the Territories. A sunstroke received when at Medicine Hat, N.W.T., in 1885 had a lasting effect on his constitution.

For many years Mr. Webb was a member of the Boards of Examiners for Provincial Land Surveyors at Toronto and for Dominion Land Surveyors at Ottawa.

The Village of Brighton, which was the home of Mr. Webb during the last twenty-five years of his life, was almost entirely laid out by him. Mount Hope Cemetery, in Brighton, which was subdivided by him many years ago, now contains his earthly remains.

Mr. Webb leaves a wife, two sons and a daughter to mourn his loss. Prominent in matters political, municipal, and professional, he will be missed by many.

TORONTO, JUNE 10TH, 1891.

LIST OF MEMBERS.

ACTIVE MEMBERS.

NAME. OCCUPATION. ADDRESS.

Abrey, George Brockitt .... 35 Adelaide Street E. Toronto.

Aylsworth, Wm. Robert .. .. Deseronto.
Engineer for Napanee, Tamworth and Quebec Railway.

Aylsworth, Charles Fraser, Jr... .....Madoc.
Engineer for Tps. of Sydney, Thurlow, Rawdon, Huntingdon, Hungerford, Madoc and Tyendinaga, also Villages of Madoc and Tweed.

Baird, Alexander.....Box 195, Leamington.
Engineer for Tps. Romney, Tilbury W., Colchester S., and Malden, also Town of Leamington.

Beatty, David ....Parry Sound.

Berryman, Edgar, M. Can. Soc. C.E..... ..Sherbrooke, Que.
Chief Engineer Quebec Central Railway.

*Bolger, Francis ..... Penetanguishene.

Bolton, Jesse Nunn ..... Albion.

*Bolton, Lewis..... ....Listowel.
Engineer for Townships of Elma, Grey, Morris, Town of Listowel and Village of Drayton.

Booth, Charles Edward Stuart, A. M. Can. Soc. C.E.,
Radford, Virginia.

*Bowman, Clemens Dersteine ..... West Montrose.

*Bowman, Herbert Joseph, Grad. S.P. Sc. (Toronto);
A.M. Can. Soc. C.E. .....Berlin.
Superintendent Berlin Water Works.

Browne, Harry John.....17 Toronto Street, Toronto.

Browne, Wm. Albert ..... 17 Toronto Street, Toronto.

Burke, Wm. Robert..... Ingersoll.

Butler, Matthew Joseph, M. Am. Soc. C.E.;
M. Can. Soc. C.E.; Asso. M. Inst. C.E.....Napanee, Ontario.

*Campbell, Archibald Wm., A. M. Can. Soc. C.E.....St. Thomas.

NAME. OCCUPATION. ADDRESS.

Campbell, David Suter.....Box 253, Mitchell.
Engineer for five Townships.

Casgrain, Joseph Philip Baby, A. M. Can. Soc. C.E...Morrisburgh.

Cavana, Allan George ..... Orillia.
Engineer for Townships of Rama, Mara, Carden and Dalton; Land, Loan and Ins. Agt.

Cheesman, Thos.....Mitchell.

Chipman, Willis, B.A.Sc. (McGill); M. Am. Soc. C.E.;
M. Can. Soc. C.E.....103 Bay Street, Toronto.
Branch Offices at Brantford, Galt, Barrie and Brockville.
Civil and Sanitary Engineer.

Coad, Richard .....Glencoe.

*Cozens, Joseph.....Sault Ste. Marie.
Mem. Am. Soc. M.E., Pres. Sault Ste. Marie & Hudson Bay Ry.

Davidson, Walter Stanley.....16 Warren Ave., Petrolea.

*Deans, William James ..... Oshawa.

*De Morest, Watson.....Sudbury.

De Gursé, Joseph ..... Windsor.
Chief Engineer, Lake Erie, Essex & Detroit River Railway.

Dickson, James.....Fenelon Falls.
Engineer for Tp. of Fenelon, Inspector Crown Lands Surveys.

Doupe, Joseph, C.E. (McGill)....7 Princess Street, Winnipeg, Man.

Drewry, William Stewart... .....Dept. of Interior, Ottawa.
Triangulation Survey of part of Rocky Mountains, Topographical Survey of Canada.

Ellis, Henry Disney, C.E .....Toronto.
Assistant Engineer in charge of Roadways, City Engineer's Dept.

Esten, Henry Lionel .....157 Bay Street, Toronto.

Evans, John Dunlop, M. Can. Soc. C.E.
Copper Cliff, near Sudbury, Ontario.
Chief Engineer Central Ontario Railway, General Manager Canadian Copper Company.

Fairbairn, Richard P.....127 Major Street, Toronto.
Public Works Dept., Ontario.

Farncomb, Frederick William.....Box 107, Exeter.
Engineer for Exeter, also Townships of Hay and Stephen.

Fawcett, Thomas, D.T.S.....Gravenhurst.
Dominion Government Surveys.

NAME. OCCUPATION. ADDRESS.

Fitton, Charles Edward ..... Drawer 31, Orillia.
Engineer Wahnapatae Mining Company, Land and Insurance Agent.

Flater, Frederick William ..... Chatham.

Foster, Frederick Lucas ..... 157 Bay Street, Toronto.

Galbraith, John, M.A.; Assoc. M. Inst. C.E., D.T.S. ..... Toronto.
Professor of Civil Engineering, School of Practical Science.

Galbraith, William ..... Bracebridge.

Gardiner, Edward ..... St. Catharines.
Engineer County of Lincoln.

Gaviller, Maurice, C.E. (McGill) ..... Barrie.

Gibson, Peter Silas, B.Sc.; C.E.; M.Sc. (Univ. of Mich) .. Willowdale.

Hart, Milner ..... 103 Bay Street, Toronto.

Henderson, E. E. ..... Henderson, Maine.

Jephson, Richard Jeremy ..... Calgary, Alberta, N -W.T.

*Johnston, Robert T. ..... 131 Wellington St. W., Toronto.

Jones, Thomas Harry, B.A.Sc. (McGill) ..... Brantford.
City Engineer.

Jones, Charles Albert ..... 215 Dundas Street, London.

Keefer, Thos. Coltrin, C.M.G.; M. Inst. C.E.; Pres. A. Soc. C.E.; Can. Soc. C.E. ..... Ottawa.

Kirk, Joseph ..... Box 373, Stratford.
Engineer for Townships of Mornington, South Easthope, North Easthope and Village of Melverton.

Kirkpatrick, George Brownly ..... 8 Coolmine Road, Toronto.
Chief Clerk Survey Branch, Department of Crown Lands.

Klotz, Otto Julius, D.T.S.; C.E. (University of Michigan) .. Preston.
Astronomer for Department of Interior.

Laird, Robert, Grad. S. P. Sc. (Toronto.)
City Surveyor's Office, Toronto.

Lawe, Henry ..... Hare Building, West Main St., Norfolk, Virginia.

*Lendrum, Robert Watt ..... Vankleek Hill.

Lewis, J. B ..... Brunswick House, Ottawa.

Low, Nathaniel E. ..... Wiarton.

NAME. OCCUPATION. ADDRESS.

Lumsden, Hugh David, M. Inst. C.E.; M. Can. Soc. C.E. ..... 7 Homewood Ave., Toronto.
Engineer for Atlantic & North-West and International Railways.

McAree, John, Grad. S.P.Sc.; D.T.S. ... 113 Winchester St., Toronto.

McCulloch, Andrew Lake, Grad. S. P. Sc., Toronto ..... Galt.
Engineer in Charge of Construction Galt Water Works, and Engineer for Town of Galt, Townships of Beverley and North Dumfries.

*McEvoy, Henry Robinson ..... St. Mary's.
Tourists' Guide, North Bay.

McFarlen, George Walter ..... 11 St. Vincent Street, Toronto.

*McGrandle, Hugh ..... Huntsville.

McKay, Owen ..... Windsor.
Assistant Engineer L. E. E. & D. R. Ry.

*McKenna, John Joseph ..... Dublin.

McNabb, John Chisholm ..... Chatham.
Engineer for Erie & Huron Ry. and Town of Chatham.

Miles, Charles Falconer ..... Walkerton.
Engineer Minto, Normanby, Carrick, Brant, Greenock, Bruce, Arain and Town of Wingham.

Moore, John McKenzie ..... Albert Building, London.
Engineer for four Townships.

Morris, James Lewis, C.E. (Toronto University), A. M. Soc. C. E. ..... Pembroke.
Engineer County of Renfrew.

Mountain, George A. ..... Ottawa.
Chief Engineer Can. Atlantic Ry., and Chief Engineer Ottawa and Parry Sound Ry.

Murphy, Chas. Joseph ..... 157 Bay Street, Toronto.

Niven, Alexander ..... Haliburton.
Outline Surveys, Crown Lands Department.

Ogilvie, William ..... Ottawa.
Dominion Land Surveyor.

Patten, Thadeus James ..... Little Current.
Agent for Can. Perm. Loan and Savings Co.

Paterson, Jas. Allison, M. C. Soc. C.E.
9 Masonic Chambers, Toronto St., Toronto.
Engineer for Toronto Belt Line Ry.

Proudfoot, Hume Blake, C.E. (University of Toronto) ..... Toronto.

NAME. OCCUPATION. ADDRESS.

Purvis, Frank ..... Eganville.
Engineer for Townships of Bromley and Wilberforce.

Rainboth, E. J ..... 48 Sparks St., Ottawa.

Roberts, Vaughan Maurice ..... 11 Peter Street, Toronto.

*Robertson, James, Grad. S. P. Sc. ..... Glencoe.

*Rogers, Richard, Birdsall; B.A.Sc. (McGill) ..... Peterboro'.
Superintending Engineer Trent Canal.

Ross, George, B.A. Sc. (McGill) ..... Welland.
Engineer for Towns of Welland and Niagara Falls, and six Townships.

Russell, Alexander Lord ..... Box 240, Port Arthur.
Mining Engineer.

Sankey, Villiers ..... City Hall, Toronto.
City Surveyor.

Sanderson, Daniel Leavens ..... Enniskillen.

*Saunders, Bryce Johnston, B.A.Sc. (McGill)... Box 114, Brockville.
Engineer for Counties Leeds and Grenville, Townships Augusta and Elizabethtown.

Scane, Thomas. ..... Ridgetown.
Engineer for Townships of Orford and Done, and Town of Ridgetown.

*Selby, Henry Walter ..... Castile, New York.

Sherman, Ruyter ..... Brantford.
Assistant City Engineer.

Smith, Henry ..... Crown Lands Dept., Toronto.
Supt. Colonization Roads.

Speight, Thomas Bailey ..... Arcade, Yonge Street, Toronto.

Steele, Edward Charles ..... 34 Yonge Street, Toronto.

Stewart, Elihu ..... Collingwood.

Stewart, Louis Beaufort, D.T.S..School of Practical Science, Toronto.
Lecturer on Surveying.

*Tiernan, Joseph M ..... Tilbury Centre.
Engineer for three Townships.

Tyrrell, James Williams, C.E. (Toronto)..42 James St. N., Hamilton.
Engineer for Townships of Ancaster and Flamboro' West, and Village of Burlington.

Unwin, Charles ..... 157 Bay Street, Toronto.

Ure, Frederick J. ..... Woodstock.
Engineer for Town of Ingersoll and six Townships.

NAME. OCCUPATION. ADDRESS.

VanNostrand, Arthur Jabez.....Arcade, Yonge Street, Toronto.

*Vicars, John ..... Cannington.
Engineer for Village of Cannington.

Warren, James, Asso. Mem. Can. Soc. C.E. .. .. Kincardine.
Engineer for the Townships of Ashfield and Culross, Kincardine and Bruce, and Lucknow Water Works.

Weatherald, Thomas .....Box 116, Goderich.

Webb, Adam Clark, D.L.S. ..... Brighton.

*Wheeler, Arthur Oliver ..... Ottawa.
Department of Interior.

Wheelock, Chas. Richard.....Orangeville.
Engineer for Counties of Wellington, Dufferin and Peel.

Whitson, James Francis ..... North Bay.
Engineer for six Townships.

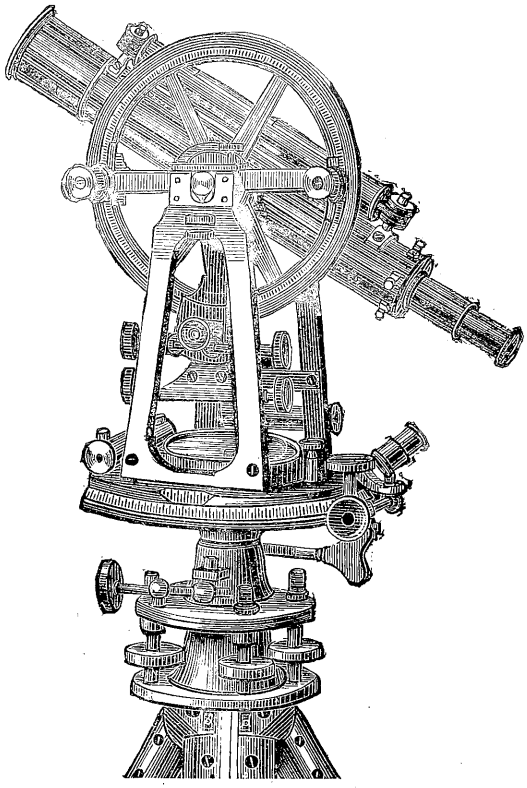
Wicksteed, Henry King, B.A.Sc. (McGill), M. C. Soc. C.E..Cobourg.

Wilkie, Edward Thomson.....Carleton Place.

Yarnold, William Edward ..... Port Perry.
Engineer for Townships of Brock, Reach, Scugog, Mariposa and Georgina.

HONORARY MEMBER.

Carpmael, Charles, M.A.....Toronto.
Superintendent of Meteorological Service.



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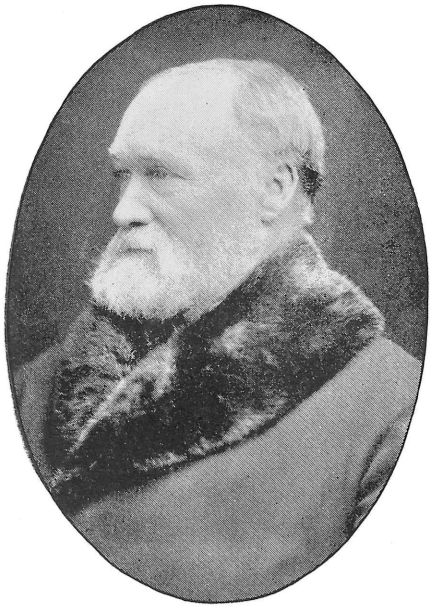


HUGH WILSON, F.G.S.

A. C. WEBB, P.L.S.

PROCEEDINGS

OF THE

ASSOCIATION OF

PROVINCIAL LAND SURVEYORS

OF ONTARIO

AT ITS SEVENTH ANNUAL MEETING, HELD AT TORONTO,
ON FEBRUARY 23RD, 24TH, AND 25TH,

1892.

The Eighth Annual Meeting (First Annual Meeting of the Association of Ontario Land Surveyors) will be held in Toronto, on Tuesday, 24th of February, 1893.

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

NOTICES.

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

Members can be supplied with copies of the Proceedings for 1887, 1888, 1889, 1890, or 1891 by remitting fifty cents to the Secretary.

Copies of the Act of Incorporation will be sent upon receipt of three-cent stamp.

PATRONIZE OUR ADVERTISERS.

CIRCULAR No. 3.

ASSOCIATION

OF

ONTARIO - LAND - SURVEYORS

Incorporated by Act of Parliament '55 Vic. Chap. 34)

To the Members of the Association of Ontario Land Surveyors:

As the publications in the Daily Newspapers may not have reached all our members, the following facts are given for general information.

The first election under the Act of Incorporation was held in July last and resulted as follows:—

PRESIDENT, E. STEWART, Collingwood.
VICE-PRESIDENT, M. J. BUTLER, Napanee,
SECRETARY-TREASURER, A. J. VANNOSTRAND, Toronto.

COUNCILLORS,

P. S. GIBSON, Willowdale M. GAVILLER, Barrie	For three years term.
JNO. MCAREE, Toronto V. SANKEY	For two years term.
A. NIVEN, Haliburton G. B. KIRKPATRICK Toronto	For one year term.

AUDITORS,
WILLIS CHIPMAN, Brockville and JNO. MCAREE, Toronto.

At the first meeting of the Council of Management, held at Toronto, on 18th of October. V. SANKEY was elected Chairman of Council and Board of Examiners for the current year. The following members of the Board of Examiners were also appointed:

M. J. BUTLER, for three years term (by Lieut-Gov. in Council)
G. B. KIRKPATRICK, for two years term (by Lieut-Gov. in Council)
P. S. GIBSON and A. NIVEN, for three years term (by Council of Management).
R. COAD and M. GAVILLER, for two years term (by Council of Management).

PROF. COLEMAN, of the School of Practical Science, was also appointed by the Council to assist if necessary in the subjects of mineralogy and geology at the coming examination.

MR. MCAREE, having tendered his resignation as auditor H. B, PROUDFOOT, the next in order of votes for that office, was declared elected auditor.

By-laws are now being drafted and will be submitted to the Association for ratification at its next general annual meeting.

Respectfully submitted,
A. J. VANNOSTRAND, Secretary.

PREFACE.

To the Members of the Association of Provincial Land Surveyors of Ontario :

THE Proceedings of the Association at its Seventh Annual Meeting are herewith presented.

The registered attendance at this meeting exceeded that of either of the two preceding meetings.

As a result of affiliation with the Association of Dominion Land Surveyors two papers read before that Association are published herein.

Since the date of the Seventh Annual Meeting the Act of Incorporation of the Ontario Land Surveyors has become law and our standing assured. A copy of the Act will be found in this issue.

The hearty co-operation of all our members is requested, in order that the benefits of the new status of the Association may be felt by each member.

Respectfully submitted on behalf of the Executive Committee.

A. J. VANNOSTRAND,
Secretary.

CONTENTS.

ASSOCIATION OF

PROVINCIAL LAND SURVEYORS

OF ONTARIO.

ORGANIZED 23RD FEBRUARY, 1886.

Officers for 1892-3.

PRESIDENT.

Elihu Stewart, P.L.S., Collingwood.

VICE-PRESIDENT.

M. J. Butler, P.L.S., Napanee.

SECRETARY-TREASURER.

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

COUNCILLORS.

J. McAree, D.T.S., Toronto.
M. Gaviller, P.L.S., Barrie.
P. S. Gibson, C.E., Willowdale.

BANKERS.

Imperial Bank of Canada.

STANDING COMMITTEES.

LAND SURVEYING.—M. Gaviller (Chairman), H. J. Browne, T. B. Speight, P. S. Gibson, C. F. Miles, L. B. Stewart.

DRAINAGE.—J. C. Macnab (Chairman), R. Coad, J. M. Tiernan, M. Gaviller, J. Robertson, W. R. Burke, Geo. Ross, C. A. Jones, L. Bolton, A. G. Cavana, B. J. Saunders, C. F. Miles.

ENGINEERING.—G. B. Abrey (Chairman), C. F. Aylsworth, John McAree, H. D. Ellis, J. Galbraith, T. H. Jones, Jas. Warren, H. J. Bowman, H. K. Wicksteed.

LEGISLATION.—J. Dickson (Chairman), O. J. Klotz, A. Niven, G. B. Kirkpatrick, Willis Chipman, C. Unwin, W. Ogilvie, Joseph Cozens, J. P. B. Casgrain, W. R. Aylsworth.

ENTERTAINMENT.—F. L. Foster (Chairman), Chas. Murphy, H. D. Ellis, G. B. Abrey, T. B. Speight, H. B. Proudfoot, W. A. Browne.

PUBLICATION.—H. L. Esten (Chairman), H. J. Browne, F. L. Foster, Willis Chipman, Chas. Murphy, John McAree.

INSTRUMENTS.—W. S. Drewrey (Chairman), Thos. Fawcett, F. L. Blake, W. A. Browne, J. W. Tyrrell, J. F. Whitson, W. Ogilvie.

PROGRAMME OF THE

ASSOCIATION OF PROVINCIAL LAND SURVEYORS OF ONTARIO

AT ITS SEVENTH ANNUAL MEETING HELD IN TORONTO, FEBRUARY 23RD, 24TH AND 25TH, 1892.

PROGRAMME.

Tuesday, February 23rd—Morning, 10 o'clock.

Meeting of Executive Committee.
Meeting of Standing Committees.

Afternoon, 2 o'clock.

Reading of Minutes of Previous Meeting.
Reading of Correspondence.
Report of Secretary-Treasurer.
Appointment of Auditors.
President's Address.
Report of Committee on Land Surveying, with Question Drawer. A. Niven, P.L.S., Chairman.
Report of Committee on Engineering, with Question Drawer. G. B. Abrey, P.L.S., C.E., Chairman.
Announcements by Committee on Entertainment. F. L. Foster, P.L.S., Chairman.

Evening, 8 o'clock.

Paper—"Cement and Cement Mortars." M. J. Butler, P.L.S., C.E., Napanee, Ont.
Paper—"Does the Passing of an Act of Parliament always do Justice?" A. Niven, P.L.S., Haliburton.
Paper—"Hints to a Surveyor about to Survey a Township for the Ontario Government." W. R. Burke, P.L.S., Ingersoll, Ont.
Paper—"Exploratory Surveys." Wm. Ogilvie, P.L.S., Ottawa.

Wednesday, February 24th—Morning, 10 o'clock.

Discussion—The Drainage Act.
Paper—"Compass Lines." John McAree, D.T.S., Toronto.
Paper—"The Value of Old Records in Relation to Municipal Surveys." G. B. Kirkpatrick, P.L.S., Crown Lands Dept., Toronto.

Afternoon, 2 *o'clock.*

Discussion—Incorporation.

Paper—"Sewerage for Towns and Villages." H. J. Bowman, P.L.S., C.E., Berlin, Ont.

Paper—"Georgetown Water Works." James Warren, P.L.S., C.E., Kincardine, Ont.

Paper—"Hamilton and Barton Incline Railway." J. W. Tyrrell, P.L.S., C.E., Hamilton, Ont.

Paper—"Are the Great Lakes Retaining their Ancient Level?" J. G. Boulton, R.N.

Thursday, February 25th—Morning, 10 *o'clock.*

Paper—"Exploring for Nickel." C. E. Fitton, P.L.S., Orillia.

Paper—"Railway Surveys." H. K. Wicksteed, P.L.S., C.E., Cobourg, Ont.

Paper—"Rock Blasting of Trenches for Water Works and Sewerage Purposes." A. L. McCulloch, P.L.S., C.E., Galt, Ont.

Report of Committee on Drainage. J. C. Macnab, P.L.S., C.E., Chairman.

Afternoon, 2 *o'clock.*

Report of Committee on Legislation. W. R. Aylsworth, P.L.S., Chairman.

Report of Committee on Incorporation. A. Niven, P.L.S., Chairman.

Report of Committee on Publication. John McAree, D.T.S., Chairman.

Report of Committee on Instruments. W. Ogilvie, P.L.S., Chairman.

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

Unfinished business.

Election of Associate Members, Junior Members, and Honorary Members.

Nomination of Officers.

Appointment of Scrutineers—Ballot of 1892.

New Business.

Adjournment.

Full discussion after each Paper and each Report.

ASSOCIATION OF

PROVINCIAL LAND SURVEYORS

OF ONTARIO.

MINUTES OF THE SEVENTH ANNUAL MEETING,

FEBRUARY 23RD, 24TH AND 25TH, 1892.

The Association met at 2 p.m. on February 23rd, in the Library of the Canadian Institute, 58 Richmond Street East, Toronto.

The President, Villiers Sankey, Esq., in the Chair.

Moved by A. J. VanNostrand, seconded by A. Niven, That the minutes of last meeting, as printed in the Proceedings, be confirmed as read. Carried.

The Secretary read a letter from Professor Galbraith, in reference to the admission of Provincial Land Surveyors to the School of Practical Science.

Mr. VanNostrand, the Secretary-Treasurer, then read his Annual Report.

Moved by M. Gaviller, seconded by H. D. Ellis, That the Report of the Secretary-Treasurer be received and adopted, and that the Financial Statement be referred to the Auditors for their report. Carried.

Moved by M. J. Butler, seconded by Mr. Fawcett, That Messrs. Campbell and Gaviller be the Auditors for the current year. Carried.

The President then read his Annual Address.

Moved by A. Niven, seconded by C. F. Aylsworth, That the thanks of the Association be given to the President for his address and the many practical suggestions contained therein. Carried.

The report of the Committee on Land Surveying was presented by the Chairman of the Committee, Mr. Niven. After discussion, on motion of Mr. Niven, seconded by Mr. Aylsworth, the report was received and adopted.

Mr. Burke read a paper prepared by him, entitled "Hints to a Surveyor about to Survey a Township for the Ontario Government."

Moved by A. Niven, seconded by T. H. Jones, That the paper read by Mr. Burke be received, and that he be tendered the thanks of the Association. Carried.

The matter of Incorporation was then taken up and discussed, after which Mr. Foster announced that on account of the meeting at the School of Practical Science, on the following evening, the Committee concluded to dispense with the customary Annual Dinner.

The meeting adjourned at 5.15.

Evening Session, 8 p.m.

The President in the Chair.

Mr. Niven read his paper on "Does the Passing of an Act of Parliament Always do Justice?"

Moved by T. H. Jones, seconded by T. B. Speight, That the paper of Mr. Niven be accepted, and that the thanks of the meeting be tendered him. Carried.

Mr. Alan Macdougal, on behalf of the Canadian Institute, gave a short address, welcoming the members of the Association, to which the President, on behalf of the Association of Provincial Land Surveyors of Ontario, replied.

Mr. M. J. Butler then addressed the meeting on the subject of "Cements and Cement Mortars." A full discussion followed. On motion of Willis Chipman, seconded by A. Niven, a vote of thanks was tendered Mr. Butler for his address.

The paper read by Mr. Gaviller at the last Annual Meeting, on 'Descriptions," was then discussed till the adjournment, at 10 p.m.

WEDNESDAY MORNING SESSION, 10 A.M.

The President in the Chair.

The Secretary read a letter from Mr. J. B. Rankin, Chairman of the Ontario Drainage Commission, in reference to the appointment by the Association of the members to meet the Commission *re* changes in Drainage Act. Also a letter from Mr. W. G. McGeorge, regretting his inability to attend the meeting.

Mr. McAree then read a paper, prepared by him, on "Compass Lines," after which, on motion of Mr. Stewart, seconded by Mr. Niven, the thanks of the Association were tendered Mr. McAree for his paper.

Mr. George B. Kirkpatrick read his paper on "The Value of Old Records in Relation to Municipal Surveys." After discussion a vote of thanks was tendered Mr. Kirkpatrick.

Owing to the absence of Mr. C. E. Fitton, of Orillia, the paper prepared by him on "Exploring for Nickel" was read by the Secretary.

Moved by E. Stewart, seconded by P. S. Gibson, That a vote of thanks be tendered Mr. Fitton for his paper on "Exploring for Nickel." Carried.

AFTERNOON SESSION.

The Vice-President, Mr. E. Stewart, in the Chair.

Mr. Niven read the report of the Committee on Incorporation, which, on motion, was adopted. The discussion on Incorporation was continued for some time, when it was moved by M. J. Butler, seconded by Willis Chipman, That the following be a committee of this Association to wait upon the Attorney-General and Commissioner of Crown Lands *re* Incorporation, and to use every endeavour to secure the passage of the Bill, No. 63, now before the Legislature, and to accept the Bill, provided the clauses retaining the management of the Association be not expunged: E. Stewart, P. S. Gibson, V. Sankey, A. J. VanNostrand, W. Chipman, C. Unwin, H. J. Browne, G. B. Kirkpatrick, A. Niven, O. J. Klotz; three to form a quorum. Carried.

Mr. H. J. Bowman then read his paper on "Sewerage for Towns and Villages," and also exhibited some specimens of sewer pipe. After discussion a vote of thanks was tendered Mr. Bowman for his paper.

Mr. J. W. Tyrrell next read his paper on "Hamilton and Barton Incline Railway," showing plans of the structure, for which the thanks of the Association were tendered him.

The meeting adjourned at 5.45.

THURSDAY MORNING SESSION, 10 A.M.

The President in the Chair.

Moved by C. F. Aylsworth, seconded by A. Niven, That owing to the fact that Mr. D. S. Campbell, one of the Auditors appointed, is unable through illness to attend to the business of accounts, Mr. H. D. Ellis be appointed to act as Auditor with Mr. M. Gaviller. Carried.

Mr. James Warren's paper on "Georgetown Waterworks" was read by the Secretary, owing to the inability of Mr. Warren to be present.

Moved by Geo. Ross, seconded by A. L. McCulloch, That a vote of thanks be tendered to Mr. Warren for the paper on "Georgetown Waterworks." Carried.

Mr. A. L. McCulloch followed with a paper on "Rock Blasting of Trenches for Waterworks and Sewerage Purposes."

Moved by Mr. Abrey, seconded by Mr. McAree, That a vote of thanks be given to Mr. McCulloch for his interesting paper. Carried.

The report of the Drainage Committee was read by the Secretary.

The President then read the letter of Mr. Rankin, which had been previously read, and advised that some action be taken on it. After discussion it was moved by Mr. Niven, seconded by P. S. Gibson, That, complying with requests in correspondence from the Ontario Drainage Commission, the following be appointed a committee of this Association (with power to add to their numbers) to discuss the various Drainage Acts, and represent this Association before the Ontario Drainage Commission: J. C. Macnabb (Chairman), R. Coad, J. Tiernan, M. Gaviller, J. Robertson, W. R. Burke, G. Ross, C. A. Jones, and Lewis Bolton. Carried.

Moved by P. S. Gibson, seconded by Jno. McAree, That Mr. Wicksteed's paper on "Railway Surveys" be considered as read, and that the thanks of the Association be given to the author. Carried.

The Drainage Act was then taken up and discussed at length.

Afternoon Session.

The President in the Chair.

The report of the Auditors was read by the President.

Moved by Mr. Gibson, seconded by Mr. Aylsworth, That the Financial Statement of the Treasurer be adopted. Carried.

The President announced that the Committee on Legislation have no report to make at the present time.

Mr. McAree, Chairman of the Committee on Publication, read the report of said Committee. Moved by Mr. Niven, seconded by Mr. Speight, That the report be received and adopted. Carried.

The President, speaking for Mr. Ogilvie, Chairman of the Committee on Instruments, stated that nothing had come before them in the way of improvements on instruments or anything worthy of report to this Association during the past year.

The report of the Committee on Engineering was read by the Chairman of the Committee, Mr. Abrey, and on motion of J. McAree, seconded by M. J. Butler, was received and adopted.

The Secretary intimated that, owing to some unaccountable delay, Mr. Rogers' paper on "Storage of Water on the Trent System" had not yet arrived. It was moved by Mr. Niven, seconded by Mr. Abrey, that it be received and printed with the Proceedings. Carried.

The application of Mr. W. I. Mackenzie, Jr., for admittance as junior member of the Association of Provincial Land Surveyors of Ontario, was received and Mr. Mackenzie admitted as a member, being recommended by T. B. Speight and P. S. Gibson.

Moved by Willis Chipman, seconded by A. Niven, That the reports not now presented by the Chairmen of the Committees on

Entertainment, Instruments, and Legislation be printed in the Proceedings when received. Carried.

Moved by E. Stewart, seconded by A. Niven, That we, the members of this Association here assembled, desire to place on record our feelings of regret at the removal by death of two distinguished members of our profession, viz.: Lieut.-Col. A. C. Webb, P.L.S., of Brighton, and Mr. F. F. Passmore, P.L.S., of Toronto, both of whom were members of the Board of Examiners of Provincial Land Surveyors for this Province, and were universally respected and esteemed as honoured members of our profession. We feel that their departure has left a blank in our ranks which it will be very difficult to fill, and we desire to convey to the members of their respective families this expression of the esteem in which we hold their memories. Carried.

Moved by G. B. Abrey, seconded by M. J. Butler, That the usual salary be paid to the Secretary-Treasurer. Carried.

Moved by T. B. Speight, seconded by F. Purvis, That any omissions or clerical errors in the record of 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.

The nomination of officers for the ensuing year was then proceeded with.

Moved by Mr. Butler, seconded by Mr. Gibson, That Mr. E. Stewart be President for the ensuing year. Carried.

Moved by Willis Chipman, seconded by A. Niven, That Mr. M. J. Butler be Vice-President for the ensuing year. Carried.

Moved by T. H. Jones, seconded by W. R. Burke, That Mr. A. J. VanNostrand be re-elected as Secretary-Treasurer of this Society for the coming year. Carried.

The following gentlemen were then nominated as Councillors :— Messrs. G. B. Abrey, T. H. Jones, P. S. Gibson, M. Gaviller, T. B. Speight, O. J. Klotz, C. F. Aylsworth, H. J. Bowman, A. M. Bowman, J. L. Morris, Jas. Robertson, Jno. McAree.

Moved by M. J. Butler, seconded by P. S. Gibson, That Messrs. F. L. Foster and H. J. Browne be Scrutineers for the ensuing year. Carried.

Moved by Willis Chipman, seconded by M. J. Butler, That the Secretary send to every member of the profession a copy of Bill No. 63, now before the Legislature, asking for his hearty co-operation to assist by every means in his power to carry the said Bill in its present form. Carried.

Mr. Gibson moved, seconded by Mr. McAree, That the President do now leave the chair, and that Mr. Stewart take it.

Mr. Gibson, in moving a vote of thanks to the retiring President, said : "I consider our retiring President has filled the position with credit to himself and honour to the Association. I need not say any thing more now, and I have much pleasure in moving a vote of thanks to him for the able manner in which he has conducted the affairs of

the Association during the past year." Mr. Niven seconded the motion, and it was carried unanimously.

Mr. Sankey, the retiring President, replied. (See page 46.)

Moved by Mr. Butler, seconded by Mr. Gibson, That the meeting do now adjourn. Carried.

The meeting was then declared closed. 4.45 p.m.

MEMBERS IN ATTENDANCE AT SEVENTH ANNUAL MEETING.

Abrey, G. B.	Gaviller, M.	Paterson, J. A.
Aylsworth, C. F., Jr.	Gibson, P. S.	Purvis, F.
Bolton, L.	Johnston, R. T.	Rainboth, E. J.
Bowman, A. M.	Jones, T. H.	Roberts, V. M.
Bowman, H. J.	Jones, C. A.	Robertson, J.
Browne, H. J.	Kirkpatrick, G. B.	Ross, G.
Browne, W. A.	Mackenzie, W. I., Jr.	Sankey, V.
Burke, W. R.	McAree, J.	Smith, H.
Butler, M. J.	McCulloch, A. L.	Speight, T. B.
Campbell, D. S.	McDowell, R.	Stewart, E.
Chipman, W.	McEvoy, H. R.	Stewart, L. B.
De Morest, W.	McMullen, W. E.	Tyrrell, J. W.
Ellis, H. D.	McNabb, J. C.	Unwin, C.
Esten, H. L.	Murphy, C. J.	VanNostrand, A. J.
Fawcett, T.	Niven, A.	Walker, A. P.
Foster, F. L.	Ogilvie, W.	Whitson, J. F.—48.

RESULT OF ELECTIONS.

President.....E. Stewart .....(by acclamation).
Vice-President .....M. J. Butler .....(by acclamation).
Secretary-Treasurer ....A. J. VanNostrand.....(by acclamation).

Councillors—J. McAree, M. Gaviller, P. S. Gibson.

I hereby declare the abovenamed Councillors elected.

A. J. VANNOSTRAND,
Secretary-Treasurer.

Certified correct.

(Signed) F. L. FOSTER,
A. J. BROWNE,
Scrutineers of Ballots.

REPORT OF SECRETARY-TREASURER.

MR. PRESIDENT,—The following report is herewith submitted as the business of the Association from 10th March, 1891, to 22nd February, 1892 :—

The number of paid-up members on the list for the current year now stands at 107, being ten members more than at the annual meeting of last year. In addition to this number there are nine members in arrear for less than the twelve months specified in the Constitution as the limit allowed.

Death has claimed another member in the person of Mr. A. C. Webb, a prominent member of the Board of Examiners, and an active member of this Association since its inception. As his death occurred before the publication of the "Proceedings of the Sixth Annual Meeting," notice thereof was appended to the "Proceedings."

It is with regret that I have to announce that illness causes the absence of several of our active brethren from this meeting. Among this number is our venerable friend Mr. Kirk, of Stratford, who has been obliged through ill health to abandon active practice.

Owing to the distances separating the various members of the Executive and Standing Committees, meetings in some cases have not been practicable, and it has been found necessary to transact a considerable amount of the business by mail, but this has been done in a satisfactory manner.

The following circulars have been issued to all the members by direction of the Executive Committee during the past year :—

No. 35—Ballot for Officers, 1891-92.
No. 36—Explanation respecting Ballot.
No. 37—Requesting Papers for Seventh Annual Meeting.
No. 38—Programme for Seventh Annual Meeting.

The exchanges with the various sister societies have been the same as last year, with the exception of the Arkansas Society of Engineers, Architects and Surveyors, which did not this year publish a report A careful perusal of the exchange reports received will well repay the reader. It is unfortunate that a modification of railway rules in respect to reduced rates for conventions has placed those benefits beyond the reach of the members of our Association.

Much work has been done in the matter of incorporation, but this will be spoken of in the report of the Committee on Incorporation at another portion of this meeting.

The Secretary takes this opportunity to thank the members of the various Standing Committees for the able assistance rendered him in the matters relating to their several departments.

Accompanying this report is a statement of the financial transactions of the Association from 10th March, 1891, to 22nd February, 1892.

All of which is respectfully submitted.

A. J. VANNOSTRAND.
Secretary-Treasurer.

STATEMENT OF RECEIPTS AND EXPENDITURES OF THE ASSOCIATION OF PROVINCIAL LAND SURVEYORS OF ONTARIO FROM MARCH 10TH, 1891, TO FEBRUARY 22ND, 1892.

1891. RECEIPTS.

To Balance on hand 10th March, 1891		$89 40
" Fees, 1 Active Member for 1890 at $3	$3 00	
" " 98 Active Members for 1891 at $3	294 00	
" " 1 Active Member for 1892 at $3	3 00	
		300 00
" Advertisements for 1890	$6 00	
" Advertisements for 1892	27 00	
		33 00
" Proceedings sold		4 50
Total		$426 90

1891. EXPENDITURES.

By Postage	$27 00
" Telegrams	50
" Stationery and Printing Circulars	6 50
" Printing Proceedings and Engraving for same	160 35
" Express, Freight, Cartage and Packing in Exchanges	10 43
" Duties paid	2 25
" Customs, Brokerage and Bank Exchange	75
" Rental of Rooms for Sixth Annual Meeting	12 00
" Amount granted R. Currie for Compass	10 00
" Amount granted Stenographer for Sixth Annual Meeting	35 00
" Amount granted Secretary-Treasurer for 1890-91	40 00
" 4 Copies of Quebec Act of Incorporation	1 00
" Typewriting re Incorporation Act	5 90
" Balance	115 22
Total	$426 90

1892. RECEIPTS.

To Balance from 1890		$115 22
" Fees, 1 Active Member for 1890 at $3	$3 00	
" " 6 Active Members for 1891 at $3	18 00	
" " 3 Active Members for 1892 at $3	9 00	
		30 00
" Advertisements for 1891		33 50
Total		$178 72

1892. EXPENDITURES.

By Postage	$4 75
" Balance	173 97
Total	$178 72

A. J. VANNOSTRAND,
Secretary-Treasurer.

TORONTO, 22nd February, 1892.

REPORT OF THE AUDITORS.

We hereby certify that we have examined the above accounts of Receipts and Expenditures, together with the vouchers therefor, and find them correct in all particulars.

M. GAVILLER,
H. D. ELLIS,
Auditors.

February, 25th 1892.

Received and adopted.

VILLIERS SANKEY,
President.

REPORT OF COMMITTEE ON LAND SURVEYING.

MR. PRESIDENT,—The Committee on Land Surveying beg to report as follows:—

1. Several questions of survey have been submitted to your Committee, which questions and the answers of the Committee are hereto annexed.

2. As the Surveyors' Incorporation Act is now before the Legislature, your Committee do not deem it advisable to make any suggestions as to alterations in the Survey Act at the present time.

Respectfully submitted.

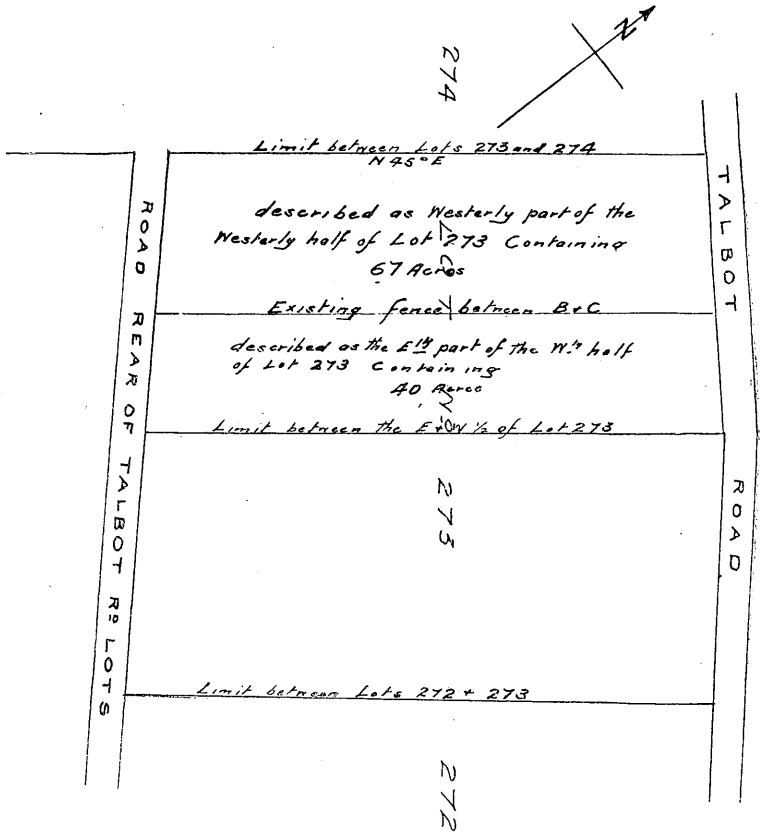
A. NIVEN,
Chairman.

February 23rd, 1892.

QUESTION DRAWER.

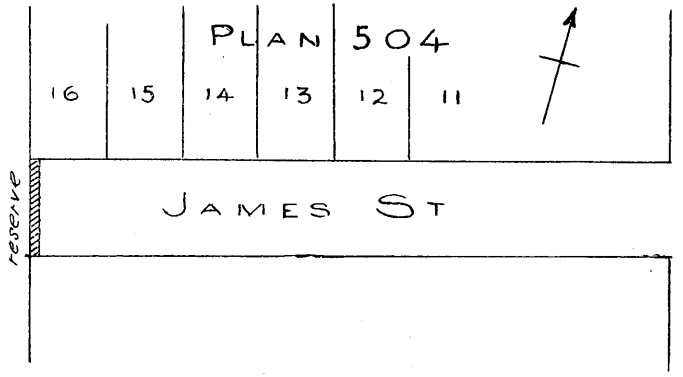
Question 1.—A sold to B, January, 1884, 40 acres of land, described as the easterly part of the westerly half of Lot No. 273, and in 1885 he sold to C 67 acres, described as the westerly part of the westerly half of Lot 273. Now B built a fence the whole depth of the lot, and

according to measurements he possesses $43\frac{1}{3}$ acres, while C has practically 67 acres ($66\frac{97}{100}$ acres). Can C compel B to move his fence so as to give C the whole or his just proportion of the surplus?

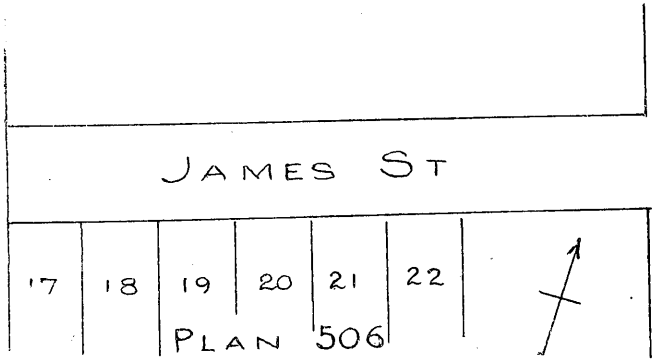


Answer.—Divide lot into east and west halves; then lay off 40 acres on easterly side of westerly half of lot; then lay off the westerly 67 acres of the westerly half of lot. The remaining $3\frac{1}{3}$ acres is not conveyed by either of the descriptions.

Question 2.—An owner, A. B., registers a plan, No. 504, showing a foot reserve on the west end of James Street, thus :

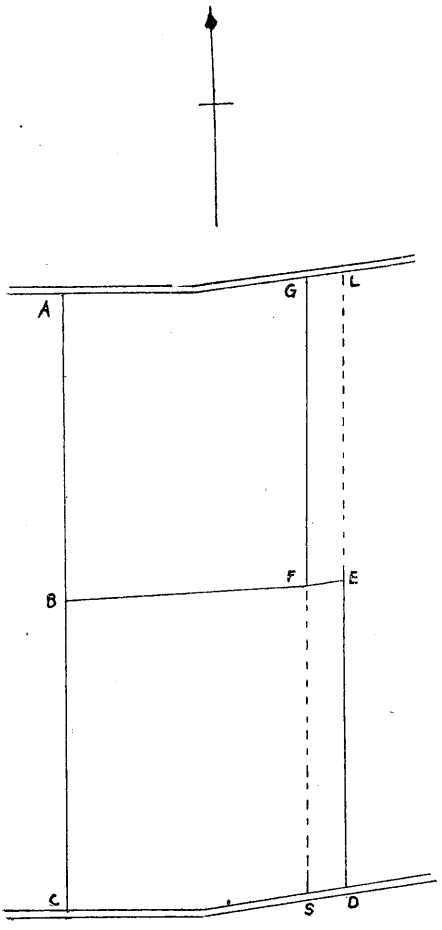


A month later he registers a new plan, No. 506, without any reserve, thus :



Is the foot reserved removed by the filing of the second plan ?

Question 3.—In the re-survey of lots in double-front concessions, shall the division-lines between lots be run to the centre of the concession, as per section 56, Survey Act, irrespective of the frontage of the half lots, or does section 43 apply, giving to each patented half lot exactly half the area of the whole lot?



Answer.—Section 56 governs.

DISCUSSION.

Question 1.

Mr. J. A. Paterson — It was no doubt the intention to convey the whole of it to these two men; it is described as the west half, generally speaking.

The President—I think in a case of that kind, if there was a special description as to the 40 acres, and that in each case there were metes and bounds following the statement that it was the easterly 40 acres and the westerly 67 acres, metes and bounds in which the boundaries would show that the owner did intend to convey it all, then I think there might be some force in the question as to whether the surplus should be proportionately divided. It is a question as to whether an accurate description by metes and bounds after a general statement in a deed has not some effect.

Mr. Niven—I think if those are the only descriptions given that they are bad.

The President—If the two do not agree I think the metes and bounds play a considerable part in the final decision.

Mr. Gaviller—You mean to say when metes and bounds are given?

The President—Oh yes. It is to be presumed the information sent was all the surveyor had when he sent the question.

Question 2.

Mr. Foster—It seems to me he entirely does away with that reservation when he registers the new plan.

Mr. Niven—It is a question of law, I presume.

The President—The question is, what does one foot reserved mean when it is put on the plan; is it part of the plan at all?

Mr. Jones—I don't consider it is; I think it still belongs to the man that owns the land.

Mr. Gaviller—Supposing James street only extended halfway through, surely you are not going to say that that first plan governs.

The President—In the absence of any special information on the plans, I believe James street is first dedicated by plan 504 as far as the foot reserved, and the second plan dedicates the one foot as well in addition to that, so that when the second plan is registered the original owner owns nothing in connection with James street at all, and he cannot now raise a claim.

Mr. Niven—In other words, the filing of the plan 506 did away with the plan 504. That is the decision of the committee.

Mr. Stewart—It is quite likely it was a mistake.

The President—Then the poor surveyor would come in for the blame.

Mr. Aylsworth—No, I think not. I think when the owner signs a plan he relieves the surveyor of any responsibility.

Mr. DeMorest submitted a question to the meeting (with diagram on blackboard) in relation to the present system of subdividing lots in Nipissing. He was asked to lay out the south half of the north half of the east half of lot 11. AB has not been finished, and the production comes 1 chain and 40 links from where the post is planted; B is an original post, and A and C also.

Mr. Kirkpatrick—How can A be a governing post in the rear of a single front concession? B is the front, and that post at A has no reference to it.

Mr. Butler—A surveyor on the ground might run a line from A, although the line started from B——

Mr. DeMorest—It is an original line.

Mr. Aylsworth—Was it authorized in the original instructions?

Mr. DeMorest—The plan has been filed.

Mr. Stewart—The question is how you are to connect B with the line AB.

Mr. DeMorest—The first thing I thought of doing was to divide the lot into east and west halves.

Mr. Stewart—You will have to connect A with B some way. AB is a governing line.

Mr. Butler—Take one-eighth of the whole area.

Mr. Jones—Did you connect A and B to find the area?

Mr. DeMorest—Yes; I joined B to the end of the line, and calculated.

Question 3.

Mr. Niven—The gentleman who submitted this question stated that he had passed his examination before the Board recently, and that there was a divergence of opinion between the members of the Board themselves as to that question. For that reason he thought it would be of interest to submit it to this meeting.

Mr. Aylsworth—Supposing there was a jog of about forty rods at the south side-line, then how would you do it?

Mr. Niven—I suppose it would be as good a way as any to take half the distance through here and also there. You mean that BF and BFE would not be in the same straight line?

Mr. Aylsworth—Yes. I had a case like that.

The President—Does not BF govern first?

Mr. Niven—In discussing that this morning, I think Mr. Gaviller, one of the Committee, said something about cutting off the north-east quarter of the lot. It might be profitable to the Association to discuss how that would be done, whether it is half of the north half of the lot, or is it one-quarter of the whole lot.

Mr. Butler—Suppose one man owns the whole lot, and he sells the north-west quarter of the whole lot?

The President—How would you divide the lot into east and west halves first?

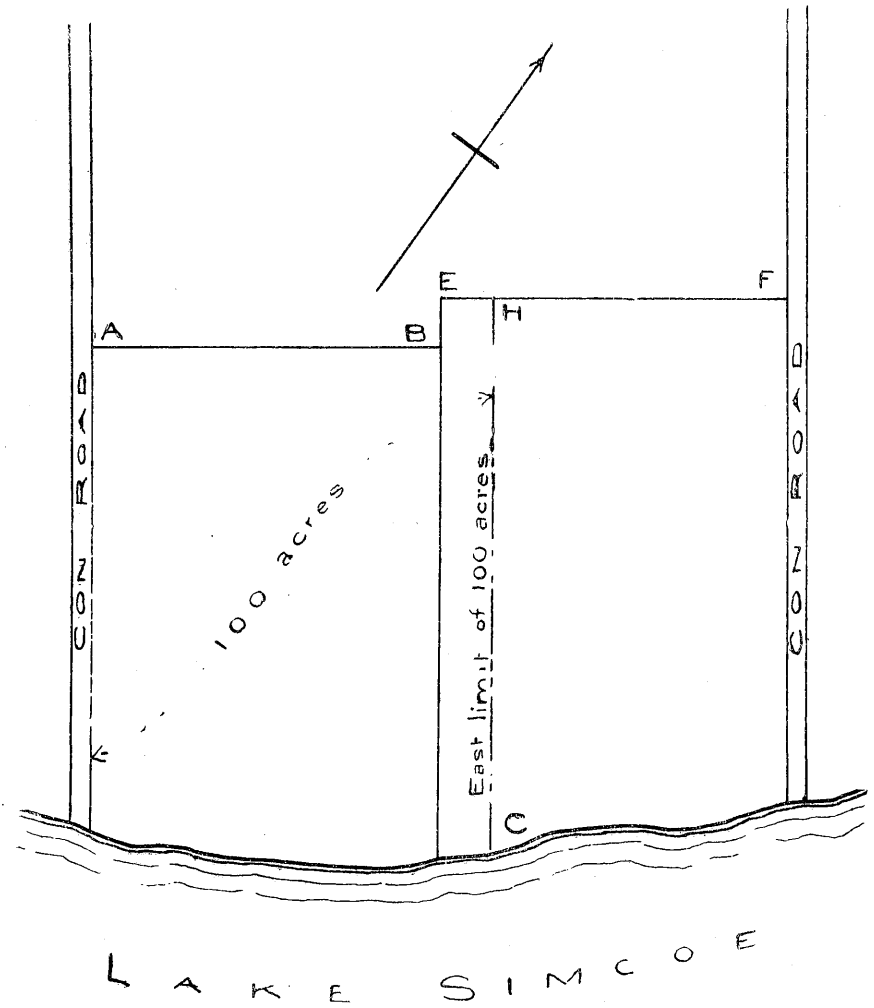
Mr. Niven—By an equal division of the distance along the two sides and drawing this line.

The President—That is, the north and south half; how about the east and west? The reason I ask is, I think there is a decision—I don't know the case—but I think it is held that lands referred to in that way shall be divided by the divisions of the half lots; that is, a line dividing the north from the south half would form the southerly boundaries of the two north quarters, and the line dividing the east from the west would define the other boundaries, and that area has practically little or nothing to say to the result of the work.

Mr. Niven—That is my idea. If I were called upon to survey out the north-east quarter of that lot I would give it half the north half of the lot by a line parallel with the side. That would be fixed by measurement. The north half of that lot is just as distinct and separate from the south half as if that were one concession, and this another.

Mr. Aylsworth—But supposing the deed called for the north-east quarter of Lot No. 4 in a certain concession, and nothing else about it? that is all the description there is in the deed?

Diagram illustrating the President's remarks referring to his Survey on Lake Simcoe.



Mr. Niven—I would divide the lot into north and south halves by measurement, connecting B and E by a straight line, then I would divide the four equally in area.

Mr. Gaviller—You would make a similar survey for the north-east quarter as you would for the east half of the north half? Both would be the same piece of land?

Mr. Niven—The same area—yes.

Mr. Abrey—How would you run DEFG, the line between the north and south halves?

Mr. Niven—What I say is that I would take half the distance. Establish the point E halfway between D and L, and F would be established halfway between G and S.

Mr. Abrey—Then EFB would have an angle in it of course at F.

Mr. Niven—There might or might not be an angle there. It is just one of those cases that often turns up on the ground, and BEF might be straight or there might be an angle there. If the distance from E to F was short the difference would be very little. But the point I wish to come at here is in laying out the north-east quarter of the lot that it meant the east half of the north half of the lot, instead of meaning one-quarter of the whole lot.

Mr. Abrey—I don't think you could cut into the south half to get the portion of the northern quarter.

Mr. Niven—Of course the question was whether that line should be drawn by division of the distance, or whether the area of the whole lot should be taken into account, and the answer of the committee was that this line BEF should be drawn equidistant between the concession lines.

The President—There was a case which came up in my practice once on this very section of the Act. It was on the north shore of Lake Simcoe. The part of the lot was supposed to contain 100 acres, and on the face of the deed it said "containing 100 acres." Part of the lot had been deeded to one person, and the rest to some other person, containing what was apparently the balance of the lot. On a survey being made it was found that there was a very considerable jog in the middle and some seven chains surplus between the west and east boundaries of the lot. The parties who came into possession of the easterly portion of the lot, not the easterly half of the lot, claimed that the first man should have his survey made by drawing AB, and it should be continued on in a straight line in the way the description read until the fixed distance mentioned in the first patent was obtained, and then it should be run down to C, and from the fact that the distance given from east to west filled up what was said to be the total distance of the lot, that therefore he was to come into possession of all that was left. The first man, having got all that the Government intended to give him in the first place, the second thought that therefore his description gave him everything that was over. The case came into court, and I was employed by the parties who claimed under

the original title. I made the survey in this way, by running AB, EF. It was decided from the last sub-section of Section 56 "without respect to how the lots or parts of lots have been described in the original patent." It was held that the northerly boundary of the whole lot had first to be determined, and that the first description gave the man everything that lay to the west of H, C. It was decided entirely on the last clause of 56. You see in that case the patent was for a fixed area: it said "Being the piece of land containing 100 acres"; as a matter of fact it contained 117 acres, but a considerable portion of it came into the lake shore, and there was a surplus in that direction as well as between east and west. The other man on the east side of the lot got a surplus too, but not anything like what he hoped to get.

Mr. Aylsworth—And then it also said you had to measure along the north boundary?

The President—Yes, and that was where the discussion arose. The parties on the east side claimed, if you get the area of 100 acres by measuring it that way, then we take all the balance. There happened to be some valuable timber on the disputed part.

Mr. Jones—I have had one or two cases similar to that, with the exception of the lake front; and I did as you did, I followed up the jog and then along the north limit of the east half.

The President—The idea is that the boundary lines of lots are governed by survey, not by description. The survey has first to be made, and then you cut up the lot in either way the description directs.

REPORT OF COMMITTEE ON DRAINAGE.

MR. PRESIDENT,—Your Committee on Drainage beg to make the following report thereon:—

During the past year there has been such a disorganization in drainage matters that this report must partake more of the nature of a review of the causes leading thereto, rather than a record of the amount of work done and money expended, both of which have been light, as in the extreme western portion of the Province no large schemes have been carried out, and the work mainly consisted of the necessary repairs and the construction of small drains tributary to the outlets now in use. This also has been the experience in other localities. A radical change in the working of the Act has been brought into operation during the year, by the institution of the office of Referee, before whom appeals may be laid, and whose decisions thereon are final. This is, in the opinion of your Committee, a step in the right direction, tending as it does to simplify the machinery, lessen the expenditure and, most important of all, give the engineer

an opportunity to complete the work within reasonable time, and therefore extend to the ratepayer some hope of a return from his investment. Under the present Act the possibilities for vexatious litigation are extensive, as cases may be carried on up through all the costly intermediate steps to the highest court, necessitating a heavy outlay and great loss of time. As an instance of such we might cite Williams vs. Raleigh, now in the Supreme Court, which has been before the courts some four years, and which suit for damages, by reason of insufficient outlet, is one of those cases involving the assessment of uplands which now enjoy thorough drainage, and whose owners do not feel disposed to pay again for that which they consider they already possess. The case has been appealed every time a decision has been given against the township. This assessment of uplands for outlet has always been the bugbear of the present Act to the engineer employed on any work where the question enters. Up to within a recent date the engineers have relied upon the decisions of the courts as something tangible and a safe guide, but of late these decisions have been such as upset all preconceived notions as to the correct interpretation of the Act, and now the engineer is at sea. Nor is it easy for him to determine which horn of the dilemma is the least—the old decisions or the new. As a matter of fact they are so conflicting as to render the Act of no value, as it is unworkable, especially where large schemes are in contemplation ; and as these large schemes are usually the backbone of the system of drainage in any township, it is easily seen how vital the fault is. To remedy this and any other defects that may be found in its working, a Commission has been appointed by the local Government, and it may be safe to predict that till the revision by this Commission has passed the Legislature and received assent, there will be a lull in drainage matters, which will in all likelihood extend over the years 1892 and 1893.

Much dissatisfaction has been expressed by members as to the working of the Ditches and Watercourses Act, and the Committee appointed for revision should be asked to provide a remedy.

Respectfully submitted,

JOHN C. MACNABB,
Chairman.

DISCUSSION.

Mr. President—I think it would be well to take some action on this letter from the Chairman of the Ontario Drainage Commission. We have been invited by the Commission to appear as an association, which I think is another evidence that the Association is doing the profession some good. When a Government Commission are willing to hear us as such, I think we ought to take advantage of it. About two years ago our Drainage Committee went to a very great deal of trouble in revising the existing Acts, and prepared a draft of those amendments which it was intended to submit to the Government, but, owing to some cause that I am unaware of just now, these proposals never were presented. Perhaps Mr. Burke could tell us something about it.

Mr. Burke—I know I was up there with several other gentlemen before the Commissioner of Crown Lands, and we discussed the matter fully. We proposed a great many changes, but they did not wish to adopt them, though they did make a few amendments to the Act at that time. There was one important thing that we wanted, and that was cases under the Ditches and Watercourses Act not to be taken up before a judge, because we thought sometimes a judge did not understand the matter properly, and the lawyers could make a drain appear to him a mountain, but our suggestion was not adopted though there were a few changes made.

Mr. Robertson—There are very many things in the Ditches and Watercourses Act that are unworkable to a very great extent, and also in the Municipal Drainage Act, there is so much that is in an unsatisfactory condition I think it would hardly be of interest to the Association to take it up as suggested in Mr. Rankin's letter. I think it would be better left in the hands of the committee to deal with at present. It would necessarily be a very long, tedious work to go through the whole Act.

(The committee was then appointed in compliance with Mr. Rankin's request.)

Mr. Gibson—I suppose you would leave it optional whether they would go to the trouble of meeting the Commission or not ; I suppose it is understood they are not compelled to go ?

The President—I think I would just let them represent the Association with unlimited powers. I fancy that this committee is as good a representative committee of the men interested in drainage as we are likely to get, and I think the matter will be quite safe in their hands. Personally I think it ought to be left to their own judgment. We would urge them, of course, to take such a stand in the matter so that it will be shown that this Association has the interests of the public at heart. I think, though, that before any of these appear before the Commission, it would be well to decide that they should go there with the opinions of the committee, and not merely give their own personal ideas. They should have some collective opinion which would be the opinion of this Association.

Mr. Bowman—It seems to me that the better way would be to submit to the Commission the names of the prominent drainage men in our Association, and have them summoned to attend in the regular way and give their evidence. It is a matter of dollars and cents. If they can go all round the country holding meetings, it would be much simpler to have the members go to any convenient place for the Commission.

Discussion on Drainage Act.

Mr. Gibson—The Act is unworkable in many respects. My practice has always been to take a book along and get the crowd together and take down all they have to say, and I never failed yet to get the

crowd to put their hands to a paper recommending me to make my award, although after the award is out they see things in a different light sometimes. The ditches and watercourses adjoining Toronto are very small and don't amount to much, but I had a case lately I thought was going to be quite a job. There was one man who was going to fight to the bitter end. The man above said he would not dig the ditch through this man's land. I told them all what I purposed to do and all about it. But no, he will never step on my land, he said. What are you going to do about it ? I said. I will do it myself, he said. And before I left each one had agreed to do his own portion. Of course, when you get out West perhaps that style of arranging matters would not work, but that is the way I always try to do around the county of York. There is a great deal in joking, flattery, etc., in trying to get men to do what is right, and, as a rule, if you show men that it is to their advantage to settle they will settle.

Mr. Burke—It is all very well, as he says, to get the people together and get them to agree, but they cannot always agree. And there are a great many difficulties in the Act that it is almost impossible to get over, by which injustice is done (drawing diagram on blackboard to illustrate a case of that sort). Another thing under that Act is, we lay a great deal of tile drain now under the Act, where each man does his portion. The engineer may take all the pains he possibly can to have the levels and grade and everything right, but the man may do his part of the work very badly, and it is all covered up and you don't see it, and then the whole neighbourhood are down on you as being an ignoramus and don't know your business, through no fault of yours. At my own expense one time I took up about ten or fifteen rods of drain just to see the way it was put down, and it was something shameful. All these men thought that it was my bad levels and bad work. I say that the Act should so be amended that no drain should be covered up till it is inspected. Some of these tiles were four or five inches of being down in the drain. Another case ; you may specify a curve at so much radius and they will run it off square and swear that it is all right. Then about the fees ; a man will come up with an appeal against your award—I never had an award upset yet, but I have fought them pretty hard in order not to have them upset —I had to get an engineer from St. Thomas in one case and had to go to all that expense myself; the judge did not allow a thing, although he did not upset the award.

Mr. Bowman—Was this tile drain laid in accordance with the specifications in your award ?

Mr. Burke—It was intended to be, but it was not done.

Mr. Gibson—An inspector should be appointed by the engineer to go over the drain.

Mr. Bowman—About giving grades for drains, I would like to ask some of the members what their system is of giving those grades. I know in sewer work the simplest and easiest way by which the ordinary workman can understand it is the system of boning rods. Every

300 or 400 feet a bridge is put up, simply two stakes stuck in the ground on each side and a plank nailed across at any height above the tile which you want to lay—for instance, ten feet. Then the boning rod is nothing more or less than a big T-square, and that is held up and a man sights from one sight to the other. It is so simple that any workman in half-an-hour's time can see how it is done, and the engineer any time he is going up can take a look over the sights and see that it is all right.

Mr. T. H. Jones—I have always adopted the system of putting down the chaining stakes for these municipal drains every 100 feet, planting the stakes right side to the ditch, and the level back six inches to the right of that. I have found the boning rod to work well. I have instructed the different contractors and they have adopted that in every system and found for themselves it is the easiest and simplest way. Of course the trouble is that the work is inspected after it has all been done. About the quickest way to inspect a drain is by using boning rods.

Mr. Gibson—There was a suggestion made once to this effect, that under the Ditches and Watercourses Act the most advisable way was to give them too short a time to do the work, and then you could let the contract and get it done properly.

Mr. C. A. Jones—One of the Drainage Commission was speaking to me about making a change in this way, that you assess the parties so much money and let the contract instead of each one doing his own work.

Mr. Gibson—That ought to be done too.

Mr. Ross—In a good many cases the farmers don't object to digging the ditch, but they do object to paying anything out for it. They think more of what fees they have to pay the engineer than making the whole ditch.

Mr. Tyrrell—In the case of small ditches where it would only take a few days to make the ditch, is there any objection to making the time for the completion of the ditch less than the time given for the appeal?

Mr. C. A. Jones—You could not do that.

Mr. Tyrrell—I cannot find anything in the Act that would limit you in the time that you give. Last year I had a case of that kind where I received a notice late in the fall, and they wanted it done that fall so that damage would not be caused by floods in the spring, and I gave the man only about a week to do the work.

Mr. Bowman—There is one matter that I think the Association might bring before the Commission. The way the Act stands at present the engineer employed may be a Provincial Land Surveyor or any other person. I think it should be confined to Provincial Land Surveyors or members of the Canadian Society of Civil Engineers.

Mr. C. A. Jones (Drawing diagram on blackboard)—"A" sent in a requisition for a drain through B C and D. When I went out there I found that there were two drains existing under an old Fence

Viewers' award, both open drains, one running south and the other west and north. That was the only outlet that A had through either one of those drains. I made out the award going through C and D, and they appealed against the award on the ground that I had no right to interfere with either of those Fence Viewers' awards. A could not ask to have the drain re-considered, he was not a party to the old drains. I may say that the old drains were not deep enough for A to drain through. The judge crawled out of it by finding a flaw in the requisition ; he set the thing aside on that ground, so that he did not decide on the point at issue.

Mr. Burke—Do you think that these awards under the Fence Viewers' Act will hold water now ?

Mr. C. A. Jones—A good many of the ditches do hold water now. But we did not get any decision on that point on account of the flaw. The question I intended to bring up was, Could I interfere with that old Fence Viewers' award ?

Mr. Gibson—I had an opinion given by some lawyers that a ditch meant an open one and a drain meant a tile drain. That was the opinion of two or three lawyers in Toronto.

Mr. Jones—Would I be justified in changing the portions of that drain made under the Fence Viewers' award, or award it to be done just in the same proportion as it was done under the Fence Viewers' award, or not take that into consideration at all ?

Mr. Ross—That is a point, I think, that should be cleared up in the Act.

Mr. Gibson—You will find if you looked up the papers about that Fence Viewers' award you could not produce evidence to prove anything.

Mr. Jones—They had the award. They had a big law-suit about it before, and they had a bundle of papers.

Mr. Gibson—I think the Act is very hard on the engineer. He is placed in a position in which no lawyer or other professional man would act.

Mr. Jones— It is my opinion that a good many of the judges don't understand a case thoroughly at the time of an appeal. I knew of a case where there were two drains under appeal at the same time, and the judge never got through his head who was appealing on each drain ; and in making his decision he spoke of the appeal of one man against such and such a drain that was not his drain at all.

REPORT OF COMMITTEE ON ENGINEERING.

MR. PRESIDENT,—Your Committee on Engineering beg to report that this year a fair proportion of the papers to be read at the Annual

Meeting are on general engineering questions closely connected with land surveying.

To secure better and fuller discussions on these important questions your Committee would recommend that in future advance proofs of all papers to be read, unless of an historical nature, be printed and distributed to the members with the programmes for the Annual Meeting, and in case members cannot attend, they be requested to prepare and forward to the Secretary written comments on their papers, as is now done in the Canadian Society of Civil Engineers.

Your Committee would congratulate the profession on its success in engineering pursuits, as witness the occupations of the members in the list of names, etc., in the proceedings.

G. B. ABREY,
Chairman of Committee on Engineering.

REPORT OF PUBLICATION COMMITTEE.

MR. PRESIDENT,—Your Committee have very little to report, and might very well discharge this function by transcribing the similar document presented last year, so little variety is there from year to year. The same firm has printed our "Proceedings" from the beginning, having always given good satisfaction.

Our exchange list is about the same as last year. Below is a statement showing the number of copies of our Report sent to the different engineering societies and the number received in return :—

	Copies sent.	*Copies received.*
Ohio	130	120
Illinois	100	120
Indiana	60	50
Iowa	50	120
Michigan	135	120
Eng. Soc. School Practical Science	150	120

Your Committee would again ask the co-operation of the members in the work of securing orders for our advertising columns, our only source of revenue that is capable of enlargement, but at the same time one that is worthy and capable of cultivation.

Respectfully submitted on behalf of the Committee,

JOHN MCAREE,
Chairman.

Toronto, February 25, 1892.

REPORT OF THE COMMITTEE ON ENTERTAINMENT.

MR. PRESIDENT,—The Entertainment Committee for 1891-2 have to report that the annual session of the Association of Provincial Land Surveyors of Ontario for 1892 was held, in accordance with the usual arrangement, in the library of the Canadian Institute.

Owing to unavoidable circumstances the date for the opening of the new Engineering Laboratory of the School of Practical Science was, by its managers, fixed for the 24th of February, 1892, the date on which it was proposed to hold our Sixth Annual Dinner.

It was considered, therefore, by your Committee, that, as invitations had been issued to all the members of our Association to attend the opening, insufficient time would be given in which to enjoy the usual social gathering on that evening, and that the business on our programme would be interfered with if held on any other evening of the session, and would be otherwise unacceptable to our members.

It was therefore reluctantly decided to forego the Dinner this season.

From the good attendance of our *confrères* at the School of Practical Science on that evening, and the close attention paid to the many embodiments of mechanical skill and power, and of advanced science, it was evident that the change in form of entertainment was, by many, highly appreciated.

We would wish, however, to recommend that the Annual Dinner be in future adhered to whenever practicable, as this appears to be, from the opinion so far expressed, the most popular way of closing our annual sessions.

On behalf of the Committee,

FRED. L. FOSTER,
Chairman.

Toronto, February 26, 1892.

REPORT OF COMMITTEE ON INCORPORATION.

MR. PRESIDENT,—The Committee on Incorporation beg to report as follows :—

1. That shortly after the last annual meeting a deputation of the Committee waited upon the Commissioner of Crown Lands and explained the objects of Incorporation. After hearing the views of the deputation the Commissioner suggested that no action be taken until the Parliamentary Session of 1892.

2. The Committee again met in December, 1891, and in January, 1892, and had a Draft Bill of Incorporation prepared by Mr. W. J.

McWilliams, barrister-at-law, and submitted to the Commissioner of Crown Lands, who kindly consented to take charge of the Bill and bring it in as a public measure.

3. The Bill has been printed, and a copy is now being sent to every land surveyor in Ontario in accordance with the resolution passed at last meeting.

4. Your Committee suggest that at the present meeting of the Association a committee should be appointed to watch the Bill in committee, and be prepared to answer any objections that may be made to its passage.

Respectfully submitted,

A. NIVEN,
Chairman.

February 24, 1892.

DISCUSSION.

Mr. Niven—I may say that the committee that was appointed to take charge of this business went to a very great deal of trouble and pains in preparing the present Bill. They had meeting after meeting and went through the Bill, and I don't know how many drafts we had. We consulted members of the profession elsewhere. Mr. Klotz, who happened to be in the city, to my knowledge devoted a whole day to preparing some of the clauses of the Bill. All that he put in has not been left in it, but a good many of his suggestions were adopted, and every pains taken to get the best information that we could. To the best of their ability the committee did what they could, and I think the Bill before us is as perfect as that committee could get it, at all events. Latterly, Mr. Sankey took charge of it, and, in connection with Mr. McWilliams, got the Bill into its final shape, and he perhaps is better posted in its provisions than anybody else.

[The Bill was then read by the Secretary, Mr. VanNostrand, and discussed clause by clause.]

Mr. Stewart—The idea is not to have another meeting this year, but to send this notice to all the surveyors who, if they wish to vote, pay their fees and send in their ballots.

Mr. Tyrrell—Is there anything specifying who they shall vote for?

Mr. Stewart—I think the clause explains itself. In reading it over it seemed to me they could vote for any one they like at the first election.

Mr. Butler—There is no provision made for who are to be candidates though.

Mr. Stewart—No; I think not.

Mr. Kirkpatrick—How can the thing be organized until it be first started? and the only possible way to start it is by the surveyors themselves. I should think the matter could be got at very easily by this Association nominating any person they like, but the surveyors

may vote for anybody they like; but after the first election it provides that they shall vote for nobody but those that are nominated. There is nothing to hinder this Association giving them a list of candidates to choose from.

Mr. Gibson—I think that will be proper too. An informal nomination will suit this case.

Mr. Stewart—I would like to ask Mr. Kirkpatrick whether there is any way that we could get the address of all the surveyors in the Province?

Mr. Kirkpatrick—We have a list of all those that have passed, and it has always been a rule that I have made—and which has always been neglected by the candidates—to ask them to send me their post-office address as soon as they picked out a place of residence. Of course we always have their address at the time of passing, and we can get their present address as far as it is known. It would be a good thing if every surveyor here who knows of a change in the address of any other practicing surveyor would let the secretary know.

Mr. Stewart—We are perhaps getting ourselves into a little difficulty here by making it compulsory that each duly authorized land surveyor in the Province shall be notified. There may be some difficulty in finding his address. I suppose his last address, however, would answer that.

Mr. Chipman—Why is "secretary-treasurer" included in sub-sections 1 and 4 of section 8, while in section 4 on page 2 it is dropped? In section 4 we find,—"The council shall elect annually one of its members as its chairman, and shall appoint from amongst the members of the Association such other officers as may be necessary for the working of this Act, who shall hold office during the pleasure of the council." Then sub-section 1 (reads). The council does that; then page 6, sub-section 4, the members of the Association shall elect the same officers.

Mr. Kirkpatrick—The only way in that sub-section 4 is to strike out the words "secretary-treasurer" and the word "auditors." If these are elected by the council they won't be elected by the Association. I should think there is a misprint there. Sub-section 1 of 4 provides that the Association shall elect a secretary treasurer and the auditors. It is quite clear that the intention is that the council shall elect the secretary-treasurer and the auditors in the first place, but every subsequent election shall be made by the Association. It provides that expressly in sub-section 1 of 4.

Mr. Chipman—I think it would be better if that sub-section 4 were put somewhere else; I don't see any use in that there.

The President—I might say that that section was put in by the Commissioner of Crown Lands and the law officers of the Crown. In the original draft sent to them that was not in at all, and I was notified that the Commissioner of Crown Lands could not see his way to ask every surveyor in the Province to come to Toronto to vote,

and his idea of getting over the difficulty was this section 8, which he put in his own words and in its own place. This Bill has been revised by the law officers of the Crown, and the position and rotation of the different sections have got their places by the authority of the Department, so I hardly think we can very well criticise it. The general election in this Bill is exactly in the terms that were submitted.

Mr. Stewart—It seemed heretofore the only parties that the members of the Association could vote for were those nominated at the annual meeting. I think there is nothing provided for that in this case at the first election, that the members, by sending in their fees, would be permitted to vote for anyone, but it would be well to nominate someone.

Mr. Jones—According to section 4 on page 2 they might elect the secretary-treasurer to be chairman and preside over the president.

The President—The secretary-treasurer is not a member of the council.

Mr. Jones—Still, we will take any other member; according to that they might elect some other member. It is understood that the president of the Association shall be chairman——

The President—No, sir; it is not understood. This council of management has practically all the management of the whole Association on its shoulders, and it is unavoidably necessary that that council should be more or less located in Toronto. Now, we don't wish to confine the president of the Association to Toronto or to a person who could readily be in Toronto. But it appeared that the chairman of the council should be easily got at, and with the view of not confining the person of the president to Toronto and immediate surroundings, that was the means devised for having one chairman of the meetings, and so it was thought advisable that the council should elect a chairman annually to preside at the council meetings. There is no reason why the president should not be elected, but it might so happen that he might not always be convenient to get. The most convenient man and the most suitable is most likely to be elected.

[The matter of filling in the blanks as to dates was then discussed.]

The President—Then the way to fill in the blanks on page 2 would be just to fill in March and April and leave other dates the same.

Mr. Butler—Is it possible that the old well known title of "Provincial Land Surveyor" would be wiped out by this Bill; would it become "Ontario Land Surveyor"?

Mr. Aylsworth—I think so.

The President—That is the idea of the Bill.

Mr. Gibson—Take the Registry Act, we will have to get that changed.

The President—At the present time I don't think it would be wise to discuss it. I may say that if this Act goes through in the condition

it is in now, there is no reason in the world why we should not keep the old letters "P.L.S.," but it was in the event of possible changes being made in this Act that the other was suggested.

Mr. Kirkpatrick—Ontario is a province of the Dominion, and an Ontario Land Surveyor would be a Provincial Land Surveyor.

Mr. Niven—I think the intention of the committee was to do away with the word "Provincial." "Ontario Land Surveyor," to my mind, is better than "Provincial Land Surveyor." It just states exactly what it is.

The President—There is no question about it, with all due respect to the Dominion Land Surveyors present, that the term "Dominion Land Surveyor" is very misleading to the public. A great many people believe that any one who signs "D.L.S." can survey anywhere throughout the whole length and breadth of the Dominion, whereas, that is not the case.

Mr. Niven—Let it go, I say.

The President—Then we will call the annual general meeting the fourth Tuesday in February.

[The motion to adopt the report was then carried.]

Mr. Chipman—I think it would be wise for every member of the Association here present to express himself in as few words as possible as to whether he favours this Bill or not, and that it be put on record. It is very important that we have the co-operation of every member of this society. This Bill may not include everything that every one of us would like to see in it, but we had better take what we can get now and try to get the rest in future years. I am in favour of it.

Mr. Gibson—I did not see my way clear to endorse the Bill as it was introduced last year, as it was likely to do us an injury; but the Bill as proposed at the present time puts us in the same position as we always have been, and in that way it meets my approval. With regard to the letters "P.L.S." and "O.L.S.," I would prefer "P.L.S.," and I think that we should have "P.L.S." continued. There may be reasons for the change that I do not understand, as I have not examined the Bill very closely, but I am rather of a conservative turn of mind and I don't like changes. However, under the circumstances, if a majority of the Association go in for this matter, as I said last year, I go in with them. But it seems a little hard this trying to force old gentlemen out that won't join us. For instance, we say, if you don't register your name you are not allowed to practise, and if you do practise we will put you through. I think there will be some trouble in that way, but, taking the Bill as a whole, it is a good Bill and I think a majority of the Association approve of it, and if so, I am going to go in with it. But I would like all our profession throughout the Province pleased with it. Of course it is not any worse than all the other professions; we see the medical and legal men, the architects and all these professions try to get incorporated, and they form a kind of mutual admiration societies for their own benefit,

intellectually and otherwise. Even the hod-carriers in Toronto have their society. You can't employ a man on the public roads in the Township of York unless he has his ticket of membership in his society. It certainly gives a man standing, and the world is really coming to such a state now that a man has to have a standing in order to make a living at all. I have not very great faith that this Bill will pass, as there are a lot of these grey-haired old men that have a lot of pugnacity in them ; they don't want to give up their practice and don't care to join, but, as I say, if the crowd goes in for it, I go.

Mr. Niven—I need not say, Mr. President and gentlemen, that I am in favour of the Act. I have given the matter a good deal of consideration along with the other members of the committee, and I think that we have the Act now in as nearly perfect condition as we can get it. So far as the appellation of "P.L.S." or "O.L.S." is concerned, it was considered by the committee that "Ontario Land Surveyor" would be preferable to "Provincial Land Surveyor." It is a matter of taste however. I am in favour of the Act altogether as it stands.

Mr. Abrey—I am with Mr. Niven.

Mr. Brown—I am in favour of the Act. I would prefer that "P.L.S." be retained, but if there is good reason for the change, of course I am with you.

The President—The principal reason was that the alternative was "Registered Surveyor," and "Ontario Land Surveyor" was a compromise between "Registered Surveyor" and "Provincial Land Surveyor."

Mr. A. L. McCulloch—I see no good reason for opposing the Act. I think if it is going to give a standing to the profession in any possible way that we ought to be in favour of it. As for myself, I see no particular reason for retaining the title "Provincial Land Surveyor." It might possibly be that it would mean a land surveyor in other provinces besides Ontario, while "Ontario Land Surveyor" must mean a surveyor for the Province of Ontario.

Mr. Bowman—I think that Mr. Gibson has forgotten that there has been a change before. The old plans are all signed "D.P.S.," and I think it would be well to have something mentioned in that Bill of the right to use those letters. As far as I am concerned, with regard to the Bill, I feel that I have not been able to give it sufficient consideration to pass judgment on it, although I think that the desire of the whole profession is to raise it to a higher standard, and so far I support the Bill. But at the same time I think that there will be some difficulty in regard to the other Acts; the Registry Act still exists even though the "O.L.S." stands. If we wish to sign plans we will have to sign them "P.L.S.," and unless these Acts are changed the new candidates who receive their certificates will have to sign "P.L.S.," which they will not be able to do until the Acts are changed, though required to do it by the old Act. The officers of the

crown are not likely to see an Act passed which will be inconsistent with other Acts.

Mr. Burke—I may say that I am very strongly in favour of the Act, and I think it has already taken a very desirable shape. I think the report in last year's proceedings where Mr. Casgrain spoke so strongly about the Quebec Incorporation ought to have a great deal of weight with us. As regards the question of the use of "O.L.S." and "P.L.S.," I think if any of us were to go to the States or be spoken of in the States, that using the word "Ontario"—as Ontario is at least one of the greatest provinces in this Dominion—cannot possibly affect us in any way injuriously. And as regards bringing in outside members who have not joined this Association and who might object to register, I don't think they could have any very strong excuse for not doing so. The fee is a very small one, $1.00 for registering and a very small annual fee, and I know one or two surveyors who have not come in simply because we have not been incorporated.

Mr. Roberts—I may say I am in favour of the Act right through. It seems to be the only way of raising the standard of the profession.

Mr. Butler—I am in favour of the Act.

Mr. Tyrrell—I am in favour of the Act as it stands.

Mr. Stewart—I don't think this Act takes away the title "P.L.S."

Mr. Jones—I have no objection to it at all; I think there is nothing to be lost and a good deal to be gained.

Mr. Paterson—If there are any defects about it now, they can be remedied at some time again. I am in favour of it.

Mr. Aylsworth—I am in favour of the Act. After all these men have expressed themselves in favour of it, I think I would be rather in the wrong if I did not express myself in favour of it too; I think they have had more experience than I have had. Although I spoke against it yesterday afternoon, I can only express myself now as heartily in favour of the Act.

Mr. Robertson—I am in favour of the Act.

Mr. Fawcett—I have always been in favour of Incorporation. I have talked with a good many surveyors down in Quebec and surveyors in Manitoba, and they all claim that through Incorporation they have a great many advantages which they would not have without. What is good for them I think would be good for us.

Mr. McDowall—I am strongly in favour of the Act. I am also in favour of the "O.L.S." It would carry more prestige in the States and outside provinces.

Mr. Speight—I bear my testimony like the rest of them here in favour of the Act.

Mr. Abrey—In the event of opposition from outside members to this Bill, what then? I think that ought to be spoken of here.

The President—I think the simplest way to do it is to appoint a committee with instructions to act in whatever might be considered its interests, whether any proposed changes are of vital importance.

Mr. Ross—I think, so far as I have looked over it, I see no objection to it.

Mr. McAvoy—I am in favour of the Bill.

Mr. Rainboth—I think it would be of the greatest benefit to us. I have gone over the Bill and I do not see that it can be improved on in any way, and I am altogether in favour of it. I might mention that I am a member of the Quebec Association, and the Incorporation there has been a great success in every way. It has added to our numbers there and improved our standing. Of course the tariff may be a secondary consideration with some, but it has been a great success in that line with us in preventing any disputes.

(The committee to wait upon the Attorney General and Commissioner of Crown Lands *re* Incorporation was then appointed.)

Discussion on Incorporation.

The President—The inception of Incorporation took place about two years ago, and last year we had a good deal of discussion about it. We know that the Provincial Land Surveyors of both Quebec and Manitoba are incorporated, and their experience has been decidedly satisfactory. They find that the profession is decidedly improved, and the members of the profession at large take a more earnest interest in it than before. After the discussion we had last year a committee was appointed, and it was moved that the committee should bring the matter before the Commissioner of Crown Lands and have a Bill prepared in order to carry out the ideas of Incorporation. Some of our members last year, you may remember, thought that inasmuch as the surveyors of Ontario were appointed by the Government, the examiners appointed by the Government, and our certificates issued by the Government, that if Incorporation took the form of an ordinary incorporated society we would be under certain circumstances cutting ourselves away from the Government patronage and Government protection that we at present enjoy. For this reason, when the committee met and discussed the form that our Bill should take, it was decided that the principle that we wish to try and carry out was to procure if possible such powers as would not be inconsistent with our connection with the Government. In other words, it was thought that the profession would gain greatly by each surveyor having an active interest in the management and government of his own profession. The Bill now before us is drafted with that view. You will notice that the Bill does not profess to do away with the existing Land Surveyors' Act, but merely to amend such sections of the Act as become necessary, and to define the regulation and government of the Association by means of a governing body

elected by all the members in Ontario, by officers and a council elected by them. The principal point of the Bill now before us is simply as to its government, how the election shall be held, what the powers of the council shall be, the appointment of the Board of Examiners, and matters of that kind, also of the fees payable to the Incorporation by members of the profession. It certainly will enlarge our ideas; it will bring us more together, and all matters of interest in the profession will receive the attention of the council. There will be somebody to bring these matters before us. Take, for instance, a surveyor out in a distant part of the Province where persons who are practising may be unlicensed surveyors, he may not have the time or means to prosecute these men. I know this is occurring, and perhaps has occurred in the past, a little more than it does just now, but that man, as we now stand, has himself to look to for the protection of his own practice; whereas, with the Incorporation and council it will be the council's duty to appoint some committee or person whose business it will be to look after this on receiving proper notice.

You will see on the first page of the Bill the various powers that the by-laws will have,—"For the government, discipline and honour of its members," and so on.

Now, it occurs to me that there is a matter in which Incorporation would do a great deal of good, if we have properly established fees for the work in connection with surveying. A surveyor is not so much then at the mercy of the public as to what they feel like giving him for his work. If there is an established tariff he knows that he will be backed up by the profession at large in the charging of fees that may be established by that tariff, and he also has the assistance of every member of the profession in the province. Being united, we can all help each other, but, being as we are now, practically disunited, we are each one standing very much on his own merits. Until this Association was established, we were practically alone.

There are other members of the profession who, I think, are better able to describe the various improvements that are sure to come from Incorporation; but I know we would all like to hear any one that foresees any trouble or difficulty in the way in order that we may know what we are doing.

Mr. Stewart—There was a remark made some time ago which may cause some misunderstanding about these fees. Now, this Bill, as I understand it, does not impose any fees for our services. We don't attempt by this Bill any new fees for our services to the public. The fees mentioned here are the fees charged for admission and apprenticeship and becoming members of the profession. We don't wish it understood that we are attempting to force any higher fees on the public at large.

Mr. Butler—I might just mention a little thing I saw the other day. I went out in the township of Marmora to examine some reported trespasses. When I went into the woods I found a line blazed out and posts set and I naturally concluded they had a surveyor. After examining around a while I found the line had been

run by Mr. Bolger, and it was between that line and this new one that the trespasses were supposed to have been made, and I was informed that the work had been done by a wood ranger employed in the neighbourhood. Now, there is a case where, if we were incorporated, I think I would have sent a notice to the proper officer here in Toronto and he would have notified some local man to have that man brought before a magistrate and fined. Personally I could not do it on account of the connection that exists between that man and a friend of mine, and at present it is a very disagreeable place for a surveyor to put himself in, to appear to be prosecuting a man who is earning his living as a wood ranger for instance. But in this case he is planting posts and perhaps ten or fifteen years from now some young surveyor will find one of these posts there, and some man will swear he has known that post there for twenty-five or thirty years and it will pass off as an original post. I took them up and threw them in the swamp and warned the fellow that I would have him fined. It was only to frighten him a little, but at the same time it is a disagreeable place to be in.

The President—The public should certainly be protected. He may have started from some point that he had taken no means of ascertaining whether it was right or not. He is not authorized to administer an oath to find out where the true post was planted.

Mr. Stewart—It seems to me that if any body of men are capable of conducting the examinations and looking after the interests of the profession, certainly the members of that profession are the ones who should do it. Heretofore the examinations may have been conducted all right—I believe they have been—but that is no guarantee that they will always be in the future, and I think with this Incorporation it will be our fault at least if they are not conducted properly. I cannot see any objection to it, and I think the principal thing is this, that we take into our own hands the conducting of the examinations and the regulation and the working of our profession the same as other professions. The Law Society became incorporated, the Medical Society became incorporated, and I think it is just as necessary for us as for them.

The President—This Bill does not propose to do away with any of the powers of the existing Surveyors' Act; it simply adds something to them. The Government may either throw out the whole of this Bill or part of it, but in no case can I conceive our being worse off than we are now; on the other hand, I think we must necessarily be better off.

Mr. Butler—Who are so competent as the surveyors themselves to decide as to the efficiency of the examinations to determine the qualifications of the men who are going to carry on that work? Certainly there is no question at all about past Boards being men of exceptional ability, but it is a political appointment after all and one that may be made not wholly from the point of view of the capability of the examiner, it may be for political reasons, and therefore it would be better to do away with the possibility of any such appointment.

Mr. Stewart—As far as I can see in this Bill there is no attempt to enlarge the field of the operations of surveyors. What I mean by that is that there is no attempt, as far as I can see, in this Bill to encroach on any other profession, engineering or any other. There has been some little uneasiness felt, I understand, in certain quarters, that perhaps surveyors might take advantage in the passing of this Act to restrict to themselves certain works which are now performed by engineers and perhaps others.

Mr. McAree—It does not seem to be too much that the Association shall have full power to control all the members. Does the first clause of Section 10 prevent a man from practising who is not a member?

The President—It does as an Ontario land surveyor.

Mr. McAree—That, then, gives the council power to control the licensing and making of all regulations of the Association?

The President—Certainly. The Association under this Act has the power of passing such by-laws not inconsistent with the provisions of the Act, and the principal things that, under the provisions of the Act, the by-laws of the Association will not have power to alter will be the various fees that are mentioned in Section 7. The by-laws of the Association would have no power to increase, they might have power to reduce but certainly not to increase, any fees that are mentioned in Section 7. So that it is not intended that the Association shall have the arbitrary power of increasing the annual fee or registration fee or anything of that kind.

It appears to me that the sum and substance of any objection amounts to this, whether a surveyor thinks he would get value for what he is compelled to pay—the sum of $1 for registration, which is paid once and for all, and afterwards an annual membership fee of $4. That really seems to be the whole point that is worth while discussing in the matter. Do surveyors think that their practice will not stand that fee of $4, or, on the other hand, will they get corresponding value for their money?

Mr. Stewart—Well, at present our fees are $3; it is only $1 more.

Mr. Butler—I don't think that is worthy of consideration.

The President—I cannot see how any surveyor could reasonably believe that we are not going to get advantages. I have been told personally that there are surveyors in certain portions of the Province who thought at one time of joining our Association, but when they found that we had no power to stop improper or illicit practice, they said it is not worth our while to join; we can read books at home perhaps just as good and more useful than the Association reports; it is no good to us; it is not worth our while paying $3 to the Association. And I think many of them would be very glad to pay $4 to an incorporation that has the power to do what all competent men should have, take care of themselves. With regard to real estate or property, the Quebec Surveyors' Incorporation, I believe, have the sum of $2,500 in the bank. In the State of Ohio, where they have not got

Incorporation, they have some kind of general association, and they are now trying to get a Bill passed outlined very much on the Ontario Land Surveyors Bill. They propose to have a library and corresponding secretary, so that the profession shall have communication with the secretary and reference library in the State town, and every question of doubt or trouble submitted to a council and answers made, so that the whole profession all over the State will benefit by it, and I don't see but something like that would work very well in Ontario.

DISCUSSION ON MR. GAVILLER'S PAPER ON "DESCRIPTIONS."

The President—On the first page this statement is made, "The description of a property should be so drawn that any qualified person could lay it out on the ground without doubt or dispute as to the position or content."

I think we all agree in the general fact, but with regard to whether a surveyor is able to write the description in that way is another question. He may be controlled by circumstances that he cannot very well obviate. There may be matters connected with the ownership of the land which a surveyor is bound to respect. I mean the surveyor who is acting for the seller is bound to write the best description he can as a surveyor for the man who is selling the land, and yet, at the same time, he may not be able to write the very best description he would like himself. In a case of that kind, is the surveyor bound to give way, or is he bound to write the very best description he can and put the seller to perhaps a great deal of trouble and expense in explaining away the difficulties in title or matters of that kind?

Mr. Gaviller—I think that comes under the same heading with a great many other difficulties. There are a great many occasions in which a thing should be done but in which it is impossible to do it. It is not a question of what is best, but what can be done under the circumstances.

PRESIDENT'S ADDRESS, 1892.

GENTLEMEN OF THE ASSOCIATION OF PROVINCIAL LAND SURVEYORS OF ONTARIO:—

It is with great pleasure that I again welcome you to our Annual Meeting, and trust that having been spared to enter on this, our seventh, year, we may be guided through its days with health and strength to carry out the work that may fall to our lot to undertake.

In my last address, I referred to the death of the Late Mr. Hugh Wilson, and before our Annual Report was issued we lost another of our members, and the profession one of its prominent men, by the death of Lt.-Col. Webb, of Brighton, Ont. His obituary was published in our report, which you have no doubt all read.

Quite recently our profession has lost another prominent and esteemed member—one who was, I think, personally known to most of us. I refer to the late F. F. Passmore; he died in Toronto, where he had practised for nearly half a century. He was the oldest member of the Board of Examiners, and enjoyed a reputation in the community, and particularly with the legal profession, which we may all look up to. There is no doubt that his retiring disposition alone kept Mr. Passmore from filling some of the most important positions.

Last year I drew your attention to what I thought was the most important subject we had before us, "Incorporation." It again comes up in a stronger and more forcible light, but I shall not go into details as it will be the subject of a Special Report from the Committee appointed to look after it. I would strongly impress upon you all to give it not only your passive assistance, but a live, earnest helping hand, for if we do not believe in ourselves and help ourselves, we cannot expect the public to have faith in us or even those of our own profession not among our members. I can assure you that the Committee has done all in its power to carry out the instructions, and a Bill is now before the House, so that it rests with the members of the Association and profession whether we succeed in obtaining what we ask—a reasonable share in the government of our profession. The Government has put no unreasonable difficulties in our way, and I feel it my duty to express my thanks to the Hon. Mr. Hardy, Commissioner of Crown Lands, for his courtesy on all occasions when I had interviews as your representative in this connection.

A new departure is being made this year in the discussing of some of the papers of last year. This is undoubtedly a good move. Many of the papers presented are so carefully prepared and so concisely written that it is not possible to discuss them properly or do justice to the writer, merely on hearing them for the first time. I hope, therefore, that you have all brought your Reports of last year, as requested by the Secretary.

On this year's programme are papers treating of most interesting subjects, which are written by gentlemen whose experience and knowledge are a guarantee of the accuracy of the statements and of the results deduced.

While on the subject of papers, let me urge upon the members the great good derived by us all from writing and reading papers such as those which appear in our Annual Reports. The writer of a paper derives the greatest good; he takes up a subject in which he has some special interest or with which, in the course of his practice, he has had to make himself familiar, but before he gets his paper finished he finds there are many points on which he requires more information, and he at once sets to work to get the information necessary. When his paper is finished and ready to be presented, he stands in the position of having one more subject added to his store of knowledge in a clear and workmanlike condition. The readers of a paper benefit in a degree proportionate to the information they already possess or the interest they take in the particular subject. Do not think from what I have just said that it is only the very clever brother or the one who has a big practice who can write papers which will be useful or interesting. There is no surveyor in the country who has not some information of interest to his brethren, or who cannot learn from others; it is by bringing these points out, and our brethren together to discuss them, that our Association is doing much good.

Let me, in conclusion, ask you to join in making this, our seventh, year, the most important of all that have preceded it, by uniting to forward and improve all that is for the good of our profession and for our usefulness to the public.

PRESIDENT SANKEY'S RETIRING ADDRESS.

MR. CHAIRMAN AND GENTLEMEN,—You have put me in rather an awkward position, and it is not the first time you have done it. It is not the first vote of thanks you have proposed to me. I think the first time you did it I explained to you in the most convincing manner that what I did was for the love of the profession, and on account of the hearty good-will and co-operation I have always received from every member of the profession. At the same time, I don't want to say that I am not very much flattered and very much pleased that you should have passed this vote of thanks to me. It is a kind of reward that one does not get simply by hard work. I feel personally that there is something more than the fact that I have done something for you and you want to give me a return for it; I think there is something in the fellowship and good-feeling between us all. And if there is one thing that pleases me it is this, that this Association has fostered a feeling of good-fellowship amongst the surveyors of this Province, a feeling that we never had an opportunity of cultivating until the Association existed. I am not a native of Canada. I have not been a very great many years in the Province, and yet, through the good graces of this Association—for I am comparatively a young man both in the profession and in the country—I have now the honour of being the retiring President, having held the office for two years. Now, if it had not been for the Association this thing could never have occurred. There are very few here to-day who would have known me personally. They might have seen my name in connection with that of the city or something of that kind, but that would be all. Now, if the Association has done so much for the profession in Ontario, there is no doubt in my mind that Incorporation is going to do a great deal more. (Applause.) We are all going to feel that we are members of one Association; we are going to feel that we are members of one profession, and our individual exertions will be to the furthering of the interests of that profession. Are there any people in the Province more interested in the well-being and high standing of the profession than ourselves—than we, the practising surveyors of Ontario? I cannot see for one moment how any person could ask the question, What good is Incorporation going to do?

I again thank you for the very kind feeling you have exhibited towards me personally, and I can assure you that my feelings are exactly the same way towards each and all of you; and I hope that if there is anything more I can do or may have an opportunity of doing, as I said, the fact of my being President or not will not have anything to do with whatever I may do for the furtherance of the Incorporation of the Association in whatever direction it may take.

CONVENTION OF CANADIAN LAND SURVEYORS.

MINUTES OF THE PROCEEDINGS OF THE CONVENTION OF CANADIAN LAND SURVEYORS, AT THE FIRST MEETING, HELD IN OTTAWA, TUESDAY, FEBRUARY 16TH, 1892.

The Convention was held in the Lecture Room of the Literary and Scientific Society, Sparks Street.

At 2 p.m. the Chairman, Mr. J. S. Dennis (being Chairman of the Delegation representing the Association of Dominion Land Surveyors), took the Chair.

Mr. W. S. Drewry, Secretary of the Delegation representing the Association of Dominion Land Surveyors, acted as Secretary of the Convention.

The following delegates, representing the affiliated Associations, were present :—

Representing the Association of Dominion Land Surveyors.

J. S. Dennis,	A. H. Witcher,	John Sullivan.
W. S. Drewry,	D. C. Morency,	

Representing the Association of Provincial Land Surveyors for Ontario.

O. J. Klotz,	William Ogilvie,	J. B. Lewis.

The following members of the Association of Dominion Land Surveyors were also present :—

J. I. Dufresne,	P. B. Symes,	J. B. Dowling,
J. J. McArthur,	Jacob Smith,	John Vicars,
James Gibbons,	T. D. Green,	R. Rauscher,
S. L. Brabazon,	W. F. King,	William Pearce,
P. T. C. Dumais,	Prof. Macoun,	John Nelson,
J. E. Woods,	Dr. Bell,	Samuel Bray.
H. Irwin,	Comdr. Boulton,	

The rules and regulations adopted by the affiliated Associations to govern the Convention meetings were then read.

The Chairman read letters from the President of the Ontario Association and others expressing regret at being unable to attend the Convention.

The Chairman stated that the Association of Provincial Land Surveyors in British Columbia had adopted the scheme of affiliation too late to appoint delegates for this meeting.

The credentials and proxys of delegates were received and filed.

The Chairman then presented the list of questions presented to the Convention for discussion and action as follows. The Chairman suggested that these questions be taken up seriatim and disposed of by resolution, which was agreed to.

QUESTION I.—After discussion it was *Resolved*, That in those Provinces where a penal clause exists in the law for illegal practice of surveying, an officer should be appointed to prosecute parties so practising; and that where no such penal clause exists, an endeavour should be made to have such a clause inserted in the law governing surveys and surveyors.

QUESTION II.—After discussion it was *Resolved*, That while it is considered by this Convention that an amalgamation of all the Associations of Surveyors is desirable, it is not thought that any scheme, other than that of the affiliation now in force between the Associations of Provincial Land Surveyors in Ontario and British Columbia and the Association of Dominion Land Surveyors, can at present be carried out.

QUESTION III.—A report of a Committee of the Association of Dominion Land Surveyors on Geoditic and Topographical Surveying was presented and read, and after a lengthy discussion it was *Resolved*, That the report on Trigonometrical Survey of the Dominion submitted be adopted by this Convention and incorporated in the Report of Proceedings, and that each of the affiliated Associations are requested to submit this matter to their respective Governments, adding such further remarks thereto as may be deemed necessary.

QUESTION IV.—After discussion it was *Resolved*, That in the opinion of this Convention the length of apprenticeship for pupils, consisting of three years' service under articles, one of which is spent in the field, is satisfactory, and does not require amendment.

QUESTION V.—This question gave rise to a lengthy discussion, and it was finally *Resolved*, 1st, That this Convention is of opinion that Surveyors are not paid in proportion to the services rendered. 2nd, That as the requirements of Surveyors have materially increased, the minimum remuneration per day should be ten dollars. 3rd, That each of the affiliated Associations should take steps to legalize such minimum pay.

QUESTION VI.—After a lengthy discussion it was *Resolved*, That this Convention is of opinion that graduates of engineering schools or colleges should not be granted any further privileges regarding service

of time under articles, but, on the contrary, the service of such graduates should be lengthened to two years.

This closed the consideration of subjects submitted for consideration and action.

The following papers were submitted to the Convention :—

Paper—" Are the Great Lakes Retaining their Ancient Level ? "—Staff Commander J. G. Boulton, R.N.

Lecture—" Phototopographical Surveying." — J. J. McArthur, D.L.S.

Paper—" Irrigation Legislation : its Primary Principles "—William Pearce, D.L.S., Superintendent of Mines.

Paper—W. F. King, D.L.S., Chief Astronomer, Department of Interior.

Paper—" Latitude by Elongation."—O. J. Klotz, D.L.S.

Paper—" Exploratory Surveys."—William Ogilvie, D.L.S.

Paper—" The History and Use of the Arithometer."—J. I. Dufresne, D.L.S.

Paper—" Geographical Nomenclature."—A. H. Witcher, D.L.S.

Paper—" A Latitude Attachment for the Transit."—William T. Thompson, D.L.S.

Paper—" Notes on Maps and Map Making."—Jacob Smith.

Paper—" The Process of Photolithography."—H. N. Topley.

Paper—" Amber."—O. J. Klotz, D.L.S.

The Convention then adjourned to meet in Toronto, in 1893, during Annual Meeting of the Association of Provincial Land Surveyors for Ontario.

W. S. DREWRY,
Secretary.

J. S. DENNIS,
Chairman.

PAPERS.

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

EXPLORATORY SURVEYS.

By WILLIAM OGILVIE, D.L.S., P.L.S.,
Ottawa.

In presenting a few remarks on exploratory surveys, I intend as far as possible to avoid all reference to technicalities; such as description and use of instruments, methods of reducing observations, or any other information which can be readily and fully got from works prepared by competent men for the use of surveyors generally.

I will confine myself to what might be called the executive part of such expeditions, and merely present what experience has shown me is the most difficult part for a beginner to contend with.

Let it be granted that we are about to conduct an exploratory survey which involves an instrumental traverse of a stream or streams —which may be more or less dangerous of descent—and at the end of such survey have to determine by accurate observations the latitude and longitude of our terminal point, or some important point in our line of march.

We will first consider equipment. To conduct such a survey you will require two canoes and a party of four men: if you have only three men and anything goes wrong with one of them, you are at a standstill while he is incapacitated; or, if he is lost, may have to abandon the enterprise altogether—as one man is wholly unfit, except in very smooth water, to handle a canoe of the requisite capacity; and even in smooth water he will not make much headway propelling her. Those four men should all be hearty, lusty fellows, possessed of infinite fortitude and patience, capable of carrying on their back at least one hundred pounds over rough ground and through the woods for a period of at least ten minutes without halting. Your canoes should not be less than 18 feet in length, upwards of 40 inches in width (half a dozen more would be better still), and at least 20 inches deep. Such a canoe will give you satisfaction in every way. Whatever you are disposed to yield in, be firm in this. A small canoe will be lighter, of course, but will give you infinite trouble and delay. Your outfit will crowd it and sink it so much that you will have very little freeboard; besides, thus loaded, it will actually draw more water than a larger one. Thus cramped you will often find it impossible to

proceed through rough water, or in shallow, when a larger canoe would allow advance with ease and safety. Such a canoe, when ready for delivery from the shop, will weigh about 170 pounds, and after a few weeks' use will weigh about 190 to 200 pounds. Two men will soon learn to carry it without much trouble, and it would take two to handle a canoe that would not carry more than half its load. Each canoe should be furnished with not less than four good stiff paddles. The ordinary sporting paddle is much too light for such work as we put them to. Giving them a coat of paint before using them adds much to their life, by preventing warping and splitting in hot weather when exposed to the sun.

As on every such survey more or less portaging has to be done, it is essential to provide a set of pack-straps for each man, and two or three extra sets for use by extra help when it is available. The old-fashioned tump-line, by which the load is supported principally by the neck, is simple and convenient, but requires a lot of practice to develop the necessary stiff-neckedness. Pack-straps which put the whole weight of the load on the shoulders are objectionable, in that they produce paralysis of the arms in beginners and do not permit of the load being readily put down, as with the tump-line. Besides, the load works down into the small of the back and becomes very fatiguing. I have seen a combination of the tump-line and pack-strap devised by an old trapper on the upper Ottawa River. It is made by a shoemaker in Mattawa Village, and seems to me just what is required. Tarpaulins long enough and wide enough to cover the canoe completely should be provided against rain storms, and also to cover the stuff at night.

The amount of provisions necessary to start with is, of course, entirely dependent on local circumstances, and will have to be determined by the surveyor taking into consideration all known local facilities for obtaining supplies on the way; but carefully avoid risk by depending too much on such local aid. It is better to have too much with you than to find yourself at some point without food, and unable to get any. I will add as a warning which I cannot repeat too solemnly: "don't depend on your gun or fishing-rod for anything." If you do you will very likely repent it bitterly. By all means take along a gun, or guns, and plenty of ammunition for them, and some fishing tackle, and whatever they bring you is so much gained; but you will probably find at the end of the season that it has cost you more than it is worth. Still, the sport it affords some of us is not to be valued by dollars and cents. You cannot, however, do two things at once; and hunting and surveying are two distinct callings; and, of the two, I think hunting requires the most tact and experience. True, large game once in a while does stumble on to you; but such cases are not frequent, and not at all to be depended on.

Your instrumental outfit will consist of a small transit—or, if you can take two along, it insures you against accident—and some form of micrometer to measure small angles with; the angle, subtended by a constant base, being what you deduce your distances from. The best form of micrometer for this purpose is, I am convinced, the Lugeol

—or a modification of it—which has been approved by the Surveys Office, and issued by it for use in this way. I don't think a description of it is necessary here, as it must be familiar to nearly all of you. The results obtained by this instrument, under good conditions, with a 20-link base in distances not exceeding 60 or 80 chains, are very satisfactory. I would define good conditions thus: atmosphere temperature. 50° to 60° Fahr.; sky clouded; a clear, grey light, and gentle breeze blowing. Under those conditions, distances less than a mile can generally be determined within one five-hundredth of the true distance, and often much less. With a higher temperature and strong light, the error averages much more, and the distances deduced are short; with lower temperatures the distances are long. The error in the distances deduced increases out of all proportion to the distances themselves; so that it does not follow that because we find an error of 10 or 20 links in a mile, that we will find twice that error in a two-mile distance. You will probably find the error increase in the ratio of the third or even fourth power of the ratio of increase in the distance. Why that is need not be discussed just now, as it would exceed the limits of a reasonable paper itself, and besides I am not quite clear as to why it is myself. If you have one of the ordinary forms of transit it will be well, as a check to the work of the micrometer, to have a micrometer head put on the tangent screw of the telescope, so that small vertical angles can be measured in that way. I had my four-inch D. L. pattern transit fitted that way at a very small cost, and, when using that instrument, always checked the micrometer work with it, and found the agreement between the two entirely independent methods very close. In practice it sometimes (owing to unfavourable background and the division of light in the Lugeol Micrometer) happens that the angle cannot be satisfactorily read with the latter instrument; in many of such cases the other arrangement enabled me to get over the difficulty, as with its single image there was no blending of unfavourable conditions. Whenever I could not satisfactorily, by one or the other instrument, determine the angle subtended by the base, I always left a base behind me from which I could deduce the distance from the succeeding station. This was done by setting up, in addition to the picket at the station, another one to the right or left of it, at right angles to the course to be measured and distant from the station 30, 40 or more links, as the ground would permit. From the succeeding station the angle subtended by this base was measured, and the distance deduced from it. Occasionally it would happen that there was no room for such a base; I would then, by a pre-arranged signal, let the base men know that I wanted them to erect such a base where they were, and I would measure the angle subtended by it from my station. On my arrival at the following station I would measure the inclination of this base to the course it was intended to measure, and if found not at right angles to its length was reduced to its tangential length. It was sometimes found necessary to do this in the case of leaving a base behind. In order to facilitate as much as possible such cases, it is

necessary that you have a good flag to signal with, and your base men have a good field-glass, or telescope, to see distinctly what you do signal. For a flag I used a piece of bleached cotton a yard wide and two yards long. It very seldom occurred that the signals made with this could not be distinctly seen. It is necessary that this be kept clean, or renewed occasionally, as a dirty one is not much use. Your base men should be thoroughly drilled in your code of signals before starting; otherwise you may have annoying misunderstandings and delay.

An amusing instance of this occurred the first day of my first micrometer survey. My flag was a small piece of red cloth, which worked all right the first four or five courses, none of which were a mile; then came one of a mile and three-fourths, in which I was in the shade of some large spruce. Do what I might, I could not make the base men understand I was through with them there. At last, in desperation, I pulled the cover off the canoe and waved it with all my might. This answered. In the evening I asked them what was the matter, and they innocently told me they could see nothing until I waved my white pocket-handkerchief. Imagine their surprise when I told them the white handkerchief was the canoe-cover, a piece of cotton duck 17 feet long and 6 feet wide.

Each one can devise for himself his code, but I found the following work well:—The flag-pole held horizontally to the right, with the flag hanging perpendicularly from it, signified that I was ready for the base to be erected; when I was through, it was signalled by waving the flag across the line of sight high above the head. If the conditions for seeing and making a satisfactory measurement were not favourable, it was shown by waving the flag low in front of the observer; and, if I wished them to put up a base for me at their point, I immediately followed this by quickly waving the flag vertically on the left side of the signal man. Of course it was necessary for one of the men at the base to be on the look-out all the time they were at a station, for some time after the survey commenced; but experience soon taught them just what to expect and when to expect it.

My experience is that, with courses averaging a mile, on a down-stream survey about 20 miles per day can be made, and on an up-stream from 15 to 20. The greatest number of stations I set up in one day was 37, but that was an exceptionally long day. The greatest distance I have made in one day was $23\frac{3}{4}$ miles, and strangely enough that was on an up-stream work (on the Mackenzie). There were only twelve stations in it. The next greatest was going down the Athabasca, 23 miles, with, I think, about 18 stations in it. Had I plenty of time to do my work in, I would instruct my base men to confine themselves to distances of about a mile, as far as practicable; but when you have a long distance to go and a short time to do it in, with the certainty of a tiresome snowshoe tramp of perhaps hundreds of miles if you are frozen in, they are very apt to think they have gone only a mile when they have gone upwards of two; and, though you expostulate with them, you are not very emphatic about it.

It should always be made a point to take along an instrument with which latitudes can be simply determined, and, during the course of the survey, as many latitudes as the weather will permit should be taken. If your transit is not fitted with a vertical arc of the requisite precision, a small reflecting circle and false horizon is convenient and simple ; and, by combining meridian altitudes of north and south stars, close and reliable results can be obtained.

To determine the latitude and longitude accurately of your principal point, you will require an astronomical transit. To determine latitudes with it, it will have to be set up in the " prime vertical "; or, better still, have a fine level attached to it on the principle of the zenith telescope. The stand for this instrument, in order to give it the necessary firmness, has to be made very heavy. This is a serious item for us. In order to overcome this, I had brass Y's made for the telescope I used, which are only a few pounds weight and answer just as well as the stand. A stump of a tree of the requisite size is selected, the middle portion cut out of it in the direction of the meridian, the Y's I have mentioned are then firmly screwed to the sides of the stump in such a position that the telescope when placed on them will revolve nearly in the meridian. It is finally adjusted in inclination and azimuth by the attachments to the Y's. When a suitable stump was not available, I have made a good stand by combining a couple of pieces of timber, 7 or 8 inches square and 8 or 10 feet long, in the form of the letter X ; but with one part of it made much longer than the other. This was carefully and firmly planted in the ground in the proper direction, the Y's firmly screwed to the top of the timber and the final adjustment made as before. With this arrangement I am confident I have got as good results as with the regulation stand, and saved the transport of upwards of 200 pounds of rather bulky outfit. Before beginning to observe, a platform should be built around the stump or stand, above the ground, to prevent any vibration of the telescope in making the necessary movements around it.

In compiling your returns of survey, the latitude observations will show the errors of the micrometer work, and if a record is kept of the atmospheric conditions for each day, you can, with this data and the lengths of the courses, apportion the error in the intervals, so that there will be very little error in the final plot.

If you have only to make a track survey—that is, one in which the azimuths are taken with a compass and the distances inferred from the time taken to travel over them—your instrumental equipment need only be a reflecting circle or sextant, and a false horizon with a chronometer, or more than one if convenient. In conducting such a survey you should, as often as is possible, determine the magnetic inclination of the compass used, and as often as possible test the rate at which you travel. On such a survey it is essential that you observe, as often as possible, for latitude, by meridian altitudes of north and south stars ; or, better still, circum-meridian altitudes of the same stars. For time and longitude, observe altitudes of stars

east and west of the meridian, when near the prime vertical, and if possible not less than 30° above the horizon. By observing stars on both sides of your zenith, you eliminate the results of index error in your instrument. My experience is, you never know just what the index error of a sextant is; as I found it different in different atmospheric conditions. The reflecting circle I used last season, in ordinary summer temperature, was eccentric about 40″; but in the winter, in low temperatures, I found it nearly 3′.

Before starting on your survey, provide yourself with as many different maps of the district you are to pass through as you can. Very probably many of them are mere guesses based on hearsay, but they are valuable in that they show you what you may expect to find somewhere in your route. By combining them you can generally, though not always, map out your route and make your plans accordingly. You will generally find, however, that you have to go it blind, so to speak, until you enter the confines of your work; here you can learn from the natives the general character of your route, and the number and nature of obstacles in it. In this, however, as in every other human attribute, you will find many kinds and degrees of intelligence. Here, as in civilization, the greatest curse—to use a strong term—is the man who knows everything. You have but to ask him about a place or thing, and he immediately begins a tedious description of it, which generally has some truth in it, but in the main is imaginary. Get him to make a map and then note his remarks upon it, and you will be disgusted with the general result. Possess your soul in patience; don't get prejudiced; get as many different maps from as many different men as you can, and in the end you can build a tolerably good one out of them all. You will also likely find that some one of them embodies the main features of all the rest. You can rely on the man who made that one. One striking feature of Indian maps is the general absence of all idea of scale; no two of them will delineate the same stream, for instance, anywhere nearly alike except by accident. It seems to me their conception of distance on their sketch is based on the time it has taken them to travel over the different parts; but I have found so many glaring exceptions to this that I do not give it as general. The best way—in fact the only way—to get an idea of distance from them, is to find the time it has taken them to travel over it, taking all possible care to learn the conditions at the time of travel; such as the time of the year, the state of the weather; whether they were travelling light or loaded; whether game was plenty or scarce; whether they had plenty to eat or were hungry—in fact, anything that would be likely to hurry or retard them on their march. Right in the way of the acquisition of this information comes in the general repugnance of the Indian to being questioned. If you could converse with him and had lots of time and means to entertain him sumptuously, you could get all the knowledge he is possessed of—probably more; but to start in cold blood and draw it out of him by a series of short, pointed questions, is contrary to his ideas of the nature of things. The probabilities are that if you

attempt to question him too much he will shut up altogether. Above all, avoid pointing out to him what you think is absurd or contradictory in his statement. Such is not "received with thanks" by him; and, if you do, you have very likely incurred his pity, if not his contempt. "What does a poor, ignorant white man know about these things?" Swallow all he gives you, and digest and assimilate all you can of it; but don't refuse anything or he will likely cut short the supply.

I have heard many amusing anecdotes of their contempt for whites who don't believe what they tell them; but they are too lengthy, and would be out of place here.

Another discordant feature in their map-making is the want of agreement as to the position of the general features in it with reference to the cardinal points of the compass. Very seldom will two of them independently agree on the direction of any distant point. Often I have marked the terminal points of a route I wished them to sketch in on a piece of paper, and held it in its proper position with reference to the meridian; but very seldom could they do it without turning the paper around to suit their idea of direction. It will be found that though they know the country well, they have not much capacity for conveying an intelligent description of it to a stranger, whatever they may do among themselves or with friends. If you employ any of them as guides, don't ask them too many questions about what is ahead if you wish to retain their good will and confidence; they seem to infer from it that you doubt their competence to guide you, and grow sulky. Don't be surprised if you find your guide, though he knows the route well, make many mistakes as to the time of arrival at different points on your route. It seems to me they generally build their time-tables on the time or times it has taken them to go over the ground, and they don't realize for some time that they are travelling under different conditions. Don't be surprised if you find many guides among them like the Irish pilot who declared he knew every rock in the bay, and when the ship struck one exclaimed, "An' be jabers that's one of 'em!" Very retentive memories are not more common with them than others; and I have seen many of them who, to use a common phrase, got lost, and did not know as much about where they were as I did at the time—though very unwilling to admit it.

I would say to you emphatically: don't depend too much on them. Exercise all possible care and keep just as sharp a look-out as if you were without them; but be just as careful that they don't see that you distrust them. By consulting the officer in charge of the post or posts nearest to your route, you will generally be referred to some one fairly reliable, to whom you can apply for information or secure as a guide; but you will very often find that, just when you want them, the best men are engaged by the traders or missionaries. In obtaining information from them concerning country beyond your route, it is important to interview them several times, as very rarely do they give you all they know at one sitting, and it would be unreasonable

to expect them to do so. Also, as far as you can, have such information confirmed or corrected by as many others as you can.

In getting names of places, it is important to learn from them why the names were given, and whether or not the name is merely local, or general. You will find many places have names which are merely local, and were given for some absurd or childish reason by some local character, and are only known as such by himself and a few others.

In descending streams, if you are making a micrometer survey, the rate of the current can be fairly well determined by sending your canoe into mid-stream in a calm day, putting your paddle two or three feet vertically into the water, with the blade across current, and timing yourself over the courses. By repeating this in different rates of currents, at frequent intervals, you soon learn to rate a current fairly well by looking at it. The same rate of current, however, has a different appearance in different depths of water, and with different bottom formations.

In descending rapids, even if you have a guide, it is well to take a good look at them before running them. This can be best done by getting as high above the river as possible; do this at several points so close together that you can have a good, clear view of the whole rapid on the side you intend to run on. From a height you can see better the whole surface of the water than when standing on shore; but you must always bear in mind that you will find the water much rougher when you are in it than it appears to be when looked down upon. When you are making this examination, if any place appears to you to be shallow, you can, if not too far out, sound it by throwing a three or four pound stone in such a way that it will descend vertically on the place you are doubtful about. If you hear distinctly the sharp blow of the stone on the bottom, it is unsafe—unless it is at the end of the rapid; if so, you can slow up on approaching it by holding your paddles or, better still, good, stiff poles firmly against the bottom, and then taking a safe time to cross the shallow. It is very important to know just where to enter bad places. To do this you have to know the set of the current. This you can ascertain, if it is not too far from you, by throwing in sticks and watching their drift and entry into the bad spot; a few trials will show you just where to drift and how to steer. When in very rough water, unless it is absolutely necessary to avoid danger, don't drive your canoe fast; if you do, she will ship water. If she were simply drifting with the current, she will go safely through places in which she might be swamped if driven at speed. When she is running she cuts into waves instead of riding them. Never turn sharply out of a swift current into an eddy; you are very apt to be upset if you do.

Don't forget, before you start on such an expedition, to provide every man in the party with a good life-preserver, capable of supporting at least 17 pounds, and as much more as you can get. The most convenient kind is made of india-rubber cloth, which you fill with air by blowing; but, as generally made, they are much too small, and

only the largest size possess 17 pounds buoyancy. One of this buoyancy will keep a man, weighing about 180 pounds, head and neck out of the water without any exertion on his part; but when exerting himself he is much higher out of water. It is not enough, though, to enable him to help a companion or save property with safety. The confidence which it gives a party, in any place into which they will venture, is worth much; they feel perfectly safe about themselves and don't lose their heads, as they otherwise might.

In ascending streams of more than three miles per hour current, the quickest and easiest way is tracking; that is, one of the party walking along the bank and hauling the canoe with a line. This line should be so attached that the canoe will keep out from the bank by the mere act of being hauled. The line need not be heavy: in ordinary current a good, strong fishing line is strong enough, but in rapids you want a hard spun-line of at least one-eighth of an inch in diameter. One unaccustomed to it could hardly believe what steep inclines in a rapid such a line will haul a canoe up. If your line is heavy in easy water it curves and sinks in the water, thereby keeping the boat too close to the shore; it also catches on sunken sticks and stones, causing trouble and delay. In ascending a rapid in this way, there are only two ways in which accidents can happen: one is, the line breaking in a bad spot; the other is, putting the canoe into a rushing current out of an eddy too square with the current—to do so is to invite disaster. Your line may break, your canoe upset, or the water rush over her side and fill her. Enter her as nearly parallel with the current as you can, and keep your line tight while doing so, that there may be no undue strain on it when it does tighten.

To enable you to make your report as complete as possible, you should provide yourself with a good, self-registering thermometer, and the minimum temperature of every day should be noted; also the temperature at mid-day, or soon after. Also the temperature of the river water should be frequently noted. The latter is important to yourself in the fall, as indicating in a general way how much longer you will have open water. In clear open water a large stream cools very slowly, so that, if the temperature of the water is about 40 degrees, you may look forward to eight and ten days without ice; but if a heavy snow-fall comes on, start at once for the nearest post.

Also provide yourself with an aneroid barometer of good size, and before starting adjust it by a good mercurial to the proper reading; note its reading at least once a day. As soon as possible after your return, compare it again with a mercurial; if there is much difference, your knowledge of what it has gone through on the journey will help you to adjust the difference properly. In running down a river, if there is much fall you can, by reading it at frequent intervals—say every quarter or half hour, or at the head and foot of every steep part—arrive at a very fair estimate of the ascent in that part of the river; but in ordinary currents it is practically useless. The use of the daily record is obvious. In the interest of science you should collect as many specimens of the fauna, flora and geology of the region you pass

through as you can. Some of the specimens may have more than a scientific interest, for they may help to determine the general character of the country, or its general meteorological conditions. I must say, however, if a surveyor attends to his own professional duties properly and fully, he has not very much time to attend to those matters; and very often when he sees some specimens that he would like to acquire, he is so situated and engaged that it is practically impossible for him to do so; yet, it is not out of his power to do something. All information you may get should be noted at once, with the date, place and name of party giving it, and any comments you may have to make on it, or conclusions to draw from it.

In conclusion I would say, aim at collecting all possible information, even if it is not pertinent to the object of your expedition, nor of a nature to be inserted in your report; you will probably find use for it some day, or it may be useful to someone else.

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

ARE THE GREAT LAKES RETAINING THEIR ANCIENT LEVEL?

By STAFF COMMANDER J. G. BOULTON, R.N.,
Ottawa.

This question is not easy to answer definitely from past experience, because, as far as I am aware, there are no continuous records of the movements of lake waters, further back than thirty years. During this period, careful records have been kept, and the question would have been better put in the shape of—"Are the great lakes likely to maintain the mean level of the last thirty years?"—or it might have been put—"Have we any reason to fear the lakes are being slowly but surely drained?" I was led to make a few remarks on this subject because of the unprecedentedly low stage of water at the present time on all the lakes excepting Lake Superior. I have no theory to propound as to the future movement of the lake waters; my object has been simply to collect and give the Association what information I can upon the present and past condition of the inland seas, and invite opinion on the likelihood of their future movements.

Many of the members here present have read of the anxiety of ship-owners and vessel captains about the low stage of water last year, and there is little wonder at their alarm, when official records kept by the United States Government show that before the close of last navigation the water in Lake Huron was three and a-half feet lower than the level in June, 1886.

What no doubt increases the alarm is that this is not a sudden dip, but a steady fall of half a foot a year since 1886. All members of this Association know sufficient of marine matters to understand how seriously this action of the water may have effected the earnings of some of the splendid 3,000 ton steamers belonging to the States, trading from Lake Erie to Lake Superior, built in 1886, when the water had stood at a high and apparently permanent level for four years; vessels which when loaded were drawing all the water the canals and artificial channels could give them in the high stage of 1882 to 1886, all finding on their last trips in the fall of last year three and a-half feet less water; that is, if they made the trips at all, which they could only do with half cargo. To these men, Canadian ship-owners, and to lake commerce generally, the question of the maintenance of the lake level is a very important matter.

From records of the rain and snow fall kindly furnished me by Charles Carpmael, Esq., it appears that the diminished quantities of

precipitation since 1886 is nearly equivalent to the amount the water has fallen below the mean level since that date. In Lake Superior the rain fall has been normal, and the level has not lowered like that of the other lakes.

Those well up on the subject of forestry will be able to say whether the clearing of the forests by fire and axe is likely to cause a permanent diminution of rain and snow.

Evaporation plays an important part in the lowering of the level of the lakes, no doubt, not merely from the sun's rays (which in the course of the survey my officers and myself have reason to feel hot enough at times), but by the dry westerly winds accompanying a bright sky and blowing with great force and evaporating effect when forming the dry rear semicircle of the revolving storms which pass over the lakes.

An alteration in the meteorological conditions to cause a preponderance of these winds in duration and force would no doubt have a marked effect on the water of the lakes.

The Welland Canal is an additional outlet for Lake Erie, the Sault Canal for Lake Superior, lower canals for River St. Lawrence, and the deepening of St. Clair River for Lake Huron. But I leave to hydraulic engineers to calculate the additional quantity of water carried off in this artificial way.

Another interesting calculation would be the wearing effect of continual running water at the various rapid outlets. It is *possible* that the rocky spots of these lakes are wearing deeper by this natural means.

It is not necessary to say much about the reported sub-aqueous and subterranean passage from Lake Huron to the Gulf of St. Lawrence, because it is probably of very ancient origin, and may be considered a constant factor affecting equally both sides of the equation —the future and the past. Should any member of the society have made a survey of this passage at any time a few words about it might be interesting. This tradition has some value, however, on account of its being handed down by seamen whose veracity on all matters maritime, we all know, has never yet been impugned.

In 1838, there seems to have been the highest stage of which we have any authentic record.

This high water has been used by the United States authorities as the plane of reference for their soundings on their charts and for the records of the oscillations to which I have alluded.

From 1859 to 1887 the mean water surface of Lake Ontario was two feet four inches below the high water of 1838; there has been on the whole a gradual fall from 1859 to 1872, and a similar rise to 1888. I have not the records from 1888 to date, but have reason to believe the fall has been similar to that on Lakes Huron and Michigan, for which there are records to end of last year. In Lake Ontario during this period of twenty eight years the water has fluctuated from eighteen inches above to the same distance below the mean level for that period. The relationship between the rain fall and stage of water in this lake, however, is not very apparent. The yearly rise and fall

ranges greater in this than in any other lake, as much as four feet in 1867, the highest water taking place in May, and the lowest in mid-winter.

In Lake Erie the mean level from 1859 to 1887 is 2.1 feet below the high water of 1838; though the records are not printed to date there is every reason to believe that the water since 1887 has fallen similarly to that of Lake Huron, for which we have records. There has been a gradual fall from 1859 to 1872, and a corresponding rise to 1887, but not so marked as in Lake Ontario. The fluctuations on either side of the mean line have not been so great as on Lake Ontario, nor has the yearly range exceeded one and three-quarters feet, excepting twice.

For Lakes Huron and Michigan the mean level from 1859 to 1887 is 2.8 below the high water of 1838. There was a period of low water from 1864 to 1869, again in 1872-3, also in 1879 and 1880. The water then rose steadily to 1886, and has fallen over three feet since, or to one and a-half feet below the mean level of 1859 to 1889. The average yearly fluctuation is about fifteen inches. In these two lakes the periods of high water have been attended by copious rain-falls, and vice versa.

For Lake Superior the mean level from 1859 to 1887 is given as three feet below the high water of 1838, and this level it has maintained to the present time very steadily; the relationship of the level to the rain-fall is not very evident here. The yearly rise and fall is about one foot.

On all the lakes, excepting Lake Superior, the period from 1881 to 1886 was attended by high water, it being during the principal summer months one foot higher than the mean from 1859 to 1887. This period was sufficiently long for men who had not studied the previously recorded movements of the waters to conclude that this stage of water was the normal condition, and quite accounts for the alarm of the ship-owners and masters who have had unpleasant reminders by the grounding of their vessels that the water has been steadily falling nearly half a foot yearly since 1886.

The water in Lake Ontario attains its maximum in May; Lake Erie, in June; Huron and Michigan, July and August; Lake Superior, in August and September.

The sudden fall of the water since 1886 was very noticeable on the steep shores of the vicinity of Parry Sound last year, the rocks being stained black and void of vegetation for two to two and a-half feet above the level of the present water. Admiral Bayfield in 1820 shows these as clean granite rocks just level with the water in that year. In 1887 these two rocks were in the same condition.

General Poe, U.S.A., the best authority, probably, on the hydrography of the inland seas, says in a letter to me:—"I cannot believe that the unprecedentedly low water in Lake Huron will continue, but I think the level will come up again as soon as the precipitation becomes normal. For four or five years in succession the precipitation in the basins below Lake Superior has been below the mean, a fact which sufficiently explains the low stage we now have. Still, I

am further of the opinion that the surface of the lakes has been at some time at a considerable lower level than that of which we have any record, and it is possible that the subsidence may continue until that lower stage is reached. That is, evidence exists to show that we are now in the highest stage of a series of fluctuations which have long periods, probably a century or two."

Mr. Carpmael, the Director of the Observatory at Toronto, says :— "As to whether the recent deficiency in rainfall is likely to be permanent, this is a question of great difficulty ; it seems not unlikely, to a limited extent, it may be, owing to the diminution of the forests."

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

CEMENTS AND CEMENT MORTARS.

By M. J. BUTLER, P.L.S., C.E.,
Napanee.

Taking into consideration the many valuable papers, reports, etc., pertaining to this subject that have appeared in recent years, it must be considered a mark of the importance of the subject.

Cement has been aptly defined as being the "soul of masonry." With most engineering works masonry is the all-important part.

What is cement? The following definition is taken from Brandt and Cox's Dictionary of Science and Art: "In building, a mixture of carbonate of lime and silicate of alumina, in the proportions of 16 to 64 per cent. of the latter to 84 to 36 per cent. of the former, which possesses the faculty of setting rapidly under water, and of increasing in hardness with time. There are two descriptions of cements, the *natural* and the *artificial*. The former is obtained by calcining natural stone; the latter is obtained by the calcination of a mixture of chalk and clay. The Roman cements are a type of the first class, and Portland cement of the second, these names having reference to some supposed resemblance to Roman mortar and to Portland stone."

It is almost needless to remark that the foregoing definition is one of no value, from the fact that it fails to lay down the exact composition and properties of either natural or Portland cement. Having, however, been roughly divided into two classes, it may be advisable to retain this form while we proceed to give the distinguishing characteristics of each.

Natural cement is a cement made from magnesian limestone, by burning the stone in suitable kilns and grinding the burnt rocks as finely as possible, and should have, as nearly as may be, the following composition:—

Silicic Acid	32.00
Alumina and Iron Oxide	8.00
Lime Ca. O.	54.00
Magnesia Mg. O.	6.00
	100.00

A small quantity of the alkalies, soda and potash, are also frequently present.

TABLE OF TENSILE STRENGTH—NATURAL CEMENTS.

NAME.	1 Day.	1 Week.	1 Month.	6 Months.	1 Year.	2 Years.
	Sq. in.					
Louisville	72	.....	.....	150	.....	.....
Rosendale	49	73	156	286	.....	.....
Average of 25,000 E. C. Clark, Boston, Mass., drainage tests	71	92	145	282	290	.....
Napanee average 1,000 sample	50	90	140	280	300	315

Portland cement is an artificial mixture of carbonate of lime and clay in proper proportions, which are brought by suitable means into close mechanical contact, formed into bricks, dried, burned into a hard lava-like clinker, and afterwards ground as *finely* as possible. The chemical composition of which should be :—

Lime Ca. O	60.05
Magnesia Mg. O	1.17
Alumina and Iron Oxide	11.30
Silicia Si. O^2	21.11
Alkalies (Soda and Potash)	.1 to 2 per cent.

"Artificial cement was manufactured in England several years prior to 1824, and if by accident a portion of a kiln was over-burned, producing clinker, this portion was thrown out as worthless. During the year named a Mr. Aspdin, of Leeds, England, thought to experiment with some of this waste clinker, and after pulverizing and wetting it up into cakes or blocks he was surprised at its colour and hardness. It resembled in colour a limestone that was being quarried for building purposes on the Island of Portland, in Dorsetshire, and in taking out a patent for the new product he named it 'Portland' cement. Had the Portland building stone been light coloured, we should never have heard the word in connection with hydraulic cement. From this small beginning the word has grown to be a power in the public mind."

The writer feels constrained to give the above a place, from the fact that he has so often found rather erroneous ideas among engineers as to the meaning and origin of the word "Portland."

When about to use a cement the important question is to draw up a specification that will secure a suitable quality for the purpose in view. Too often we find some such specifications as the following :—"The cement shall be the best English Portland." No analysis, no tests for setting, fineness nor tensile strength. Now, of course, every manufacturer in England thinks his cement the best. It is an absurd and unfair specification. Germany, France, Belgium, Switzerland, the United States and Canada all produce cements quite as good as England. There is no magic in the word "Portland," nor in the combination of *English* with it.

Another, having heard that *fineness* is a good quality, the finer the better, therefore specifies that not more than 10 per cent. shall be left on a sieve of 10,000 meshes to the square inch. Also learning that heaviness is a desirable quality, therefore specifies in conjunction with the above fineness that the cement shall weigh not less than 130 pounds to the struck bushel. Now it so happens that these two properties are incompatible; a very fine cement cannot be a very heavy one, from the fact that the finer the material is ground the more bulky it becomes.

At the present time the tendency is to call for too high a tensile strength with *neat cement*, in short period tests. A coarsely ground, over-clayed cement, when tested neat, will show the highest test on a period of one or seven days.

The following are the recommendations of a committee of the American Society of Civil Engineers to bring about a uniform system for testing cements :—

"It is recommended that tests for hydraulic cement be confined to methods for determining fineness, liability to checking or cracking, and tensile strength; and for the latter, for tests of seven days and upward; that a mixture of 1 part of cement to 1 part of sand for natural cements, and 3 parts of sand for Portland cements, be used in addition to trials of the neat cement. The quantities used in the mixture should be determined by weight.

"The tests should be applied to the cements as offered for sale. If satisfactory results are obtained with a full dose of sand, the trials need go no further. If not, the coarser particles should first be excluded by using a No. 100 sieve, in order to determine approximately the grade the cement would take if ground fine, for fineness is always attainable, while inherent merit may not be.

"*Mixing, etc.*—The proportions of cement, sand and water should be carefully determined by weight, the sand and cement mixed dry, and all the water added at once. The mixing must be rapid and thorough, and the mortar, which should be stiff and plastic, should be firmly pressed into the moulds with the trowel, without ramming, and struck off level; the moulds in each instance, while being charged and manipulated, to be laid directly on glass, slate or some other non-absorbent material. The moulding must be completed before incipient setting begins. As soon as the briquettes are hard enough to bear it, they should be taken from the moulds, and be kept covered with a damp cloth until they are immersed. For the sake of uniformity the briquettes, both of neat cement and those containing sand, should be immersed in water at the end of twenty-four hours, except in the case of one day tests. Ordinary, fresh, clean water, having a temperature between 60 and 70 degrees F., should be used for the water of mixture and immersion of samples.

"The proportion of water required varies with the fineness, age or other conditions of the cement, and the temperature of the air, but is approximately as follows :—

For briquettes of neat cement, Portland, about 25 per cent.; natural, about 30 per cent.

For briquettes of 1 part cement, 1 part sand, about 15 per cent. of total weight of sand and cement.

For briquettes of part 1 part cement, 3 parts sand, about 12 per cent. of total weight of sand and cement.

The object is to produce the plasticity of rather stiff plasterer's mortar. An average of five briquettes may be made for each test, only those breaking at the smallest section to be taken. The briquettes should always be put in the testing machine and broken immediately after being taken out of the water, and the temperature of the briquettes and of the testing room should be constant between 60 and 70 degrees F."

For ascertaining the fineness of cement it will be convenient to use three sieves, viz.:—

No. 50 (2,500 meshes to the sq. in.) wire to be No. 35, Stubbs' gauge.
No. 74 (5,476 " " ") " " 37 " "
No. 100 (10,000 " " ") " " 40 " "

For sand two sieves are recommended, viz.:—

No. 20 (400 meshes to the sq. in.) wire to be No. 28, Stubbs' gauge.
No. 30 (900 " " ") " " 31 " "

Reject the material retained on No. 20, and retain material retained on No. 30.

To determine if a cement will "blow," as it is called, that is, to find if free lime is present, mix up some small pats with thin edges, expose them to the air until set, put, say, one or two into warm water, and note if any cracks appear; if none, it is certainly safe to use at once.

In the absence of proper testing machines, it is often desirable to make a quick examination of a cement, and the writer submits the following:—

1st. Fineness. Test with 10,000 mesh sieve. There should not be more than 15 per cent. retained on this sieve.

2nd. Test for "blowing" as above outlined. If in warm, moist air, the defect will be at once apparent, and shows the cement is insufficiently seasoned.

3rd. Note how long it takes to set hard enough to resist an impression with the finger nail. It should set up in thirty minutes, when mixed neat, so as to resist the finger nail.

Mortar.—The cement and sand should be mixed dry in relative proportion thoroughly. Then add sufficient water at once to make a stiff, plastic mortar. If for brick-work, a little excess of water will be less liable to do harm; if for concrete, to be rammed to place, less water should be used. It cannot be too strongly insisted on that in

the case of natural cement mortars a very slight excess of water will utterly ruin the mortar. Portland cement mortars admit of more abuse, yet it is important that the same rules be applied in order that we may get the best results.

DISCUSSION.

Mr. Alan Macdougal—I would like to say in connection with this that the great difficulty in getting a reliable cement test is really to find out the way in which the briquette has been prepared, because, as Mr. Butler says—and I suppose he has had as much experience in that as any of us—some engineers when they make their tests press the briquette down, they ram the cement in hard, and in that way they try to put the cement into the conditions under which it will be placed when put in the work. A man I met last summer told me that his cement test ran from about 700 pounds. Well, I said, if you have got a thing of this kind it will knock the spots off everything. I said: Do you ram your cement? Yes, he said, I do; I ram it as hard as I can. That would be almost on the same principle as compressed brick. I think the safest and fairest way is always to refer to the American Society of Civil Engineers' tests, then we all get a basis on which we can work.

There is one point I should like to ask the speaker on, and that is, why it was that Napanee cement went off so much. At one time there was some very good Napanee cement, and then after that it seemed to vary so much that it went out of the market altogether. The cement, as far as I know it, is a slow-setting cement, and I think if you take it at the end of a year you find that it will give a very good result in your work. If you use it in concrete work you will find it will set hard and solid. I know one example I had of it where it gave as good concrete as another that was made from Portland cement. I think one fault we are rather disposed to run into in Portland cements is we want them all quick-setting, to have a cement that will set almost immediately, and when it does that, I think that you will find it will deteriorate and will lose a large amount of its binding and staying qualities. I was always brought up on the principle of slow-setting cements, and I have never altered my views on that point. I think investigations should be made, and the only way it could be done would be by keeping some of these briquettes a period of one or two years. I was in Newfoundland about a year ago where we used the Alson cement, a German cement, in some work, and we used also some of White's Victor, an English cement. In the eight-day test the English cement gave much better results than the Alson; but from twenty-eight days and over the results were all in favour of the Alson's, showing that if the slow-setting cement takes a longer time to set, it binds and has greater strength than other cements. In a paper prepared by Vernon Harcourt, he shows that after a certain time deterioration sets in in these quick-setting cements. It is a question that we will do well to consider and to give to each other any experience we have of those points.

Mr. Butler spoke of the preparation of these. Are these quantities by bulk or by weight?

Mr. Butler—By weight always. In all the new works on the Cornwall canal they have used about 50,000 barrels of concrete, and 50,000 barrels have been ordered for the new "Soo" canal, so that puts it beyond any question as to the advantages of using a natural cement when you want a cheap cement, as Portland costs nearly three times as much as natural. That was made to set under water, but it is given a certain time in air before being put under water; it is generally given about a month or two months. This will run two or three years probably. During the construction of the work there will be no water admitted, but after it is completed then of course it will be under water.

Mr. Chipman—Although this is a surveyors' meeting, I see here a good many engineers who are more or less interested in this subject of cements. I cannot altogether agree with the previous speakers as to the advisability of using a slow-setting cement, especially in works that we, as municipal engineers, have to deal with. I think for an ordinary municipal engineer, who is unable to spend a year or a good part of a year in conducting tests, that a quick-setting cement is safer than a slow-setting one. In the works with which I am connected we specify a strain of 125 pounds to the square inch after immersion for twenty-four hours. We had great difficulty in getting Portland cement up to that standard, but, after once attaining it, we have had less difficulty in maintaining it at that. I have tried the natural cements and have found them quite satisfactory for engine foundations, foundations of buildings, etc., but for any troublesome work, or work that when once done must be covered up to remain covered up, I prefer the quick-setting Portland; in fact, in some cases, I use Roman cement.

Mr. Butler—Do you mean a quick-setting as against a slow-setting Portland?

Mr. Chipman—Yes; slow-setting Portland for some of the work we had would not answer.

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DOES THE PASSING OF AN ACT OF PARLIAMENT ALWAYS DO JUSTICE?

By A. NIVEN, P.L.S.,
Haliburton.

In the paper which I am about to read I beg leave to submit for your consideration the question whether or not a certain Act of Parliament has done justice or otherwise to the land owners in the 4th concession of the township of Etobicoke, in the county of York.

In our Survey Act you will find a list of local Acts relating to surveys in Ontario, and to one of these I wish to direct your attention, viz., "An Act to establish the true location of a road allowance between the township of Etobicoke and the township of the Gore of Toronto." (22 Vic., c. 59, passed A.D. 1858.)

Having been engaged in making a survey of the front and rear angles of all the lots in this 4th concession of Etobicoke, the question naturally enough arose at that time whether or not there was any road allowance between the said townships and the Gore of Toronto, and if there was, which township was to contribute the land for such road?

I think I have a sufficiently clear recollection of all the facts connected with the case to lay them fairly and impartially before you, and having done so, with a few remarks of my own, I shall leave the subject to you for discussion as to whether or not justice has been done to the township of Etobicoke, and also to the townships of Vaughan and King.

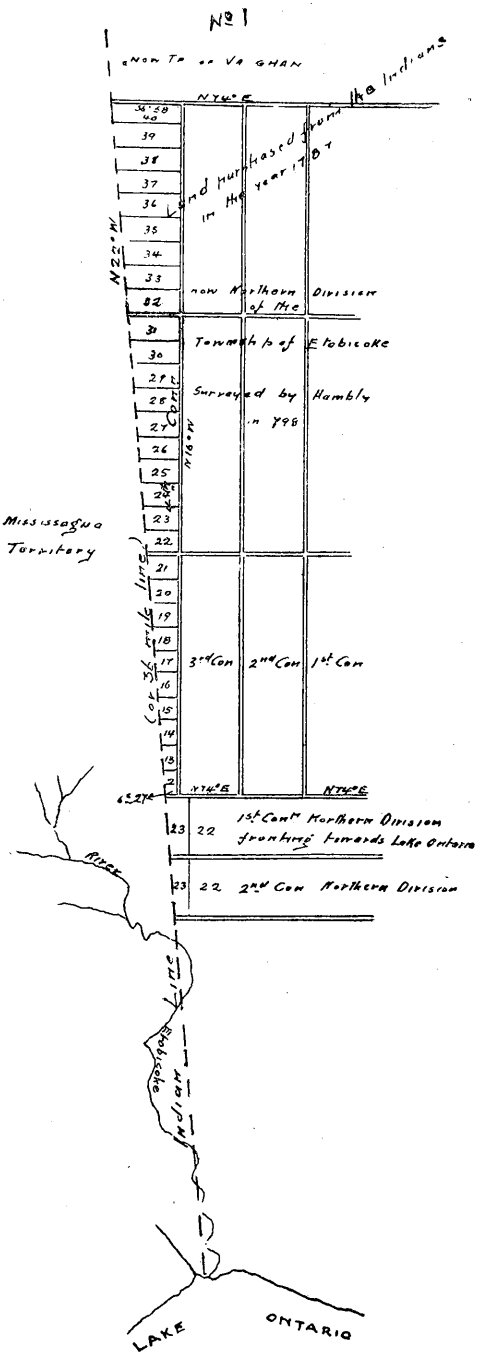
The division line between the township of Etobicoke and the township of the Gore of Toronto was originally a territorial line, sometimes called the "Indian Line,"—a line which commenced at the mouth of the River Etobicoke, and ran a course N. 22° W. for a distance of 36 miles, the land to the east of it being land recently purchased from the Indians. To the west of it the land was as yet Indian territory. I will give you the facts as they occurred in historical order, so that you may better comprehend the subject.

In the year 1798 instructions were issued to William Hambly, Deputy Surveyor, to subdivide the northern part of Etobicoke. It was a single front concession township. For as yet the double front system was not introduced. The width of the lots was to be 20 chains by a depth of 50 chains where it was possible to give that depth. The 4th concession, which abuts against the "Indian line," is a gore, its southernmost lot having a depth of only 6.27 chains, but

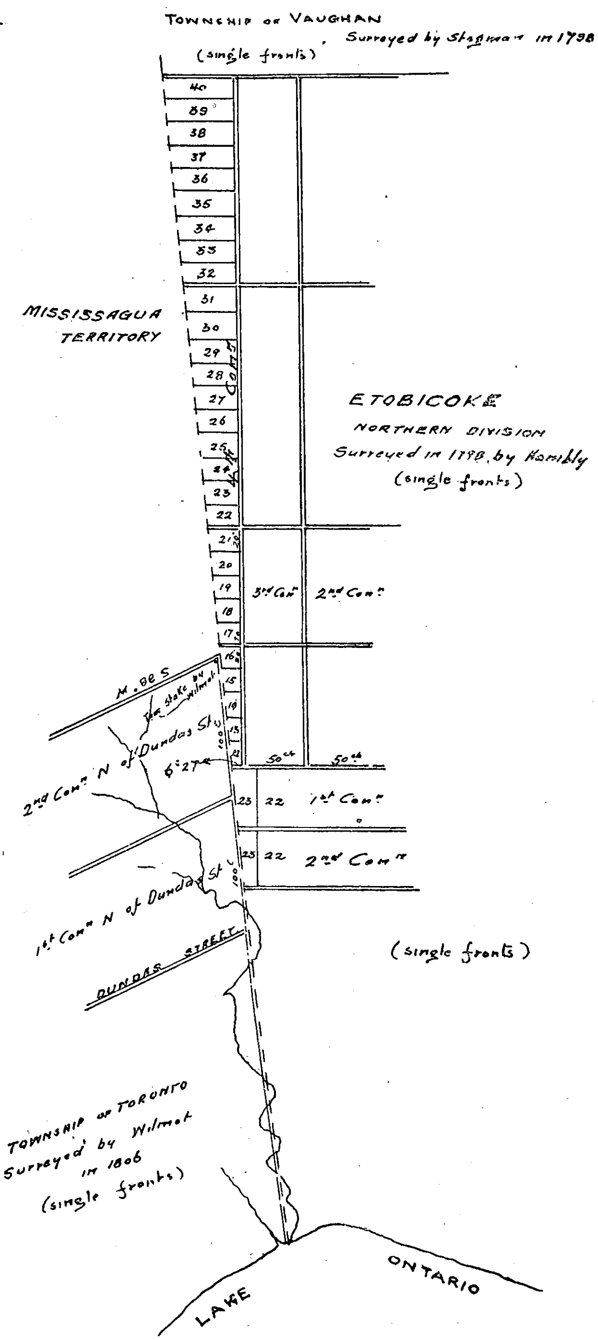
lengthening out therefrom as we go north until the last lot has a length of 56 chains 58 links. Hambly's "Field Notes" make no mention of his having left an allowance for road in the rear of this concession abutting on the Indian line. His plan, drawn by himself from his own field notes, shews only a *single line* in rear of this 4th concession, and no evidence could be procured from the oldest settler of any stake having ever been seen anywhere for a distance of $7\frac{1}{4}$ miles from lot 12 to lot 40 inclusive.

It has been said that in other parts of this plan of Hambly's there was only a *single line* drawn where it was well known that between two concessions there must of necessity have been a road, and that the same error or omission might have occurred when he drew the Indian line. But in those other places there were stakes marked, and sometimes trees in line of stakes marked with the letter R, which undoubtedly indicated a road allowance, and it was also a way of necessity, but in the rear of the 4th concession of Etobicoke, in the year 1798, there was no necessity for a road, as the land to the west was Indian territory.

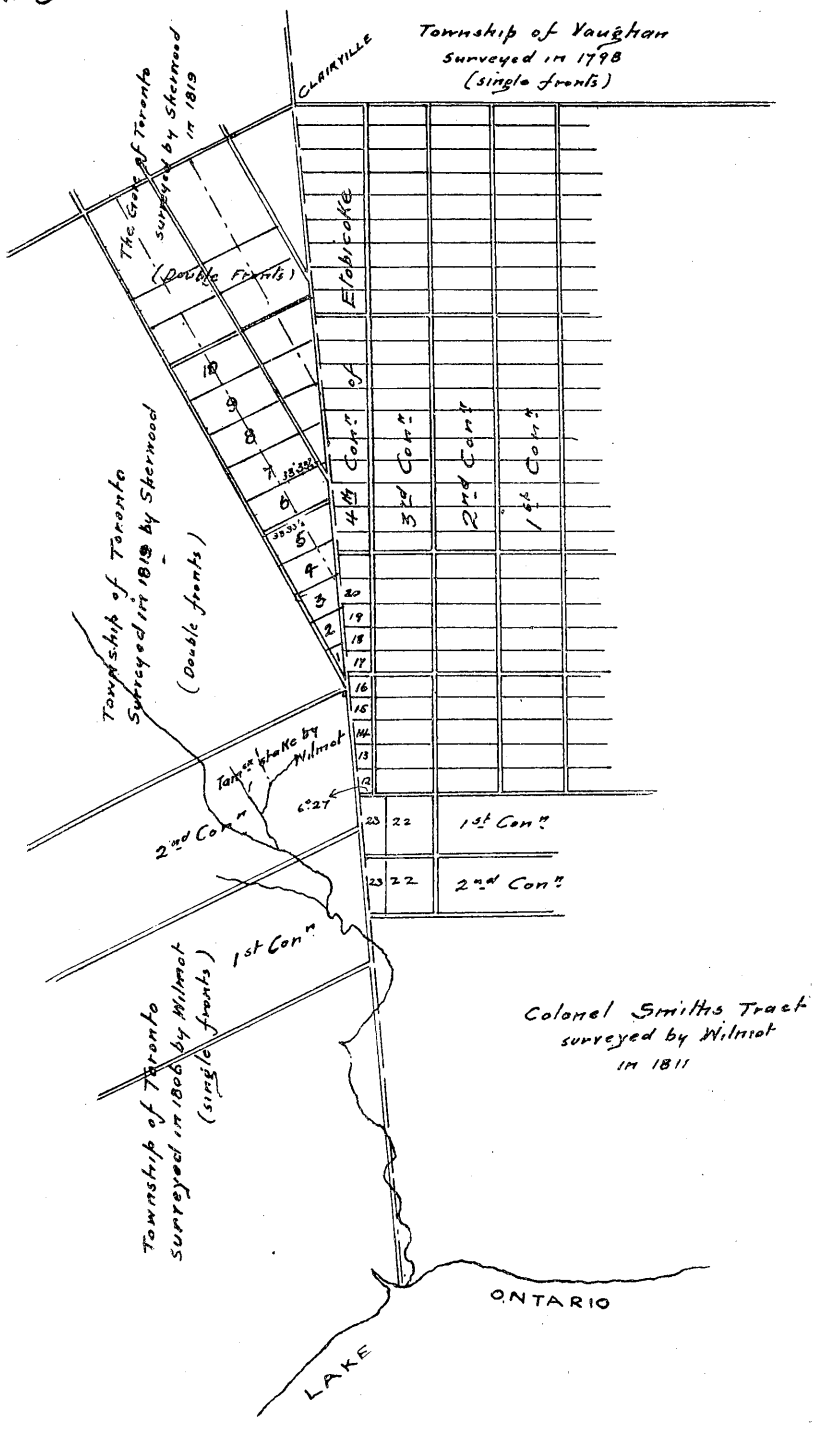
The first patent, which was issued on the 5th of August, 1799, was for lot 20, described as follows: Commencing in front of the 4th concession, at the south-east angle of the lot, then S. 74°



No. 2


Township of Vaughan
Surveyed by Stegman in 1798
(single fronts)
Mississagua Territory
Etobicoke
Northern Division
Surveyed in 1798, by Hambly
(single fronts)
3rd Con.
2nd Con.
1st Con.
2nd Con.
(single fronts)
2nd Con. N of Dundas St.
1st Con. N of Dundas St.
Dundas Street
Township of Toronto
Surveyed by Wilmot in 1806
(single fronts)
Lake Ontario

No 3


Township of Vaughan
surveyed in 1798
(single fronts)
CLAIRVILLE
The Gore of Toronto
surveyed by Sherwood in 1819
(Double Fronts)
Etobicoke
4th Con.
3rd Con.
2nd Con.
1st Con.
Township of Toronto
Surveyed in 1819 by Sherwood
(Double fronts)
Taken out of Lake by Wilmot
2nd Con.
1st Con.
Township of Toronto
surveyed in 1806 by Wilmot
(single fronts)
Colonel Smiths Tract
surveyed by Wilmot
in 1811
ONTARIO
LAKE

W. 20 chains more or less *to the westernmost boundary of the township*, then along said boundary line N. 22° W. 20 chains more or less to the limit between lots 20 and 21, then N. 74° E. to the front of the said concession, then S. 16° E. 20 chains more or less to the place of beginning. This lot was granted the year after Hambly's survey was made, when all matters connected with the survey were fresh in the Surveyor General's Department.

The next patent was issued on the 15th May, 1800, for lot 21, and described thus: Commencing at a post, etc., in front of the 4th concession, at the north-east angle of the lot, thence S. 74° W. 23 chains more or less *to the easternmost boundary of the Mississagua lands*, then along said boundary S. 22° E. 20 chains more or less to the limit between lots 20 and 21, etc., to the place of beginning.

Although the next patent issued was not for any lot in the 4th concession, I cannot refrain from here alluding to it, because it shows that no road allowance was left on the east side of the Indian line. The lots described were a little below the 4th concession, and may be included as having a bearing on the question now before you, viz., lots 23 in the 1st and 2nd concessions, Northern Division. (See diagram.) Commencing in front of the said concessions, at the south-east angle of each of the said broken lots, then N. 16° W. 50 chains more or less to the allowance for road in rear of the said concession, then S. 74° W. 15.00 chains more or less *to the western boundary of the Toronto purchase in 1787*, then along said boundary S. 22° E. to the allowance for road in front of the concession, etc., to the place of beginning. This was issued from the Surveyor General's office 11th August, 1807.

After this, and before the adjoining township of the Gore of Toronto was surveyed, a number of patents issued, viz., Lot 12, Con. 4, on 24th January, 1810; Lots 15, 17, 27 and 30 in the 4th concession, on 26th January, 1810; Lot 18, on the 25th January, 1810; Lot 24, on 30th November, 1816; and probably other lots. All these lots were described thus: Commencing in front of the concession, then S. 74° W. *more or less to the allowance for road in rear of the said concession.* You who are familiar with the books of the Land Granting Department are aware that often descriptions are most frequently prepared by filling bearings and distances in a printed blank form, and consequently the words, *more or less to the allowance for road in rear of the said concession* occur in every issue, and may really have no effect. It was this expression which caused the Crown Lands Department to obtain legal opinion as to its value in another district, and I quote it here as having a bearing on this question.

CROWN LANDS OFFICE, *11th May, 1846.*

To the Hon. W. H. Draper, Attorney General (West).

SIR,—In the original survey of the township of Moore no road allowance was made in the rear of lots fronting on the River St. Clair, owing to a road allowance having been erroneously drawn on an office copy of the plan of that township. Several of the lots, both in

the concession fronting on the St. Clair and in those in rear thereof, have been erroneously described for patent as being bounded by such road allowance. The descriptions framed from the surveyor's original plan are correct. I have therefore the honour to submit for your consideration the questions, Does the expression in the description for patent, *to the allowance for road*, create such road allowance, when it was not intended nor laid out in the original survey? If it does not, should the grantees of the lots so described surrender their letters patent in order to have the description corrected, or should the deeds issue in their favour for the supposed road allowance?

(Signed) T. B.

(REPLY.)

MONTREAL, *12th June, 1846.*

To the Hon. the Commissioner of Crown Lands.

SIR,—In reply to your letter of the 11th ult., I have the honour to state my opinion that the erroneous statement in a land patent of a lot being bounded by a road allowance, where there was none reserved in the original survey, or directed to be made by competent authority, will not in itself create an allowance for road. . . .

I have, etc.,

(Signed) W. H. DRAPER.

In the present case now before you an office copy of this part of the township of Etobicoke had been prepared, and it shewed a double line in the rear of the 4th concession, and from this office copy the later patents were framed, and erroneously so in describing lots therein to a road allowance in rear of the concession, when we have seen that by one survey on the ground, original field notes and original plan, and the *earliest patents* no road was made or intended to be made on the east side of the Indian line. The descriptions then in the later patents, on which considerable effort was made by the people of the Gore of Toronto to prove a road allowance, did not in reality sustain their contention.

In course of time the land to the west of the 36 mile line was purchased from the Indians. The exact date of this transaction is for the present unimportant, but we next observe that on the 14th of February, 1806, instructions were issued to Samuel Wilmot to survey a part of Toronto Township on the old system of single fronts. This survey was outside or to the west of the Indian line, and overlapped the 4th concession of Etobicoke for upwards of 80 chains. (See diagram No. 3.) The instructions were to the effect, You are hereby authorized and directed to survey the tract of land lately agreed to be purchased from the Mississagua Indians, etc.

Commencing at the mouth of the River Etobicoke, then run N. 22° W. 6 miles, being the western boundary of the Toronto purchase in 1787, which line you will follow, etc. Wilmot's field notes say he

ran the six miles up to a cypress swamp, where he *planted the necessary posts and references.* Then *from the purchase line*, or 3rd concession north of Dundas Street, *he turned on a course S. 38° W.* and planted a post *one chain west of the Indian line*, and said in his field notes "Road." Here then it is evident that no road had been made previously on the east side of the line in Etobicoke for a distance of six miles up from the Lake, but that Wilmot *made a road west of the line* in his township, and I would here again call your attention to the patents which were issued for Lots 23 in the 1st and 2nd concessions, Northern Division, adjoining on the south Lot 12 in the 4th concession, which described those lots as 15 chains more or less *to the western boundary of the Toronto purchase in 1787.* Wilmot we see now in the year 1806 makes a road allowance outside those lots on the west side of the Indian line. In his field notes, at this north-east corner of his township he *planted a stake one chain west of the Indian line* for the width of a road allowance. No one disputed its position, and although planted in the year 1806 the part of it which was driven into the swampy ground was apparently as sound in the fall of the year 1856 as when it was first planted. I pulled it up and examined it. The part above ground, however, was at the top decaying downwards. Possibly the foot of the same stake is there at this day.

The Highway Act, 50 Geo. 3, c. 1, was passed on 12th March, 1810. This Act was repealed long since excepting the 12th section of it. That section has always been retained, and imported into all the Consolidated and Revised Statutes and Municipal Manuals which have been framed. You will find it in Section 524 of the Municipal Act, or page 92 of our latest manual.

It confirmed all roads which in the first survey of a township had been laid out by surveyors under Government inspection to be public highways. If, then, Hambly, when surveying the northern part of Etobicoke had left a road in rear of this 4th concession, the Highway Act would have confirmed it, but as yet it does not appear that any such road was laid out or created, except the descriptions contained in the patents for Lots 12, 15, 17, 18, 27 and 30, which were issued before the Highway Act was passed. The Attorney General, the late Chief Justice Draper, gave it as his opinion that the words *to an allowance for road* did not in *itself* create a road. Well, if it did not, there was no collateral circumstance which helped to create a road in the 4th concession of Etobicoke, but every event to the contrary.

In order to put you in possession of all matters bearing on this subject, both for your present discussion and future consideration, I must call your attention to the case of "Field vs. Kemp," which occurred in the township of Niagara. You will find it in Vol. 3, Old Series U.C Reports, page 374.

At the present day we have the idea tolerably well planted in our minds that the work on the ground governs and overrides all plans, field notes and patents. Well that idea is correct now, and has been so since the Survey Act passed, 27th November, 1818, but it was not so before that date. Under the old Quebec Act land was surveyed in accordance with the language used in the patent. Division lines

between lots were not then run parallel to governing lines or proof lines, or at a certain angle with the concession, but each and every surveyor would run division lines by his compass needle, after allowing for annual variation, and 40 or 50 years ago the slur might often have been heard that you never could get any two surveyors to agree in running a line. And why? Because according to their difference of education and reading some surveyors would allow one minute, some two minutes, and some three minutes or more for annual variation, and then compasses were just as divergent as thermometers or watches—no two alike,—and as to chaining, chains would vary from one to five inches or more in length.

I am glad to say we do not hear those slurs at the present day. The lines have fallen to us in more intelligent times. There is, however, even yet room for improvement and unanimity. The statute of 1818 for the first time laid down the rule for running parallel to governing lines, and the Act of 1849 introduced standard measures.

Well, but to return to the case of "Field vs. Kemp." It was a question of where a side-road should be located between lots. The township of Niagara was surveyed and staked out with a side-road between every two lots. There was an odd number of lots in the township. The plan, however, through some mismanagement was drawn the reverse way, the plan shewing the side-roads to be between different lots from what the actual survey and the stakes on the ground shewed. Patents had been issued in accordance with the plan. Roads had been opened in accordance with the stakes. Which was to govern? At the present day we should no doubt adopt the stakes as the controlling feature in the matter, but the Court decided otherwise and held that the patents, having been issued before the passing of the Highway Act of 1810, must be considered as most correct.

To apply this ruling, then, to the 4th concession of Etobicoke, we should say that the earliest patents issued before the year 1810 established the fact that there was no road left or intended to be in the rear of that concession, and then, taking up Attorney General Draper's opinion that the language used in subsequent grants could not of itself create such a road, it must follow that there could not by any possibility be a road there.

Instructions were issued to Reuben Sherwood on the 25th of January, 1819, to commence at the north-east angle of the 2nd concession north of Dundas Street, in the township of Toronto, *where posts placed by Deputy Surveyor Wilmot, and the allowance for road with the necessary references, will be found to point out the allowance for road in rear of that concession on a course S. 38° W. between the townships of Toronto and Etobicoke* on a course N. 22° W. It is well known to this day, and was always known, where Wilmot's stakes were in the cypress swamp.

Sherwood was to commence at the stake planted by Wilmot in this swamp, four rods west of the Indian line. There is not the least doubt but what he did so. Sherwood's township was to be surveyed under the new system with double fronts, now for the first time in the

year 1819 come into operation. As a matter of necessity he would require a road allowance on and west of the Indian line. Wilmot had already in 1806 made a road for six miles in length in the old survey of Toronto township, and who could undertake to say but that it was evident from the instructions that Sherwood was to take it up from where Wilmot left it, and carry the road through his township on the west side of the Indian line. Yet the Municipality of the Gore of Toronto opposed the making of such road in their township, saying that it should be taken from the 4th concession of Etobicoke.

In the year 1851 Mr. David Gibson was appointed by the township of Etobicoke, and Mr. Stoughton Dennis by the township of the Gore of Toronto to enquire into this matter. Those gentlemen, as the result of their investigation, reported it as their opinion that there was no road in the rear of the 4th concession of Etobicoke, but could not agree whether or not there should be a road on the west side of the Indian line to come off the Gore of Toronto. A different decision might have been arrived at if instead of those gentlemen having been appointed separately by the townships they had been appointed jointly, and the expenses jointly paid by the townships. As it was, however, it was decided that no road allowance was to be taken off Etobicoke.

In the year 1856 instructions were issued to Mr. F. F. Passmore to survey and to plant stone monuments at the front and *at the rear* angles of all the lots in the 4th concession of Etobicoke. It was on this survey I was engaged, and to plant monuments at the rear angles of all the lots again brought up the whole question, going back as far as the Indian purchase.

The report of this survey, the evidence taken of old settlers, the documents examined, with other matters can be seen amongst the records of the Crown Lands Department. The Township Council of the Gore of Toronto entered a protest against this survey and report, but what right they had to interfere with any matter on the east side of the Indian line I never could understand. The report was that there was no road on the rear of the 4th concession of Etobicoke, and the stone monuments were planted for the rear angles of the lots *on* the Indian line. This was no more than Mr. Gibson and Mr. Dennis had concurred in, but the Gore of Toronto would not have it so, and insisted upon having a road taken off Etobicoke.

Now comes the question of right and wrong. The Gore of Toronto applied to the Legislature for an Act to take a road off Etobicoke. Members from Lower Canada were canvassed and lobbied. De-la-Haye, the French master of Upper Canada College, owned and lived on Lot 15 in the 7th concession of the Gore of Toronto, and the Lower House, by a large majority, declared in favour of passing an Act to take the road off Etobicoke, but in the Upper House the Bill was passed by a bare majority. The Deputy Reeve of Etobicoke told me the majority was only *one*. The Commissioner of Crown Lands, Mr. Sicotte, in the Upper House said this last survey of 1856 was correct. Mr. Vankoughnet (Chancellor) said the courts of law was the proper place to settle this question. Many other eminent members

spoke also to the same effect, but the Bill passed with a majority of *one* or at the utmost *two*.

The Governor General was then petitioned to withhold his assent to this Bill. His Excellency referred the matter to the Commissioner of Crown Lands for his opinion. Unfortunately for Etobicoke the Commissioner was not at his office that day, and the following day, with some slight hesitation, assent was given, and the Bill passed into law.

You will see it amongst the list of local private Acts in our Survey Act. But the mischief did not stop here, for the townships further north petitioned to have the road extended to King and Albion. Passed 34 Vic., c. 60, A.D. 1870.

I think that the passing of the Act of Parliament in question certainly did an injustice to the township of Etobicoke.

DISCUSSION.

Mr. Kirkpatrick—Mr. Niven alluded to the Township of Moore, the road allowance in rear of the front concession there. Now, it is only a very few years since there was a petition to have that road allowance established. The trouble is going on yet, although Mr. Niven says in 1846 it was decided by the late Chief Justice Draper that there was no road there. It is just as Mr. Niven says, there is a road allowance on the office plan and a good many of the lots run back to this road allowance. A good deal of trouble devolved upon me in hunting up this case. They asked that the road allowance be laid out. There was no road allowance in the original survey; there was no mention of a road allowance in any of the lines that struck this line, but there was the road allowance on the plan, as Chief Justice Armour would call it, a purchase plan, and in nearly every case the lots ran back to the road allowance. The municipality asked to have a surveyor sent to establish the road allowance. Mr. Coad established the line, planted the posts to establish the line, and then there was a good deal of ill-feeling among the council. They said they did not want the line established, they wanted the road allowance established; but it has never been established, and my belief is that if they want a road allowance they will buy it from the property owners on either side.

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

HINTS TO SURVEYORS ABOUT TO SURVEY A TOWNSHIP FOR THE ONTARIO GOVERNMENT.

By W. R. BURKE, P.L.S.,
Ingersoll, Ont.

Before commencing this paper I might mention that the mode of making a survey, which I intend to explain, is merely written as a help for those who have not had any previous experience in this kind of work.

I know that there are many members of this Association who have had much more experience than I have, and if they wished could write a paper on this subject of much more interest and value than this will be.

However, having been asked to write something, I am anxious to do what little I can to aid the Association in making their meeting as interesting as possible.

We will suppose that instructions have been received to survey a township of six miles square, somewhere in the Algoma or Nipissing district, and the work is to be done during the summer months, and that you intend to survey it with one party.

These surveys are made under contract, that is, you are paid so much per acre for the faithful performance of the work; from this sum allowed, every expense connected with the work has to be paid, and also you are to furnish the Department with a plan and field notes, etc., so it will be necessary to run the survey as economically as you can.

The party may consist of the surveyor, his assistant, a cook, and five axemen, one of the latter to be used as head chainman. It is well to get a good assistant with you, one who understands something of surveying, and a person who is willing to work and assist you in every way that he can. A good cook is also very essential, and one should be very careful to try to secure a man that is capable and willing to make things in his line as comfortable as he can for the party.

In selecting the other men it will also require some care and judgment in order to secure the best you can. A poor cook with a party of lazy men will give no end of trouble and annoyance to the surveyor, and it may end in your being obliged to discharge part of the staff and get in others, which causes great delay in the work and loss to yourself.

If it be possible, when engaging men, hire them to remain until the work is completed, at so much per day. Explain to them fully that if they wish to come they must engage in this way. That should they work a little while and wish to leave, that you will not pay them at all, unless in the case of sickness or accidents, but when the survey is completed they will be paid in full. It often happens that men, after working a short time, will get dissatisfied without any apparent cause and wish to leave you; this will cause delay and annoyance, as everyone is aware that it is very difficult at times to replace men when one is far in the woods. It is frequently the case that one disagreeable and cranky individual will create discord and dissatisfaction among the whole of the men, and with such a person it is necessary to be firm and severe.

It might be well for those who are inexperienced to mention the complete outfit necessary. For a survey and party such as I have mentioned I would take the following:

Five tents, all moderately small and light, made of drill, one for yourself and assistant, one for the cook and another man, one to hold four men, one for provisions, etc., at camp, and another for the storage of the bulk of your supplies at a point perhaps where you enter the township; eight pairs of double blankets; three or four rubber sheets are very comfortable and useful to take along; one light tarpaulin; eight leather packing straps, with head pieces to rest on head when carrying; six axes, weighing about $3\frac{1}{4}$ pounds each; one small axe with leather cover for head chainman; two brush hooks; one small grinding-stone; some small whetstones; one ball of strong twine; ten common table knives; ten common table forks; one large carving-knife; one large iron fork; one large iron spoon; ten small tin spoons; one frying-pan, small size; one dozen tin plates; one iron shovel, called an Irish shovel, without handle (handle can be made at each camping place); one tin dipper; a scribe, or marking iron, for marking posts with; five or six pounds of pitch for canoes; two tin pails, holding about three quarts each; two tin pans to hold bread, etc., when cut up; two wash dishes, one dozen tin tea dishes; one large tin bake dish; three bake kettles, made of heavy tin, made to fit one inside the other. If you take a reflector with you, which is a very convenient article, one or two bake kettles would do. Three oval-shaped tin kettles, made to fit one inside the other, for boiling pork, making tea in, etc., etc.; towelling; some extra cotton bags; one dozen axe handles; red flannel for chain pins; two steel band chains; one compass, with Vernier plate for laying off variation of needle.

One transit (a light one is preferable); a solar compass, if you have one; one micrometer and discs for the survey of lakes, etc.; about one dozen pairs of shoe packs or beef-skin moccasins, different sizes without legs.

Regarding the provisions required, it will be necessary to calculate about how long you are likely to be out. You will be enabled to see how many miles are required to be run when the instructions are received, allowing a little time for the survey of the lakes, bad

weather, etc., also time getting into and out from the work. It will not be difficult then to form some idea of how much work can be done each day, and then calculate about how long it will take you to finish the contract.

Allowing about three-quarters of a pound of pork and about one and three quarter lbs. of flour to each man per day, I think this will be sufficient.

The list of provisions needed to live well, provided you have a good cook, would be as follows :

Flour ; bacon (long, clear bacon done up in sacks, about fifty lbs. in each sack) ; dried apples (take plenty, say three bushels) ; beans ; currants ; raisins ; rice ; sugar ; tea ; fine salt ; pepper ; mustard ; yeast cakes ; some pain killer, and Fowler's extract of wild strawberry to be used in case of sickness, such as dysentery, etc.

If you are going into the survey by water, or partly by water and partly by portages, you will require a few bark canoes, perhaps, for the party and outfit mentioned, two moderately large canoes and two very small ones would do nicely.

It is always well to bring a small light canoe or two along, as you will perhaps require to carry them here and there throughout the work, in order to survey lakes, etc.

Try to purchase your provisions, etc., at some place as near your work as possible. The party you deal with will always try to help you to secure the men, canoes, and everything that will be necessary.

It is not a good policy to take men from a distance, if you can avoid it ; you are obliged as a rule to pay their fares going and coming, etc., which adds to the expense.

The only person required to accompany you the whole distance is your assistant.

I have now given a tabulated list of everything that is absolutely necessary to mention in this short paper. Upon some of these articles I might make a few remarks.

Regarding the tents, some might prefer larger ones in order to accomodate more sleepers, but I think a number of small light tents are preferable, as the men are more comfortable ; and again, the light tents are more easily folded and conveyed from place to place.

The tarpaulin mentioned is very necessary, when travelling with your outfit, etc., and perhaps having to leave your supplies out all night deposited here and there on some portage. Should a heavy rain come on, the tarpaulin and rubber sheets come in very useful indeed. I have found that they add greatly to one's comfort in the camp at night.

I said you should take two band chains, that in case one breaks, of course a chain can be mended if broken, but if you have not all the necessary appliances along with you, it is not an easy matter to mend it properly, but with a little care there is very little danger of one being broken. Band chains are much better to work with than the common iron link chains, they always keep their proper length, are light and easily held up, and drawn tightly over logs, rocks, etc.,

and they do not catch in twigs and sticks nearly so readily as the other chains do.

It is well to use a light mountain transit with extension tripod, if you can. A light instrument of good make will do just as good work as a heavier one; and in running a line over perhaps a rough and rocky country, and carrying it day after day, you will find the benefit of a light instrument, and when one is moving camp, carrying the light instrument is not a difficult matter, packed in a light box and furnished with straps for packing. The extension tripod when closed being only three feet long, it can be packed away with your blanket and tent. So the surveyor can carry his instrument, tripod, small tent, blanket, clothes, etc., while the assistant can carry his blanket, clothes, and something more of the outfit.

In subdividing a township, if one has a good solar compass, it will not be necessary to use the transit very much, if at all, excepting in the triangulation of a lake, or should you experience cloudy weather and be unable to see the sun for some time, then you might be obliged to resort to the transit. In my work I have found the solar compass a very convenient instrument indeed. Surveys can be more rapidly made with it than with the transit, or perhaps with the ordinary needle instrument, there being no time consumed in waiting for the needle to settle, or in avoiding the errors of local attraction.

The most favorable time to use the solar is, of course, in the summer, when the days are long and more generally fair. It is not best to take the sun at morning and evening when it is within half an hour of the horizon, nor at noon, for about the same interval before and after it passes the meridian.

When the sun is obscured the line can be run by the needle alone, it being always kept at o on the arc, and thus indicating the direction of the true meridian. The sun must be regarded as the most reliable guide, and should, if possible, be taken at every station. Some may think it difficult to work in a thick bush with this instrument, on account of the sun being shut out by the branches and leaves of trees overhead, but this is not the case; one will have little trouble in getting the sun's image to appear on the silver plate; it might be necessary to move a little forward or backwards along the line. It is necessary to turn off the latitude and declination upon their respective arcs with care. The latitude can be taken each day with the solar at noon. If the sun is visible, it is little trouble and can be taken during the dinner or lunch hour.

Be sure and take a nautical almanac along with you.

When surveying lakes with a Rochon micrometer use a ten link base wherever possible. I find with my instrument that all sights taken at about twenty chains away and under, produce the best results. Never measure a distance when the sun is shining in your face; you cannot see the discs properly; try to work with the sun at your back. A dull or moderately cloudy day I find preferable for making a survey with the micrometer.

As to the shoepacks or moccasins I mention, it is wise to take them along. Men as a rule never come into the woods with proper

footwear. After a little time, they will likely complain, and perhaps find it difficult to get along with the boots or shoes they may have; so you can sell them a pair of shoe packs, which are always comfortable in the woods. Should you not use all that are taken in, the party you purchased from will allow you to return those that have not been used.

Before leaving on your trip into the township it may be necessary to provide yourself with some bread, as the cook cannot make bread travelling in this way, as the stoppages will likely be very short.

On arrival at your work for the first day it is wise to take things quietly. Get everything settled around camp, provisions put carefully in one tent, axes helved and ground. If you are camped near the boundary of your township, which, perhaps, has been run before, get some of it opened out again. Pick out one of the men to act as head chainman, get him to go along with the assistant, have them chain a half-mile, and watch them go over the operation again, until you are satisfied that they can chain correctly. This is desirable at the commencement of the work; and the men should be instructed fully —if a pin is lost not to guess, but have them chain from the last tally; that the posts are to be well made, nicely marked, and if the scribe should not mark well, to cut the figures or letters over again with a knife; and when a post cannot be driven into the ground carry stones and place around it.

Before commencing to run a line yourself, if using a transit or solar compass, select the most active and intelligent man of the party as picketman. He should be able to choose the points for stations in the production of the line, and for a transit line to make pickets straight and of a uniform size. With a little practice he will soon get into this if he is willing and anxious to learn.

In running a line with the solar compass it is not necessary to be so particular about straight and uniform pickets.

Instruct the men as to the blazing of the trees; be particular and see that they do it. If they miss trees frequently call some of them back, and they will soon learn that it has to be done.

Tell the cook that each morning during breakfast time he has to prepare the dinner for the party in the woods during the day. Get a clean cotton bag, into which put some bread, bacon, and tea, with tin cups and a small tin pail in lieu of a tea pot. It will be necessary to put a cloth or something around the pail, as it will soon become so black, being held over the fire, as to discolour everything inside the bag. The tea should be put in a little bag, and the pork also. The head chainman carries this with a packing strap on his back. This is a better way, and more comfortable, than having each man carry his own lunch.

When moving camp start as early in the morning as possible. See that each person takes a good load. Go around among the men and see that none of them are trying to get away with as light a pack as they can. Take all you can the first trip, and when arriving at the new camping place get one of the men to help the cook in getting things arranged; the others may be putting up their tents. Have an

early dinner, and get out to work again on the line. There may be some things left at the former camping place; take one of the men from the party, the best suited for packing, and keep him at this work until everything necessary is brought along, and enough provisions to last several days. A tent with the main supply of provisions is left at your first camping place in the township, and when anything is wanted you send this man for it. Sometimes, if he has far to go, and you are in a hurry for supplies, let the head chainman and assistant give him a helping hand. In this way you will have always three men on the line, and can keep the work going on continually. It will not be necessary to stop work and allow the whole party to go portaging.

The chaining for a man is very light work, as there are so few posts on these surveys to make. Tell the chainman that when he is up to the choppers and has nothing else to do, to take his axe and turn in and help on the line, going back after a little to chain up again. Start to work early in the morning, and get back to camp in good time in the evening—this is the best plan.

Instruct your men to grind their axes in the evenings; that you wish no time wasted in the morning at this work.

Move camp frequently, so as not to have too much walking to and from the work.

It is advisable, if you can, to have a few good Indians, or half-breeds, in your party, as they are, as a rule, good packers, and will keep the canoes in good order for you.

Have a large note-book with you, properly ruled and settled beforehand with an index map of the township. Enter the field notes taken during the day each evening. See that everything is entered up properly, and mark off each day's work on the diagram of the township kept for that purpose.

If one is surveying a township with two parties, of course more assistants will be necessary, and things arranged a little differently.

I might mention that it is wise to take some fly oil with you in a can, and some small bottles, so as to give each man a bottle to carry with him, as the flies and mosquitos are always troublesome in the summer.

Order, regularity, patience, and perseverance, good in all pursuits, are especially necessary for a surveyor. His work is often trying, and requires much foresight and sagacity. He should discourage all profanity and intemperance. The surveyor should set an example himself of upright conduct, and will find this often the best means of influencing those under his charge to a right and faithful performance of their several duties.

I offer the foregoing remarks with diffidence, but trust they may not be unacceptable to my professional brethren, and while I ask indulgence for defects, my paper will, I trust, show a sincere interest in the success and advancement of our profession.

DISCUSSION.

Mr. Butler—There is one thing: be sure and take some yeast cake along. It one time cost me about $20 to find that you could not grow yeast cake spontaneously in the bush.

The President—I would like to ask if any gentleman has ever tried the ordinary fly powder. I have tried it, but I used it by burning it. In the evenings, when surveyors generally look after their field notes, I found the burning of that powder in the tent answered very well, and is far preferable to anointing yourself with oil. It is known as insect powder.

Mr. Ellis—In reference to the amount of provisions to be allowed, I found in eighteen months that my men averaged two pounds per day of all kinds of provisions.

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COMPASS LINES.

By JOHN McAREE, D.T.S., P.L.S.,
Toronto.

I was down for a paper on this subject last year, but from some cause it was not forthcoming; and, upon further reflection, I was not altogether sorry, and was hoping that the secretary had forgotten it—the subject being so trite, and not of much interest to the majority of the rising generation of our surveyors and engineers, while the elder ones already know all about it. On receiving the programme, however, I found that the paper was down for this year again, so I must take hold of it and do the best I can.

As a surveying instrument, the compass has quite fallen into the background in our Province; the transit having superseded it in city, town and most farm surveying; and, even in the survey of our new townships it occupies, as a rule, quite a subordinate position—being employed only as an auxiliary to the transit, or solar compass.

And yet, while there remains in our Province so much bush country to be surveyed, where lines have to be run through heavy timber, considerations of economy will cause the compass still to be used—and it is pretty safe to say that, so long as there are lines to be run in the bush, there will be a compass to run them. The great price of the solar compass, and the heavy customs duty, is a great drawback to its general introduction.

The original surveys in the older townships of Ontario—in what might be called agricultural Ontario—were made with the compass, chiefly; and most of the division lines between the lots, as the land became settled upon, were run by the same instrument; and for the various errors and the general lack of precision of these primitive surveys, the compass has been too generally held responsible. Now, the art of instrument-making has received great development in recent years, and the compass itself has received improvements since those early days.. Yet, with due allowance for all this, the greater share of the errors in the surveys in question is, in my humble judgment, to be attributed to the humble qualifications of the surveyors of those times, and to careless chaining—including the uncertain and varying length of the chain—coupled with the inexpensive rate at which the work had to be done; involving, as it did, a sort of hunter-and-trapper mode of life for the surveyor and his party. While, as an aggravation of the evil, and giving it its full effect, was the imperfect method of keeping field-notes and the omissions from plans—through which important, and even vital, information relating to a

given survey was lost for want of being recorded—bequeathing a legacy of contention to the succeeding generation ; as they might dispute over the interpretation of the meagre records, and find out, as best they might, what was done or what not done in the original survey, or intended to have been done or not.

With a good compass, such as is made at the present day, and the old link-chain, with the magnetic declination ascertained and the chain tested from time to time, the older portions of Ontario—being for the most part a comparatively level country, underlaid by Silurian rocks and free from any notable amount of local attraction—could have been laid out with a degree of accuracy sufficient for all practical requirements, and that would have left a minimum of work for lawyers and courts. I would be very sorry, indeed, to cast a slur upon the memory of these brave and hardy pioneers in our profession, remembering the many and great disadvantages under which they laboured ; and persuaded, as I am, that the majority of them did the best they could, as we are trying to do now in our generation, under our more favourable circumstances. It is easy to indulge in disparaging criticism from the vantage ground of our increased knowledge, derived from the experience of our predecessors ; but we, in turn, may not appear to any better advantage when compared with those who shall come after us. Again, if the settlers on the township lots had kept their boundaries and corners from being lost, the worse effects of the errors in the original surveys would have been avoided ; it was when re-surveys became necessary that trouble began, so that the farmers themselves are largely to blame for the litigation and the attendant evils that have ensued.

By the time the advancing surveys had reached the more rocky portions of our province, the use of the theodolite or transit had become general, and was used to run the principal lines, at least, of a new township—the compass being reserved for cutting up the blocks that were laid out by the superior instrument ; and this is the practice at the present time. A compass line is checked every mile or two by closing on the transit work.

The needle works fairly well over the Laurentian rocks, generally —except near bodies of magnetic iron oxide ; but in the Huronian the compass is very little use ; nor in the trap region, west and southwest of Thunder Bay, Lake Superior. It will, no doubt, be employed in the Silurian and Devonian areas around James' Bay when that region comes to be opened up.

Those who have never had much practice with the compass are apt unduly to despise it, and think there is nothing to be learned about it ; they are ignorant of the fact that it has adjustments that are worth while attending to, and they treat it as being altogether beneath the notice of the educated surveyor of these days ; whereas there is great scope for the exercise of much skill and care in its use, and a longer apprenticeship is required to become an expert with it than with the ordinary transit. I would not employ it in city, town, or even in farm, surveying—except in the back townships, where land is not as yet very valuable—although, as an old P.L.S. once observed

to me, "a good compass line is hard to beat." But on the survey of new townships, and on much topographical work, it is the instrument for making a rapid, and therefore inexpensive, survey. For working in the open, as traversing on the ice or along an open beach, the transit is more rapid besides being more accurate; but along our northern lakes and streams the brush comes down to the water's edge, leaving no beach at all, and here the compass and the micrometer must be the surveyor's outfit.

"Always have a backsight" is the great maxim in using the compass. This does not imply that you are always to have a back *picket:* a boulder, a bunch of grass, a peculiar bough, a point of rock—on or near the line—will be utilized for such a purpose by the practised compass-man. Ordinarily the blazed trees along the line, or the opening made for the line through the brush, where there are no large trees, will be all that is needed to give a backsight that will furnish a check upon the needle. In running lines in the survey of a new township the brush and smaller trees should be cleared away, leaving only the larger centre trees standing, which will then act as pickets to show the line. Where the centre trees are far apart, or where the brushwood is very dense, it will be economy to keep pickets set up as a guide to the axemen; especially until they become used to the work, and able to keep the line. The worst case is where there is local attraction and the surface is broken with heavy timber, so that the line cannot be seen for any distance back; all that can be done is to be content with short sights, and work along carefully until better ground is reached.

In surveying with the compass it is generally necessary to know the magnetic declination, for which course resort must, of course, be had to astronomical observation when working away from lines of known azimuth; and the more frequent these observations, the better —since the declination changes from point to point. In township surveys there is always a line to start from, viz., the boundary, or else some of the interior lines run by the transit.

In a region where there is local attraction, as in our own northern territory, it is sometimes troublesome to obtain the true declination. In this case the line should be followed for some distance, taking sights and readings at short intervals, the needle all the while showing the same bearing, which may then be adopted with reasonable confidence as the true magnetic bearing free from the effect of local attraction. The bearing of a line should never be adopted from a single "sight," nor from the readings of another compass, as there will generally be a difference in the bearing of a line when taken with different instruments: the bearing for a given line that is to be run should be taken by the compass that is to run it.

The great drawback in the employment of the compass is, of course, the occurrence of local attraction; and the surveyor must be on the look-out for it, not only where the rock is exposed and the ground high, but in other places as well. He may meet it in a swamp, or in crossing a belt of sand or sandy soil. The only way to be safe against its surprises is to keep up the backsights all the time.

Besides the ordinary local attraction arising from substances in the soil, there are other causes of it which must be guarded against. For instance, the operator must take care that no articles of iron or steel about his person are allowed to come close to the needle. The writer on one occasion inadvertently replaced one of the supports of the brass plate that raises the needle off the pivot by a piece of a common pin, which turned out to be galvanized iron; the result being that the needle was deflected more than a degree, and the mile of line run had to be re-surveyed. Another surveyor traced a disturbance of the needle to a steel buckle in his hat-band, that was brought down near the needle while he was taking a reading. And Mr. Abrey, P.L.S., informs me that the ordinary ebonite hand magnifier will attract the needle. Sometimes the glass cover becomes electrified by friction against the clothing when carrying the compass upon the arm, while under a hot sun the magnetic intensity is greatly weakened. In these cases the glass should be "discharged" by cooling off with water, bringing the wet fingers down upon it, etc.

Sometimes, from some cause that is not apparent, the needle behaves badly, vibrating violently about its axis, but otherwise seeming to be fixed to the compass box; this is probably due in some way to the electric condition of the inside of the glass. At other times again the needle will be sluggish and inert, as if it had lost its directive force, experiencing what might be called a sulky fit. At such times the needle would better repeatedly be raised off its pivot and lowered again, while the moistened fingers are rubbed over the glass and the Jacob-staff tapped with the hand until the needle comes to itself again.

When running by the needle alone without backsights the presence of local attraction is detected by the strange behaviour of the needle, which then shows a peculiar agitation, coming to rest in a reluctant, hesitating manner, and resuming its vibrations on the slightest provocation. When the instrument is set up at a station and the sights put in line, the needle, when let down, oscillates about its mean position, yet settles down to it with a promptitude and decisiveness that is generally unmistakeable when it is in its best mood and free from any alien force. A single reading should never be relied upon however. The needle should be disturbed from its position of rest and allowed to settle again several times before the reading is finally accepted.

Care must be taken when the needle is working that it is quite disengaged from the lifter, and that there is no dirt on the inside of the glass or around the circle anywhere, which might cause the needle to stick. It may be necessary occasionally to remove the glass cover and wipe its under surface, as well as the graduated circle, and even the needle itself. When the instrument is not in use the brass cap should be kept on.

In reading the eye should be vertically over the end of the needle to avoid parallax and the effect of refraction by the glass. A magnifying glass may be used to aid the eye. The glass cover should have its faces parallel, and the glass smooth and clean, at least around the circumference, and be smooth and clean and free from flaws.

The needle should be an "edge bar," sharp at both ends to permit of fine adjustment, and no shorter than is necessary for its just swinging clear of the face of the compass box. When level its ends should project the slightest amount above the circle, the graduation marks of which should extend down the face, as in the Gurley instruments.

The adjustments of the compass must not be neglected. It is the general practice, I believe, to send it to the instrument maker's before going out on a lengthened trip, to have the needle recharged and the instrument overhauled generally, and give the adjustments no further attention. But the surveyor should test the adjustments of the needle himself, and see to it that the ends of the needle and the pivot on which it turns are precisely in line at the same time that the pivot is at the centre of the graduated circle. The test for this is to reverse the instrument in each of two positions at right angles to each other, and observe whether the difference of the readings of the two ends of the needle in each of the four positions is exactly 180°; if this is the case the adjustment is all right and there is no eccentricity. It would be worth while for any one to submit his compass to this test if he has not done so already.

The plane of the sights should pass through a diameter of the graduated circle, and should be a vertical plane when the instrument is level. Sometimes the compass plate becomes twisted, so that the lines of the slits of the two sights lose their parallelism, which then will give differing alignments as different portions of these slits are used. Error from this cause being more certain to occur where sights have to be taken up and down hill.

The ball and socket joint of the Jacob-staff should be kept smooth and clean and properly oiled, so as to give a steady, even motion without any jerking, and the ledge or projection on which the socket of the compass rests, and on which the whole instrument revolves, should be lubricated and kept smooth and clean so that the needle may be set with as great precision as possible.

The instrument should have a Vernier reading to single minutes.

About the size of the instrument there appears to be a difference of opinion. The writer has used a six-inch needle and considers this size of instrument the best, as there is a greater distance between the sights and the divisions of the circle are wider; on the other hand the instrument is heavier to carry, which is a consideration sometimes.

Among smaller compasses the prismatic is the best, being the most portable and the most precise; readings can be taken to half a degree or even less, and the "sight" and the reading of the circle are taken simultaneously.

DISCUSSION.

The President—I think Mr. McAree's paper is of great practical value. There is no doubt about it that although the compass is going somewhat into disuse there is still a good field for the compass in many parts of Ontario.

Mr. Gibson—I have often used the compass in running a certain class of lines, as there are certain degrees of accuracy required in

different classes of surveys. Where it is only an approximate survey, and it is not absolutely necessary to run the line exactly, you can accomplish the work with the compass with a great deal less exertion than in any other way; but of course when you come down to fine work the compass is not the thing.

Mr. Abrey—I would like to ask Mr. McAree if, in using the microscope, he ever noticed that it had the effect of attracting the needle to one side. My experience is that you never get one of these microscopes near the compass without moving the needle somewhat. In reference to taking back sights, on account of local attraction, I suppose he has observed in running a line two or three miles long that there is a very gradual declination, perhaps too small to take up with a back sight; he has perhaps found that he has made a bend in it of perhaps a degree, but it has been very gradual all the way through. In surveying in one place in Manitoulin most of the lines were run with the transit, one being run with the compass, but after I got through I was a long way out, and in going over it with the transit I found it was just a gradual bow all the way through. I presume that is one of the reasons why our streets, Dundas and some of the roads out west, have taken a bow; and I presume it was for the same reason that it was too small to observe by the ordinary way of taking back sights.

The President—In your observations, does the curve you speak of move in the same direction?

Mr. Abrey—I think Queen Street does; and I know in the County of Halton the lines there all take a bow in one direction, and that bow is of course too small to observe by taking back sights.

Mr. Stewart—How do you account for that swing?

Mr. Abrey—The lines are run that way, and these lines are run in several days; it has taken more than one day to run them. In one case in particular in Manitoulin I ran two or three chains out one day by the time I got the line two or three miles long, and it was simply owing to the gradual change.

Mr. Ellis—Some years ago I ran a line for a piece of railway on the north shore of Lake Huron—a trial line. We started on a very high rock and then went down in the valley about five miles. There was no local attraction whatever, and we got back sights every time; and on going back about two days afterwards, when we got up on the top of the hill, we could see the chopping completely through the bush, and it was just as Mr. Abrey said, there was a complete swing on the whole line from one end to the other. It was not very much, only about one and a-half degrees on the whole length of the line, but you could distinctly see it looking from the hill, though in going along you could not notice it anywhere. It was a gradual drawing towards the end on the same bearing.

Mr. Gibson—In regard to this solar compass work, there is a variation, of course, from about 8 o'clock in the morning to about 2 in the afternoon from five to fifteen minutes, and the old compasses

always have vernier plates to correct this. In making your survey you start at 8 o'clock with the needle due north, the proper bearing would be laid off on the plates, and then the plate has to be moved gradually between 8 and 2. At 2 o'clock we are at the extreme variation of the needle, and from that time the needle begins to retrace its course toward 8 o'clock in the morning. If you don't make allowance for that change you will have a beautiful scallop. An old surveyor once said, "Any fellow can run with a transit, but it takes a pretty smart man to run with the compass."

Mr. Ellis—I think it took us two and a-half days to run this line that I was speaking of, and my impression of the way in which the swing was caused was that, in making our sights through the slits, it was our personal error,—you are inclined to put your picket to one side or the other.

Mr. Gibson—I always make a note of what time of day I take my bearings. But of course we don't propose at the present time to use the needle for anything like fine work. It is used, I understand, away in Muskoka by some surveyors who want to make quick work.

The President—I was going to ask what kind of sights they used on their compasses?

Mr. Abrey—The sights I was using at the time I spoke of were ordinary slit sights, placed about 16 inches apart. It could not be accounted for by what Mr. Ellis says in my case, about making that bow, and neither was it accounted for by doing it at different times of the day, because these lines were run over considerable periods.

The President—Probably one side of the slit was brighter than the other.

Mr. Abrey—It could not possibly be from that.

Mr. Gibson—I have always been trained to use the hair slits.

Mr. Ellis—The compass I am speaking about was one of these $5\frac{1}{2}$-inch face instruments with very large surface. It was a very difficult instrument to use.

Mr. Paterson—I would like to mention a case I had once in running a long line, about eighty miles. This line was not a straight line, and when we came to plot the line we found there was a variation of some six or seven degrees. I found that this had been gradually accumulating, so that it brings out the idea of the bow in the same way as the other cases spoken of. I often wondered how it was, and I asked friends and they never could explain it. The line was east and west, and I suppose if we had gone on farther it would have increased very largely.

Mr. Stewart—It was swinging over as you went west I suppose?

Mr. Burke—In Mr. McAree's remarks he says you should always use a six inch needle. I have always used a four-inch needle, and I think I can run equally as good a line with it as I can with the six.

Mr. McAree—I have never used anything but a six. I think that the six inch needle does not settle down quite so soon to the bearing as the four inch; the longer the needle the longer it takes to settle down.

Mr. Stewart—I would like to ask, if any one ever noticed the difference between long and short needles with regard to local attraction? I have heard that the shorter needle was not affected to the extent the long one was; or the reverse, I forget which. I would like to know which was the least liable to magnetic attraction.

Mr. Abrey—I cannot see where the difference would come in. Of course the advantage with a long needle simply is getting a larger division. With a six-inch needle you could set it $33\frac{1}{3}$ per cent. closer than you could with a four-inch needle. On the solar compass needle the long end is about $2\frac{1}{2}$ inches, and I must say I never had a needle equal to the needle I have on the solar compass. The other end is made blunt and heavy.

The President—Is it not probable that the magnetic intensity of the needle would be the governing quality of the needle as to whether it would be affected by the local attraction? There is a difference in magnetic intensity.

Mr. Gibson—I should think the more delicate the needle the better.

Mr. Burke—I think these little compasses they have now are excellent; in any case I would not go back to the Jacob staff for any one.

Mr. Gibson—I never would think of not having the vertical motion as well as the horizontal motion.

Mr. Ogilvie—My experience is that the shorter needle gives just as good results as the longer one. The magnetic force may be just the same but the friction is less. I think a four or five-inch needle is all that you want.

Mr. Abrey—The only variation would be in the size of the graduation of the circle.

Mr. Fawcett—I remember once at home using a compass of rather elaborate construction. The needle was very short and it had a non-magnetic metal pointer. The needle was below the pointer and the pointer was apparently fixed on some white metal, evidently non-magnetic metal, and this point looked like a little piece of straw sticking out from each end of the little short dumpy needle. It had long graduations with a short needle. They were referring a short needle to a large circle.

Mr. Ogilvie—I was supplied with a declination instrument here from the Observatory. It read to less than a minute, and the magnet, as I recollect it, was about $3\frac{1}{2}$ inches long. There were three magnets supplied with the instrument and that was the length of the whole of them.

Mr. McAree spoke of approaching the needle with iron or steel about your person. I made a series of experiments as to that; I had

a four-inch needle suspended just about as delicately as they can be suspended, and by taking an ordinary jack-knife I found I had to bring it within two feet before I could notice any movement at all. If the knife were magnetized if I brought it within six feet I could notice motion; when I brought it within a foot there were several degrees. In reading, you have got to read the needle several times, and of course the readings are not all the same. I did the thing just to see what error you might expect in carrying a jack-knife about it. Of course when they are very close to the needle I agree with anybody that they will displace it. As far as my experience goes, I should say that it takes quite a lot of metallic substance about you to deflect the needle very much. Then as to these curves, one explanation to me would be what you might call the personal error in not properly dividing the slit or putting your picket to one side of the true line. In making surveys on the prairies we have found the same deflection and we discovered it was due to the illumination of the picket.

Mr. Burke—I have found that if you put a sod on the top of the picket it does not affect it so much.

Mr. Ogilvie—The last time I ran any transit line on the prairie I employed a very small picket and I found the error much less than before.

Mr. Stewart—I think it is a capital idea where they divide down the side instead of just on the top. I think it would be a great improvement if the compasses were all made in the same way, that is, the graduation extended down along the side.

Mr. Campbell—There is one point that has not been brought out, and I think it would be rather in favour of having a long and heavy needle. It depends a great deal on what the attracting force is where there is local attraction. Supposing you bring a jack-knife near a small needle, you would deflect the needle much easier than a large needle. I think it would deflect the smaller body more than it would the larger. I have taken my knife near a small needle and it would fly around with the knife, but with a large needle it would move very slowly. The little one was attracted more by the attracting force than the larger one.

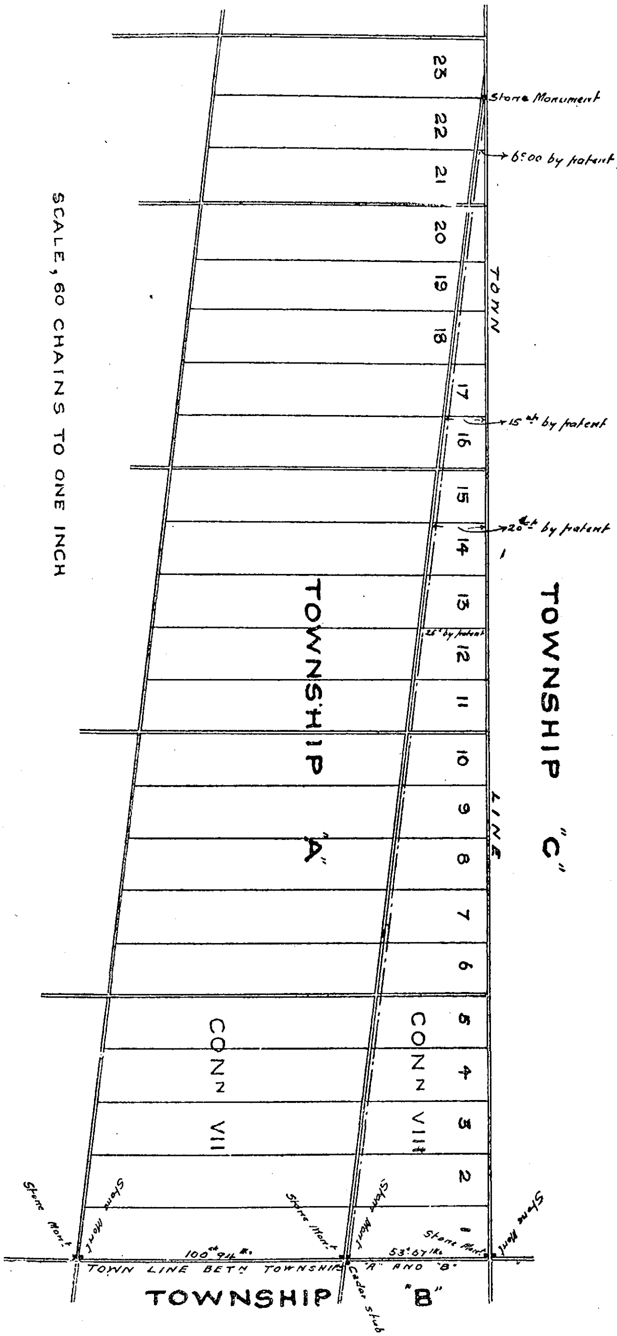
Mr. Ogilvie—That depends altogether on the intensity in the body attracted. If the needle was not magnetized or the knife magnetized there would be no deflection at all.

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

OLD RECORDS IN RELATION TO MUNICIPAL SURVEYS.

By GEORGE B. KIRKPATRICK, P.L.S.,
Director of Surveys, Crown Lands Department, Toronto.

THIS subject has often suggested itself to my mind when examining Returns of Surveys performed under instructions from the Commissioner of Crown Lands on the petition of the Municipal Councils of Corporations of counties or townships in the Province of Ontario. If the land surveyors of one hundred years ago had been able to take a peep into futurity, and to see the great importance to generations yet unborn, of not only accurate work in the field, but of clear and methodical entry in the pages of their field-books of the course of their proceedings, and of the nature of the monuments set up to mark their operations, methinks the farmers of this Province would have been the richer by many hundreds of thousands of dollars. Our present system, infinitely superior as it is, both in theory and practice is still, I venture to think, capable of much improvement in one important particular, and the reason for it is not difficult to discover. The old saying "familiarity breeds contempt" is responsible for it to a great degree. When a surveyor has been for several months employed in the survey of townships, baselines, meridian lines, road lines, etc., etc., his work becomes, as it were, second nature to him. He understands himself all about it, the details seem self-evident, and when he comes to write the report of his operations, he is very apt to omit as superfluous some of the most important items of detail, and to make his report as brief as possible, so far as these are concerned, contenting himself by stating "I have the honour to inform you that I have performed the survey as per instructions; the nature of the country is rolling, in some places almost mountainous, in others intersected with swamps." Of course I do not mean that such meagre reports are general now, but I contend they should be wholly things of the past. I have read reports otherwise very good, where the reader is left wholly in the dark as to the nature of the monuments planted by the surveyor, where the instructions went fully into the diameter of the iron to be used, the kind of piping, the length above ground, the marks to be cut thereon with a cold chisel, the exact mile at which iron was to be used, and where wooden posts might be substituted, and where a combination of both were to be used, all with the view of enabling the explorer or lumberman to locate himself without difficulty on coming across any of these monu-



SCALE, 60 CHAINS TO ONE INCH
TOWNSHIP "A"
TOWNSHIP "C"
TOWNSHIP "B"
TOWN LINE
CONN VII
CONN VIII
TOWN LINE BETN TOWNSHIP "A" AND "B"
Stone Monument
6c.00 by patent
15 ch. by patent
20 ch. by patent
25 ch. by patent
Stone Mont
Cedar stub
100 ch. 91 lks
53 ch. 67 lks
1
2
3
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ments. The ideal surveyor's report is one which states all the details in clear, concise sentences, capable of being clearly understood by non-professional people for whose benefit and information these reports have been for many years published in the annual report of the Commissioner of Crown Lands.

But if this is true of the end of the nineteenth century, how much more so is it of the records of the last century and the early part of the present, where the exception is to find a word to indicate that any monuments were planted, how wide the allowances for roads were left, or on which side of the allowance for road the line was actually run and marked in the field, and where the instructions themselves are at this date of reading very vague, in that they often refer to a projected plan sent, which was to be returned with the fair plan of survey, but which, alas, if returned, has long ceased to exist, or again the instructions refer to the knowledge possessed by the surveyor, which renders it quite superfluous to repeat to him what he is already well aware of from former surveys. Well, then, you will say, if this is the case, are the old records valueless? Is not time wasted in searching amongst rubbish for the chance of finding a precious pearl? By no means! It is to show how useful evidence can be extracted from these old documents that the present paper is penned. An example will perhaps make my meaning clear. For obvious reasons I withold the name of the township, actual dates, the surveyors employed, merely designating the townships by letters A and B, and the surveyors by letters A, B, C, D, E, F.

About ninety-two years ago, D.S. A—— received instructions to survey four concessions in the township of A——, the concessions to be 100 chains deep, leaving an allowance of one chain for a road between each concession. About three years later, D.S. B——, received instructions to "survey the remaining part of the township of A——, four concessions of which have been already run. . . . . You will proceed to the north-west angle of the fourth concession on the division line between townships A—— and B——, and continue the same on a course N. 74° E. until you intersect the Eastern boundary of the townships; you will then proceed to run the remaining concessions on a course of N. 9° W., laying off the lots and roads," etc.

The plans, field notes, etc., of both these surveys are of record in the Department of Crown Lands. About sixty years after the second survey, the Township Council of township A——, at the request of the landowners interested, petitioned the Governor-General in Council to have a survey made of part of the 8th concession line of township A——, and permanent posts planted to define the angles of the lots along the front of said concession, and praying that instructions be given to P.L.S. C——. An order-in-council authorizing said survey having been passed, instructions issued to the surveyor named in the petition. I have heard that a tradition has existed in the township, that this portion of the concession, lying as it did in a dense cedar swamp, had not been originally surveyed by D.S. B——. Be that as it may, when P.L.S. C—— went on the ground he could find no marks from lot 16 to lot 35 on the town-line;

at lot 16 he found the old post marking the north-west angle of the lot, and drew a random line across the lots northerly to the town-line. Here he found a cedar tree or stump marked for the north-west angle of lot 35 in 8th concession, with the marks clearly indicated, viz: R on north side, lot 35 on south side, concession 8 on east side. He stated in his report that the markings were so clearly defined that he did not require to take any evidence, having known it himself for some years. He then offset back from his random line and planted his posts to define the angles of the lots. His survey was confirmed by the Department the same year it was made. The following year the County Council of the county in which the townships A—— and B—— are situate, on the petition of the parties interested, sent in a petition to the Governor-General in Council to have stone monuments planted at the angles of the concessions upon the south boundary of the township of B——, the same being the governing line for that township. (I may say that this line is the boundary between the townships of A—— and B——, and was run by D.S. B—— in 18—, on the south side of town-line.) The necessary order-in-council having been passed, instructions issued to P.L.S. D——, the surveyor named in the petition. He performed the survey and I find in his report, the following extract as to the corners between the 7th and 8th concession line: "Here I found a cedar stump with the sides slabbed off marking the north-east angle of lot number 35 in the 7th concession of the township of B——, and displaying the following marks, inscribed with a marking iron, on the west 7th concession, on the east side 8th concession, and R on the north side, the blazes on the old original town-line could also be easily traced, and from this data I established the corners and planted the monuments."

P.L.S. D—— sent in his returns of survey about four years after receiving his instructions, and his survey was then confirmed.

I may explain here that the two last named surveyors found the same cedar stump but each took it to mark different points and made their surveys on this assumption; the one taking it to mark the north-west angle of lot 35 in 8th concession, the other the north-east angle of lot 35 in 7th concession, the two points being one chain apart.

About ten years after this survey, the County Council petitioned the Lieutenant-Governor in Council, at the instance of the parties interested, to have the 8th concession line of the township of B—— run out, the same not having been surveyed in the original survey of the township The necessary order-in-council having been passed, instructions were issued to P.L.S. E——, the surveyor named in the petition, to define the 8th concession line and to plant stone monuments therein. He performed the survey, and in his plan and field notes showed the stone monument planted by P.L.S D——, apparently defining the front of the 8th concession; on this assumption the survey was confirmed.

About six years after this it was represented that the survey had not been acted upon, so far as opening the road allowance, and that doubts existed as to which side of the line the road should be opened.

It was not easy to see how any difference of opinion could exist on this point, but at last, by patiently investigating the old records in the Department of Crown Lands, the error was located.

The original field notes show that D.S. A—— ran the boundary between township A and township B——, along four concessions on the south side of the road allowances, and the concession lines on the east side of the concession road allowances, the same being the front of the concessions and the lines on which the lot posts were planted. From the quotation from the instructions given to D.S. B—— it is clear that the north-west angle of the 4th concession was believed to have been defined by D.S. A——. This would be the north-west angle of lot 35, 4th concession, township A——. On examining the diary of D.S. B—— the record is found that on Saturday, January 28th, 18—, he set out early in the morning and got to No. 35 on said line and camped late in the evening; on Sunday opened the line between township A—— and township B—— and continued it through cedar and spruce swamps, Monday, Jan. 30th, continued the line, and at 101 chains planted the 5th concession stake. From this entry it is clear that he planted the stake on the east side of the allowance for road. After enumerating a number of days' work, this entry occurs: "Saturday, Feb. 4th, then 101 chains to the front of the 8th concession, marked a cedar picket, then through to the eastern town-line 55 chains." The cedar picket here described is the site of the cedar stump variously described by P.L.S. C—— and P.L.S. D—— as above mentioned.

It now became necessary to investigate on the ground the cause of the trouble, and to see how matters could be set right. P.L.S. F—— having notified the Reeve of the township that he would be on the ground a certain day, and after the parties interested had been notified to be present, proceded under instructions from the Commissioner of Crown Lands to make the necessary examination. He chained the depth of the 7th and 8th concessions along the town-line to ascertain the exact depth between the stone monuments set by P.L.S. D——

The 7th concession measured	101 ch., 94 lks.
" 8th " "	52 " 67 "
Total depth exclusive of road.....	154 ch., 61 lks.
Depth given in original field notes.	155 " 00

The stone monuments stood exactly one chain apart and by the letter R indicated that a road allowance lay between them, the Western one stood exactly one chain North of the site of the old cedar stump before alluded to. The concession road in township A—— has been opened out and travelled for many years to the west of this cedar stump, and thus the stone monuments as found indicated a jog to the east of the road allowance of one chain. It is well to explain here that the two townships were surveyed at the same time originally, and in every other case the concession lines were continuous.

On enquiring if any old resident knew of the existence of the original monument, an old man was found who had given evidence as to its position before P.L.S. E——. On visiting him and asking what he knew of the matter, he at once clearly described the position of the cedar stump as marking the north-west angle of lot 35 in 8th concession, stating that he had known it now upwards of thirty years, and that it was marked with an R on the west side in the same way as another old monument in the 7th concession was marked to define the front, and that he had known both of them for over thirty years. He also clearly described the operations of P.L.S. C——, whom he had assisted to make the survey in the 8th concession of township A——, and described his running the random line, his coming out west of this cedar stump before mentioned and his offsetting his posts for the front of the lots—a remarkable instance of memory of a transaction which had taken place nearly thirty years before. This man's evidence proved conclusively that an error was committed by P.L.S. D——, in assuming the cedar stump to mark the north-east angle of lot 35 in the 7th concession, instead of the north-west angle of lot 35 in 8th concession, and that this error was made from two causes: (a) not examining the old records, whereby he could have ascertained the fact that the concession lines had been run on the east side of the road allowance and the posts planted on this line; (b) not adopting in this concession the municipal survey made the year before by P.L.S. C—— and confirmed the same year.

On P.L.S. F—— reporting to the Commissioner of Crown Lands the result of his investigation, the Commissioner held and found that it was established that the position of the cedar tree as the original monument marking the north-west angle of lot 35 in 8th concession of township A—— was clearly defined by P.L.S. C——'s survey as confirmed by the Department of Crown Lands. That any subsequent survey purporting to establish the position of the same cedar tree as marking the site of another point was inoperative so far as this point was concerned. That by the removal of the two stone monuments so planted in error by P.L.S. D—— to points which would bring them in accord with P.L.S. C——'s survey, the error so made would be rectified. He therefore directed P.L.S. E—— to amend his survey so as to cover this point, and the stone monuments were moved each one chain west, thus bringing the road allowance in direct continuation with the travelled road to the south, and as this concession line had never been run in the original survey, the Commissioner of Crown Lands directed that it be treated as an original survey, and be paid for by the Department of Crown Lands.

Moral—Whenever you get instructions for a municipal survey, make it a point to examine the original records before commencing the survey.

DISCUSSION.

Mr. Gibson—There seems to be an impression amongst surveyors that if they make a survey under instructions from the Commissioner of Crown Lands and they get it confirmed that the thing must be all

right; but if, as in this case, it is shown afterwards that there has been a mistake made it upsets the whole thing. I remember discussing the matter with Judge Osler one time, and he cited a number of cases where they had been set aside. As to the old notes mentioned by Mr. Kirkpatrick, there is no question but that the instructions were rather indefinite and the returns were sometimes worse; and I have understood that some of these men actually did not make any returns at all.

Mr. Niven—I think that the remarks made by Mr. Kirkpatrick about furnishing reports were very good. Most of us in writing our reports, being familiar with the ground and the nature of the surface, often omit details,—I know I have omitted details which I have been convinced since would have been useful. I think that is a point that has been well taken, and most of us could benefit by bearing in mind when we are writing our reports that the parties for whom this work is intended are not familiar with everything as we are and it is for their information we are giving it. I am satisfied that we often overlook the point in that way.

Mr. Gibson—Don't you think the difficulty arises by the surveyor on the ground taking rather a small field book with him? I have a satchel and a good big book and I take everything down—and get paid for it too. Besides, you can write down affidavits and everything; and if they get into a row I take their names and what the trouble is, and if it comes to a court of law, there I have it.

Mr. Gaviller—Did I understand you to book your affidavits in the field book?

Mr. Gibson—Yes; the Act speaks about taking evidence. Now, when I was a young fellow I remember being on a case and was asked if I took any affidavits. I said "No." "Why didn't you?" they asked. "Why," I said, "there they are, swear them yourself." But I made up my mind that if I was doing a survey afterwards I would take affidavits just to protect myself. The statute says you must, so I take them and file them away in the office; then I refer to them by number. I use an indelible pencil and then apply a damp blotting paper; it is much handier than ink to use. These affidavits are a great protection to the surveyor.

The President—Yes, but some of the members of the legal profession seem to think that a surveyor does not know how to take an affidavit, and I am afraid there is some truth in it. I have seen affidavits that the very last clause knocks the whole thing out. I know a case where, after swearing all about a certain stump, the very last clause was that he had no reason to doubt that it was the right one. The moment the lawyer got his eyes on it he said it was no good at all, the man wasn't sure.

Mr. Stewart—Did you ever take negative evidence? That is, when a man has lived in a place a great number of years and has not seen a post?

Mr. Gibson—It is just a question; some say that you have no right to take negative evidence. I would not pay much attention to

it if it was from an interested party; but I think it is as well to take his evidence anyway.

Mr. Ogilvie—Suppose you took an affidavit and went to court with it, and the witness gave materially different evidence in court from that affidavit, and the witnesses who heard it read and subscribed their names as witnesses were there and swore to it, what would you think the judge would be justified in doing in such a case?

The President—The case happens every day in ordinary courts. A man, after being examined by the preliminary examiner, goes to court and gives a different version of the case.

Mr. Ogilvie—I remember one time I examined a man on the ground and gave him three days to think over it, and told him if he was then convinced he was right to come back, and he came and made it stronger. I drew up an affidavit very carefully and read it over to him and was particular to see that he understood it thoroughly. He came in court, and under stress of cross-examination and a little whiskey he gave entirely different evidence, and the judge threw the affidavit aside and said it was not what he swore to last week or last year, it was what he gave there. Afterwards the man asked me how that case came to go the way it did. I told him it was no wonder it went the way it did after the evidence he gave, and I told him what he said. He said it was a lie, that he had never sworn to that. The man did not actually know what evidence he did give in court, and right there he corroborated in full the affidavit. That case was lost because the man did not tell the truth and because the judge took the evidence given to him and rejected the affidavit, and rapped me severely over the knuckles for taking the affidavit when my motives were just as pure as his were.

Mr. Stewart—I think you will all find a great many men in the country who are willing to make affidavit to almost anything, and we have to look out for them.

Mr. Ogilvie—But how are we to protect ourselves against these men?

The President—I know in matters of that kind a surveyor very often lays himself open to improper imputations. The first time I ever took an affidavit, after examining four or five, I concluded that only two of them really had sufficient knowledge to make it worth while taking their affidavits, and rejected the other three. Well, it was immediately imputed to me that was dealing unjustly. I was brought in under the pay of both parties to settle the matter, and through over-carefulness I got the imputation of being a partisan.

Mr. Gaviller—We all know that the person who is most likely to have some knowledge about the corner of a lot is the owner, but then would not his evidence be looked upon in court as the evidence of an interested party?

Mr. Gibson—From an experience I had some years ago I made a rule that I would swear every man. It was a case concerning a certain stake that had been planted, and they all swore it had been

planted by such and such a man. I wrote affidavits all day long. Now, said I, are you men all through swearing? Then I pulled out my old field book and showed them that they were wrong. Oh, they said, they must have been mistaken. But they would have been very angry if I had refused to swear them.

Mr. McAree—Then there is not much use in taking an affidavit.

Mr. Gibson—You have to; the law says you must. My practice is this: If I get an individual to swear against his own interests his affidavit is a good one, but if his evidence is in his own favour it is not much use. I think it is a good plan to take affidavits right along; I always take the whole batch of them.

Mr. Ogilvie—I might mention a case I had near Ottawa. There were seven men, all Protestants, swore a post occupied a certain position; but there was one man, an Irish Roman Catholic, came along and contradicted them flatly, said the post did not stand there, it stood forty-seven feet from where they said it stood. Two of these witnesses had established it in court and surveys were governed by their evidence. There was likely to be a law-suit and I did not know what to do. I was three days driving around making inquiries, and at last I found one old man, bed-ridden with rheumatism, who gave me a clue, and from that I demonstrated that the Irishman was right, and so completely that the seven men came along and apologized about it.

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SEWERAGE FOR TOWNS AND VILLAGES.

By HERBERT J. BOWMAN,
Town Engineer, Berlin.

In Ontario, all of the cities, most of the towns, and some of the villages have now systems of water-works, but only a few of the larger places are as yet provided with sewers. Thus a large proportion of our people are living in communities that have within the last few years greatly increased the consumption of water for domestic and manufacturing purposes; and this water after being fouled is poured upon back-yards, or into street gutters, or, worse still, run into cess-pools, polluting the ground surrounding dwellings, causing rapid increase in deaths from typhoid and diphtheria, and surrounding the inhabitants with the worst conditions under which to fight an epidemic of Asiatic cholera, should it again sweep over the country. The necessities of our Province require that the people living in its towns and villages be aroused to their danger, and in this good work the members of this Association are fitted by their professional attainments to not only point out the danger, but to suggest the remedy.

In small villages where there is no public water supply, and wells are entirely depended upon for drinking water, it is in the highest degree important that the soil should be kept free from pollution. Removal by public scavengers of all dangerous matter at least once a week should be encouraged. This will of course prohibit the use of that abomination of abominations the privy pit, and necessitate the adoption of some form of the pail system, or the dry earth closet. This will, however, not suffice in larger places possessing ample public water supplies, and containing factories, tanneries, large hotels, and other public buildings, from which the liquid waste is considerable. Experience has shown that under these conditions removal by water carriage through underground conduits is the only satisfactory method. In designing a system of these conduits or sewers, the first question that presents itself is the disposal of the fouled water or sewage, and on this depends also to a great extent the question whether it is expedient to carry the rainfall in the same conduit with the sewage proper, or to provide two separate conduits.

The "combined" system is in use in nearly all of the cities in this Province already provided with sewers, but this does not say that in the majority of cases it is the best. There is no doubt, however, but that it will prove satisfactory in large cities, with their many miles of

paved streets, and in a climate with frequent falls of rain to flush the sewers, but in case the sewage must be pumped, or treated either chemically or by application to the soil, these sudden additions to the flow will of course be very troublesome.

The "separate" system when carried out in its entirety, namely, the construction of two separate conduits, one for sewage proper and the other for storm water, possesses all the advantages of the combined system even for the largest cities, and the cost has been found not to exceed the old method, while sewer gas is almost unknown, and cellars are never flooded with foul matter as is frequently the case in the "combined" system. However, the great advantage of the separate system is that the small conduit for the sewage proper, sometimes called the sanitary sewer, may be built at a comparatively small cost, long before the storm water conduit becomes a necessity, and in fact there are many towns with porous soil and good natural drainage into some regular watercourse, where it will never be required.

In designing the sanitary sewers of the separate system, the quantity of sewage to be carried is usually determined from the probable quantity of water that will be delivered to the inhabitants when the estimated limit of population is reached. In case this estimate does not exceed about 50,000 inhabitants, the daily quantity of water consumed will probably be not more than 75 gallons per capita, and it is usually estimated that half of this will be carried off in eight hours. The capacity of the sewers should be such that this assumed maximum flow will never more than half fill the pipe, except, perhaps, in the case of a main outfall sewer with no private drains connecting, where it may run nearly full without detriment. For most of our towns, unless the available fall is very little, it will be found that even for the outfall sewer no larger diameter than 18 inches will be required; and for this and all smaller sizes the best practice is to use vitrified salt-glazed clay sewer-pipe. It is to be regretted that we have in Ontario no deposits of fire-clay, so necessary for the manufacture of a good sewer-pipe, so that the raw clay must be imported. However, good sewer-pipe—Canadian, Scotch and American—can be bought here at very little, if any, advance over the prices paid by our more fortunate cousins over the border; and as labour is cheaper sewers can be constructed at as low cost here as in the United States. In fact the average cost of sanitary sewers for any of our towns should not exceed one dollar per foot, exclusive of the cost of private drain connections across the streets to the property lines. In most cases brick manholes are now built every four or five hundred feet at least, and at all changes of direction and grade, to facilitate inspection and the removal of obstructions, as well as to assist in ventilation. To overcome any tendency to deposit, particularly at the upper ends of the lateral branches of the system, some method of flushing is required. This may be accomplished by admitting along these upper ends the rain-water from roofs of houses or by systematic flushing from the nearest water-works hydrant. However, the most effectual method is obtained by the use of automatic flush-tanks discharging their con-

tents, about two hundred gallons, with a rush. In some cases, where the water supply is very limited, these tanks are supplied by connecting with them the drains from some of the houses, but the most reliable way is to have a service-pipe from the nearest water-main, admitting constantly a small quantity of water sufficient to have the tank discharge once or twice a day. In towns having a gravity water supply the cost of operating these flush-tanks will be reduced to a minimum; and even where water must be pumped the cost per tank should be very small.

As mentioned before, the question of the disposal of the sewage is in reality the most important, and happily are those towns situated that have some large body of water—like the mighty St. Lawrence—into which the sewage may be discharged without danger. All inland towns, however, and perhaps eventually those now discharging into the great lakes, will have to provide some means of purification of their sewage, and the Provincial Board of Health, whose approval must first be obtained in every sewerage system, is looking well to the future by requiring municipalities to make provision for sewage farms, even when the sewage may be in the meantime run into a river or other body of water not now used as a water supply. Chemical treatment of sewage has been found very expensive to obtain satisfactory results, and purification of sewage by application to the soil has been found to be the best method, either by broad irrigation where sufficient suitable land can be obtained, or by intermittent downward filtration through specially prepared filter-beds.

DISCUSSION.

[With samples of sewer pipe.]

Mr. Butler—From my experience I have yet to find a salt glazed pipe that will remain watertight under pressure.

Mr. Bowman—In our work we use all kinds. I don't like to run down any manufacturer's pipe. I know in Toronto it has been very hard for these St. Johns people to sell any pipe, because if you take up the report of the city engineer you find it has been run down for a number of years, not allowing any to be used at all, but this year they have got the contract. It may be because of the economy wave that has struck the city, but at the same time they are beginning to use it. I think they can make just as good a pipe in St. Johns as in Buffalo.

Mr. Gibson—Where do they get the fire clay for this?

Mr. Bowman—They bring the clay by train from New Jersey. Pure fire clay does not make the best sewer pipe.

Mr. Butler—In regard to the separate system, it seems to me to multiply the cost about 75 per cent. by putting in separate conduits.

Mr. Bowman—If you look into the thing, it will not be necessary to put in a large brick sewer for storm water at anything like the depth of the other.

Mr. Butler—What about the cellar drainage? That is a very important matter.

Mr. Bowman—That is a matter, of course, that has got to be looked into, but you find some very eminent men in the Canadian Society of Civil engineers endorse the separate system. In every place the work has to be done on its own merits. For instance, it may be found, in a town, necessary to take the sewage several miles out into a sewage farm, whereas the storm water will not be required to be taken any length at all.

Mr. Butler—I would like to get the opinion of Mr. Chipman as well as the writer of this paper as to how we are to provide for the discharge into these inland bays, where there are no particular currents, but just simply a large body of water; for instance, the Bay of Quinte. How would you provide for that?

Mr. Bowman—Where is the difficulty you have anticipated?

Mr. Butler—In disposing of the sewage along the shore. And I anticipate that if you discharge the sewage close to the shore that it will remain there.

Mr. Bowman—Would it make any difference how far out you deposit it?

Mr. Butler—I should think so.

Mr. Bowman—With an iron pipe it could be carried out as far as you like. Either in cast iron or wrought iron or steel it can be laid at much less cost than is usually figured on; and I know it stands the ice of Lake Huron with very little protection. I had charge of the laying of a pipe into Lake Huron at Kincardine, put 430 feet into the lake. We put it all together at once, and towed it out of the harbour and up along the shore with a team of horses, and then cut away the floats and let it sink. It was this cast iron pipe with flexible joints. But you cannot make any flexible joint tight unless it is gone over and caulked after it is put in its position. If you got it perfectly tight it would not be flexible.

Mr. Chipman—This paper is worth discussing and is interesting to a good many of us, though there are some points upon which probably we might take issue. I cannot see why the combined system of sewers should flood cellars more than any other system if it is properly constructed. If the writer had said that in constructing the combined system more errors have been made than in the separate system, perhaps it would have been the better way of expressing it. Again, where falls of rain are depended upon to flush the sewers, we find here in Toronto to-day it does not work satisfactorily; it is impossible for a rain-fall to flush a sewer system such as we have in this city. The only proper way to do it is by means of flush tanks. In this climate we may not have a rain for two or three weeks, and that two or three weeks is quite time enough for the sewer to become perfectly foul. Three days will make a very foul sewer; and when you have a rainfall only once in two or three weeks you have during a great portion of this

time a foul sewer. As to the question of laying pipe, etc., which has been mentioned, during the last year I have laid six of these pipes, and in all cases but one—and that one we could not fix, it was down so low—we found it quite tight after it was laid. When I put in a submerged pipe I specify that that shall be made watertight, and we make it watertight. We use very few flexible joints. We laid one in Brockville 900 feet long and next day that was dry; we laid two in Barrie this year and they were tight. There is no trouble about making them tight. As to what we shall put in in the towns mentioned by Mr. Butler, of course it all depends upon the town, but in these towns, Kingston and Picton, they have first polluted their harbour and then they take the water from this polluted basin. They get the water from the wrong place; they started wrong.

Mr. Gibson—I am interested in sanitary matters for some of these inland towns, and the greatest difficulty is that people will not allow you to put in any kind of a sewer; they run off their sewage into the creeks, and the great trouble is to get rid of it. Take East Toronto; in the first place I know they have got to use dry earth closets, and then all they have to do is to dig six or eight feet into the gravel below, and all the storm water will disappear. West Toronto Junction, however, has quicksand under it, and it is in a worse position. With reference to the separate system, a point is made in this way, that in the separate system you can take the sewage away and leave the storm water. Why, the first thing in any new town is to get rid of that water. For my part, I don't see how you can run a large town under the separate system. I have made investigations as to the town of North Toronto, and I have found that it would take miles of sewers to take it to the bay. All I can see for these villages is to have dry earth closets and to take the slops, etc., into the creeks.

Mr. Chipman—In some of our inland cities and towns it is altogether out of the question to build combined sewers. In the city of Brantford we carried the sewage over two miles, but to convey all the storm water and dirt, etc., for two miles would be a ruinous enterprise for the city. As to the pipes breaking and being found broken, it depends upon the pipes themselves, the maker, and upon the factory, and upon how they are laid. Now, I will venture to say in the fifteen or twenty miles of sewers that I have laid within the last two or three years you will not find 100 feet that is broken.

Mr. Gibson—They are just as careful in Toronto as they are any place else.

Mr. Chipman—No, sir; they are not as careful in Toronto as they are in other places.

Mr. Roberts—With regard to the pipe in Toronto, I might say in the work in Barrie last year the contractor shipped up pipe the same as he had used in Toronto. I went down to his yard and culled the pipe roughly before they were shipped, and I found a good 75 per cent. of culls that were not fit to use at all. And I found on reaching Barrie that I had to cull 25 per cent. of the quantity delivered. These were the pipes he had used in the city of Toronto.

Mr. Bowman—In writing this paper I did not attempt to treat it in a technical way, simply in a popular style for the information of those members who have not paid any attention to this question at all, and not with the idea that there would be so many sewer constructors in the meeting. My object was more to interest the outside places, where this question has not been taken up at all, and I did not go into details of construction, so I would like to have any questions answered by members of the Association who are looking into this question.

Mr. Butler—I question very much indeed the tightness of all pipe sewers. I think that at times they are liable to run under pressure, and I think if they do they fail.

Mr. T. H. Jones—As regards the question of the separate and combined systems, I think, as Mr. Bowman says, that each place must be considered in itself. In Brantford, as Mr. Chipman says, under the combined system we would require the main sewer to be two miles long. There was a great deal of newspaper discussion there, and I made an estimate and I found that it would take a sewer six feet in diameter to discharge the rainfall which would be required to start, and as the pipe would have to increase in size as it went down, it would take a pipe nearly as large as a house at the bottom. In Brantford the separate system is plainly the system. We have the Grand River there and the creeks and little depressions running into the river which provide for the rainfall. As regards the cost, it struck me that Mr. Bowman's estimate was rather low, judging from our experience in Brantford. The Scotch pipe has been used altogether for sewers over nine inches in diameter.

Mr. Bowman—Fault has been found with my saying that the combined system necessarily flooded cellars; and it was said that that was caused in these cases by the combined system not being designed properly. That is no doubt correct, but was there ever a combined system designed properly? The combined systems are designed to carry a certain amount of storm water, but I don't think there ever was, as far as I could find, a combined system that at all times carried the surface water. If so, it was at a very great expense. For instance, from half an inch to an inch of rainfall per hour is usually taken to base calculations on, but there have been storms as high as three and four inches of rainfall per hour, so that you can hardly expect a sewer to carry that exceptional rainfall. Mr. Rust, who has had charge of the Toronto sewers for a number of years past, read a paper on the construction of the Toronto sewers before the Canadian Society, and he speaks of that question and gives the basis on which they figure out the capacity for these sewers. At all events they never attempt to provide for the heaviest rains, and that is why the cellars are flooded. Last summer there was a storm here that filled the sewers so completely that it washed off the cast-iron tops of man-holes on Jarvis Street. It would bankrupt any city to put in a combined system that would carry off every rainfall. Then Mr. Gibson says the first thing in his experience has been to provide for the storm-water.

Mr. Gibson—That is the creeks.

Mr. Bowman—That may be in muddy York, but when we get out to these high, sandy ridges where there is perhaps a stream running through the middle of the town, the storm water looks after itself. It may never be required to be carried in the sewers. Then about the tightness of the pipe sewers, I don't think it is fair to expect that a sewer will stand a forty-foot head or even a ten-foot head. Sewers are not supposed, especially the separate system, to be filled full at any time.

Mr. Butler—The flush tank is ten feet above the sewer.

Mr. Bowman—I don't think any flush tanks, or very few, put ten feet head on the sewer ; in fact they don't more than fill the sewer in a very short distance. If it did it would be perhaps all the better. If you take the combined system on that basis—because they are made of porous brick—they allow the foul water to percolate through them. And about running outlets into bays, the first question would be, Would the Provincial Board of Health allow you to run your sewer into the bay ? They have authority to prevent it. All sewerage plans have to be submitted to the Provincial Board of Health, and it would be very unwise, if they had to use that as a source of drinking water, to run it into the bay. The engineering difficulty of laying the pipe to carry it is very simple, especially in a protected bay where there is no surf to beat the pipe. It is a very difficult matter to get a flexible joint water-tight.

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GEORGETOWN WATER-WORKS.

By JAMES WARREN, P.L.S., A.M. Can. Soc. C.E.
Kincardine.

Early last year I was employed by the Corporation of Georgetown to examine into a scheme proposed for the supply of water, both for fire and domestic use. The proposition was to bring the water from a stream known as Silver Creek, from a point about $2\frac{3}{4}$ miles away from the village, which would give sufficient pressure for fire purposes. On taking levels I found there was a fall of nearly 200 feet from a favourable location for a reservoir to the centre of the business part of the village. The route was also very favourable indeed, as there were only two places where there was any rise—or rather any depression—that would in any way obstruct the flow. We had to cross the line of the G. T. R., where there is a cutting of 23 feet, but, fortunately, just after crossing the line there was a steep incline, so that by digging our trench deep and tunneling, 17 feet could be taken off this rise, so that it practically would not interfere with the flow of the water.

The location of the reservoir is very favourable indeed, as the ravine through which the creek runs at this point narrows, so that a dam was easily constructed, and can at any time be raised higher if required; and also at this place there are several springs flowing out of the bank that of themselves give enough water for domestic supply. The reservoir is 96 feet across, or wide, on the dam, and 10 feet deep, but runs out at 150 feet as you go up the stream. The ground was nearly all clay, so that it would hold water, except in a small portion of the bottom which was puddled. The whole bottom and sides are cobbled with small stones, so as to give the bottom a nice appearance —also will give facilities for cleaning out the reservoir at any time. On the north side we came on one or two beds of quicksand which caused us to change our location a little, but we overcame the diffi- by building a strong retaining wall, as there was danger, if the quicksand began to run, that part of a steep bank would be undermined and run into the reservoir. There is a six-inch main laid down at the lowest point of the reservoir and through the dam, so as to quite drain the whole of the water out in case of cleaning out the reservoir at any time.

There is a small dam built at the head of the reservoir, and is so arranged that the whole or part of the stream that comes by the creek can be turned off and flow past in a channel cut for the purpose; by

this means the water collected in the reservoir is entirely spring water; or, in case the springs do not give sufficient supply, part of the stream may be turned in. The quality of the water, as taken from the creek last September and submitted for analysis to Dr. Bryce, Secretary of the Provincial Board of Health, gave the following analysis per million parts: Chlorine, 3.2; free ammonia, 0.2; albumenoid ammonia, 0.09; oxygen absorbed in 15 minutes, .72; absorbed in 4 hours, 1.60; total solids, 246; loss by ignition, 128. By comparing this statement with a table on page 33 of the reports of the Engineering Society, 1890–91, it will be seen that the water is "exceptionally pure," as remarked by Dr. Bryce at one of the meetings of the Board of Health, "and falls easily within the first class."

The water is brought in a ten-inch main from the reservoir into a point in the village, from which it is distributed by eight and six-inch mains as required. The mains are:—

10-inch	14,540	feet.
8 "	1,374	"
6 "	7,825	"
4 "	11,632	"
Or a total of	35,371	"

—nearly 6 7-10 miles. This is divided into 24 sections by valves, so that any portion between these points can be shut off in case of any damage and repairs being needed, and is also arranged that in the important points, if one section is shut off, water can be supplied by the mains from other sides. The Ludlow Hydrant is the one used, and gives good satisfaction. There are 36 of them in all, and in the centre of the village are placed about 200 to 400 feet apart so as to give good fire protection on all sides.

To overcome any reaction that would arise on a heavy draw on the mains, four relief valves are placed, which blow off at a pressure of 120 pounds per square inch. Also at the highest points on the line where there are no hydrants there are air valves placed, so as to allow any air that would accumulate in the mains to escape, which, if not allowed to escape, would, in a very serious manner, interfere with the flow of the water.

The pressure in the centre of the village is 85 pounds per square inch, but allowance must be made for friction, which, after allowing for a discharge of 750 gallons per minute, gives a working pressure of 60 pounds, which is sufficient to throw an inch stream 90 feet in the air through 100 feet of 2½-inch hose. On some of the tests water was thrown from 160 to 175 feet horizontally from one of the hydrants where the working pressure was about 80 pounds per square inch.

The pipes used were tested to stand a pressure of 300 pounds per square inch, and one section required a test of 400 pounds. The pipes all stood the pressure of the system without any flaw being found in any. The main from the reservoir is 10-inch, and is divided into three sections by valves so that the water can be shut off at any time in case of any accident. On this section there are four hydrants,

furnished with secondary gates, which allows the hydrant to be shut off or entirely removed without the flow of water being interfered with. The system is also furnished with vacuum valves to allow the air to enter the pipes in case of the water having to be drawn off. The 10-inch main extends from the reservoir into the village, the whole distance being 14,540 feet. For the first mile they weigh 50 pounds per foot, this being quite heavy enough to stand the pressure in that part of the system. The weights required for each size of pipe are:—

10-inch	light 10-inch	8-inch	6-inch	4 inch
60 lbs.	50 lbs.	45 lbs.	30 lbs.	20 lbs.

per foot. The mains were all coated with the usual waterproof coating. From the extra quality of the water there will be a great many water-takers, as the water will be supplied at reasonable rates, which will be a great boon to many parts of the village, as water from wells is hard to be got, and is also not good for domestic use; and as the G. T. R. and the H. & N. W. railways cross here, no doubt the railway company will take water also, as they can get an abundant and never-failing supply for their engines. This makes Georgetown an important point of supply, as it is at the beginning of the heavy grades on the line going west.

The advantage of the gravity system will be easily seen, as after the first cost of the work there is no further cost for any outlay in the shape of pumping, fuel, or any other expense; and, also, there is a direct pressure on the mains at all times, and no risk to run of the pumps getting out of order.

DISCUSSION.

Mr. Bowman—This paper, I think, is one of the most interesting we have ever had read before this Association, and gives a case where one of our members has had entire charge of the building of a very economic system of water works, looking at it from every point of view. He does not mention the cost of the works, but I think it is somewhere in the neighbourhood of $30,000. This includes a system of nearly seven miles of pipe and a small reservoir which did not cost very much to construct. The pressure they get should be ample for a town of Georgetown's size, where, I suppose, there are no buildings more than two or three storeys at the most, so that a pressure of eighty-six pounds would be ample, and with two or three streams going, the pressure still remains sixty pounds. Mr. Warren does not give the biological examination of the water. Now the Provincial Board of Health are examining all waters and giving the number of bacteria per cubic centimeter; this, perhaps, is more an indication of the quality of the water than the chemical analysis. Mr. Warren told me about this reservoir. He said it was at one side where they can turn this creek in if they require, but at present it is fed from springs along the side of the reservoir; just one pipe, a ten-inch main, about three miles out in the country.

Mr. McCulloch—Why is it necessary to have a pressure test of 400 pounds per foot on part of the pipe? Three hundred pounds is the pressure he has for most of the pipe, and is probably larger than is required by the standard of the American Society of Civil Engineers. In this connection, too, I would like to ask the experience of any of the members present as to an actual test of this pipe. In Galt during the summer we had some tested that was sent to us. The pipe was poor in quality and we discarded a great deal of it. The manufacturers asked us if we would accept a pipe if it stood a proper test. They went on with the test, and it stood the 300-pound hammer test with two and a-half inch hammer and fifteen inch handle, sharp blows. But on one occasion while unloading the pipe one of them that had stood that test broke in the unloading. I was almost satisfied from that that this 300-pound hammer test was not a satisfactory one.

Mr. Butler—There is no doubt that the pressure test is a very equally and uniformly distributed test; in the other case it is a jar.

Mr. McCulloch—For a length of probably two or three feet they were full of blow holes. It could not possibly be expected to stand any pressure at all, and this man that was testing them, I know, hit them very sharply. We had to condemn the whole batch of pipe after that.

Mr. Butler—Have any of you used Stewart's of Glasgow? I have thought seriously of using it soon. I know in India and South Africa, where the difficulty is to get proper caulking materials, that they used a great deal of that pipe. I think it was in the Hong Kong works that they used it and found it perfectly water-tight under good high pressure. I know in the West, in hydraulic mining, that the pipes there under heads of 2,000 or 3,000 feet are simply forced in; they are not rivetted or coupled in any way, just simply forced in one length inside of another. Of course in that case it is wrought iron pipe.

Mr. Chipman—I fear that the return joint would not answer in this country, one reason being the extreme climate here, where the earth freezes to a considerable depth. I am not prepared to give a statement as to what extent the soil temperature varies from the atmospheric temperature. At McGill University some experiments have been made, but unfortunately they don't take the temperature at a great enough depth to be of much use. I have made some examinations myself on this subject, but they are not in a condition yet to be of much use to the Association or to the public. At a future time perhaps I will be able to give the result of my investigations.

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

THE HAMILTON AND BARTON INCLINE RAILWAY.

By J. W. TYRRELL, C.E.,
Hamilton.

In selecting this subject for my paper I am perhaps a little ahead of time, as the railway is not yet completed; however, as the character of the work is something new in this country, a general description of the road, will perhaps not prove uninteresting.

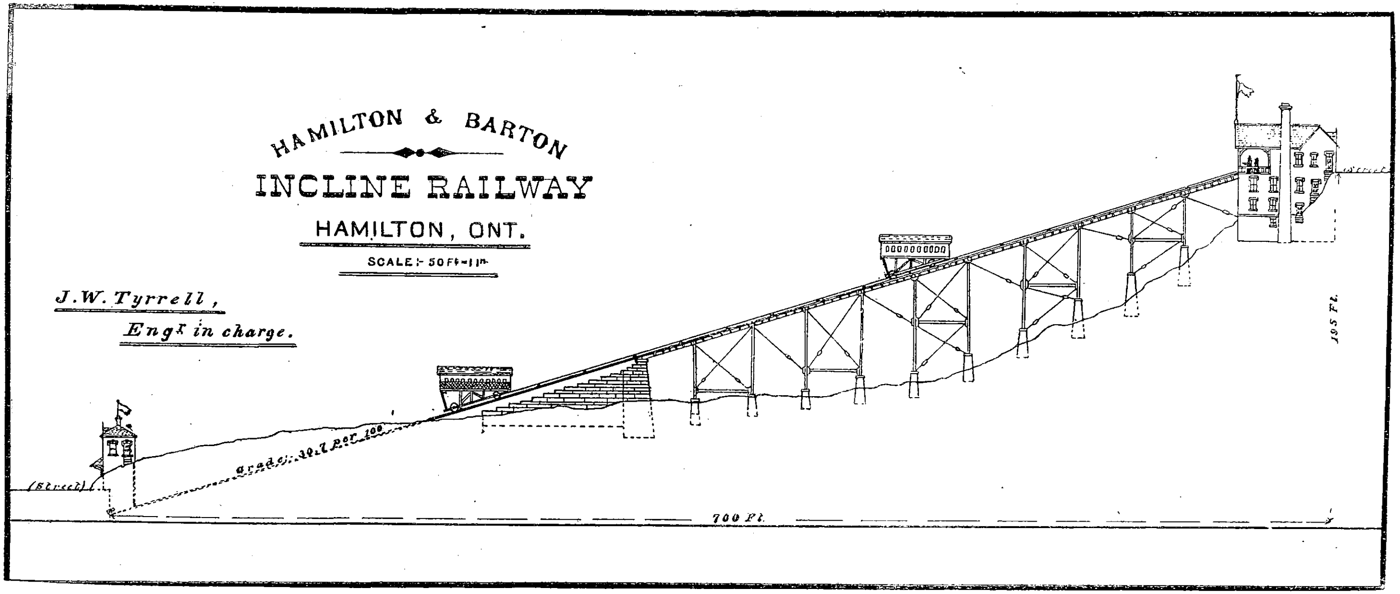
I will not attempt to go into details of construction or the calculation of strains; but will endeavour to convey a general idea of the appearance of the work and its mode of operation.

Those who are familiar with the city of Hamilton relatively to to the back-lying country will readily understand the object and great necessity of some means of facilitating traffic between the city and the rural districts to the south. All along the south side of the city, and extending for miles in either direction, stretches a bold, steep escarpment, commonly called the Hamilton mountain.

The city is built on what has been the beach of Lake Ontario—a strip of land about two miles wide—while the elevation of all the back country is from two to four hundred feet higher. This high table land, which has been cut away in part by the action of the lake, forms the escarpment, which is a very serious barrier to traffic, and though a number of roads have been constructed, and some of them in use for a great many years, leading up the mountain, their grades are so steep—varying from 10 to 15 feet per 100—that ordinary loads cannot be taken up with one team of horses, and light vehicles only with difficulty. The natural result of this inaccessability of the table land from the city has been that, though the most valuable resident property in Hamilton lies along the foot of this escarpment, the property on top, only a few hundred feet distant, is valued at little more than farm land and is very little built upon.

In consideration of these facts and with the object of making our southern suburbs more accessible, a local company, styling themselves the Hamilton and Barton Incline Railway Company, was formed, and secured an Act of Incorporation, which was passed on the 7th of April, 1890.

The greater part of the right of way was secured from the township of Barton over an original side-road allowance. The boundaries of this not being defined upon the ground, our recently departed and


HAMILTON & BARTON
INCLINE RAILWAY
HAMILTON, ONT.
SCALE:- 50 Ft = 1 In.
J. W. Tyrrell,
Engr in charge.
(Street)
Grade: 30.7 per 100
700 Ft.
195 Ft.

highly esteemed brother, F. F. Passmore, was instructed by "the department" to locate them, which instructions he carried out.

Next, the services of an engineer were required, and M. D. Burke, who had built several inclined railways in the United States, was engaged. He visited the ground and prepared the general plans for the road; but not being able to remain in the country the writer was employed to take charge of the construction. His proposition was to construct a straight cable road of uniform grade from a point at the commencement of the rapidly rising ground to the top of the escarpment.

The distance between these two points along the line of location was found to be about 700 feet, and the rise 195 feet. Of this rise 125 feet occur within the southerly 200 feet—that is, nearest the face of the hill; consequently, it was found that by adopting a uniform grade the central portion of the track would be at an elevation of about 50 feet above the surface of the ground.

The design of the company being to provide for the carriage of heavy loads of coal, electric cars, etc., as well as passengers, it would at once seem advisable that the road should be built in a substantial manner, and of materials which would require as few repairs as possible. After a good deal of discussion in order to meet these demands it was decided to adopt stone and steel as far as possible.

Whilst these preliminary, but essential matters were being considered, the writer was engaged in making the right of way surveys, cross-sectioning the ground, etc.; and these all having been arranged and completed, the general plan was prepared which in the main has been adopted, though a great many more or less important changes have been made.

I will now proceed with a description of the road as it is being built:—

It consists of a double track inclined railway. The lower portion of the road-bed is built upon the ground, partly through a cutting and partly upon an embankment formed by the material taken from the cut. The road-bed at the lower end commences in a pit 13 feet deep—that is, 13 feet below the level of the approach to the track.

This pit is formed to receive the peculiar-shaped cars of the road, which are built with level platforms and consequently, to suit the steep grade which is 30.7 per cent., require to be 13 feet high at the one end, the other being as close to the track as possible.

The cutting, which commences with a depth as mentioned, within a very short distance attains a depth of 30 feet. The width of road-bed being 34 feet the amount of material requiring to be excavated was therefore very considerable; and as much of this as could be used with economy was graded up to form an embankment. However, on account of the character of the material—it passing from a stiff clay near the surface to a soft, red rock at the bottom—and the heavy grade of the road, this work was very expensive.

The company having only acquired the right to occupy 48 feet of the side-road, it was necessary to build retaining walls, both to sup-

port the sides of the cutting and those of the embankment, which reaches a height of 25 feet.

The upper end of the embankment is terminated by a heavy stone abutment, built to receive the lower ends of four girders forming part of a steel trestle viaduct.

This abutment is built with large, heavy stone, and provided with wing walls turning back to meet the retaining walls, or rather the retaining walls are extensions of the wings. Some difficulty was experienced in obtaining a good foundation for this stone work, as the ground to a depth of about 20 feet was found to be loose made earth consisting of old boots, ashes, etc. A ravine had crossed at this place, but for years an untiring old squatter had been at work improving this scrap of a road allowance, only to have it taken from him when his task was about completed. In addition to the fact of the ground being loose, a large brick sewer cut through the foundation. This, however, was stepped over with large, flat stones, care being taken to leave plenty of room over the sewer to allow for settlement; and the former difficulty was overcome by excavating until a hard, stiff clay bottom was obtained.

These difficulties were met with again at other points higher up the bank in obtaining foundations for piers to support the steel trestle, which extends over about two-thirds of the length of the railway.

It would take up too much time and space to go into a very full description of this viaduct, but briefly it consists of eleven 30-feet spans and one of 37 feet.

Most of the bents, which are of steel, supported by two stone piers or pedestals, are from 30 to 50 feet in height. They carry four parallel track girders two feet in depth and spread eight feet from centre to centre. The whole structure is designed so that a moving load of 60,000 pounds will not produce a greater strain than 10,000 pounds per square inch of section on any member.

Across each pair of these inclined girders the ties are placed, and upon them, directly over the centre of the girders, the track rails, which are bolted to the girders.

There are then two parallel tracks eight feet from centre to centre of rails and eight feet apart. Upon the bank, below the trestle, the tracks are laid in the ordinary way, except that the ties are supported on the lower side by stout stakes to prevent them from working down hill; and the grade of the whole is as before mentioned, 30.7 feet per 100 feet.

On either track runs a single car 36 feet in length by 14 feet in breadth. The cars, as already intimated, are constructed with level platforms, being supported by wedge-shaped frameworks, which raise the platforms toward the lower end about 13 feet above the tracks.

The cars are combination affairs, being arranged to carry passengers and teams at the same time.

About five feet along one side of each car is covered in to form an apartment, the inside of which resembles the interior of a street car, while the remaining nine feet space is open, being enclosed only by

iron lattice walls on the sides and iron folding gates at the ends, which are opened alternately at top and bottom of the plane to admit of the entrance and exit of teams.

Attached to two heavy timbers, braced by heavy iron knees, in the lower framework of each car, are two steel wire cables, each having a tensile strength of 125,000 pounds by actual test. From the cars the cables are carried up the centre of the tracks on small carrier wheels 14 inches in diameter. To prevent noise and wear of the cables these are made so that they can be packed with leather or rubber.

At the head of the plane the cables pass over large cast iron sheave wheels, 10 feet in diameter (these being strongly supported by iron girders and columns). Thence the draught cable passes down to a winding drum 10 feet in diameter, about 30 feet below, situated in the basement of the depôt at the head of the plane; but the safety cable passes from the sheave wheels onto another large cast-iron wheel of about equal size, which is set in a heavy iron frame-work and securely anchored to the solid rock, so that in case of the possibility of an accident happening to the draught cable the cars would be held securely by the safety. Powerful brakes are attached at either side of the drum and to the safety wheel, and these may be applied by the engineer from the pilot house.

The foundations of the drum—which itself weighs about 10 tons—are strongly anchored down to the solid rock by 16 two-inch iron bolts.

The drum is controlled, and from it the road operated, by a pair of Wheelock engines of about 125 indicated horse-power.

The depôt, situated at the head of the plane, and which contains all the machinery, is a four storey stone and brick building. The basement is occupied by the engines and drum, the boilers and fuel room, and also contains a large room to be used as a workshop. The second and third flats are designed to be used as a dwelling for the engineer and his family, and the upper flat, which is only on a level with the top of the hill, contains the driving platform, a waiting room, a board room, and a large covered balcony looking out over the city. In the centre of the driving platform and opposite the centre of the tracks is situated the little 4 x 8 feet pilot house. This is built with large glass windows on all sides and commands a view of the whole road. Within it stands the engineer, who has within arm's reach the means of controlling every part of the machinery.

At the lower end of the plane there is another small but neat brick depôt, and dwelling above it for a caretaker. The entrance to this depôt is guarded by sliding gates, which are opened when a car is down. Into the face of the car pit are built four large iron air buffers—two for each car to strike against. These consist simply of 18-inch iron cylinders provided with pistons which are drawn out by wire sash-cords hung with weights and working over pulleys. I have here the general plan of the railway, and a few other plans of various parts of the work for the examination of any who may care to see them.

And now, in concluding this brief description, which I am afraid I have not made as clear as I would like to have, I may add that I will be pleased to give any further information or explanation to any who may desire it.

The road was completed and opened for traffic on the 11th of June, 1892.

DISCUSSION.

Mr. Butler—There are incline platforms similar in principle to the one Mr. Tyrrell describes so well, but none of anything like the size in this country. The idea of transporting a team of horses from the level of the lake up to the top of the mountain is a novel scheme. In the city of Quebec where they have about 300 to 400 feet to rise there is an elevator on the same principle, I think. Supposing something should go wrong with the machinery or both cables give way. I presume the drum is driven by gear wheels. I know of a case where a drum driven in that way stripped, the gear stripped through a flaw in the casting, and the drum ran away and the car dropped from the top to the bottom. In all such cases where you have incline railways it is necessary to provide against that contingency in constructing the drum or by putting some form of governor brake on the drum itself, and I have designed an arrangement which by fixing band brakes on both sides of the drum and governor balls driven at a definite speed, so that if anything went wrong that band brake would set and retain the car in its place. Something of that kind should be on all such incline railways.

Mr. Tyrrell—We have a powerful brake, but it could only be applied in this case by the engineer or some one in charge. It is on the drum, one on each side of the drum. They are belt brakes lapping around the drum, and by applying the foot to a lever the brake is applied.

Mr. Butler—Instead of leaving it under the control of the engineer, it ought to be perfectly automatic, driven with governor balls.

Mr. Tyrrell—The safety cable would come into play anyway, and would keep the car in equilibrium.

Mr. Butler—There was an accident of that kind in Kansas City, where a cable car dashed across through a passenger station and killed ten or twelve people. It has about thirty per cent. grade, and since then they have introduced a kind of grip brake; a grip driven by governor-balls regulated by the speed of the car, so that if the car gets a certain speed these grips clutch the centre rail and hold the car still.

Mr. Bowman—I suppose this cable is made of different strands. A case happened on the cable railway in St. Paul, I think, where one strand became broken and the grip was caught in the strands, so that they could not release it when they wanted to stop, and from that there was a very bad collision, killing four people.

Mr. Tyrrell—In this case the cable is attached permanently to the car and the cars balance each other.

The President—Is there any provision in case the cable should stretch at all ?

Mr. Tyrrell—Yes; cables will stretch, especially when they are new. That will perhaps stretch a foot the first day. They are fastened by means of clamps turned over, put through a heavy eye and clavises put around the double cable, and these can be loosened. That is on the cars themselves. After cables have been in use for a short time they vary very little in length.

The President—I presume the cable on a road of that kind would last much longer than on the ordinary cable road ?

Mr. Tyrrell—Yes; probably it would.

Mr. Bowman—Is this railway being built by a company by day labour, by letting the different contracts for the different iron works and looking after the work themselves, or by letting it all to one contractor?

Mr. Tyrrell—No; the different parts of the work have been let to different contractors, the steel and iron work. This trestle viaduct was built and put in place by the Hamilton & Barton Company. The engines and drum machinery are being built by Goldie & McCullough of Galt, and different contractors in that way are doing parts of the work. The earth work was done by contract as well. The different parts of the work have all been done by contractors.

Mr. McCulloch—What is the estimated cost of the road ?

Mr. Tyrrell—Between $35,000 and $40,000, and the length is 700 feet.

Mr. Abrey—That is the cost irrespective of land damages, I suppose ?

Mr. Tyrrell—Yes.

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EXPLORING FOR NICKEL.

By CHARLES E. FITTON, P.L.S.,
Orillia.

It would have been better, perhaps, if I had added the words "in the vicinity of Sudbury" to my title, but in the haste of replying to a request from the Executive Committee to prepare a paper I sent in the above rather indefinite heading.

It occurred to me that now our wealth in that particular ore is becoming a matter of general interest, and that there is seemingly an inexhaustible supply in the above mentioned district, extending for miles in a part of the country that was considered until lately a barren waste of little or no value to man or beast when stripped of its timber, it might be a benefit to some, and interest to others, if I endeavoured to reduce to writing the experience and knowledge gained in portions of three summers spent in that section exploring and locating mines.

The best season of the year for the work is undoubtedly the spring, beginning directly the snow goes off the ground or rocks, as the case may be, and the rivers and lakes open up, which generally takes place in the district mentioned between the 1st and 10th of May. You can then remain out with comparative comfort until about the middle of June, when the flies and mosquitoes take full possession and warn you off.

The outfit may be elastic, and depends on the depth of one's pocket, but you must have at least one good tent, a good Peterboro' canoe, one large and one small axe, a coarse whetstone or small grindstone, prospectors' hammers in number according to party, one or two magnifying glasses, and a magnet for each member of the party; drills (half a dozen or so), and small anvil to keep same in order, and two heavy hammers. A few pounds of blasting powder, and a limited quantity of dynamite should also be taken.

The next requirement is a knowledge of what to look for and how to look for it. I have known of parties camping for days on and near what afterwards turned out to be a rich deposit, and be quite innocent of the proximity of minerals; and I might say it is not always the most scientific man of the party who is the most successful, but rather the old bushman or trapper, who cannot tell one mineral from another, but whose sharp eye, trained to note every change, can at once discern any rock (decomposed or otherwise as the case may be) differing slightly from the surrounding formations. Sometimes it may be the colouring of the rock or earthy matter that first attracts

his attention which, followed up, leads to the exposure of a rich vein or bed of mineral.

A great help to the inexperienced, and which will amply repay the time spent, is a careful examination of the mines already discovered and working, as the surface indications are all very similar. Circumstances alter cases, so that it would be next to impossible to give any cast-iron rule for the best method of directing the efforts of a party without being on the ground.

I hope that readers will take the will for the deed in this my first contribution to the Association, as my forte evidently does not lie in an editorial direction.

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RAILWAY SURVEYS.

By HENRY K. WICKSTEED, P.L.S., C.E.,
Cobourg.

LAST year I had the honour of reading before you a paper containing a few notes on the "Theory of Railway Location," as at present accepted. I propose, on the present occasion, to follow this up by an equally brief discussion of the most modern "practice" in the same art; and in doing so I address myself more to the younger members of the Society, who will look in vain, as I have, for a description in the text books of the operations I am about to describe, and their proper sequence. Of the older, there will scarcely be one who has not his own way, and his own order of performing the necessary operations. To them I would say that I wish to compare notes with them rather than to dictate; and feeling that their ideas would be of interest and value to me as a student, and not a master, of my art, I feel the less diffidence in giving them the benefit of mine, and asking for an exchange in subsequent discussion. Without further apology for its shortcomings, I beg to submit the following description of my *modus operandi*.

Being asked to locate a line between two given points, and from a given point, in some definite direction, we shall first obtain the best map of the district which we can lay hands on, showing the natural drainage of the country, the travelled roads, villages, towns, and municipal boundaries, and studying this with due regard for the purpose and object of the railway, about which our letter of instructions will give us more or less information, we shall probably soon form some idea as to the approximate position of one or more desirable lines. Armed with this map, an aneroid barometer, a compass, and a note-book, we shall, if we are in a civilized country, proceed to the nearest livery stable and hire a strong, steady-going horse, and a buggy or other vehicle to match, and proceed to drive across country as near as may be to the likely-looking lines. If we can pick up a man to accompany us who knows the roads and the people, and who can give us information of the kind we ask when we ask it, and hold his tongue when we do not, we may do well to take him along to do the driving, and look after the horse. But beware of the garrulous creature who has lived in the country all his life, and longer, and knows every square inch of it—who will show you a beautiful line all ready for the ties and rails, and who will introduce you to every loafer around the village inn, as the "Surveyor come to lay out the new railroad," and

therefore a fit subject for "treatment" at the bar. Such a man is a nuisance, and will give you five times as much trouble as he is worth.

Few men whose eyes are not specially trained can detect a rise of 25, 50, or even 75 feet per mile, and so long as the ascent or descent is uniform and smooth they will call it "level" ground, and be much puzzled and disappointed when it is not found so satisfactory as rougher ground affording easier gradients.

They will talk *sotto voce* to their chums of your wish to favour Smith or Brown, who have friends upon the directorate and a seat on the County Council, and otherwise make themselves an intolerable nuisance.

My own preference is for a solitary drive, stopping occasionally for a closer inspection of some ravine or notch in the hills, or at a farmhouse or inn for straightforward answers to explicit questions as to the flood level of a creek, the value of land, the output of a mill, or the price of railway ties—such questions, in fact, as the average countryman can answer offhand, and without drawing on an imagination unduly excited by the knowledge that you are a railroad man.

Barometric readings should be taken frequently and entered fully in the note-book opposite the date, time of day, and an index number or letter, referring to a similar one on the plan, showing the point at which it was taken. When a stop is made for a meal, or overnight, take two or more readings at the same point; the differences, divided by that of the times, will give you a rate of rise or fall due to atmospheric changes independent of the altitude, and this rate will generally be found tolerably constant for the next and the preceding two or three hours, and multiplied by the proper interval of time will give a correction to be applied to other readings in order to obtain the relative altitudes.

When returning to the same point in the evening be especially careful to compare the reading with that of the morning, and so obtain an average rate for the whole day. This rating and correction is of the utmost importance. The results are at best reliable only as a rough guide, and without correction they are often utterly worthless and even misleading.

This preliminary skirmish or reconnoissance will sometimes occupy a long time, sometimes a short one, varying with the nature of the country, and the distance of our objective point. If not more than 10 miles away we can do much in a single day, but if 20—and other things are equal—there is really four times the amount of ground to be looked over, it is an area we are examining, not a line, and similar figures are as the squares of their similar parts—but often, as in the approach to terminals, the ground is so confined, and choice of route so limited, that there is little to be done in this way. Let us be careful, however, to examine all reasonable possibilities before making a more detailed survey, and consider the time well spent if we feel satisfied that we have examined a considerable area where there is *no* line to be had.

If the country is very wild and unexplored, a couple of Indians and a canoe will be substituted for the horse and buggy, or we may

have to travel on foot. But generally it may be said that it is better to follow the main arteries of travel in the first place from end to end before examining in detail, and that we should guard carefully against prejudice in favour of any one route until we have examined all from end to end.

The last few miles will very often prove quite impracticable a route which for the balance of the distance is incomparably the best. It is better, therefore, to take the line of travel which affords the most extended view of the country generally, rather than to attempt to follow closely some tempting lead or valley.

If we drive over the main roads and the hill tops, or travel over a canoe route well out in the lakes, we shall notice many small gaps and passes which would be quite unsuspected if we followed the valleys, or tramped through the woods *on* the route which we fancy the railway will take; and again there will generally be some governing points, crossings of rivers, or summits, which will fix the route and gradients for miles on either side, and it is these points which we wish to establish first and with least possible delay.

This is the true aim of the reconnoissance—not to examine or compare in detail one or more routes, but to find all possible routes, and by a process of elimination to weed out those which are impracticable, and gradually narrow the choice down to one, two, or three worthy of examination and comparison by the more precise methods which we will now go on to describe. In unsettled countries we shall probably now have to make a preliminary survey, mapping out the country on either side of the proposed route with sufficient nearness to determine distance and direction, and obtaining levels of summits and valleys with sufficient precision to establish the gradients.

A few years ago the only instruments in common use for such purposes were the transit or compass, the spirit level and the chain; and on the early C. P. R. surveys, for instance, hundreds of miles of line were laboriously cut through the wilderness, and carefully traversed, levelled, and chained, which were never afterwards used or seen.

Their main object was, I have said, to lay down on the map the main features of the country, and establish the levels of plains, swamps, lakes, rivers, and divides, and to form a base from which exploratory trips could be made on either hand with barometer and compass.

These objects, however, were generally lost sight of, and the party confined themselves to making an elaborate profile of the ground actually passed over, and a plan of the line actually run—represented by a very narrow red line on a very wide sheet of white paper, with daubs of brown colour and Prussian blue, representing such fragments of the topography as were visible from the immediate neighbourhood of the line, which in the case of our dense forests of spruce, tamarac, and pine, were very fragmentary indeed.

Later the objects of these surveys has come to be better understood, and the micrometer, Locke's hand-level, even the plane table, have been brought into use as affording means of getting much more extended information with quite sufficient accuracy, and in very much

less time. Four men in two canoes will make a survey of a canoe route with a light transit, provided with a gradienter or micrometer attachment, at the rate of several miles per day, and will be able to lay down *en route* by compass bearings or plane table, a large amount of detailed topography. Arrived at a portage one pair of men take over the horizontal measurements and the other the vertical. To do half this amount of work under the old method of running through the woods with transit, chain, level, and axe, would necessitate a party of ten or twelve men, with at least six or eight more to move camp outfit and supplies. With a fifth man attached to the little party, and a third canoe, the engineer in charge can make side excursions with barometer on either side of the micrometric survey as a base, and lay down the levels of a great number of points on either hand, with their approximate positions, and virtually carry on reconnoissance and preliminary survey at the same time.

In more settled and surveyed districts the preliminary survey is greatly simplified, and the work is reduced pretty much to more precise levelling in order to establish the gradients necessary, distances being obtained with sufficient accuracy from the township plans, but a more or less detailed survey of some portions may be necessary, especially in heavily wooded districts where limited field of view, and feeble definition of original survey lines, render the position of levels uncertain. By the time the preliminary survey is complete some one route will in all probability be proved the best, or at most, there will be alternative routes over only a portion of the distance. The length of the line, maximum gradient necessary, and even the approximate cost, and minimum radius of curvature, can be fixed with considerable precision by an experienced hand, and there is sufficient material to form the basis of a preliminary report to gladden or sadden the hearts of the directors. But whatever may be his private convictions the careful engineer will be extremely cautious about keeping on the safe side, and not raising hopes which subsequent location may prove to be groundless. Having prepared a small scale plan embodying all the information so far obtained in not too cumbrous shape, and having definitely decided upon our maximum gradients, we will proceed to run the trial line, or trial location, or, as I generally call it, the "traverse," or "location traverse." This in my own practice is a line carefully run with precise instruments and methods, and approximating as closely as the eye and the preliminary plan will enable us to run, the actual location, or centre line of the railway. Over the rougher portions it should be staked and levelled every 100 feet, and as the extra work entailed is small, it is as well to do so throughout. The extra stakes and hubs needed can often be used again on location, saving time and work, and the extra points (centred by the instrument), are often of great assistance in obtaining intersections and angles. A full party will, therefore, be needed, comprising transitman, leveller, two chainmen, picketman, rodman, and from two to five axemen. A "back-picketman" is sometimes added, but after trial of different methods, I have found that not only can he be dis-

pensed with, to the saving of one man's wages, but that more accurate work can be done, and annoyance avoided, by allowing the transitman to set a small picket himself immediately behind the eyepiece of his instrument, the level of which is marked by a chip nailed or wedged across near the top of the picket. The punishment for touching this picket, or shoving it out of perpendicular is never clearly specified, but threats, though vague, are forcible, and generally entirely effective in protecting the point from desecration.

On rocky ground a back-picketman is often indispensable, but rocky ground is generally clear, and one of the axemen can usually be spared. He should be provided with a plumb-bob to enable him to plumb his picket.

Some engineers dispense with the transit altogether and run a picket line, taking angles with the compass. More line may certainly be run in a day in this way, and with a slightly smaller force, but the subsequent location is rendered more laborious and the checks upon its accuracy less certain, and balancing one thing against another I believe that it is time and money saved to run the trial line as elaborately and perfectly as may be, and to line in all chain stakes with the transit, so that each one is a transit point, and we may start a location tangent or loopline from any point without going backwards or forwards to finds hubs from which to locate the exact line at intersection.

On the other hand, while the instrumental work should be careful and reference points numerous, extreme nicety and precision is so much time wasted. We must project our location on a plotted plan and work from protracted angles, rarely from calculated ones; and the eyes and hands of few engineers are sufficiently keen and steady to take these angles off much more precisely than the nearest five minutes of angle.

If cumulative errors and mistakes in reading are guarded against by keeping the instrument in fair adjustment and by repeating all angular measurements right and left face the small errors will be found to fairly balance one another, and hence a small light transit which can be rapidly set up and handled is the best for the purpose, and will give in good hands excellent results, and much better than a large and heavy instrument carelessly handled. Young transitmen especially are far too prone to believe that it is the instrument which does the work and not the man, or perhaps I should say that when the work is good the man is generally credited, and when bad the instrument is held responsible.

My favourite graduation is from 0 to 180 on each side of the centre, with one double Vernier to limb. The telescope should be furnished with a tolerably sensitive bubble of its own and a clamp and tangent movement to its axis; but a vertical arc is a redundancy of no use except for an occasional latitude, which can be better determined with a box sextant.

A most useful attachment, the gradienter, has been already mentioned; it enables small angles of elevation or depression to be measured with extreme nicety, so that the transit may be used in con-

junction with an ordinary levelling-rod as a micrometer for measuring distances or for inclined levelling. The almost universal practice is to measure and book angles to right or left of the produced line; bearings should be promptly worked out and compared every few courses with the readings of the magnetic needle as a check against errors in reading, and an observation of polaris every ten or fifteen miles is little trouble and gives a great sense of security. Similarly in levelling, it is correctness and rapidity which are desirable, and not extreme precision. If care is taken to equalize back and foresights, and to manipulate the rod properly and wave on turning points, remarkably close work can be done with a very light instrument, and more rapidly and with less effort than with a large instrument with extremely sensitive bubble taking time to set up and adjust. A point not generally realized among instrument men is that the accuracy of a traverse, especially a very crooked one, is dependent on the excellence of the chaining quite as much as on the angular measurements, and ordinary chaining over rough ground can hardly be considered precise measurement. If chainmen can be trained to measure 400 or 500 feet across a ravine to within an inch of the actual distance then it may be of some use to approximate in reading angles to less than the nearest minute, otherwise it is time wasted. Similarly, if the rod is held on a nailhead at each turn, and the graduations are all exactly equal for its entire length and painted on the wood itself, if there is no play about the joints and the greatest care is taken to hold it exactly plumb, then, and only then, will it be consistent to use a 24-inch Y in place of a 10-inch dumpy.

As these auxiliaries are usually handled, however, on railway surveys, the only advantage a large and expensive level has over a small one is the more powerful telescope with which it is fitted, enabling longer sights to be taken in open country. In ordinary woodland or mixed country, however, this is seldom of much consequence, as the leveller can generally get along faster than the line can be cleared and staked, and has ample time on his hands, and on rough, broken ground rapidity in handling and setting up is of much more consequence than great power or range.

Common practice is to run the traverse completely through from one terminal point to another before starting to locate. If we are going to compare two distinct lines there is something to be said in favour of this, but not much, for the preliminary survey will give us a fair basis for approximate comparison, and if this is not decisive the traverse rarely will be, and a fairly close location is the only reliable basis for a determination of approximate quantities and cost. American engineers are going more and more into elaborate contour surveying over a considerable area enabling a location to be laid down on paper in the office, and a profile to be made and quantities taken out without the planting of a single location stake. If this is all that is wanted, well and good; and the contour plans are certainly very interesting to compile and very beautiful studies when completed; but while all this field work and office work is being done (and it takes considerable time) the first stakes and hubs are being dis-

turbed and ploughed out by the farmers. And the extremely delicate personal knowledge of the ground which is acquired by working over a limited amount of it all day with the instruments is dulled by time and subsequent work; and if the object is to lay down the actual centre line as quickly and accurately as possible, I prefer to run only so much traverse ahead as will determine two arbitrary points on location, and then locate at once, and work over the same ground again and again until we are satisfied no improvement can be made. This procedure economizes time in moving the party from point to point, and a great deal can be left to the memory from day to day, which would otherwise have to be noted at extreme length on plan or profile, adding to labour, and serving often rather to confuse than to give information.

Locating in this way, long maximum grades should always be run from the top downwards, as the summit is generally fixed in position and the lower end free; the length of the location and the necessary "slack" to compensate for curvature can not be determined with certainty beforehand, or only with considerable labour, and if we run upwards we are apt to find ourselves a foot or two lower in our summit cutting than we intended, or on the other hand, that we could have lessened the height of our stream crossings considerably lower down.

This running of a maximum gradient for a long distance is one of the prettiest, most interesting, and at the same time most tedious operations which the locating engineer has to perform, and any one who has the patience and ability to make a success of it may safely be trusted to find his own way out of any other situation in which he is likely to find himself placed. The traverse being run for a mile or two ahead, it is cross-sectioned with more or less exactness and detail. The grade elevations proposed are entered in the level book opposite the respective stations and their surface elevations as just determined, and the leveller can tell at a glance whether it is higher or lower ground which is required, and how much of either, and will regulate his work accordingly. Often, however, it is impossible without excessive curvature to approximate even as closely to the proper level as the traverse does, and then the problem is to balance the cuts and fills, with a leaning towards an excess of the latter. If the traverse has been well run a few shots with the hand-level will often be sufficient, the cross-sections being entered in the book opposite the stations in the form of a fraction, the numerator representing the distance at right angles to centre line from the latter, and the denominator the difference in elevation, thus:

$$\frac{40\ \mathrm{R}}{+5} \qquad \frac{70\ \mathrm{R}}{+10.}$$

the signs representing higher or lower. The frequency of the cross-sections depends altogether upon the nature of the ground; 200 feet apart is generally near enough, provided that the highest points in cutting and the lowest in filling be among them. The object being to determine the greatest number of points on the inclined contour, the best run

traverse is that which is alternately a trifle too high and too low, and crosses it oftenest. With a line so placed on a tolerably regular slope, very little cross-sectioning is necessary. Stretching a sheet of manilla paper upon our camp drawing-board, we proceed to plot the line in pencil; I prefer to do this just as it is run by angles right or left from the preceding line produced. If the lines are long enough to warrant it the protracting is done by co-ordinates, one of which is assumed and the other taken out by inspection from a table of natural tangents, but usually a brass protractor of four or five inches radius, a boxwood scale, and a two-foot straight-edge, are all the instruments I care for.

If several miles are to be plotted on end on the same sheet accumulated errors will be avoided by plotting the bearings or by making out a table of latitudes and departures, but as in the side hill case we are considering a closure or check will be made between the traverse and the location at least every day, I keep only a mile or two, or say four feet on a scale of 200 feet to an inch plotted ahead, and then start afresh on a new sheet of paper from the end of the location as far as run. In this way I have seldom to plot more than 20 or 30 angles at most, and producing first and last courses to meet and comparing the angle with the calculated differences in bearing, I seldom find the error greater than 10 or 15 minutes, which means that the probable mean is not more than five minutes. With ordinary camp appliances it is hard to get much better results by any other method even if considerable time is spent. Having plotted plan in pencil, the lines and chainage should be inked in in fine black, and each chain stake ticked off. Then on the profile we lay the projected grade line, allowing enough "slack" to compensate for the necessary curvature which must be estimated. As the necessary flattening amounts to only about 17 feet per mile for a continuous 10° curve, a little error in the estimated quantity and pitch will not amount to a great deal in a mile or two. With this profile before us we proceed to tick off on the plan, with the aid of the cross-section notes, as many points as possible on the inclined contour or ideal location by offsets from the traverse, and then, commencing with the more crooked portions, to project a line intersecting this location at as many points as possible, consistent with a moderate radius of curvature, and a reasonable amount of tangent between the curves of contrary flexure. The curves must be sketched in first and the tangents drawn to them. A set of cardboard or hard rubber curves, cut to represent every 15 or 20 minutes of curvature on a scale of 400 feet to one inch from 0° to 2° and every half degree, from 2° to 4° will be found almost indispensable for scheming the lines rapidly and easily. Sharper curves can be drawn with the help of a table of radii with a pair of pencil dividers. It is well to commit the radii of all the even degree curves to memory as quickly as possible. The curves being schemed and their connecting tangents drawn in and produced to intersections with one another, the intersection angles are protracted and pencilled in, and the points of curvature and tangents, or B C's or E C's, are established. In the case of the flatter curves this is best done by taking out the subtangents

from Menck's invaluable table, and setting these off by scale on either side of the intersection point. With the sharper curves whose centres fall on the paper, it is often quicker and equally accurate to draw the terminal radius, which is of course perpendicular to the tangents, by means of a set-square slid along a straight-edge. The P C C's, or points of compound curvature, are found by drawing the common radius connecting the centres. Having schemed out sufficient work for the following day, we have next to give the transitman some notes by which to start and run it from the points he has on the traverse or previous location, the end of which (generally at end of a curve) will be shown on the plot. Connecting this existing location with that just projected, we shall be able to dictate to the transitman somewhat as follows: "Produce last curve to 1,072 + 50, or 2° 30′. Run tangent 1,055 feet, then 3° 20′ curve to right for 54° 10′; then tangent 550 feet, then 2° curve left for 15°. Run tangent to intersect with traverse, and 240 feet back from intersection start 1° 40′ curve to right for 24°."

These three curves will probably fetch us nearly a mile ahead, and unavoidable errors in plotting and scaling will be very apt to throw us considerably off our intended course if we run much further. To make things safe and fetch us back to our projected position, we may lay the next tangent down before the curve is run, by intersection with the traverse at some point to be determined from the plan. Our notes will then read thus: "At 1,224 + 30 on traverse, turn off angle 6° 30′ to R and run back to intersection with tangent of last curve, insert 4° curve, and at point 125 feet east of intersection with traverse put in B C of 2° curve for 10° 15′."

This is equivalent to taking a fresh start from the traverse and eliminating all previous errors in both lines, so far as their effect on the subsequent work is concerned, but it is often, nearly always, a tedious and tiresome operation, and I avoid it whenever possible by tieing to the traverse at the end of each day's work, and plotting the remainder as a continuation of location on a fresh sheet of paper. If the last curve or two are not exactly where we want them, we can run them over again in the morning in probably less time than the intersection process would have demanded, and the second running will bring us nearer to the true location than we could hope to get in any other way except by accident. There are so many indeterminate quantities which influence the proper location, and the minute graphic representation of the ground would consume such a large amount of time, that in my experience the true line is obtained more satisfactorily on extremely rough and difficult ground, by a series of approximations rather than by any attempt to lay the line down once for all on the plan and run it by a series of intersections on the ground. But there are some who locate every tangent directly from the traverse, run them out to intersection and put the curves in by the methods in the field books. In this method extreme or even moderate accuracy in the traverse and plotting are unnecessary, but the location operations are tedious, and it will generally be found that considerable subsequent revision is necessary. It is claimed again that the intersections are a

valuable and necessary check on the accuracy with which the curve is run. I prefer, myself, to check with a closely run traverse running over the same ground, and consequently more likely to agree in chainage than long sub-tangents whose intersections may be away off in the next township, and often altogether inaccessible.

Arrived at the end of our traverse, a new one is started as a continuation of the location with the same chainage carried on, and a new sheet of plan is started on in plotting, avoiding the handling of huge rolls of paper and confusion in grade heights owing to difference in length between the two lines.

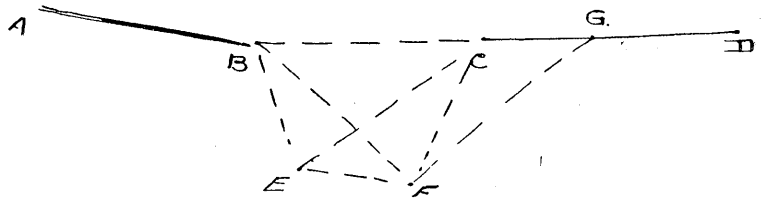
The bearings of location tangents should be kept worked up just as in the case of the traverse and discrepancies looked for at each closure. The actual running of curves and tangents, and the marking of stakes and lines has been too often described in books to make repetition necessary; there are numbers of tricks in handling instruments which can be learned only in practice.

In thick woods it is a laborious process to run in every stake with the transit on a long curve, and there are a number of methods of avoiding the necessity. The most common is to break the curve up into a number of chords, and run it as a series of straight lines off-setting the individual stakes into position as we go. The great trouble is that having started a chord we must run it to the end, and if this end is on an inaccessible point we have no recourse but to return to its beginning and lay off a fresh angle which may bring us out at an equally undesirable point. My own method, which I have never seen described or used by anyone else, is to run a series of short tangents to the curve which enables us to pick and choose our transit points. If we take care that the angle between any two tangents shall not exceed 4° or 5° on the flatter curves, and double this on the sharper, the difference in length between the tangents and the curve is small, and may often be neglected. For instance, we have a long 3° curve, starting from a given point on a given tangent; we put this point in as we come up, but, instead of setting on it, run straight on for, say, 100 feet further; and the tangent being 100 feet, the intersection angle will be 6°, which we lay off at the end. From the angle 100 ft. will fetch us to a point on the curve, which we again put in, but do not set over, running, say, 75 ft. further to a convenient transit point; the angle will now be 4° 30′, and so on —the sum of all the angles is the total angle of the curve—and the offset to the curve at any point is found by the formula $O = \frac{7}{8} ND^2$. Where O is the offset in feet, N the degree of curvature, and D the distance from the tangential point, or P. C., in hundreds of feet. We have the option at any time of setting on the P. C. and running the balance of the curve in the ordinary way.

There are numbers of beautiful problems in almost everyday occurrence in difficult country, many of which are described in the text-books and field-books, and many which are not and must be solved by individual ingenuity. One occurs to me which is unique in my own experience, and, I think, may be interesting to some of my

hearers, as the solution was so uncommon and simple and at the same time so entirely satisfactory.

A B represents a piece of located line running on a talus slope of broken rock at the foot of a precipice on the one hand and a deep lake on the other. C D is another precisely similar piece. Between B and C was a piece of the original rock wall which had resisted desintegration and jutted out from the rest of the cliff, descending almost perpendicularly 400 feet into deep water at its base, necessitating a tunnel some 500 feet in length. It was required to lay out and drive this tunnel from each end, at once—in other words to find the deflection angles at B and C—and the bearing of these points one from another. To run over the top was impossible, for the tunnel faces were as sheer as the lake side of the bluff, and the precipice not being exactly perpendicular the line B C could be seen to fall outside the face at the top. To offset a parallel line was equally impossible, as there were precipices on one hand and deep water on the other; but luckily two small islands existed about a quarter of a mile distant, on which we placed the stations E and F. Measuring



off a distance, C G as a base, the triangle C G F was solved, and from it E C F, and from these again B E F, B C F, and B E C. The angles F B C and B C F being known, the laying off of the tunnel line and the adjustment of the short curves at either end became a simple matter, and it is worthy of remark that after the heading was run through, the line laid off from C struck the hub at B within half an inch of the nail—a very fair result, considering that the instruments used read only to single minutes, and that B and C were 100 feet above E and F. A point which has puzzled me in connection with this problem is that while the angles F B C and B C F were all we wanted, and while we could protract these angles from a plotted plan without knowing anything except the angles at E and F, yet in order to calculate them we were obliged to at any rate assume a value for the base E F. Cannot some of our mathematicians solve this problem geometrically in some way, and work out the angles B C F, F B C with no other data, real or assumed, than the angles B E C, B E F, E F C, and B F C, which are all that are really necessary for the solution of the problem.

Having started out to give others information as to modern practice in location surveying I have wound up by asking the best solution of a geometrical question; and I feel so much more at home in the position of a student asking information than that of an

instructor in a very complicated and complex science, that I think I had better stop where I am and conclude this already very long paper with a reiteration of the principle I have already laid down, that if we are pushed for time, as we usually are, we can use light instruments and approximate rules and do very practically good work, but if you want good rest at nights take every precaution against blunders and mistakes. Small errors may be annoying, especially in the case of a bench mark which has two different elevations, one for the traverse and one for location, but they cannot be felt by the locomotive or the passengers. An error in feet or degrees will cause an amount of worry and expense, which must be experienced to be realized. I have said nothing about the modern practice of tapering curves by a gradual transition into the straight line, or one of greater or less radius, because it deserves a treatise in itself, and I have already read one before the Canadian Society of Civil Engineers and which is now bound up as part of the transactions of that body. Another treatise will be found in one of our last batches of exchanges. I think it is the Michigan Society's proceedings, and is well worth perusal. Further, this refinement of curve-running belongs rather to the subsequent operation of setting or laying out the work for construction, when a number of other small changes and improvements will usually be noticed.

But the theory and practice of running these transition curves will be found to repay study, even by those who may never have occasion to use them, and if there is anything more beautiful in art than a perfectly true circular curve on a railway track, with super-elevation exactly uniform and no elbows at the rail joints, it is the end of the same curve where it melts by imperceptible gradations into the tangent and the super-elevation is gradually reduced to zero. Would that there were more track artists, and that the argument that our road is as good as somebody else's, and therefore good enough, were made a crime to utter. Nothing is good enough, if at the same cost it can be made better. And nothing has been so well done that it cannot be improved. This is especially true in location, and it is well to remember that all locations and re-locations are merely successive approximations to perfection, and that there is always a chance to improve until the line is built, and not much afterwards.

DISCUSSION.

Mr. Butler—There is one little thing that Mr. Wicksteed draws attention to. He says: "American engineers are doing more and more to economize time." I think that no general rule of that kind should be laid down. There are cases where it is absolutely a necessity to lay down a contour plan, and there is no occasion for making the contour minutely accurate. I have a case in point somewhat similar to this. (Draws diagram and explains on blackboard.) In that way I was able to make my contour plan in the afternoon and go on with the location next morning.

Mr. Paterson—There are so many different circumstances. The case shown by Mr. Butler appears very clear on the board, but there are more difficult cases where the side hill is irregular, turning round in such a way that it may be very sharp curves. When you are running, not only for quantities but for gradient, and where you are bound down to 1 in 100, you will find after great care that you have shortened your line considerably, and the result is of necessity going over the ground again. So that you cannot make a rule in those difficult cases. Through a rough country, where there are rocks interfering with the sights, these contours are necessary. In the States they have a great deal of rough country—in Mexico and those places—and every place has rules of its own, and I think there should be great care in laying down a rule that such and such a thing must be done; because, as a rule, circumstances alter cases. And I think even in Canada we have rough ground necessitating the custom of the American engineers.

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

ROCK EXCAVATION OF TRENCHES FOR WATER-WORKS PURPOSES.

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Galt.

The object of my paper is to outline in as simple a way as possible the method adopted in the rock excavation required on the construction of the distribution system of the Galt water-works during the year 1891.

Galt is situated on the banks of the Grand River, which at that point runs almost due south, the town occupying the river valley, about 2,000 feet wide and a plateau about 60 or 70 feet higher on either side of the valley.

In the river valley the silurian rocks of the Guelph formation of some geologists, by others recognized as the upper series of the Niagara, outcrop in many places, and for the most part are within one and a half to two feet of the surface, there being above the rock from six inches to one foot of loose stone, and a surface covering of one foot of loam. The Guelph formation, as most of you know, is a highly fossiliferous dolomite limestone of a semi-crystalline texture of generally horizontal strata, from a few inches to four feet in thickness. In some places the strata is disturbed and wrinkled and in many ways shows signs of disturbance, particularly on the west side of the river.

The distribution system of the water-works comprised about 55,000 feet of four to twelve-inch cast-iron pipe, of which about 25,000 feet was in rock trench. The specifications for rock trench required that "all trenches shall be excavated to such depth as will give a covering of not less than five feet above the upper surface of the pipe;" that "No extra price will be paid for rock excavation in any part of the works. The contractor must satisfy himself as to the quantity and quality of the rock to be excavated. In rock trenches the rock must be excavated so that at no point shall any part of any pipe be within three inches of any rock, and the rock trench shall be at least 12 inches wider than the exterior diameter of the pipe laid."

"In rock trenches the pipes shall be bedded in sand, fine earth, cinders, ashes, or sawdust, as the engineer may direct; and shall be covered to a depth of two feet above top of pipe with sawdust, fine wood shavings, sand, gravel, or good earth." "No rock of greater weight than 50 pounds shall be returned to the trench." "The top six inches of filling shall be of finely broken stone."

Messrs Garson & Purcer, of St. Catharines, were the contractors for all work on the distribution system, binding themselves to complete the work by December 1st, 1891.

They deserve great credit for the manner in which this work was done. It can easily be seen that in a work of such magnitude, the systematic handling of the men and plant, the use of all modern improvements in the method of working are great factors in successful contracting, and I do not think that the rock trenching on the work could have been more economically or more efficiently done. It certainly was done to the entire satisfaction of the engineer and to the people of Galt.

The method adopted in drilling was that of the percussion steam drill, but in many cases, such as in deep water drilling for the river crossings, or in an occasional hydrant run, and in cases where the first blast was not effective enough, hand-drilling for economic reasons had to be resorted to.

Both methods of hand-drilling, churn-drilling, and the jumper-drilling were tried, the former being probably the best in thick bedded strata, but the latter proved much more effective in the thin bedded, shaley rock that we were dealing with, and for this reason was most used, and requires two strikers, each with hammers weighing about five pounds, hitting the drill alternately and regularly; another man sitting down holds the drill, turning it slightly during the interval between the blows. The sitter's duty it is to keep the drill hole partially filled with water to prevent the powdered rock from accumulating under the bit and to sponge out the hole when necessary. In order to prevent this water from splashing on the sitter it is necessary to wind a piece of gasket or other similar substance around the drill at the rock surface.

If the work is of any magnitude and the time in which it is to be done limited, the hand-drill method would prove much too ineffectual to grapple with it. In such cases the method employed must have economy of time, convenience and efficiency completely under control, and a mechanical plan must be used. That used at Galt consisted of two Rand percussion steam drills and a traction steam-engine of about 15 horse-power and its connections. A traction steam-engine for trenching purposes is a necessity, as it can be moved at any moment into any desirable positon, whereas with the ordinary wheeled engine there would be constant inconveniences and delays by not having the moving power when desired. For this work an ordinary stationary engine would be entirely unsuited.

In almost all progressive farming localities traction engines for threshing purposes are used, so that one can readily be obtained, and even if it cannot be so obtained, may be brought by rail at a not very great expense.

The steam percussion drills work in the same manner as the "jumper" in hand-drilling, the motive power being steam. The principle of the drill is that of the direct acting steam-engine, the steam cylinder being vertical, the drill bars being connected directly with the piston.

The cylinder is supported on a tripod made of steel, on each leg of which is an arrangement for hanging heavy cast-iron weights of 250 pounds, which steady the machine against the upward reaction of the blows. The rotation of the piston, and hence of the drill bit, is effected by a spirally-grooved steel bar and a ratchet wheel, and so arranged that the rotation is effected in the upward stroke. As the drill bit does its work, the cylinder is lowered by means of a feed screw which is turned by the operator, who needs to have some skill, as he must operate this feed, regulate the supply of steam, and loosen the drill bar when it becomes wedged, as it frequently does in shaley rock.

The drill bars used vary in length from two feet to eight feet, the latter being the maximum depth for the machine in use. The short one being used first is replaced by longer ones, as the hole deepens. The form of bit used is that of the x-shaped cutting surface, and requires re-sharpening every half-hour.

The steam, which is used at about 70 pounds, is conducted to the drill through inch and a half extra heavy wire-bound steam hose, and the machine may be worked fast or slow as the operator desires by means of the steam cock, which he works at his pleasure. Each drill requires an operator, and an assistant to help move the drill and to pour water into the drill hole to permit the effective working of the bit, and to keep the hole flushed out. After the hole is drilled it is stopped with a wooden plug to prevent dirt getting in until the blasting gang come up.

These machines set complete weigh about 850 pounds, including the three weights of 250 pounds for the tripod legs. The machine is so constructed that it can be taken apart when moved, or can be packed in a convenient form for shipment.

Some distance in the rear of the drilling gang come the blasting gang, who first sand-pump from each drilled hole any dirt accumulation, and then sponge out with a long wooden bar about one inch thick, usually of balsam or some evergreen wood with the bark peeled off; the bar also serves as a tamping bar. The sponging finished, the hole is then filled with the explosive. Judgment must be exercised in the kind, the strength, and in the form of an explosive needed in the different classes of work.

There can be no difference of opinion in the results required in trenching operations such as I am here describing; the rock must be so shattered that it can be handled with pick and shovel.

In thick-bedded rock a strong explosive is necessary, but in the thin-bedded rock, such as is met with in Galt, an explosive with 30 to 35% nitroglycerine proved sufficient for all purposes and did its work well. I do not think, though, that an easier rock for blasting than here met with is often found, nor would it be wise to use dualin or dynamite with less than 30% of nitroglycerine in its composition. The explosive used was dualin, made by the Hamilton Powder Co., put up in cylindrical paper-covered cartridges about 10 inches long and $1\frac{1}{4}$ inches in diameter, but are furnished to order in any required size.

Dualin or "False Dynamite" is a mixture of nitroglycerine with some granular absorbent of explosive substance. True dynamite has inert granular absorbent.

The nitro-glycerine undergoes no chemical change by this absorption, but retains all its characteristics—it freezes, burns, explodes, etc., under the same conditions as when in the liquid form. The absorbent minimizing the danger of explosion in transportation and handling by acting as a cushion to the nitroglycerine. The Dualin cartridges, or "sticks," as they are always called by the men on the work, are packed in sawdust in wooden boxes containing 25 or 50 pounds each.

Its transportation is very expensive, some of the railway companies refusing to carry nitro-glycerine in any form, while with those that do it is with the following restrictions: "That each car must be labelled 'dangerous explosive' in large letters. That cartridges must be packed in sawdust, as must also the boxes containing them. That a man must accompany each car to its destination." The company, I believe, do not ship in smaller quantities than in lots of 56 cases. For these reasons, "dynamite" is rarely used on small undertakings unless there happens to be a quantity stored in the locality. When bought in large quantities it costs about twenty-five cents per pound. After being brought to the place of destination, as a guarantee to the security of property, the dynamite must be stored in some isolated place; usually it will pay best to put a temporary storehouse with stove for heating, and shelving for spreading out the dynamite when thawing. Dynamite freezes at about 45° Fah. and when frozen is very difficult to explode, so that before use they must be thawed, which should be done gradually by spreading the cartridges out on some shelving in a warm room some distance from the fire. The dynamite cartridges are exploded by the use of a fulminating cap and safety fuse, with a Siemens magneto-electric blasting apparatus.

The cap or exploder used with ordinary safety fuse is a hollow copper cylinder about one-fourth inch in diameter, and an inch or two in length, containing 15 to 20% or more of fulminate of mercury mixed with some other ingredient into a cement, the mouth of the cap is closed with a sulphur cement through which pass two fine wires about one-eighth inch apart, connected in the fulminate with a fine platinum wire which is heated to redness with the current of electricity, ignites the fulminate and explodes the cap.

These exploders called platinum caps are sold in bunches of fifty, are always kept separate from the dynamite until wanted for use, when they are fastened into the cartridge. The electrical machine consists of a wooden box about the size of a small transit box, in the side of which are two openings for attaching the two leading wires to the exploders. From the top of the box projects a handle on a vertical bar, which is toothed and gears with a small pinion inside the box. When a blast is to be fired this handle is raised as far as it will come, and then pressed down quickly, putting into operation by means of the pinion the magneto-electric apparatus inside the box, generating the electricity, which is liberated the moment the handle in its downward

motion strikes a spring near the bottom of the box. The electrical machine is usually placed about 60 to 100 feet or more, as the necessity of the case requires, from the blast, and is connected thereto by two cotton-covered copper "leading wires."

It is always better in trenching work to fire a number of holes simultaneously, thereby getting the maximum effect from each charge. The number so fired being only limited by the length of the blasting shield and of the capacity of the electrical machine. Where this is done each hole has a platinum cap inserted into its charge, and one of the short wires attached to each cap is joined to one of those of the next cap, so that at each end of the series there is one free end of a short wire; to one of each a leading wire is fastened, thus producing a circuit from the electrical machine.

The electrical machine, size No. 3, weighs about 16 lbs., and costs about $25, while the next size costs about double that.

After each hole is sponged out it is loaded with the dynamite. The paper covering to the cartridges, or "sticks," as the men call them, should be slit open the whole length with a sharp knife, thereby allowing the dynamite to get free and to thoroughly fill the hole when pressed down with the wooden tamping bar; this operation should be repeated with each stick. When within two feet of the surface a half stick with the exploder attached is put in with another stick on top of that, the top of the hole is then filled with sand, tamped solid when the hole is ready for the charge, and such a charge will let daylight into any rock: a half-dozen of these holes charged simultaneously will break the rock almost as fine as macadam for a length of fifteen to twenty feet, so that the men can handle it entirely with pick and shovel.

The results may be better illustrated when I explain that, according to the specification, no rock greater in weight than 50 pounds is to be returned to the trench, and we had no trouble in enforcing it, for the simple reason that there were rarely any left to go back. With such a blast, then, as this, in order to prevent injury to person and property on the public streets from scattering stones and debris, it was necessary to cover the blast. The method of covering with loose timbers, with brush, etc., might possibly do with an exceedingly light blast, or with work in the open country, but on public streets, lined with houses, with people constantly passing and repassing, some method more economical of time, more satisfactory and secure in its results was necessary.

For the purpose the contractors used a shield made on the following simple principles: 5 oak timbers, 12 x 12 and 20 feet long, placed side by side and thoroughly bolted together, forming a platform 5 feet wide, sheeted on the bottom and sides with $\frac{5}{8}$ inch boiler plate, rivetted into one piece, and with the timbers thoroughly bolted together.

The shield weighed about 5 tons, and did its work most effectively. By its use the contractors could load each hole to the surface without fear of results. I have yet to hear of any person who was injured in any way during the construction of the works, and probably not more than a half-dozen window lights were broken after the first week's

use. Notwithstanding the immense weight of this shield it was on a number of occasions thrown high enough into the air to come down reverse side up; it will be readily understood, then, how a blast with such lifting power would shatter the rock fine enough to be shovelled, and that too with very little use of the pick. The width of trench so shattered was seldom more than four feet, and never wider than the five feet to prevent the use of the shield.

From its weight and form this shield was very difficult to handle, but by the use of two pairs of wheels that could be readily detached and removed from danger when firing a blast, there was very little loss of time in moving it forward its own length into position for the next blast.

These wheels were 60 inches in diameter, made on the same principle as the ordinary cart-wheel; the wheel rim was two and one-quarter inches thick, four inches wide, covered with a tire one-half inch thick. The axles were of machinery steel three inches square, five feet in length between inside of hubs, and seven feet four inches in length over all.

At its centre for a length of sixteen inches this axle was widened to six inches, and had an opening four inches by two and one-half inches through which passed a square threaded screw one and one-half inches in diameter and three feet long, with a swivel link attached to the lower end of the screw for linking into a hook in the shield.

This screw has no direct connection with the axle, but passes through a nut with bearings on both ends working on the axle, with journal caps bolted to the axle to keep it in position, thus giving it a side swing motion, the axle giving the forward and back motion.

When brought into use the wheels are run into position at the front and rear end of the shield, and each screw is linked to the hook on the shield, which, by means of a hand wheel eighteen inches in diameter at the upper end of the screw, is screwed up from the ground until suspended from the axle by means of these two screws.

The whole is then moved forward, the wheels running on planks on either side of the trench. When over its new position the shield is lowered over the trench by the screws, the wheels detached and removed until wanted to again move the shield forward after the blast. By means of this shield five men could blast in about two-thirds of a day what the two drills would cover in one day, so that it was not kept continuously in use.

It was easily moved in continuous trench blasting, but when moved any distance to a new street, was troublesome enough; for as each set of wheels was entirely independent of one another, they could not be guided when drawn by a team, for the wheels would persist in going any way but the right way in just about as helpless a fashion as a man without a backbone. In moving the shield, then, to a distance it was necessary to do so by hand, laying down planks for the wheels to run on, with a man at each wheel—a rather slow operation, but it was so seldom required that it did not prove a great inconvenience. But this difficulty might be overcome if it was often necessary to move the shield any distance at a time, as it seldom was on the work.

Drilling operations commenced about the middle of April, and were carried on continuously thereafter with two steam drills until the middle of August, in doing about 25,000 lineal feet of trenching, with a probable average of about five feet in depth of rock.

Part of this time for a few weeks, when running day and night, there was drilled, blasted, excavated, with pipe laid complete, about an average of 400 feet per day.

With trench well opened ahead, so as not to delay pipe-laying, the biggest day's laying of twelve-inch pipe in a rock trench was about 380 feet; of six-inch pipe, about 720 feet, including hydrant setting, etc. The biggest day's pipe laying of eight-inch was 710 feet without any hydrant settings.

It was impossible, however, to keep a pipe-laying gang continuously at work using only two drills, so that the average day's pipe-laying on each sized pipe was much smaller than the above. Usually when the pipe gang caught up to the blasting gang, they were shifted to some contiguous street in an earth trench, and kept there for some days, allowing them to have a good clear run in the rock trench before commencing again.

OBITUARY.

It is again our sad duty to record the death of a member of this Association in the person of Mr. David Suter Campbell, of Mitchell, who was called hence on February 28th, 1892.

Mr. Campbell was born in the city of Aberdeen in 1841. His father, the Rev. James Campbell, was at that time a minister in the Baptist Church in that city, but shortly afterward removed with his family to Canada and took charge of what is now known as the Jarvis Street Baptist Church in Toronto. He subsequently removed to the county of Perth, where the boyhood and youth of his sons were spent in the difficult task of acquiring an education with the very limited facilities of that period.

Among the relatives of the late Mr. D. S. Campbell may be mentioned his uncle, William Greig, who was Provost of Perth (Scotland), and had the honour to present "the keys" to Her Majesty on the occasion of her first visit to that place. Another uncle, James, was editor of the Edinburgh *Scotsman*. And still another, Alexander, was Principal of Perth Academy.

Mr. D. S. Campbell passed his preliminary examination for Provincial Land Surveyor in 1852, and received his commission to practise four years later. He then entered into partnership with Mr. W. Rath, P.L.S., and upon the death of the latter he assumed the whole practice. His professional labours, with the exception of one year spent in the North-West Territories, were chiefly in the counties of Perth, Huron and Middlesex, and during the past few years embraced an extensive practice under the various Drainage Acts of Ontario.

In his religious views Mr. Campbell was a staunch Presbyterian, and for eighteen years he was a prominent adherent of Knox Church, in Mitchell, holding at various times the position of Elder and Clerk of Session.

Mr. Campbell was married in 1875 to Miss Murdie, of the township of McKillop, who survives him.

In 1887 Mr. Campbell became a member of our Association, and continued an active member up to the time of his death.

Those of our members who were present at the first session of the annual meeting in February last will remember that Mr. Campbell attended and was appointed an auditor. Before the afternoon session of that day he was taken ill and was unable to attend again. On the following Saturday he was taken to his home in Mitchell, and died on Sunday, February 28th, of aneurism, deeply regretted by a large circle of friends.

Toronto, July 1st, 1892.

APPENDIX.

CHAPTER 34.

An Act to incorporate the Association of Ontario Land Surveyors and to amend the Act respecting Land Surveyors and the Survey of Land.

Assented to 14th April, 1892.

HER MAJESTY, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:—

Rev. Stat. c. 152, s. 2, amended.

1. Section 2 of the *Act respecting Land Surveyors and the Survey of Land* is amended by inserting the words "and shall have become registered under the provisions of this Act" immediately after the word "force," in the last line thereof.

Rev. Stat. c. 152, ss. 3, 4, 5, repealed.

2. Sections 3, 4 and 5 of the said Act are repealed.

Incorporation of Association of Ontario Land Surveyors.

3. All persons duly authorized to practice as land surveyors, as provided by the said Act, and all such other persons as shall become hereafter duly authorized so to practice under the provisions of this Act, shall, upon becoming duly registered as hereinafter provided, form "The Association of Ontario Land Surveyors," and shall be and are hereby constituted a body corporate under the said name of "The Association of Ontario Land Surveyors," having perpetual succession and a common seal, with power to acquire and hold real estate not exceeding at any time an annual value of $5,000, and to alienate, exchange, mortgage, lease or otherwise charge or dispose of said real estate, or any part thereof, as occasion may require, and all fines and fees payable under this Act, or under any by-law which may be passed by the association under the powers hereby granted, shall belong to the association for the purpose of this Act, and with power to the said association to pass by-laws not inconsistent with the provisions of this Act for the—

(*a*) Government, discipline and honour of its members.

(*b*) Management of its property.

(*c*) Examination and admission of candidates for the study or practice of the profession.

(*d*) And for all such other purposes as may be necessary for the working of the corporation.

(*e*) All by-laws shall be prepared by the council hereinafter named, and be ratified by the association at the annual general meeting, or at a special general meeting, to be called for the purpose.

Council of management.

4. There shall be a council of management of the association consisting of the Commissioner of Crown Lands, the president and vice-president of the association, and six other elective members, to be elected and hold office as hereinafter provided. The said council shall elect annually one of its members as its chairman, and shall appoint from amongst the members of the association such other officers as may be necessary for the working of this Act, who shall hold office during the pleasure of the council.

(1) After the first election provided for in section 8 of this Act, the members of the association shall elect annually from amongst their number a president, vice-president, secretary-treasurer, two auditors and two members of the council of management, and the secretary-treasurer of the association shall be the registrar of the association and secretary of the board of examiners.

(2) The said president, vice-president, secretary-treasurer, auditors and two members of the council may be elected at the annual general meeting in each year, providing their election be unanimous, but should the election of any of them not be unanimous and a ballot be demanded for the election of any of them by any member of the association entitled to vote at such election, then and in every such case the president, or in his absence, the vice-president, shall appoint two scrutineers to count the ballots, and the secretary-treasurer shall at such annual general meeting receive nominations of candidates for the office or offices in respect of which such ballot shall have been demanded, and the election shall take place in manner following, that is to say :—

(3) At least one week after the annual general meeting, when a ballot has been demanded, the secretary-treasurer, as registrar of the association, shall send by post, when his address is known, the form of voting paper in the schedule "B" to this Act, to each member of the association, with the list of names of all candidates nominated at the annual general meeting, and also a list of the retiring members, and the voting for officers and members of the council shall be limited to the persons who have been so nominated.

(4) The votes at an election by ballot for officers and members of the council of management shall be given by closed voting papers in the form in the schedule " B " to this Act, or to the like effect being delivered to the secretary-treasurer of the association at his office, between the hours of ten o'clock in the forenoon and four o'clock in the afternoon, on any day between the second Tuesday of March and the first Tuesday of April in each year in which an election by ballot is held, and any voting papers received by the secretary-treasurer by post during the time aforesaid shall be deemed as delivered to him for the purposes of the election.

(5) The voting papers shall upon the Thursday after the first Tuesday of April be opened by the secretary-treasurer of the association in the presence of the scrutineers appointed as above provided, who shall examine and count the votes, and keep a record thereof in a proper book to be provided by the council.

(6) The persons who have the highest number of votes for officers and members of the council, as the case may be, shall be declared elected.

(7) Any person entitled to vote at the election shall be entitled to be present at the opening of the voting papers.

(8) In case of an equality of votes between two or more persons which leaves the election of one or more officers or members of the council undecided, then the scrutineers shall forthwith put into a ballot box a number of papers with the names of the candidates respectively having such equality of votes written thereon, one for each candidate, and the secretary-treasurer of the association shall draw from the ballot box, in the presence of the scrutineers, one or more of the papers sufficient to make up the required number, and the person or persons whose name or names are upon the papers so drawn shall be the officer or officers or the member or members of the council, as the case may be.

(9) Upon the completion of the counting of the votes and of the scrutiny, the secretary-treasurer shall forthwith declare the result of the election, and shall as soon as conveniently may be, report the same in writing, signed by himself and by the scrutineers, to the president of the association.

(10) In the event of any elector placing more than the required number of names upon the voting paper for members of the council, the first names only, not exceeding the required number, shall be taken for the members of the council.

(11) The elective members of the council shall hold office for the following terms respectively: the two members receiving the greatest number of votes at the first election, for the term of three years, and until their successors shall have been elected; the two members receiving the next greatest number of votes at such election, for the term of two years, and until their successors shall have been elected; and the last two members for the term of one year.

(*a*) No person shall be entitled to vote as an elector at any election unless all his fees to the association have been paid.

(*b*) All elections under this Act shall be by ballot if demanded as may be provided by the by-laws of the association.

(12) No person shall be eligible for election to any office or to the council, or qualified to fill any vacancy thereon, or to appointment by the council to any office, unless his fees have been paid, and unless duly qualified under the provisions of this Act and the by-laws of the association.

(13) All members of the council, elected after the first election, shall hold office for the term of three years, and until their successors shall have been elected, except as hereinafter provided.

(*a*) In case of resignation, death or dismissal of any member or members of the council, the other members of the council shall have power to fill all vacancies so caused.

(14) In case of any doubt or dispute as to who has or have been elected to any office, or as a member or members of the council, or as to the legality of the election of any such officer or officers, member or members of the council, it shall be lawful for the other duly elected officers and members to be, and they are hereby constituted, a committee to hold an enquiry, and decide who, if any, is, or are, the legally elected officer or officers, or member or members of the council, and the person or persons, if any, whom they decide to have been elected, shall be and be deemed to be the officer or officers, or member or members legally elected, and if the election is found to have been illegal, the said committee shall have power to order a new election.

(15) The annual general meeting of the association shall be held in the city of Toronto, on Tuesday of such week and month in each year, and at such place as the council may elect. Due notice of such meeting shall be given by the secretary-treasurer, to each member of the association,

by circular letter, posted to his registered address, at least ten days before such meeting.

(16) (*a*) There shall be a board of examiners for the examination of candidates for admission to study, and also for such other examinations as the council may hereafter prescribe for candidates for admission to practise as land surveyors, which board shall consist of the chairman of the council, four other members of the association, to be appointed by the council, and two to be appointed by the Lieutenant Governor in Council.

(*b*) Of the four appointed members of the first board of examiners by the council, two shall hold office for three years and two for two years. After the second year, the council shall appoint two members of the association as examiners, who shall hold office for the ensuing three years as the terms of the appointees shall expire, and in the case of the resignation, or death, or inability to act of any member so appointed, his place may be filled by the council for the unexpired term by the appointment of some fit and proper person.

(*c*) Of the two members of the first board to be appointed by the Lieutenant-Governor in Council, one shall be appointed to hold office for a period of three years, and the other for a period of two years, and thereafter the appointment shall be made for a period of three years, unless when made to fill an unexpired portion of a term.

(*d*) The chairman of the council shall be the chairman of the board of examiners.

(*e*) Three members of the board of examiners shall form a quorum.

(*f*) The council may also appoint competent persons to assist the board of examiners in any of the subjects of examination.

(17) The council shall have the power to fix the expenses and fees to be paid to any of the examiners, as above appointed, subject as hereinafter provided.

(18) (*a*) Each member of the board shall take oath of office before a judge of any county court, or a justice of the peace.

(*b*) The following shall be the form of the oath of office:—

I, of having been appointed a member of the board of examiners for the admission of provincial land surveyors for the Province of Ontario, do sincerely promise and swear that I will faithfully discharge the duties of such office without favour, affection or partiality. So help me God.

Sworn before me at this day of 18

Rev. Stat. c. 152, s. repealed.

5. Section 23 of the said Act is hereby repealed and the following enacted in lieu thereof:—

Dismissal or suspension of members.

23—(1) The council may in their discretion suspend or dismiss from the association any land surveyor whom they find guilty of gross negligence or corruption in the execution of the duties of his office; but the council shall not take action until the complaint made under oath has been filed with the secretary, and a copy thereof forwarded to the party accused, nor shall the council suspend or dismiss such land surveyor without having previously summoned him to appear in order to be heard in his defence, nor without having heard the evidence offered either in support of the complaint or in behalf of the surveyor inculpated, and all such evidence shall be taken under oath, which oath the chairman of the said council, or person acting as such in his absence, or the secretary, is hereby authorized to administer, and all such evidence shall be taken down by a duly qualified stenographer, as in the case of procedure in the High Court of Judicature. Any surveyor so dismissed or suspended within fourteen days after the order of resolution of dismissal or suspension may appeal to a Judge of the High Court against such order or resolution by giving seven days' notice to the council, and may require the evidence taken to be filed with the Registrar of the Chancery Division, and the costs of such appeal shall be in the discretion of the judge; unless the order or resolution shall be set aside or the judge or council shall otherwise order, any surveyor so suspended or dismissed shall not have the right to practise as a surveyor after the appeal shall have been disposed of, except where the time for which he was so suspended shall have expired.

(2) If the council think fit in any case, they may direct the registrar to restore to the register any name or entry erased therefrom either without fee or on payment of such fee, not exceeding the registration fee, as the council may, from time to time, fix, and the registrar shall restore the same accordingly.

Rev. Stat. c. 152, s. 24, repealed.

6. Section 24 of the said Act is repealed and the following enacted in lieu thereof:—

Payment of examiners.

24. The council shall pay to each member of the board of examiners, and the secretary of the board, who attends any examinations, out of the funds of the association, such sum not less than $6 nor more than $8 as the council may by by-law determine, for each day's attendance, and their travelling expenses.

Rev. Stat. c. 152, s. 25, sub-ss. 1-4, repealed.

7. Sub-sections one to four, inclusive, of section 25 of the said Act are repealed and the following enacted in lieu thereof:—

(1) By every person duly authorized to practise as a land surveyor under the provisions of this Act on applying for registration under this Act, the sum of $1. Fees.

(2) By each member of this association an annual membership fee of $4.

(3) By each apprentice at the transmitting to the secretary the indenture or articles of such apprenticeship, $10.

(4) By each candidate for examination, with his notice thereof, $1.

(5) By each applicant obtaining a certificate as a fee thereon, $2.

(6) By each applicant receiving a certificate to practise as an admission fee, $30.

And such fees shall be payable to the secretary-treasurer for the use of the association under the provisions of this Act.

8.—(1) The first election of president, vice-president, secretary-treasurer, auditors and members of the council of management shall take place on the 2nd day of July, one thousand eight hundred and ninety-two, by such returning officer as the Commissioner of Crown Lands may appoint, and one month's notice thereof shall be given by the returning officer in the *Ontario Gazette*, and to each duly authorized provincial land surveyor practising in Ontario, by mailing the same to his usual post office address. And the persons entitled to vote at such first election shall be all persons who are at the time of the holding of the said meeting duly authorized to practise as land surveyors in the Province of Ontario whose names are on the list of Provincial land surveyors in the list thereof in the Crown Lands Department, or on the list thereof in the hands of the secretary of the board of examiners, and who are resident at the time of the election in the Province and pay to such returning officer for the association the registration fees authorized by this act. First election of officers and council.

(2) Such returning officer shall perform the like duties in respect of such election as the secretary-treasurer of the association may perform under section 4, and such election shall be by ballot as provided by said section 4, and the proceedings for transmission of ballots, voting by same, opening and counting the same, and otherwise as regards such first election shall as near as may be, be the same as provided by sub-section 3 of section 4 to sub-section 11 of said section 4, inclusive, except as to any proceedings to be taken at the annual general meeting or special general meeting.

(3) The Commissioner of Crown Lands may appoint for the purpose of the first election two scrutineers who shall perform all the duties to be performed by the scrutineers under section 4.

Subsequent elections.

(4) Every subsequent election of president, vice-president, secretary-treasurer, auditors and members of the council of management shall be held at the annual general meeting on the fourth Tuesday in February in each year, unless a ballot shall have been demanded, as herein elsewhere provided, and the persons qualified to vote at such election shall be such persons as are members of the association who have paid all fees due to the association from them under the provisions of this Act and of any by-law of the association.

Registrar of association.

9. It shall be the duty of the secretary-treasurer of the association to act as registrar of the association, and to make and keep a correct register in accordance with the provisions of this Act, as shown in schedule "A" hereto of all persons who shall be entitled to be registered under this Act, and to enter opposite the names of all registered persons who shall have died a statement of such fact, and from time to time make the necessary alterations in the addresses of persons registered.

Effect of omitting to register.

10.—(1) Any person entitled to be registered under this Act, but who neglects or omits to be so registered shall not be entitled to any of the rights or privileges conferred by registration under the provisions of this Act so long as such neglect or omission continues.

Removal of names from list.

(2) 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 to the secretary of such desire, and paying up all fees due from him to the association to date, and thereafter shall not be liable to the association for annual or other fees, and may, upon like notice of his intention to resume practice and paying the annual fees for the year in which such notice is given, have his name re-registered.

Registrar not to admit improper entries.

(3) No name shall be entered in the register, except of persons authorized by this Act to be registered, nor unless the registrar be satisfied by proper evidence that the person claiming to be entitled to be registered is so entitled, and any appeal from the decision of the registrar shall be decided by the council of the said association, and any entry which shall be proved to the satisfaction of such council to have been fraudulently or incorrectly made, shall be erased from or amended in the register by order of such council.

(4) The association may by by-law provide that any surveyor who has been in the actual practice of his profession for a period of thirty-five years or more and has during the entire period being a duly qualified surveyor may be exempted from the operations of this Act.

Who shall be entitled to register.

11. Any person duly authorized to practice as a surveyor of lands, in the Province of Ontario, under the provisions of the said Act, or who had been so authorized before the passing thereof, according to the laws then in force, and who may not have become registered under the provisions of this Act, may become a member of the association of Ontario Land Surveyors, by causing his name to be registered with the registrar of the association within six months after the election of such registrar, and by paying to such registrar such fees as may by by-law or otherwise be made payable in that behalf.

Omission to register through absence, etc.

(2) In case any such person as aforesaid omits to be registered within said period of six months through absence, illness or inadvertence, such person may be admitted by the council to enrolment as an Ontario land surveyor upon payment of the arrears of fees or such part thereof as the council may direct.

Penalty for practising while unregistered.

(3) From and after the first day of January, 1891, no person, unless registered as above provided, shall be entitled to take or use the name or title of Ontario land surveyor, either alone or in combination with any other word or words, or any name, title or description implying that he is registered. Any person who, after the above date, not being registered under this Act, takes or uses such name, title or description as aforesaid, shall be liable on summary conviction to a fine not exceeding $20 for the first offence, and not exceeding $50 for each subsequent offence.

Register of practising surveyors.

12. The registrar of the association shall in every year cause to be printed, published and kept for inspection at his office, free of charge, under the direction of the council, a correct register of the names in alphabetical order, according to the surnames, with the respective residences, in the form set forth in schedule "C" to this Act or to the like effect, of all persons appearing on the general register, on the first day of January in every year, and such register will be called the "Surveyors' Register," and a copy of such register, for the time being, purporting to be so printed and published as aforesaid, shall be evidence in all courts, and before all justices of the peace and others, that the persons therein specified are registered according to the provisions of this Act, provided always that in case

of any persons whose name does not appear in such copy, a certified copy under the hand of the registrar of the association of the entry of the name of such person in the register, shall be evidence that such person is registered under the provisions of this Act.

Penalty for making improper entries.

(2) If the registrar shall wilfully make or cause or allow to be made any falsification, in any matters relating to the register, he said be deemed to be guilty of an offence, and shall be liable, upon summary conviction therefor, to a fine of not less than $20 and not more than $50, and in default of payment, to imprisonment for a period of six months, unless the fine and costs shall be sooner paid.

Penalty for procuring entry by fraud.

13. Any person who wilfully procures or attempts to procure registration under this Act, by making or producing or causing to be produced or made any false or fraudulent representation or declaration, either verbally or in writing, that he is entitled to such registration, shall be deemed guilty of an offence, and shall be liable, upon summary conviction thereof, to a fine of not less than $20 and not more than $50, and in default of payment, to imprisonment for a period of six months, unless the fine and costs be sooner paid, and the council may remove the name of the offender from the registry.

Recovery of fees and penalties.

14. All fees payable under this Act may be recovered as ordinary debts due the association, and all penalties under this Act may be recovered and enforced before one or more justices of the peace, in manner directed by the Revised Statutes of Canada, chapter 178, entitled *The Summary Convictions Act*, and any Act amending the same.

(2) Any sum or sums of money arising from convictions and recovery of penalties as aforesaid, shall be paid immediately upon the recovery thereof, by the convicting magistrate to the registrar of the association.

(3) Any person may be prosecutor or complainant under this Act, and the council may allot such portion of the penalties as may be expedient towards the payment of such prosecutor.

Services of notices, how effected.

15. Subject to the other provisions of this Act, all notices and documents required by, or for the purposes of this Act to be sent, may be sent by post by registered letter, and shall be deemed to have been received at the time when the letter containing the same would be delivered in the ordinary course of mail, and in proving such sending it shall be sufficient to prove that the letter containing the notice or document was prepared and properly addressed and put in the post. Such notices and documents may be in writing or in print, or partly in writing

and partly in print, and when sent to the council or other authorities, shall be deemed to be properly addressed if addressed to the said bodies or authorities, or to some officer of the council or authority at the principal place of business of the council or authority, and when sent to a person registered under this Act, shall be deemed to be properly addressed if addressed to him according to his address registered in the register of the association.

Application of fees.

16.—(1) All moneys arising from fees payable on registration, or the annual fees, or from sale of copies of the register or otherwise shall be paid to the registrar of the association to be applied in accordance with such regulations as may be made by the council for defraying the expenses of registration, and other expenses of the execution of this Act.

(2) The council shall have power to invest any sum not expended as above, in such securities as shall be approved of by the Government of the Dominion of Canada or of the Province of Ontario, in the name of any three of their number appointed as trustees, and any income derived from any such invested sums shall be added to and considered as part of the ordinary income of the association.

(3) The association may also use surplus funds or invested capital for the rental or purchase of land or premises, or for the building of premises to serve as offices, examination halls, lecture rooms, libraries, or for any other public purpose connected with land surveying.

Accounts to be kept.

17. The secretary-treasurer, registrar of the association, shall enter in books to be kept for that purpose a true account of all sums of money by him received and paid under this Act, and such account shall be audited by the auditors, and submitted to the council and association at such time or times as they may require, and it shall be the duty of the said secretary-treasurer, as registrar of the association to keep the register in accordance with the provisions of this Act, and by-laws of the association and the orders and regulations of the council.

Short title.

18.—(1) This Act may be cited as *The Ontario Land Surveyors Act*, and may be read with and as part of said chapter 152 of the Revised Statutes of Ontario, 1887.

(2) The words, "Ontario Land Surveyor" shall include the words, "Provincial Land Surveyor."

SCHEDULE "A."

(*Section 9.*)

NAME.	Residence. P.O. address.	Qualifications and additions.	When admitted.	When ceased to practise.	When died.

SCHEDULE "B."

(*Section 4.*)

FORM OF VOTING PAPER.

Association of Ontario Land Surveyors election, 18 .

I, of the in the county of member of the Association of Ontario Land Surveyors, do hereby declare,

(1) That the signature affixed hereto is my proper hand writing.

(2) I vote for A. B., of the of in the county of , (as president, vice-president, secretary-treasurer, auditor *or* auditors, *as the case may be.*)

(3) That I vote for the following persons as members of the council of management of the association of Ontario Land Surveyors:—A. B., of the of in the county of C. D., of the of in the county of

(4) That I have signed no other voting paper at this election.

(5) That this voting paper was executed on the day of the date thereof.

Witness my hand this day of A.D. 18

SCHEDULE "C."

(*Section 12.*)

"Surveyors' Register," 1st January, 18 .

NAME.	Residence: P. O. address.	Qualifications and additions.

LIST OF MEMBERS.

ACTIVE MEMBERS.

NAME. OCCUPATION. ADDRESS.

Abrey, George Brockitt ..... Toronto Junction.
Town Engineer.

Aylsworth, Wm. Robert ..... Deseronto.
Engineer for Napanee, Tamworth and Quebec Railway.

Aylsworth, Charles Fraser, Jr ..... Box 60, Madoc.
Engineer for Tps. of Sydney, Thurlow, Rawdon, Huntingdon, Hungerford, Madoc and Tyendinaga, also Villages of Madoc and Tweed.

Baird, Alexander ..... Box 195, Leamington.
Engineer for Tps. Romney, Tilbury W., Colchester S., and Malden, also Town of Leamington.

Beatty, David ..... Parry Sound.

Bell, James Anthony ..... St. Thomas.

Berryman, Edgar, M. Can. Soc. C.E. ..... Sherbrooke, Que.
Chief Engineer Quebec Central Railway.

Bolger, Francis ..... Penetanguishene.

Bolton, Jesse Nunn ..... Albion.

Bolton, Lewis ..... Listowel.
Engineer for Townships of Elma, Grey, Morris, Town of Listowel and Village of Drayton.

Booth, Charles Edward Stuart, A. M. Can. Soc. C.E., Radford, Virginia.

Bowman, A. M. ..... Berlin.

Bowman, Clemens Dersteine ..... West Montrose.
Engineer for five Townships.

Bowman, Herbert Joseph, Grad. S.P. Sc. (Toronto); A.M. Can. Soc. C.E. ..... Berlin.
Superintendent Berlin Water Works.

Browne, Harry John ..... 17 Toronto Street, Toronto.

Browne, Wm. Albert ..... 17 Toronto Street, Toronto.

Burke, Wm. Robert ..... Ingersoll.

NAME. OCCUPATION. ADDRESS.

Butler, Matthew Joseph, M. Am. Soc. C.E.; M. Can. Soc. C.E.; Asso. M. Inst. C.E. ..... Desoronto, Ontario.
Chief Engineer The Rathbun Co. System, Bay of Quinte Ry. & Nav. Co, Thousand Islands Ry., K. N. & W. Ry.

Caddy, C. F. ..... Campbellford, Ontario.

Campbell, Archibald Wm., A. M. Can. Soc. C.E. ..... St. Thomas.

Casgrain, Joseph Philip Baby, A. M. Can. Soc. C.E. .. Morrisburgh.

Cavana, Allan George ..... Orillia.
Land, Loan and Insurance Agent.

Cheesman, Thos ..... Mitchell.

Chipman, Willis, B.A.Sc. (McGill); M. Am. Soc. C.E.; M. Can. Soc. C.E. ..... 103 Bay Street, Toronto.
Branch Offices at Brantford, Galt, Barrie and Brockville.
Civil and Sanitary Engineer.

Coad, Richard ..... Glencoe.

Cozens, Joseph ..... Sault Ste. Marie.
Mem. Am. Soc. M.E., Pres. Sault Ste. Marie & Hudson Bay Ry.

Davidson, Walter Stanley ..... 16 Warren Ave., Petrolea.

DeMorest, Richard Watson ..... Sudbury.

DeGursé, Joseph ..... Windsor.
Chief Engineer, Lake Erie, Essex & Detroit River Railway.

Dickson, James ..... Fenelon Falls.
Engineer for Tp. of Fenelon, Inspector Crown Lands Surveys.

Doupe, Joseph, C.E. (McGill) ... 190 Smith Street, Winnipeg, Man.

Drewry, William Stewart, D.T.S. ..... Dept. of Interior, Ottawa.
Triangulation Survey of part of Rocky Mountains, Topographical Survey of Canada.

Ellis, Henry Disney, C.E. ..... Toronto.
Assistant Engineer in charge of Roadways, City Engineer's Dept.

Esten, Henry Lionel ..... 157 Bay Street, Toronto.

Evans, John Dunlop, M. Can. Soc. C.E., Copper Cliff, near Sudbury, Ontario.
General Manager Canadian Copper Company, Chief Engineer Central Ontario Railway.

Fairbairn, Richard Purdom ..... 127 Major Street, Toronto.
Engineering Draughtsman, Public Works Dept., Ontario.

Farncomb, Frederick William ..... Box 107, Exeter.
Engineer for Exeter, also Townships of Hay and Stephen.

NAME. OCCUPATION. ADDRESS.

Fawcett, Thomas, D.T.S. ..... Gravenhurst.
Dominion Government Surveys.

Fitton, Charles Edward ..... Drawer 31, Orillia.
Engineer Wahnapatæ Mining Company, Land and Insurance Agent.

Flater, Frederick William ..... Chatham.

Foster, Frederick Lucas ..... 157 Bay Street, Toronto.

Galbraith, John, M.A.; Asso. M. Inst. C.E., D.T.S. ..... Toronto.
Professor of Civil Engineering, School of Practical Science.

Galbraith, William ..... Bracebridge.

Gardiner, Edward ..... St. Catharines.
Engineer County of Lincoln.

Gaviller, Maurice, C.E. (McGill) ..... Barrie.

Gibbons, Joseph, Grad. S.P.S ..... Renfrew.
Triangulation Survey Ry. Belt, Rocky Mountains.

Gibson, Peter Silas, B.Sc.; C.E.; M.Sc. (Univ. of Mich.).. Willowdale.

Gilliland, Thos. B ..... Eugenia.

Hart, Milner ..... 103 Bay Street, Toronto.

Henderson, E. E. ..... Henderson, Maine.

Howitt, Alfred ..... Gourock, Ontario.

Hutcheson, James ..... Nassagaweya.

Jephson, Richard Jeremy ..... Calgary, Alberta, N.-W.T.

Johnston, Robert Thornton ..... Sudbury.

Jones, Thomas Harry, B.A.Sc. (McGill) ..... Brantford.
City Engineer.

Jones, Charles Albert ..... 215 Dundas Street, London.

Keefer, Thos. Coltrin, C.M.G.; M. Inst. C.E.; Pres. A. Soc. C.E.; Can. Soc. C.E ..... Ottawa.

Kennedy, James H ..... Shedden.
Resident Eng. Pac. Ex. Great Northern Ry., Montana.

Kirk, Joseph ..... Box 373, Stratford.
Engineer for Townships of Mornington, South Easthope, North Easthope and Village of Milverton.

Kirkpatrick, George Brownly ..... 8 Coolmine Road, Toronto.
Chief Clerk Survey Branch, Department of Crown Lands.

NAME. OCCUPATION. ADDRESS.

Klotz, Otto Julius, D.T.S.; C.E. (Univ. of Mich.).....Preston.
Astronomer for Department of Interior.

Laird, James Steward .....Essex Centre.

Laird, Robert, Grad. S. P. Sc. (Toronto),
City Surveyor's Office, Toronto.

Lawe, Henry ....Hare Building, West Main St., Norfolk, Virginia.

Lendrum, Robert Watt .....VanKleek Hill.

Lewis, J. B..... Brunswick House, Ottawa.

Livingston, T. Chisholm.....Hamilton.

Lumsden, Hugh David, M. Inst. C.E.; M. Can. Soc. C.E.,
7 Homewood Ave., Toronto.
Supervising Engineer Calgary and Edmonton, and Qu'Appelle, Long Lake and Saskatchewan Rys., and Engineer Can. Pac. Ry.

McAree, John, Grad. S.P.Sc.; D.T.S.....81 Rose Ave., Toronto.

McCulloch, Andrew Lake, Grad. S. P. Sc., Toronto.....Galt.
Engineer for Town of Galt, Townships of Beverley and North Dumfries.

McDowell, Robt., Grad. S.P.S., Assoc. M. Can. Soc. C.E.,
Owen Sound.
Engineer for Tps. Derby, Sydenham, Sullivan and Saugeen.

McEvoy, Henry Robertson .....St. Mary's.
Tourist's Guide, North Bay.

McFarlen, George Walter .....10 St. Vincent Street, Toronto.

McKay, Owen..... .....Windsor.
Assistant Engineer, L. E. E. & D. R. Ry.

McKenna, John Joseph .....Dublin.

McMullen, Wm. Ernest.....7 Murray Street, Toronto.
Eng. Dept. Can. Pac. Ry.

Macnabb, John Chisholm .....Chatham.
Engineer for Erie and Huron Ry. and Town of Chatham.

Manigault, W. M..... .....Strathroy.

Miles, Charles Falconer .....Walkerton.
Engineer Minto, Normanby, Carrick, Brant, Greenock, Bruce, Arain and Town of Wingham.

Moore, John McKenzie .....Albert Building, London.
Engineer for four Townships.

Morris, James Lewis, C.E. (Toronto University), A.M. Soc. C.E.....Pembroke.
Engineer County of Renfrew.

NAME. OCCUPATION. ADDRESS.

Mountain, George Alphonso ..... Ottawa.
Chief Engineer Can. Atlantic Ry., and Chief Engineer Ottawa and Parry Sound Ry.

Murphy, Chas. Joseph ..... 157 Bay Street, Toronto.

Niven, Alexander ..... Haliburton.
Outline Surveys, Crown Lands Department.

Ogilvie, William ..... Ottawa.
Dominion Land Surveyor.

Patten, Thadeus James ..... Little Current.
Agent for Can. Perm. Loan and Savings Co.

Paterson, Jas. Allison, M. C. Soc. C.E.,
9 Masonic Chambers, Toronto St., Toronto.
Engineer for Toronto Belt Line Ry.

Proudfoot, Hume Blake, C.E. (University of Toronto) .... Toronto.

Purvis, Frank ..... Eganville.
Engineer for Townships of Bromley and Wilberforce.

Rainboth, E. J..... 48 Sparks St., Ottawa.

Roberts, Vaughan Maurice ..... 11 Peter St., Toronto.

Robertson, James, Grad. S. P. Sc..... Glencoe.

Rogers, Richard, Birdsall; B.A.Sc. (McGill) ..... Peterboro'.
Superintending Engineer Trent Canal.

Rorke, L. V..... Sudbury.

Ross, George, B.A.Sc. (McGill) ..... Welland.
Engineer for Towns of Welland and Niagara Falls, and six Townships.

Russell, Alexander Lord ..... Box 240, Port Arthur.
Mining Engineer.

Sankey, Villiers. ..... City Hall, Toronto.
City Surveyor.

Sanderson, Daniel Leavens..... Enniskillen.

Saunders, Bryce Johnston, B.A.Sc. (McGill)....Box 114, Brockville.
Engineer for Counties Leeds and Grenville, Townships Augusta and Elizabethtown.

Scane, Thomas ..... Ridgetown.
Engineer for Townships of Orford and Done, and Town of Ridgetown.

Seager, Edmund ..... Rat Portage.

Sherman, Ruyter ..... Brantford.
Assistant City Engineer.

Smith, Henry..... Crown Lands Dept., Toronto.
Supt. Colonization Roads.

NAME. OCCUPATION. ADDRESS.

Speight, Thomas Bailey .....Arcade, Yonge Street, Toronto.

Steele, Edward Charles..... .....Prince Albert, N.W.T.

Stewart, Elihu .....Collingwood.

Stewart, Louis Beaufort, D.T.S....Sch. of Practical Science, Toronto.
Lecturer on Surveying.

Tiernan, Joseph M.....Tilbury Centre.
Engineer for three Townships.

Tyrrell, James Williams, C.E. (Toronto)..42 James St. N., Hamilton.
Engineer for County of Wentworth, Townships of Ancaster and Flamboro' West, Seneca, and Town of Burlington.

Unwin, Charles .....157 Bay Street, Toronto.

Ure, Frederick J.....Woodstock.
Engineer for Town of Ingersoll and six Townships.

VanNostrand, Arthur J.....Arcade, Yonge Street, Toronto.

Vicars, John .....Cannington.
Engineer for Village of Cannington.

Walker, A. P.....Toronto.
Eng. Dept. Can. Pac. Ry.

Warren, James, Asso. Mem. Can. Soc. C.E.....Kincardine.
Engineer for the Townships of Ashfield and Culross, Kincardine and Bruce, and Lucknow Water Works.

Weatherald, Thomas.....Box 116, Goderich.

Wheelock, Chas. Richard .....Orangeville.
Engineer for Counties of Wellington, Dufferin and Peel.

Whitson, James Francis .....Toronto.
Crown Lands Dept.

Wicksteed, Henry King, B.A.Sc. (McGill), M.C. Soc. C.E..Cobourg.

Wiggins, T. H.....Brantford.

Wilkie, Edward Thomson.....Carleton Place.

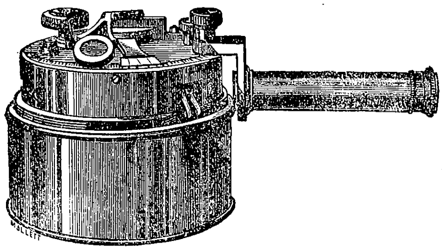
Yarnold, William Edward .....Port Perry.
Engineer for Townships of Brock, Reach, Scugog, Mariposa and Georgina.

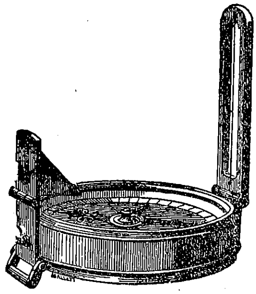
JUNIOR MEMBER.

Mackenzie, William Innes, Jr..... Toronto.

HONORARY MEMBER.

Carpmael, Charles, M.A.....Toronto.
Superintendent Meteorological Service.





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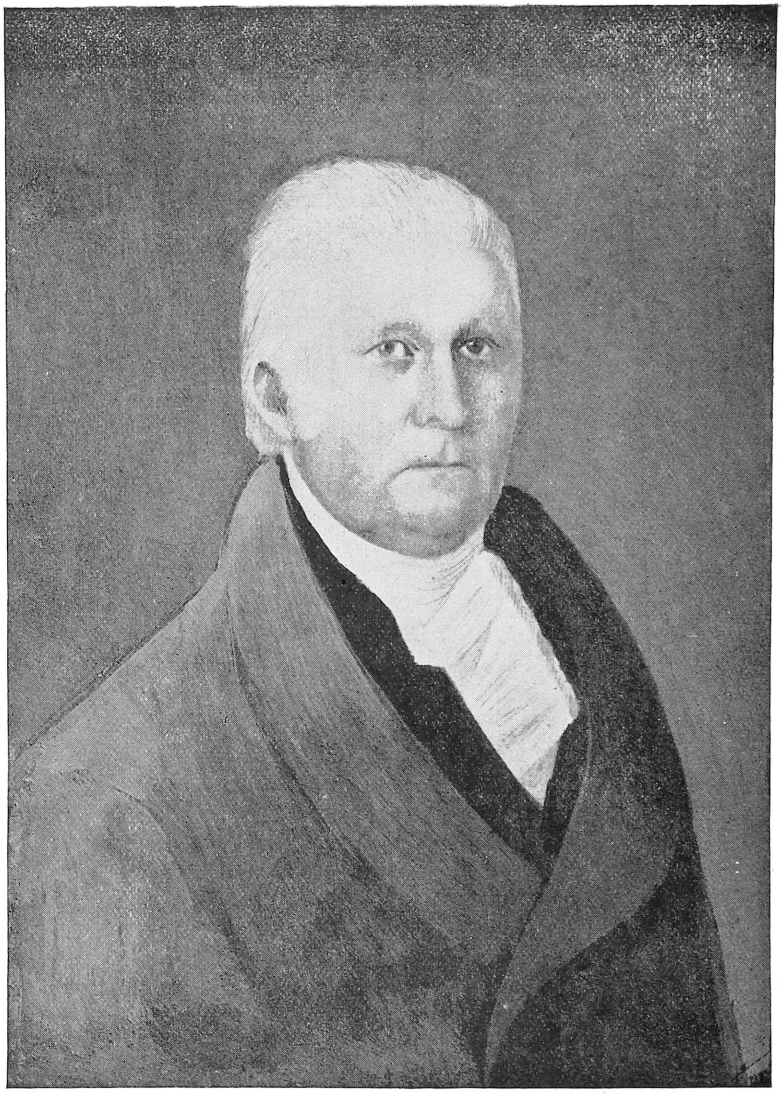


THOMAS RIDOUT,

Surveyor General of Upper Canada in 1810.

PROCEEDINGS

OF THE

ASSOCIATION OF

ONTARIO LAND SURVEYORS

AT ITS FIRST ANNUAL MEETING, SINCE INCORPORATION,

HELD AT TORONTO, ON FEBRUARY 28TH,
MARCH 1ST AND 2ND,

1893

Being the Eighth Annual Meeting of the Association of Provincial Land Surveyors of Ontario

---

AFFILIATED WITH ASSOCIATION OF DOMINION LAND SURVEYORS
AND ASSOCIATION OF PROVINCIAL LAND SURVEYORS
OF BRITISH COLUMBIA.

The Second Annual Meeting (Ninth Annual Meeting of the Association of Provincial Land Surveyors of Ontario) will be held in Toronto, on Tuesday, 27th of February, 1894.

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

NOTICES.

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

Members can be supplied with copies of the Proceedings for 1887, 1888, 1889, 1890, 1891, or 1892 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.

PATRONIZE OUR ADVERTISERS.

PREFACE.

To the Members of the Association of Ontario Land Surveyors:

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

Appended will be found the By-Laws of the Association, and Regulations of the Board of Examiners.

The attendance at this meeting was larger than at any previous one, and much interest was manifested in the discussions.

Affiliation with The Association of Dominion Land Surveyors, and The Association of Provincial Land Surveyors of British Columbia has been accomplished, and it is hoped that much benefit may result from the union of interests of representatives of our profession in the various parts of the Dominion.

The result of the Election of Officers leaves the *personnel* of the Council of Management the same as that of last year.

Each member is requested to exert himself personally to forward the interests of the Association in any direction within his power, and it is particularly desired, that the matter of contribution to the programme for our next Annual Meeting, be kept in view during the year.

Respectfully submitted on behalf of the Council.

A. J. VANNOSTRAND,
Secretary.

CONTENTS.

ASSOCIATION OF

ONTARIO LAND SURVEYORS

[INCORPORATED 1892].

ORGANIZED 23RD FEBRUARY, 1886.

Officers for 1893-94.

PRESIDENT.

Elihu Stewart, O.L.S., Collingwood.

VICE-PRESIDENT.

M. J. Butler, O.L.S., Napanee.

SECRETARY-TREASURER.

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

COUNCILLORS.

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

G. B. Kirkpatrick, O.L.S., Toronto
A. Niven, O.L.S., Haliburton } For 3 years.

P. S. Gibson, Willowdale
M. Gaviller, Barrie } For 2 years.

J. McAree, Toronto
V. Sankey, Toronto } For 1 year.

AUDITORS.

Willis Chipman, C.E., Toronto.
H. Proudfoot, C.E., Toronto.

BANKERS.

Imperial Bank of Canada.

BOARD OF EXAMINERS.

V. Sankey, Toronto (Chairman).

M. J. Butler, Napanee
G. B. Kirkpatrick, Toronto } Appointed by Lieut.-Gov. in Council.

P. S. Gibson, Willowdale
A. Niven, Haliburton
R. Coad, Glencoe
M. Gaviller, Barrie } Appointed by Council.

STANDING COMMITTEES.

LAND SURVEYING.—M. Gaviller (Chairman), H. J. Browne, T. B. Speight, J. M. Tiernan, L. V. Rorke, J. L. Morris, B. J. Saunders.

DRAINAGE.—H. J. Bowman (Chairman), J. C. MacNabb, R. Coad, R. McDowall, H. Winter, J. Robertson, W. R. Burke, Geo. Ross, C. A. Jones, A. G. Cavana, Alex. Baird, C. F. Miles.

ENGINEERING.—G. B. Abrey (Chairman), C. F. Aylsworth, Jr., O. McKay, Jno. McAree, T. H. Jones, J. W. Tyrrell, H. K. Wicksteed, A. W. Campbell.

ENTERTAINMENT.—F. L. Foster (Chairman), Chas. Murphy, H. D. Ellis, T. B. Speight, A. P. Walker, H. B. Proudfoot, W. A. Browne.

PUBLICATION.—H. L. Esten (Chairman), H. J. Browne, F. L. Foster, Chas. Murphy, J. McAree, K. Gamble.

TOPOGRAPHICAL SURVEYING.—Willis Chipman (Chairman), T. Fawcett, J. Dickson, J. P. B. Casgrain, A. L. Russell, J. Cozens, W. Ogilvie.

PROGRAMME OF THE

Association of Ontario Land Surveyors

(INCORPORATED)

AT ITS FIRST ANNUAL MEETING HELD IN TORONTO,
FEBRUARY 28TH AND MARCH 1ST AND 2ND, 1893.

PROGRAMME.

Tuesday, February 28th—Morning, 10 o'clock.

Meeting of Council.
Meeting of Standing Committees.

Afternoon, 2 o'clock.

Report of Council of Management.
Report of Secretary-Treasurer.
President's Address.
Report of Committee on Land Surveying, with "Question Drawer." M. Gaviller, O.L.S., Chairman.
Report of Committee on Engineering, with "Question Drawer." G. B. Abrey, O.L.S., C.E., Chairman.
Report of Auditors.

Evening, 8 o'clock.

Paper—"Geographical Surveying," L. B. Stewart, O.L.S., D. T. S., Toronto.
Paper—"History of Taché Gold Field," H. DeQ. Sewell, O.L.S., Port Arthur.
Paper—"Timber Surveys," J. F. Whitson, O.L.S., Collingwood.

Wednesday, March 1st—Morning, 10 o'clock.

Paper—"The Duties of a Surveyor on the Maintenance-of-Way Staff of a Railroad," W. L. Innes, O.L.S., London.
Paper—"Local Improvements," P. S. Gibson, O.L.S., C.E., Willowdale.
Ratification of By-Laws.
Volunteer Papers.

Afternoon, 2 o'clock.

Paper—"A Plea for a Topographical Survey," Willis Chipman, O.L.S., C.E., Brockville.

Paper—"Shall it be a Tile Drain?" H. J. Bowman, O.L.S., C. E., Berlin.

Paper—"The Mexican Amalgamation Progress," Samuel Bray, O.L.S., Ottawa.

Paper—"Permanent Street Pavements," J. W. Tyrrell, O.L.S., C.E., Hamilton.

Evening, 7.45 o'clock.

Annual dinner at the Arlington Hotel.

Thursday, March 2nd—Morning, 10 o'clock.

Paper—"Draughting," F. L. Foster, O.L.S., Toronto.

Report of Committee on Drainage, with "Question Drawer." J. C. Macnabb, O.L.S., C.E., Hamilton.

Paper—"The Transit and How to use It," Cyrus Carroll, O.L.S., C.E., Hamilton.

Paper—"Drainage Difficulties in the South Western Municipalities of Ontario," Henry Winter, O.L.S., C.E., Thornyhurst.

Afternoon, 2 o'clock.

Report of Committee on Legislation, James Dickson, O.L.S., Chairman.

Report of Committee on Publication, H. L. Esten, O.L.S., Chairman.

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

Unfinished Business.

Nomination of Officers.

Appointment of Scrutineers—Ballot of 1893.

New Business.

Adjournment.

ASSOCIATION OF

ONTARIO LAND SURVEYORS

(INCORPORATED).

MINUTES OF THE FIRST ANNUAL MEETING

(Eighth Annual Meeting of Provincial Land Surveyors of Ontario.)

FEBRUARY 28TH, MARCH 1ST AND 2ND, 1893.

The Association met at 2 p.m. on Tuesday, the 28th of February, in the lecture room of the Canadian Institute, 58 Richmond Street East, Toronto.

The President, Mr. Elihu Stewart, in the chair.

Moved by Lewis Bolton, seconded by M. Gaviller : That the minutes of the last meeting of the Association of Provincial Land Surveyors of Ontario, as printed in the Proceedings, be confirmed as read. Carried.

The Secretary read letters from the following gentlemen : Mr. W. E. Yarnold of Port Perry, Mr. Gibbs of Adolphustown, Mr. Henry Creswicke of Barrie, Mr. F. W. Wilkins of Norwood, and Mr. Joseph Kirk of Stratford.

After some discussion as to matters referred to in the above letters, it was moved by P. S. Gibson, seconded by A. J. VanNostrand : That the communications as read be received and laid on the table for reference. Carried.

The Secretary-Treasurer, Mr. A. J. VanNostrand, read his Annual Report.

Moved by A. Niven, seconded by H. J. Bowman : That the report of the Secretary-Treasurer be received and adopted, and that the financial statement be handed to the auditors for their report. Carried.

The President then delivered his Annual Address.

The paper prepared by Mr. Bray on "The Mexican Amalgamation Process" was read by Mr. Tyrrell, Mr. Bray being unable to attend the meeting.

Moved by A. J. VanNostrand, seconded by James Dickson: That Mr. Bray's paper be received and adopted, and that the thanks of this meeting be tendered him for it. Carried.

The Report of the Committee on Drainage was then read by Mr. Lewis Bolton, in the absence of the Chairman, Mr. J. C. Macnabb, together with some questions sent in, which matters were laid over for future discussion.

Question No. 7, submitted to the Committee on Land Surveying for 1891, was taken up and discussed (diagram explaining in Proceedings of 1891), after which it was moved by J. L. Morris, seconded by L. V. Rorke: That question No. 7 submitted to the Land Surveying Committee of 1891 be referred to the Committee on Land Surveying, with the request that they give a finding and report thereon at the next annual meeting. Carried.

On motion of Mr. Bolton, seconded by Mr. Wilkie, the meeting adjourned at 5.15 p.m.

TUESDAY EVENING SESSION, 8 O'CLOCK.

The President in the chair.

Mr. L. B. Stewart read his paper on "Geographical Surveying," after which he extended a cordial invitation to the members of the Association to pay a visit to the School of Practical Science during their stay in the city.

Moved by Mr. Kirkpatrick, seconded by Mr. Niven: That the thanks of the Association be given Mr. Stewart for the admirable paper read by him. Carried.

Mr. H. DeQ. Sewell read his paper entitled "History of Taché Gold Field."

Moved by Mr. Dickson, seconded by Mr. Miles: That a cordial vote of thanks be given Mr. Sewell for his very interesting paper. Carried.

A paper on "Timber Surveys" was then read by Mr. J. F. Whitson.

Moved by Mr. Niven, seconded by Mr. Dickson: That a vote of thanks be given Mr. Whitson for his paper. Carried.

The Report of the Council of Management was then presented by Mr. Villiers Sankey, Chairman of the Council. Mr. Sankey also referred to the case of members of the Council, who are not resident in Toronto, and who are put to considerable expense in attending the meetings other than the general annual meeting, and suggested that some steps be taken by the Association towards providing for the payment of hotel and travelling expenses of those members referred to.

On motion of Mr. Sankey, seconded by Mr. Niven: The report of the Council of Management was adopted.

A discussion took place on a matter introduced by Mr. Wilkie as to a proposed new plan for the town of Almonte.

On motion of Mr. Bolton, seconded by Mr. Wilkie, the meeting adjourned at 10.30 p.m.

WEDNESDAY MORNING SESSION, 10 O'CLOCK.

The President in the chair.

The paper prepared by Mr. W. L. Innes on "The Duties of a Surveyor on the Maintenance-of-Way Staff of a Railroad," was read by the Secretary, Mr. A. J. VanNostrand, Mr. Innes not being able to attend.

Moved by Mr. Wilkie, seconded by Mr. M. J. Butler: That the thanks of the Association be tendered Mr. Innes for his paper. Carried.

Mr. P. S. Gibson then read his paper on "Local Improvements."

Moved by Mr. Gaviller, seconded by Mr. Niven: That a vote of thanks be tendered Mr Gibson for his paper. Carried.

The report of the Committee on Land Surveying was submitted by Mr. M. Gaviller, Chairman of the Committee, with Question Drawer and answers of the Committee.

After discussion, on the motion of Mr. Gaviller, seconded by Mr. Dickson, the report was received and adopted.

The meeting then adjourned, it being 1 o'clock.

WEDNESDAY AFTERNOON SESSION, 2 O'CLOCK.

The President in the chair.

Mr. Willis Chipman read his paper on "A Plea for a Topographical Survey."

Moved by Mr Kirkpatrick, seconded by Mr. Butler: That a vote of thanks be tendered Mr. Chipman for his paper. Carried.

Mr. Allan Macdougall C.E., Secretary of the Canadian Institute, addressed the meeting, welcoming the members of the Association, to which the President suitably replied.

Mr. H. J. Bowman then read his paper on "Shall it be a Tile Drain?"

Moved by Mr. Tyrrell, seconded by Mr. McCulloch: That a vote of thanks be given Mr. Bowman for his paper. Carried.

The ratification of by-laws was then proceeded with, Mr. Sankey, Chairman of the Committee, reading them clause by clause, each one being carried separately.

Moved by Mr. Sankey, seconded by Mr. Gibson: That the by-laws that have just been carried, clause by clause, be carried now as a whole, and that the Council be authorized to have the same printed for circulation amongst the members. Carried.

Mr. Tyrrell read his paper on "Permanent Street Pavements."

Moved by Mr. Butler, seconded by Mr. Abrey: That the paper be received and a vote of thanks given to Mr. Tyrrell. Carried.

On motion of Mr. Butler, seconded by Mr. VanNostrand, the meeting adjourned at 6 o'clock.

THURSDAY MORNING SESSION, 10 O'CLOCK.

The President in the chair.

Mr. F. L. Foster read his paper on "Draughting."

Moved by Mr. Niven, seconded by Mr. Morris: That a vote of thanks be given to Mr. Foster for his paper. Carried.

"The Transit and How to use it," a paper prepared by Mr. Carroll of Hamilton, was read by Mr. Tyrrell, owing to Mr. Carroll not being able to be present at the meeting.

Moved by Mr. Niven, seconded by Mr. Tyrrell: That Mr. Carroll's paper be received and the thanks of the Association tendered him for it. Carried.

Mr. Henry Winter read his paper on "Drainage Difficulties in the South-Western Municipalities of Ontario," with a diagram on the blackboard. The discussion on this paper was laid over till the afternoon.

The discussion on the report of the Drainage Committee, which was laid over on Tuesday afternoon, was then taken up, Mr. Bolton reading the report and questions sent in.

Moved by Mr. Bolton, seconded by Mr. Niven: That the Report of the Committee on Drainage be received and adopted. Carried.

The Report of the Committee on Engineering was presented by Mr. Abrey, Chairman of the Committee.

On motion of Mr. Abrey, seconded by Mr. Bowman, the report was adopted.

Report of the Committee on Legislation was read by Mr. James Dickson, Chairman of the Committee.

Moved by Mr. Dickson, seconded by Mr. Chipman: That the report be adopted. Carried.

Mr. F. L. Foster, Chairman of the Committee on Entertainment, moved, seconded by Mr. Dickson: That the report of that committee be taken as read. Carried.

On motion of Mr. Foster, seconded by Mr. Butler, the meeting adjourned at 12 45 p. m.

Thursday Afternoon Session.

The President in the chair.

The Report of the Auditors was read by the President.

Moved by Mr. Sewell, seconded by Mr. McAree: That the Auditors' Report with the financial statement be received and adopted. Carried.

The Report of the Committee on Publication was read by Mr. Esten, Chairman of the Committee, and on motion of Mr. Esten, seconded by Mr. Murphy, was adopted.

The following resolution was then passed: Moved by G. B. Abrey, seconded by A. Niven: That we have to regret the death of two of the members of this Association since our last annual meeting, viz: David Suter Campbell, of Mitchell, and Isaac Lucius Bowman, of Berlin. One of these, that of Mr. Campbell, occurred before the date of publication of our last report and was mentioned as an obituary notice there. We desire to convey to the members of their respective families this expression of our sympathy and sorrow in their bereavement, and request that copies of this motion be sent to them by the Secretary.

The matter of the remuneration of the officers of the Association for services rendered being taken up, it was moved by Mr. Dickson, seconded by Mr. Tyrrell: That the Secretary-Treasurer be paid the sum of $120 for his services during the past year. Carried.

Moved by Mr. Foster, seconded by Mr. Morris: That the members of the Council of the Ontario Land Surveyors be allowed all reasonable expenses, and $6 per day while in attendance in their capacity as Councillors at all meetings, except the general annual assembly of the Association.

Moved in amendment by Mr. H. J. Bowman, seconded by Mr. C. F. Miles: That the members of the Council be paid all reasonable expenses in coming to, attending and returning from Council meetings. No member, also a member of the Board of Examiners, to be paid railway fare when attending a meeting of the Board of Examiners at the same time.

After considerable discussion the amendment was carried by a vote of 12 to 6.

Moved by H. L. Esten, seconded by Charles J. Murphy: That any omissions or clerical errors in the record 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.

Before taking up the matter of the nomination of officers for the ensuing year the meeting adjourned for ten minutes.

On re-assembling it was moved by Mr. Dickson, seconded by Mr. Jones : That Mr. Elihu Stewart be re-elected President for the ensuing year. Carried.

Moved by Mr. Niven, seconded by Mr. Gaviller : That Mr. M. J. Butler be re-elected Vice-President. Carried.

Moved by Mr. Butler, seconded by Mr. Sewell : That Mr. A. J. VanNostrand be re-elected Secretary-Treasurer for the ensuing year. Carried.

The following gentlemen were then nominated for the office of Auditors, two being required :—

Willis Chipman, nominated by Mr. Dickson, seconded by Mr. McAree.

H. B. Proudfoot, nominated by Mr. Niven, seconded by Mr. Foster.

C. J. Murphy, nominated by Mr. H. J. Bowman, seconded by Mr. Rorke.

F. L. Foster, nominated by Mr. Walker, seconded by Mr. Tyrrell.

The following were nominated for Councillors to take the place of the retiring Councillors, Messrs. Niven and Kirkpatrick :—

A. Niven, nominated by Mr. Dickson, seconded by Mr. Morris.

F. L. Foster, nominated by Mr. McAree, seconded by Mr. C. A. Jones.

G. B. Kirkpatrick, nominated by Mr. Walker, seconded by Mr. Tyrrell.

J. P. B. Casgrain, nominated by Mr. Miles, seconded by Mr. Esten.

T. B. Speight, nominated by Mr. Bowman, seconded by Captain Gamble.

The President then appointed Messrs. H. J. Browne and Captain Gamble scrutineers of ballots for the ensuing year.

The meeting being now open for the consideration of New Business, Mr. Abrey suggested that in future it be understood that the President should only hold office for one year instead of, as has been the custom, re-electing him for a second term. Some discussion followed, the general opinion being that things had better remain as they are and that the Association should not commit itself to any rule in regard to the matter.

In regard to the expenses incurred in connection with the annual dinner, some discussion took place. Mr. Bowman moved that a grant of $25 be made to the Entertainment Committee. This, however, was not supported, Mr. VanNostrand saying, that hitherto the Toronto surveyors had considered it nothing more than their share of the cost of the meeting, that they should make up any shortage which might be incurred in that direction, as a mark of appreciation of the visit of

their fellow-members from other parts of the province, and thought that the old order of things should be continued.

Moved by Mr. M. J. Butler, seconded by Mr. Walker: That the thanks of the Association of Ontario Land Surveyors be extended to the members of the Canadian Institute for their kindness in giving us the use of their library. Carried.

The discussion on the subject of "Drainage Difficulties in the South-Western Municipalities of Ontario," introduced by Mr. Winter during the morning session, was then resumed, Mr. Winter addressing the meeting.

Moved by Mr. Dickson, seconded by Mr. McAree: That a vote of thanks be given Mr. Winter for his paper and for the very able address he has given us upon the subject. Carried.

Mr. Dickson then introduced the matter of licensed surveyors working for less than the regular tariff charges, and asked if there was any way of disciplining such members.

After considerable discussion it was moved by Mr. Chipman, seconded by Mr. Butler: That the incoming Council be hereby instructed to report upon the question of a minimum tariff at the next annual meeting. Carried.

It was then moved by Willis Chipman, seconded by M. J. Butler: That the Secretary-Treasurer be instructed to insert in the forthcoming Proceedings a statement giving names of all articled pupils who have passed since 1885, to whom articled, and date of said articles; and also a list of all Land Surveyors who have registered and withdrawn from the Association. Carried.

Moved by Mr. Niven, seconded by Mr. Sewell: That a vote of thanks be given to the President for the able and instructive address given by him in the opening part of the proceedings. Carried.

Mr. Dickson asked for information respecting an official standard measure, and the matter was discussed by Messrs. Abrey, Butler and Chipman.

There being no other business, on motion of Mr. Dickson, seconded by Mr. Tyrrell, the meeting was declared closed. 5.40 p. m.

MEMBERS IN ATTENDANCE AT THE FIRST ANNUAL MEETING.

Abrey, G. B.
Bolton, L.
Bowman, H. J.
Bray, E.
Browne, W. A.
Butler, M. J.
Chipman, W.
Dickson, J.
Ellis, H. D.
Esten, H. L.
Farncomb, F. W.
Foster, F. L.
Gamble, K.
Gaviller, M.
Gibson, P. S.
Gibson, H. H.
Hutcheon, J.
Johnson, R. T.
Jones, C. A.
Kirkpatrick, G. B.
Laird, R.
Lumsden, H. D.
McAree, J.
McCulloch, A. L.
McFarlen, G. W.
McKay, O.
McMullen, W. E.
Miles, C. F.
Morris, J. L.
Murphy, C. J.
Niven, A.
Paterson, J. A.
Proudfoot, H. B.
Roberts, V. M.
Roger, John
Rorke, L. V.
Sankey, V.
Silvester, G. E.
Sewell, H. DeQ.
Speight, T. B.
Spry, W.
Steele, E. C.
Stewart, E.
Stewart, L. B.
Tyrrell, J. W.
VanBuskirk, W. F.
VanNostrand, A. J.
Walker, A. P.
Whitson, J. F.
Wilkie, E. T.
Winter, H.

RESULT OF ELECTIONS.

President.....E. Stewart.....(by acclamation).
Vice-President.....M. J. Butler.....(by acclamation).
Secretary-Treasurer.....A. J. VanNostrand.....(by acclamation).

Councillors elected for ensuing three years.

G. B. Kirkpatrick, A. Niven.

Auditors elected for ensuing year.

Willis Chipman, H. B. Proudfoot.

I hereby declare the above named Councillors and Auditors elected.

A. J. VANNOSTRAND,
Secretary-Treasurer.

Certified correct.

H. J. BROWNE,
KILLALY GAMBLE,
Scrutineers of Ballots.

REPORT OF SECRETARY-TREASURER.

MR. PRESIDENT,—I beg to submit the following report of the business of the Association during the period between the annual meeting in 1892 and the present.

The number of active members of the Association of Provincial Land Surveyors of Ontario at its Seventh Annual Meeting, was 107; with 9 additional who were in arrears for one year only.

At the present time there are 173 full members of the Association of Ontario Land Surveyors, 20 others who have paid $1.00 with their application for registration, with request to have their names withdrawn from the list of practitioners, 29 who have applied for registration, paying the fee of $1.00, but omitting to state whether they wished to withdraw or to remain in a position to practise, and 3 who are in arrears for a portion of the annual dues for the first Association year, making a total of 225 Provincial Land Surveyors who have applied for registration under the "Ontario Land Surveyors' Act"

As nearly as may be ascertained from the list of Provincial Land Surveyors in the Crown Lands Department, there are 136 who have not applied for registration, but of these a large number have left the Province or are engaged in other occupations.

The following circulars have been issued :—

No. 39.	(Assoc'n of P. L. Surveyors,)	to the profession, *re* incorporation.	350 copies
" 40.	" " " "	Re Anonymous circular.....	200 "
" 41.	" " " "	Ballot for 1892–3.....	200 "
" 42.	" " " "	Explanation of Ballot.....	200 "
" 1.	(Assoc'n of O.L. Surveyors.)	Ballot for 1892–3.....	360 "
" 2.	" " " "	Explanation of Ballot.....	360 "
" 3.	" " " "	Announcement in '92 report.....	1000 "
" 4.	" " " "	To unregistered Surveyors.....	200 "
" 5.	" " " "	Respecting unpaid dues.....	150 "
" 6.	" " " "	Announcing annual meeting for '93	250 "
" 7.	" " " "	Programme for annual meeting..	250 "

In addition to the above about three hundred copies of the Ontario Land Surveyors' Bill, and three hundred and fifty copies of the Act as passed by the Legislature, were sent to the profession.

One thousand copies of the Annual Report for 1892, have been disposed of as follows :—

Sent to Members, Advertisers, Libraries, Newspapers, &c.....	242
Sent to exchange societies.....	665
Sold.....	7
On hand at date.....	86
Letters sent from the Secretary's office.....	670
Post-cards.....	56
Letters and post-cards received.....	508
Exchange reports received and distributed.....	795

In order to supply copies of all the exchanges to each of our members it will, in future, be necessary to make arrangements with the various exchange societies to have an additional number of their reports printed at the expense of our Association, as our membership exceeds that of any of our exchange societies.

I take this opportunity to express my thanks to the various standing Committees and in particular to the Committee on Publication. The labor of supervising all the details in the publication of the Annual Report must be experienced before it can be properly appreciated.

Accompanying this report is a statement of the financial transactions of the Association during the past year. All of which is respectfully submitted.

A. J. VANNOSTRAND,
Secretary-Treasurer.

Toronto, 27th Feb., 1893.

STATEMENT OF RECEIPTS AND EXPENDITURES, BETWEEN 22nd FEBRUARY 1892, AND 27th FEBRUARY 1893.

1892–3 RECEIPTS.

To Balance on hand, 22nd February 1892			$173 97
" Fees for first Assoc'n year, 173 members at $5.00 each	$865 00		
" " " " " 3 " " 4 00 "	12 00		
" " " " " 49 " " 1.00 "	49 00		
" " " second " " 2 " " 4.00 "	8 00		934 00
" Advertisements in '91 Report	9 50		
" " " '92 "	89 00		98 50
" Reports sold, 7 copies at 50 cts	3 50		
" Postage received for Reports sold	06		3 56
" Receipts *re* Board of Examiners			237 00
Total			$1447 03

1892–3 EXPENDITURES.

By Postage	$53 00
" Telegrams	75
" Printing Circulars, O. L. S Act, Stationery &c	80 50
" Publishing Report of Proceedings '92 Meeting	244 40
" Express and Freight *re* Exchanges	7 76
" Cartage	50
" Import Duty and Customs Brokerage	2 10
" Export Duty on Exchanges	1 00
" Typewriting	95
" Amount paid Solicitor, *re* Ontario Land Surveyors' Bill	100 00
" " " Secretary-Treasurer for 1891	40 00
" " " Stenographer for '92 Meeting	35 00
" " " Returning Officer in first election	25 00
" Rent of rooms for '92 Meeting	12 65
" Amount paid for Office Furnishings	18 90
" Expenses and Fees *re* Board of Examiners	109 15
" Balance	715 37
Total	$1447 03

A. J. VANNOSTRAND,
Secretary-Treasurer.

Toronto, 27th Feb., 1893.

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.

WILLIS CHIPMAN, }
H. B. PROUDFOOT, } *Auditors.*

March 1st, 1893.

REPORT OF COMMITTEE ON LAND SURVEYING.

MR. PRESIDENT,—Your Committee on making the first Report to the Association under our new name of Ontario Land Surveyors, cannot but think, when so many new names have been added to our list of membership, that it is as well to mention some of the changes that have been accomplished and subjects discussed in former years.

In 1887, the new Act respecting Land Surveyors and Surveys of Land became Chapter 152 of the Revised Statutes of Ontario. In 1892, the Act to incorporate the Association of Ontario Land Surveyors was passed. Also in this year our Association affiliated with the Association of Dominion Land Surveyors. From time to time the following have been discussed, and we consider are worthy of some definite action being taken as to them.

Improvements as to the construction and registration of plans, especially as to the bearings and work required on the ground.

The establishment of an Ontario Meridian Line. The adoption of a Registered Private Mark, by Ontario Land Surveyors. Organizing a Boundary Commission.

The best method of drawing up descriptions and laying out Town Plots, and who should survey a Railway Right-of-way.

Many questions as to the Field work have been answered, and we would earnestly recommend all to take part in this, our important department, the "Question Drawer." That most complicated patchwork designated the Ditches and Water Courses Act, has engaged the serious attention of our friends of the Drainage Committee, and we have every hope that next session of the Ontario Legislature will provide us with an intelligible guide as to this department of our field work. Questions submitted and answers to same are annexed.

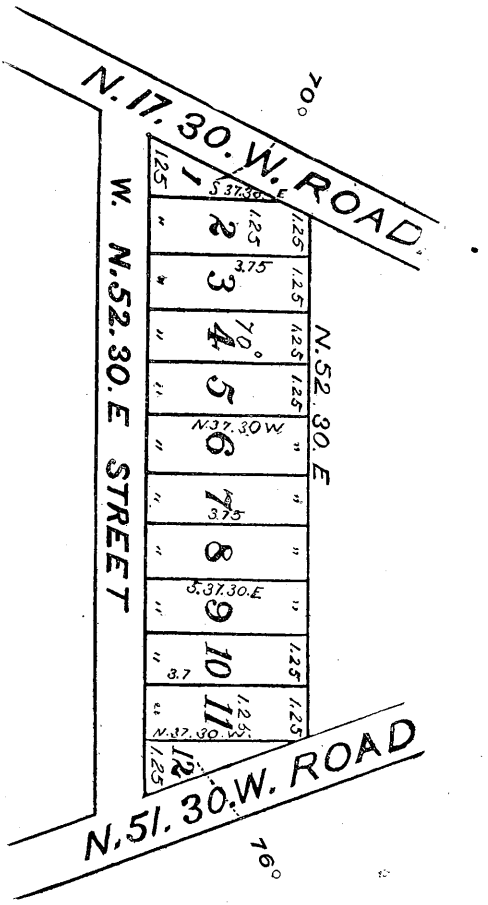
M. GAVILLER,
Chairman.

QUESTION DRAWER.

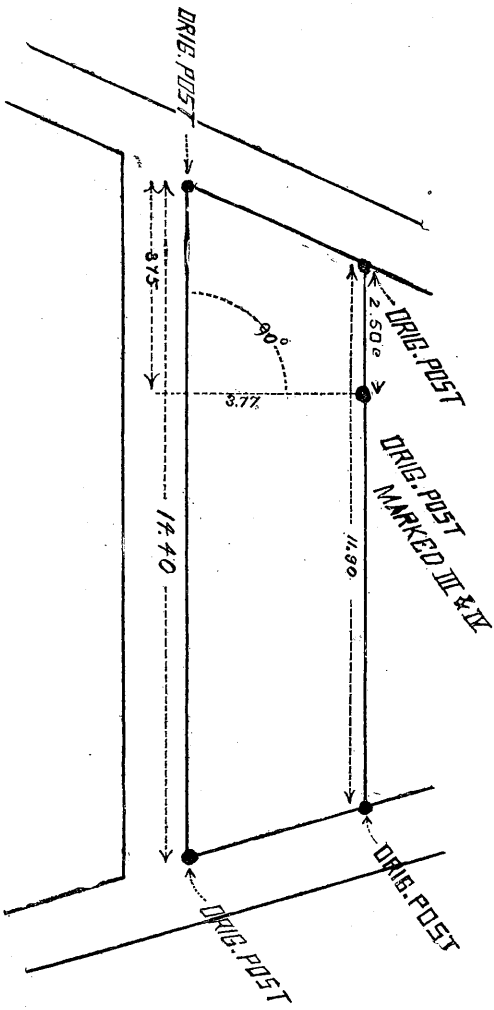
Question 1.—The principal points are, 1st, a shortage of 60 links across the block (corner indisputable), 2nd, a point between lots 3 and 4 at the *back*, also indisputable. It will also be noted that the lines (side) are to have a *fixed bearing*. Wanted the line between lots 3 and 4. *See Diagrams.*

Answer.—Assuming the plan to be registered, find point in front by proportional subdivision. Sec. 62 Surveyors' Act. Rear post already found.

FIGURE A.—Sketch of original plan.



Question 1.—How would you define the line between Lots 3 and 4?



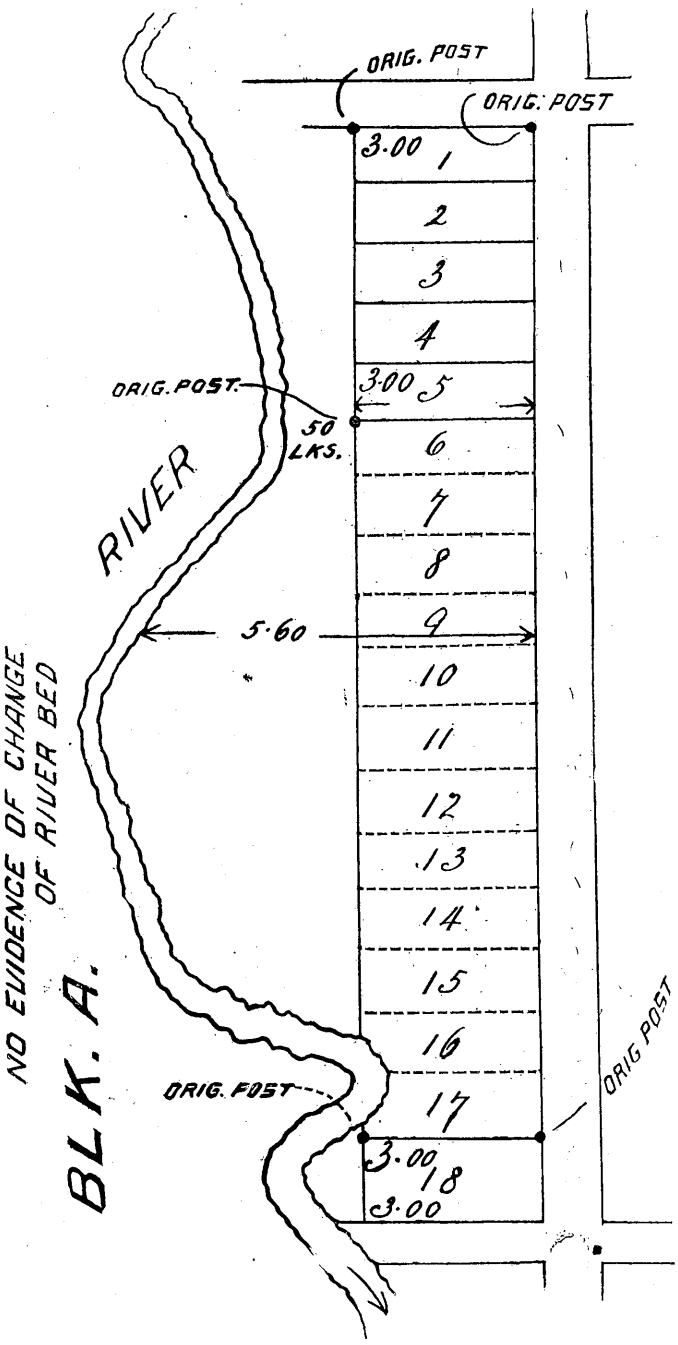
[*Question 1.*]

FIGURE B.—Sketch from actual survey.

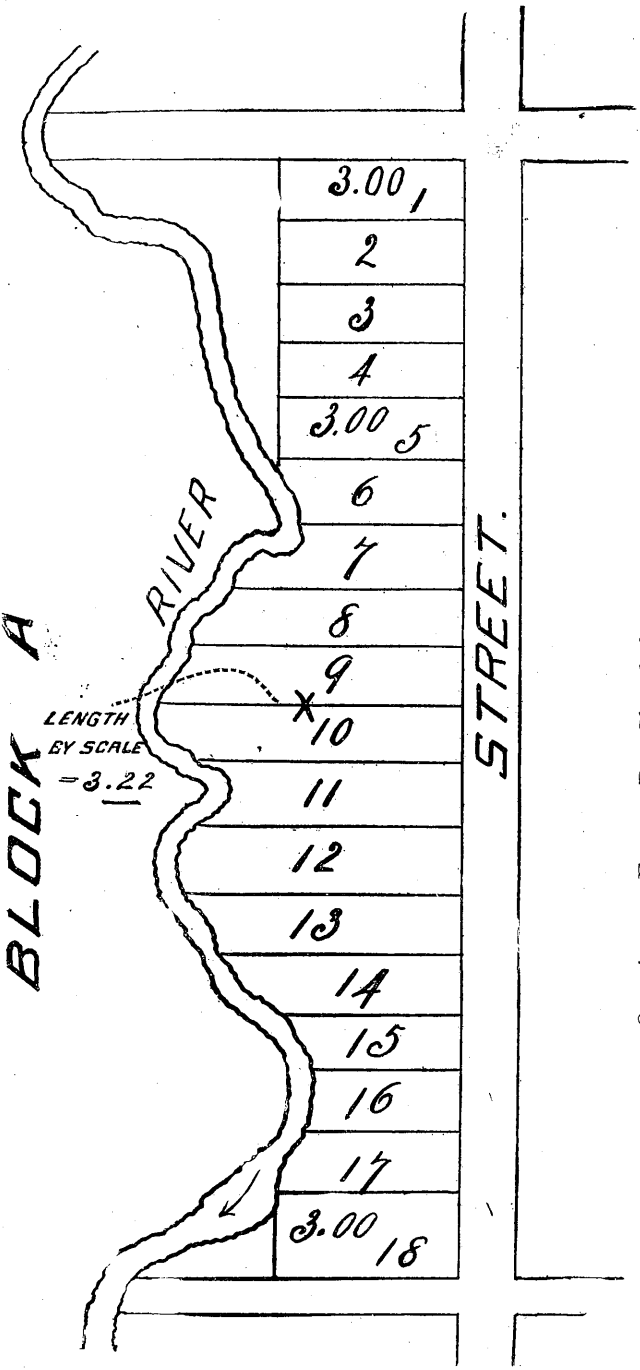
Question 2.—1st, River only sketched on ice, original survey is evident, as it does *not* agree with place at all, except at lot 18 ; owner of block A denies that lots 6–17, should not at most be more than they scale on Reg. Plan ; owners of lot 6–17 claims to go to the river.

Are either right ? See Diagrams.

Answer.—From data furnished the lot line should run through to the river.



Question 2.—Required the lengths of Lots 6 to 17 inclusive, but particularly between Lots 9 and 10.
FIGURE A.—Sketch from actual survey.



Question 2. FIGURE B.—Sketch from registered plan.

Question 3.—Double front survey, base line north boundary. Lot 23, Con XIII, has no front on Con. line XIII and XIV on original plan and field notes. How should A B (line between West halves of lots 22 and 23, Con. XIII) be run ?

Answer.—Decisions given in court to be quoted in next Report.

Question 4.—Double front survey, base line West boundary. No posts planted in original survey on lake shore. How should A B C D and E F be run ?

Answer.—Width of lots on Con. line XIII and XIV to be ascertained by proportional division on that line, and used as fronts for North half of Con. XIII.

Question 5.— On January 26, '92, I was employed by A and B to form the line between lots 7 and 8, Con. III, Township. A, the owner of lot 8, made affidavit that he had seen the original post 18 years before, had buried underneath it a broken green-glass bottle. I measured both lots from undisputed posts, found lot 7 = 30.59 chains ; lot 8 = 32.68 chains ; they were each intended to be 30.00 chains. B, the owner of lot 7, insisted upon seeing the facts sworn to in the affidavit verified, and I refused to make the survey until the frost was out and a search made. On April 24, went back ; the parties had dug, at a piece of wood which had been placed to mark the spot ; and found two small pieces of green glass, 6 small pieces of smoky glass and 22 small pieces of crockery, also a small piece of cedar that might have been the decayed part of a post. A could give no explanation, and as the articles found did not verify the affidavit, I made an equal division and ran the line. On June 1st I was sent for again ; the parties had again dug and found the glass as described in the affidavit, but 26 inches east, and 5 inches on the course of the side-line south of where the crockery had been found. I ran the line over again from that point. Was my last survey correct ?

Answer.—The last point adopted was correct.

3 *Question 3.*

Question 4.

REPORT OF COMMITTEE ON DRAINAGE.

MR. PRESIDENT,—Your Committee on Drainage beg to make the following report thereon :

During the season of 1892, the most important work done in connection with drainage matters was the taking of evidence by the Commission, appointed by the Ontario Government, regarding the working of the present Acts in the different parts of Ontario.

The method adopted by the Commission for securing this evidence from the different parties interested, was exceedingly thorough as the Commission met the parties on their own ground, and patiently listened to the views and opinions of all sorts and conditions of men—Reeves, Councillors, Ratepayers of the highland and lowland type, President and non-President, Lawyers, Surveyors and Engineers—in fact, anyone who had a suggestion to make towards the improvement of the Act was cheerfully accorded a hearing. This work extended over the greater part of the last summer meetings, having been held in the principal towns of Western Ontario, and resulted in the accumulation of a mass of evidence that covered the subject pretty thoroughly. The Commission has completed its labours and the report of the work is in the hands of the Government, so that at the present session we may expect to have an Act framed that will meet all the different situations which confront an Engineer in designing drainage works.

At the present time the Drainage Act is and has been for the past year, in a chrysalis state and inert. As a consequence of this, active operations have been confined to repairs and the construction of small works, though the legal department apparently were unaffected, as appeals, and counter appeals before the Referee were the order of the day.

In that vexations question of " Outlet " in the Township of Raleigh, the adjoining Townships of Harwick and Tilbury, each assessed for outlet, appealed, but as yet no decision has been received by the Referee. The Township of Romney appealing from an assessment by Tilbury East for outlet was sustained by the Referee. The feeling evidently is gaining ground that the high lands should not be assessed as heavily as has been the custom heretofore. Doubtless, when the new Act is in force, drainage matters will again assume that prominence they attained a year or so ago, when it is to be hoped that the dangerous element of opportunities for litigation will be found to have been entirely eliminated, and that henceforth there will be no necessity to carry appeal cases to the " foot of the Throne," as has been done in the case of " Williams *vs* Raleigh," upon which a decision is promised by the Privy Council next July. It will be a hard matter to realize that this case is really ended, as for years past it has been looked upon as a standing institution in connection with drainage in Western Ontario. The old scheme of a canal across the plains from Lake St. Clair to Lake Erie has been revived, and application for a charter is

about to be made at the present session of the Dominion Parliament. The annexed plan and description of the scheme will convey a good idea of the work and the effect it would have upon the large areas of marsh lands in its vicinity.

On behalf of the Committee on Drainage,

JOHN C. MACNABB,
Chairman.

QUESTION DRAWER.

To the Land Surveyors' Association of Ontario.

SELBY, Jan. 21, 1893.

Would it not be better if the Ditches and Watercourses Act be so amended that the Municipal clerks should keep a supply of forms, similar to Form D, and should furnish said forms to the owners of land that apply to him for the Drainage Engineer to appoint a meeting. Said owners to fill up the forms and serve them on each and all the parties interested.

Yours, etc.,
JOHN S. AYLESWORTH, O. L. S.

These forms are held and used by many Township Clerks at the present time.

RIDGETOWN, Jan. 18th, 1893.

DEAR SIR—I received from you a short time since an invitation to write something, or give some hints on some subject. I have nothing to write about unless the amendment of some of our laws.

I consider that our Municipal officers have too much power in appointing an Engineer under the Ditches and Watercourses Act. They can appoint any person they consider capable. I say we should have the work. The law makes us study and prepare 3 or 4 years and then give our work to any person.

And the law relating to holding land by possession—I consider it the most unjust law that could be enacted. A person may have a deed of land and pay taxes for a number of years, and another man along side have possession of a part and can hold it in spite of his deed. I consider it wrong; there is no use of having a deed.

I remain your obedient servant,
THOS. SCANE.

A. J. VanNostrand, Esq., Sec. &c., Association O. L. S.

DISCUSSION.

Mr. Bolton—So far as I can see, the questions that are here have nothing particular in them. This is one, "Would it not be better if the Ditches and Watercourses Act would be amended so that the municipal clerks could keep forms similar to the form D, and should

supply such forms to land owners to fill up and serve them on each of the parties interested ?" Up in our part of the country the clerks of the municipalities are all supplied with all the forms. In Listowel, the printing office publishes all the forms under the Ditches and Watercourses Act, and the clerks go there and get them.

Mr. Jones—In my experience most of the township clerks have those forms, that is, in the Western district, but still there are very often cases in which those forms will scarcely answer.

Mr. Wilkie—I am in exactly the same position as Mr. Aylesworth, who asked the question, seems to be in. Down in our country they have not any at all. However, we are not bothered with a great many cases.

Mr. Bowman—I understand that this Ditches and Watercourses Act is to be wiped out. If that is the case, we need not bother very much about the forms. The way the Act stands now, there are so many forms required that the notices and forms are more than all the rest of the Act put together. I would not trustany township clerk to make out forms to be served on parties that you could go into court on and say that the forms had been served properly. Whenever a difficult case comes up I get the interested parties to come to me and I write up a form that will suit myself and keep a copy of it, and have them served on the proper day ; and if they cannot succeed in arranging the matter between themselves, I write out the requisition for them and then they could send that to the township clerk. If you are going into court there is no use trying to make an award when the preliminary notices are not correct.

Mr. Bolton—In our part of the country they are printed exactly as they are in the Act, so there can not be any mistake about it.

Mr. Wilkie—Once in a while a case turns up where the form in the Act will not suit.

Mr. Bolton—There is another question which the Drainage Committee have not considered. It is, " What are the best methods of protecting the joints of agricultural drains, tiles of all sizes, 1½ inches to 12 inches in diameter, and laid in different kinds of soil ?"

Mr. Butler—I have had some little experience in that in clay and sandy soil, and the plan I pursued was to take a piece of the cheapest class of cotton, three or four inches wide, and a couple of wraps around the joints and cover it with sawdust or straw on top, and I have never heard of one of them being choked. The size of the tiles was up to four inches.

THE FOLLOWING QUESTION WAS SUBMITTED BY MR. TYRRELL, WITH DIAGRAM ON BLACKBOARD:

In order to drain the swamp A, a ditch was cut across the high land on the road, and a great volume of water passes down through it from A, flooding E's property. There is a fall in the direction of E and

also a fall in the direction of A. The question is whether the path-master had a right to cut that ditch through there at B, and if he had not, have I, as Township Engineer, a right to order it to be closed again and make A drain his own swamp? Now the water is carried into the road ditch, across the road, and flows off through E.

Mr. Bolton—I don't think an Engineer has any right to close any drain. He may order the opening of other drains, but I don't think there is anything in the Act to give him authority to close a drain.

Mr. Butler—I am sure a judge would soon order it closed.

Mr. Jones—I had a case somewhat similar to that this last year, and though I did not consider I had any authority to stop it up I did not tell them so, but I put it in the award that the drain was to be closed at a certain point and I believe they have done so.

Mr. Tyrrell—A claims that his water already comes out to the road, which it does. Then he claims that the township has a right to take it away from the road.

Mr. Jones—If the fall is in the other direction he cannot ask them to take it through the division of land.

Mr. Bolton—I know in our county E has good cause for bringing an action for damages. I know cases where they have got $2,000 and $3,000 in cases where it was not as bad as that.

Mr. Gaviller—I had a case like that where they asked me about it, and I told them to go and put a dam right in that ditch 6 to 8 feet thick so it would not wash away. They did that and there was never another thing about it.

DISCUSSION ON THE REPORT OF THE COMMITTEE APPOINTED TO CONFER WITH THE ONTARIO DRAINAGE COMMISSION.

Mr. Winter—Included in this report the report of a Committee that was appointed to confer with the Drainage Commission appointed by the Government appears. The chairman of this committee, has reported that the commission has completed its labors and the report of the work is in the hands of the Government, so that during the present session we may expect to have an Act framed that will meet all the different situations, which confront the engineer in designing drainage work. I will say this for the credit of the profession, or such members thereof as belong to the western country, that the engineers themselves have found no difficulty in designing the drainage works, that is, if their recommendations were carried out. But the difficulty is, that the municipalities going on with the construction of the drainage work in very many cases do not feel disposed to act upon the suggestions or recommendations of the engineer, but take a good deal of it into their own hands, and if the work turns out to be a failure, which it frequently or almost invariably does, they make him the scapegoat and blame him for it. I may say that in that section of the

country where the suggestions of the engineer have been carried out, they are almost invariably a success; they are only failures where his recommendations have been set aside. At the present time the Drainage Act is, and has been for the past year, in a chrysalis state. Active operations have been confined to repairs or construction of small works, though the legal department was apparently unaffected, for appeals and counter appeals before the Referee were the order of the day. There are more expensive suits going on there during the whole year, so that we are in that unfortunate position, that our drainage works cost us more in law costs and in damages than the construction of the drains, and in that section of the country they are naturally very anxious that something should be done. I understand that there will be an attempt made to amend the drainage laws, to cover the difficulties I have indicated, and probably we could deal with the question more intelligently, if we had an opportunity of seeing the report of the drainage commission, but of course there will be no chance of seeing that until it is first brought before the Legislature. It strikes me that the important point that requires to be covered is this, the law requires to be amended in such a way that the party proceeding with the construction of the drain, will not be sole judge of where that drain should be located, and be constructed irrespective of the effect it would have upon other parties. In the construction of a drain where conflicting interests will probably arise, all parties interested in that drain should have a voice in deciding how the drain should be located and constructed, that is, those liable to suffer by the improper or unskilful construction of a drain, should not be obliged to wait until they actually sustain the damage, but have a right to interfere and restrain those going on with the work, in order that the matter might be so arranged that the drain would be constructed according to proper principles and no damage be done. That might be done in this way, by the Act making provisions for the appointment of a drainage inspector, either a drainage inspector for each county or a Board of inspectors for the whole province, so that whenever the question should arise as to the location or construction of a drain, that is liable to involve conflicting interests, the matter would be referred to an impartial authority of that kind. I think that there should be some disinterested and outside authority to decide questions of that kind, before the damage was actually sustained in order rather to prevent the mischief than to try to remedy it after it is done, by litigation and otherwise.

Mr. Tyrrell—It appears to me, that in the cases referred to this morning, by Mr. Winter, the difficulties occurred chiefly through the entire system of drainage not being properly designed in the first place. The drains were not constructed to proper outlets and afterwards the outlets were constructed and caused trouble to the original drains. The whole system appeared to have been done in a botchwork sort of way. However, it was probably not the fault of the engineers, as he explained, but there would have been no trouble if the whole system had been properly designed in the first place and constructed after that design.

REPORT OF COMMITTEE ON ENGINEERING.

MR. PRESIDENT,—Your Committee on Engineering beg to report that they have not, this year, been able to have a satisfactory meeting, and believe that the other standing Committees have had similar experiences. Your Committee would therefore recommend that a change be made in the programme for next year, so that the standing Committees may meet on the afternoon of the first day and report to the Association the next morning. All of which is respectfully submitted.

G. B. ABREY,
Chairman.

DISCUSSION.

Mr. Abrey—I think there should be some scheme by which the members of these Committees should get together and make their report the first day. About the only way these reports can be satisfactorily got in at present, is for the chairman or some person simply to constitute himself the Committee and make the report.

Mr. Bowman—I think that something in that line must be done.

Mr. VanNostrand—It may not be out of order for me to suggest that the committees try to do a little of the business by correspondence. There must be some things that occur during the year that can be attended to without everything being left till the time of the meeting. If we have a Committee, we have it for a certain purpose; and it would, perhaps, be better for the other Committees to collect material during the year, as the Land Surveying Committee has done heretofore. The Land Surveying Committee is, of course, the one that is nearest to our interests, and theirs has always been a very interesting report. If the other Committees could keep the matter in mind and do a little corresponding amongst themselves during the year, it would facilitate the getting out of the reports.

The President—When this proposal was made, the intention was that these questions be sent to the Chairmen of the several Committees, before the meeting, so that they would be prepared to come to a finding on them when they did meet But any question that comes up during the meeting, such as Mr. Tyrrell's question now, we could scarcely expect the Committee to come to a finding on it. It would be a very great advantage if these questions could be sent in to the Chairman sometime before, so that they would be before the Committee at least at the first meeting.

Mr. Butler—I wish to say a few words in regard to the reports of the Engineering Committee. From year to year that Committee has felt a certain amount of difficulty in knowing what their duties were. Now, they cannot be expected to act as consulting engineers to all the engineers in the province; the field of engineering is too broad, including as it does, the great powers of nature converted to the use and convenience of man. There are certain kinds of engineering confined to the members of this Association, but it seems to me that

it is entirely within the province of the Engineering Committee of this Association, to deal with the question of our roads and country bridges and work of that class. I think that questions pertaining to these subjects might be brought before them, and they might embrace in their reports each year some suggestions as to that part of the work, and if that were done our Engineering Committee's report would be just as interesting as any of the others, and it would have also an educational value that it does not now possess.

REPORT OF PUBLICATION COMMITTEE.

MR. PRESIDENT,—Your Committee have to report as follows:

The "Proceedings" for 1892, were printed by C. Blackett Robinson, as usual.

Our exchanges are about the same as last year's. See list below.

Your Committee would again ask for help in getting advertisements, and hope the members of the profession will patronize those advertising with us. We would suggest, that where a paper is accompanied by a diagram illustrating it, a copy of such diagram on a sufficiently small scale to put into the report be attached to the paper.

EXCHANGE LIST.

	RECEIVED FROM.	SENT TO.
Ohio Society of Surveyors and Civil Engineers	130	130
Illinois Society, Engineers and Surveyors	100	110
Indiana Engineering Society	140	80
Iowa Engineers and Surveyors' Society	125	45
Michigan Engineering Society	150	140
School of Practical Science, Engineering Society	150	150
Association of Domininion Land Surveyors	...	10

Respectfully submitted,

H. L. ESTEN,
Chairman.

Carried.

DISCUSSION.

Mr. Esten—I would suggest that any person sending a question in to the Question Drawer, with a plan attached, should also attach a small plan on a scale suitable for putting in the Report, as it is a good deal of trouble for the Committee to plot all these plans on a suitable scale.

REPORT OF COMMITTEE ON ENTERTAINMENT.

MR. PRESIDENT,—The Entertainment Committee for 1892–3 have to report as follows:

The annual session of the Association for 1893, was held on Feb. 28th, March 1st and 2nd, in the Lecture Room of the Canadian Institute, which, though smaller than the Library in the same buiding in which the sessions for some years past have been held, is more conveniently fitted for the purpose of our Association, being provided with raised platform, blackboard, tables, reading desk, etc., and appeared to give general satisfaction.

With a view of ascertaining the wishes of the members of our Association in regard to the annual dinner, and of being able to judge as to the probable attendance, a precaution very essential to the success, pecuniary and otherwise, of such an entertainment, printed slips to that effect, and addressed postal cards were sent to all the members. And although replies from thirty-four were received, regretting their inability to attend, the answers of twenty-eight others who intended to be present on the occasion, decided the Committee in favor of the usual dinner, which was held on the evening of March 1st, at the Arlington Hotel.

Thirty-six, including five invited guests, were present to partake of the good things provided by our host, Mr. Matthews, who had evidently exerted himself to please all concerned.

Of seven invited guests five were present, including Mr. Aubrey White, Assistant Commissioner of Crown Lands; E. H. Keating, City Engineer, of Toronto, and Mr. W. A. Lee, President of the S.P. S. Engineering Society.

Letters regretting inability to attend, were received from The Hon. the Commissioner of Crown Lands, and Prof. Carpmael, of the Meteorological Observatory.

Some excellent speeches by members and invited guests contributed greatly to enhance the general pleasure and satisfaction evinced on the occasion, in reply to the various toasts prepared by yourself as Chairman, Mr. M. J. Butler as Vice-Chairman, and others, among which were the following: "Canada," responded to by Prof. Galbraith, H. Winters and J. Dickson; "The Ontario Legislature," responded to by A. Niven and Aubrey White; "Engineering Societies," by W. A. Lea, C. H. Keefer and E. H. Keating; "Association of Dominion Land Surveyors," by Willis Chipman; "Association of O. L. Surveyors," proposed by A. White and responded to by Messrs. Stewart, Butler and Dickson; "The North-West Intelligence Corps," responded to by H. B. Proudfoot and H. D. Ellis; "The Ladies," by Messrs. Tyrrell and Macdougall; "The Entertainment Committee," proposed by Mr. G. B. Kirkpatrick and responded to by Messrs. Foster, Ellis and Murphy; "Our Secretary," proposed by Mr. Chipman and responded to by A. J. VanNostrand. Songs were sung at intervals by Messrs. Niven, Sewell, Bowman and Foster.

A detailed account of Receipts and Expenditure of all moneys in connection with the business of the Entertainment Committee has been handed to the Secretary, Mr. VanNostrand, and can be seen at his office by any member.

All of which is respectfully submitted.

On behalf of the Com. on Entertainment,

FRED L. FOSTER,
Chairman.

REPORT OF COMMITTEE ON LEGISLATION.

MR. PRESIDENT,—Your Committee on Legislation have little new matter to report, as the Legislation obtained is now familiar to all.

It is a matter for congratulation that "Incorporation" has been so well received by the majority of those who had not expressed themselves prior to the passing of the Ontario Land Surveyors' Act.

Upon a second reading in the Legislature, some slight changes were made in the Bill as presented to the Association of Provincial Land Surveyors of Ontario, at its meeting in February last. These changes were in some cases beneficial to the profession, and met with the full approval of your Committee, and in other cases were assented to as being necessary to the passing of the Act.

With minor alterations, which would remove certain slight ambiguities, and which may be made at a future Session of the Legislature, your Committee beg to express the opinion, that in the Ontario Land Surveyors' Act we have a measure which bids fair to be of great benefit to the profession, without being in any way prejudicial to the interests of the public.

Respectfully submitted,

JAMES DICKSON,
Chairman.

DISCUSSION.

Mr. Dickson—I may say that the matter referred to here is owing to a trifling cause. One portion of the Act fixes the date on which we hold our annual meeting, and another portion leaves the fixing of the date with the Council. There is another matter I want to mention, which brings prominently out the necessity of what Mr. Abrey has said about any questions to be taken up in the report of any of the Committees, that they should be submitted to the Chairman sometime prior to the meeting, so that they can be prepared.

Mr. Tyrrell has drawn my attention to a matter that I think we have all met with, that is the uncertainty of the law where municipal surveys are made. Of course we are all aware that they are made under the instructions from the Crown Lands Department. A great

many surveyors were, and some are still under the impression that once a survey is confirmed it is final. Now the courts have decided that it is not final, and I have just heard of a case, where they have overthrown a survey altogether after it has been confirmed by the Commissioner of Crown Lands. I think we should have some Legislation to meet those cases. I would be glad if the gentlemen would just think the matter over during the coming year that it may be embodied in the next report.

Mr. Tyrrell—I might just refer to the statement made by Mr. Dickson with regard to confirmation of Crown Lands surveys. As he says, Crown Land surveys are no better than other surveys, as perhaps, we have all had occasion at one time or another to find out. Up in Wentworth, within the last few months, a very extensive and expensive survey was entirely upset, by a recent survey made by myself and Mr. Abrey. It seems to me it would be very desirable to have the Act so amended that when a survey is confirmed it would be final.

Mr. Sewell—There is another matter, and that is the way in which the Crown Lands Department is limited in making these surveys. The Act only provides for a very partial survey, and where there is any extensive work required the Department really has no power to authorize it.

REPORT OF COUNCIL, 1892.

MR. PRESIDENT,—The first meeting was held at the Crown Lands Department on Oct. 18th, 1892, the members present being Hon. A. S. Hardy, Messrs. E. Stewart, P. S. Gibson, M. Gaviller, J. McAree, V. Sankey, A. Niven and G. B. Kirkpatrick.

The Council proceeded to organize as follows:—

Mr. V. Sankey was appointed Chairman.

The Hon. A. S. Hardy, Commissioner of Crown Lands, informed the meeting that the members of the Board of Examiners to be appointed by the Lieut.-Governor were Messrs. M. J. Butler and G. B. Kirkpatrick. The Council then appointed the following members:—Messrs. P. S. Gibson, A. Niven, R. Coad and M. Gaviller. Professor Coleman was appointed examiner in geology when required.

The Secretary-Treasurer was authorized to procure the necessary books and forms. He was also directed to deposit the funds of the Association in the Imperial Bank (Yonge St. branch), all cheques to be countersigned by the President, or, in his absence, by the Chairman. It was also decided to require him to give bonds to the amount of one thousand dollars, said bond to be in the custody of the President until proper provision is made therefor by the Association.

A draft of proposed By-laws has been drawn up and will be presented for discussion and ratification at this meeting.

The first examination was held at the Crown Lands Department commencing November 7th, 1892. The following gentlemen, having passed the final examination, were duly sworn in as Ontario Land Surveyors:—Thos. Russ Deacon, North Bay; Thos. Alexander Moore, London South; William Newman, Windsor; and George Ernest Silvester, Ringwood. Mr. Wm. Ernest McMullen, Toronto, who passed at the last meeting, was now sworn in. The following gentlemen passed the preliminary examination:—George Spencer Abrey, Toronto Junction; Abraham Silas Code, Glencoe; and Marshall Willard Hopkins, Stoney Creek.

The Council wishes to draw the attention of the Association to the work which devolves on the Secretary-Treasurer, who now also acts as Registrar, and considers it is only right that a reasonable remuneration for the Secretary-Treasurer should be fixed by By-law.

In conclusion the Council would urge all members of the Association to unite in furthering its welfare; now that we are fairly launched with full powers of self-government. Any member having any suggestions to make for the good of the Association should not wait until the annual meeting to express his views, but should communicate with the Chairman or the Secretary, who will submit the same to the Council. It is only in this way that members of an Association like this, who are dispersed over the whole Province, can unite to bring about the results in which we all have such a deep personal interest.

Respectfully submitted,

VILLIERS SANKEY,
Chairman.

Mr. Sankey—There is another matter which I wish to bring before you to-night It is this, you are no doubt aware that now we have become an incorporated Association there is a lot of business which takes, compared with what our old Association did, a thoroughly business form. Our Councillors have really, under the Act and under the by-laws as proposed, and I believe it is in the interest of the Association that they should have, a strong controlling interest in the welfare of the Association. They are, as you all know, elected by the popular vote of the Association, and they should have the best welfare of the Association at heart. Now, it is not in the interests of the Association, that only Toronto men should be on that Council; it is clearly necessary that the profession at large should be represented from all sections of the province, from north and south and east and west; and I am very glad to see that the Council, as at present constituted, does fulfil that requirement. But, when you come to think of it, one meeting like this in the year is not sufficient to carry on the business of the Association. Under the by-laws it is suggested that there should be three regular meetings of the Council, one at our Annual meeting, and one at both the meetings of the Board of Examiners. This is something that I bring personally before you; it is not a matter that has been discussed in the Council at all; but I do think that it is nothing but right that the actual travelling

and hotel expenses of members of the Council who live outside of Toronto, should be paid by the Association. I am a Toronto member, and I don't think any Toronto member expects to be paid for any time he gives. I don't know that any surveyor asks for that, but I think it will occur to you as it does to me, that it is not reasonable to ask a surveyor away in the east, west, or north, to pay his travelling expenses and hotel bill in Toronto and still he working for the good of the Association in which we are all interested I hope some member will bring this up and make such suggestions on a purely business basis.

The President—I wish to emphasize the desirability of what Mr. Sankey says. As he says, it is a very different thing now from what it has been heretofore.

Mr. Dickson—I cordially agree with what he says about paying the expenses of members of the Council. I think further, it is very unfair that any gentleman should be brought from a distance to work for nothing. I think not only those coming from a distance, but those residing in the city should be allowed something for their lost time.

DISCUSSION ON RATIFICATION OF BY-LAWS.

On the Ratification of the By-laws, the by-laws submitted by the Council of Management being taken up separately and passed clause by clause.

"The standing committees shall be the Committee on Land Surveying, Committee on Drainage, Committee on Engineering, Committee on Entertainment, Committee on Publication."

Mr. Chipman—I would move that the word "Engineering" be struck out, and the words "Topographical Surveying" be inserted instead.

Mr. Dickson—I would move that the words "Topographical Surveying" be added in addition to what is there already.

Mr. Niven—I would second Mr. Dickson's motion.

Mr. Bowman—I think that should be tacked on to the Surveying Committee; they should take that question up, not the Engineering Committee.

Mr. Gibson—I will second Mr. Chipman's motion.

Mr. Chipman—My object in asking this, is this, we have a Canadian and American Society of Engineers, and quite a number here are members or associate members of those bodies, and I know this, that there are members of the Canadian Society of Engineers who are possibly a little jealous of this Association, thinking we are trespassing on their ground; and I think we have quite enough to do without touching engineering work proper. I think this topographical surveying will keep this committee fully employed in securing data and facts and figures to present to this Association at its successive meetings. They have enough work ahead to keep the committee employed for several years before we can expect to get the Legisla-

ture to give a grant for the work. It is true we have had several papers on engineering subjects in the last few years, but so far as the Engineering Committee is concerned it is a useless body.

Mr. Gaviller—In what position would you place the unfortunate township engineers? Are they going to drop the title "Engineer" altogether?

Mr. Chipman—I think not, but that comes under the Drainage Act. We are aspiring to have a triangulation survey made of the province, a geodetic survey followed by a topographical survey. The present Committee on Surveying has its hands full. At every meeting the report of the Committee on Land Surveying is the most voluminous and takes up more of our time than anything else.

Mr. Bowman—I have been a member of the Engineering Committee for several years, and I have felt that it has done very little, still I don't think it is the fault of the committee, but the fault of the system, in not having a special day for the committees to meet. I think every committee appointed should meet on the first day of the session, which should be taken up entirely by committee meetings. There is no use having the members here for three days when really part of the time is taken up in preparing committee reports. This way the committees are blamed for what is really not their fault at all.

Mr. Gibson—I think the trouble is this, we try to do it all by talking. I think when these questions come up they should be sent by post to the members of these committees. However, Mr. Chipman and I will withdraw our motion on condition that the other motion remain.

Mr. Chipman—But if it is "Engineering and Topographical" I would move an amendment that you insert a standing committee on Topographical Surveying.

The President—Will that meet your views, Mr. Dickson?

Mr. Dickson—Yes.

Mr. Sankey—I will second that.

(The by-law was then carried, with the addition of the words, "and Committee on Topographical Surveying.")

As to the examinations, "Candidates for admission to practice, etc."

Mr. Sankey—Shall we leave the marks to the Board of Examiners to settle?

Mr. Butler—As to the subject of trigonometry, spherical trigonometry, I think perhaps, as a member of the Board of Examiners, it might be wise to get an expression of opinion from the surveyors assembled as to how much that includes. That is a pretty flexible term. Plane trigonometry covers a large subject, so does spherical. How much of each should be given?

Mr. Gibson—The practice has been the ordinary rules of plane trigonometry and demonstrations of such rules.

Mr. Butler—But partly the object of getting this Board of Examiners has been to make it a little harder to get through.

Mr. Dickson—I think it should be altogether left in the hands of the Board of Examiners.

Mr. Sankey—I think it would be advisable that these by-laws should be distributed over the country, and when a candidate writes to the secretary, asking how much of this have I got to do, or what books have I got to read? the Secretary will just send him a copy of the by-laws. And I think the Board of Examiners should be asked to define the particular chapters of each book, and I would advise that they put in this by-law the actual works that it is advisable for the candidate to read. I know at the last examination some candidates had been reading on one book and others on another. In one case, one gentleman came up for examination in Euclid, and I happened to have the Euclid I personally knew best, and in the course of the examination he said: "I don't think the Euclid you are looking at is the one I have been reading; it is one I don't know anything about." I thought in justice to him I should take the book he had studied out of, and I found he was thoroughly well posted in it; but the class of question I was asking was not the one he had been led to expect. I think it is decidedly advisable that the candidates should have some idea what books they are going to be examined out of before they come up.

Mr. McAree—Besides the proof of the rules I think they should go on to calculation of logarithms, say about half of Todhunter's book.

Mr. Walker—I think it would be well to insert there the names of a few text books that would be used in this examination.

Mr. Gibson—Suggestive only though.

Mr. Walker—I think it is usual to have a list of text books which may be used. We don't want to compel them to use any one particular one, but I think there might be a list, which will be used as a basis for the examiners in this examination.

Mr. Gibson—There is no question but they must be examined in the studies they have gone through in the schools.

Mr. Bowman—I move that the Board of Examiners be authorized to issue a printed prospectus of the different subjects and text books recommended by them for the preliminary and final examination.

The President—There is an examination in plane superfices, and it seems to me there is nothing in solids; the idea of a surveyor going through and not knowing how to measure a cube or a sphere does not seem right.

Mr. Dickson—In suggesting that the Board of Examiners or secretary notify students as to what they shall study, suppose they should clash with what is ordered to be taken up in the schools, how would that be?

Mr. Gibson—The Board will send out a circular with reference to these points.

Mr. Walker—I think the way that is usually done in universities and schools of science is to mention what parts they are to get up; for instance, trigonometry, the relation of the parts of triangles, logarithms, and the solution of triangles; and then anybody would see what they had to get up, and use what text book they like.

As to number of marks candidates must obtain.

Mr. Abrey—Is it the intention that candidates shall know their standing after the examination—know the marks that they have obtained?

Mr. Sankey—I may say that any candidate can see now.

Mr. Sewell—I think the percentage ought to be at least seventy-five per cent.

Mr. Walker—What are the percentages now in the examination?

Mr. Sankey—Not less than one-third was what we were governed by at the last examination.

Mr. Ellis—On one or two of the subjects I think one-third is too low.

Mr. Walker—I think as this matter has been left to them that this clause had better be left to the Council also. I suppose we are not going to decide at this meeting what number of marks on each subject is to be the maximum, and it would be as well to leave this to the Board too.

Mr. Sankey—Then this clause referring to examinations is to be referred to the Council.

With regard to discipline.

"Any complaint against a member of the Association or against any other person, etc."

The President—It seems to me that is indefinite, "any other person."

Mr. Sankey—In section 5 of the Act there is a very long clause, setting out what powers the Council have for suspending or dismissing from the Association any land surveyor who is found guilty of gross negligence or corruption in the execution of the duties of his office; but the Council shall not take action until the complaint made under oath has been filed with the secretary. That governs the powers that the Council have with regard to any member of the Association. Now, the Council understood that it was the wish of a large number of the members of the Association that a by-law should be passed, giving the Council authority to take up any complaint of this kind and prosecute it against an unlicensed practitioner in any part of the province.

Mr. Winter—As the statute stands at present, could not any member of this Association do it?

Mr. Sankey—Yes; but private members don't like to do it.

Mr. Dickson—I think it should be that when any member of the profession finds any interloper coming in and working, he should simply report it with all the facts of the case to the Council and let them

prosecute him. It is astonishing how many employ these characters. I know I have had to go over a lot of their work again, and I never found it correct. But at the same time it is a very unpleasant thing for any individual surveyor to prosecute. They will write a description of a piece of land, and all the surveyors in this room could not find that land.

Mr. Sewell—It is a question whether the description of land does come within our province. I have never been clear as to whether any person could be legally allowed to write out a description.

Mr. Sankey—I think we are in the same position as the lawyers are with regard to conveyancing.

Mr. Dickson—Lawyers find a great deal of fault with others doing conveyancing, but I have had some experience with lawyers, men with Q. C. attached to their names writing descriptions, and it would be impossible to find the land.

Mr. Sankey—Then it will be, "Any complaint against a member of the Association or against any unlicensed practitioner shall be filed with the secretary . . . . at the next regular meeting of the council."

Mr. Winter—How is the council going to have power to summons before them any party that is not a member of this Association?

Mr. Sankey—They have not the power; they just rely on the truth of what they are told and make such investigation as they may have the power to make as to the truth, and then if they see reasonable grounds for commencing a law suit they will instruct it to be commenced.

Mr. Winter—What power does the statute itself give this Association to deal with parties that do not belong to the profession except just as the statute provides?

Mr. Sankey—It is not proposed that it shall; it does not give them any power at all. Any licensed practitioner has the power to bring him up before the proper courts and have him punished, and the object of this Council is to see if there is sufficient evidence to warrant them bringing him up.

Mr. Sankey—I would like to draw your attention to this in our Act, "The Association may by by-law provide that any surveyor who has been in the actual practice of his profession for a period of thirty-five years or more, and has during the entire period been a duly qualified surveyor, may be exempted from the operations of this Act."

It has been thought that perhaps it would be advisable to have a by-law passed which would enable any members of the Association who wished to avail themselves of that privilege to do so, instead of having to pass a new by-law every time a man makes application; that a by-law could be passed now, leaving the matter with the Council.

Mr. McAree—Suppose we limit the date up to which they may apply for the benefit of it.

Mr. Winter—If I recollect the reading of the statute it strikes me that that is a matter for the Council.

Mr. Sankey—When we were about getting that Act passed some of the older members of the profession wrote to us and to the Government, saying that they had been practising long years and thought it was hard lines that they should be brought under the provisions of the Act proposed, and asked if a clause like this would be acceptable.

Mr. Winter—I think it would be wisdom on the part of the Association to deal with the matter very carefully. Supposing quite a number should make that request and be freed from the control of the Association.

Mr. Gibson—Does not that apply to persons who had been 35 years practising before the passing of the Act ?

Mr. Sankey—Yes.

Mr. Bolton—That only reters to the fees.

Mr. Sankey—It is "the operation of the Act." It means he can go on and practise without paying his fees.

Mr. Niven—I think the intention of the Act is that they remain in all respects as they are, except that they do not pay their $4 a year.

The by-laws were passed as a whole.

DISCUSSION AS TO PAYMENT OF MEMBERS OF COUNCIL.

Mr. Morris—It has been moved by Mr. Foster, seconded by myself: That the members of the Council of the Association of Ontario Land Surveyors be allowed all reasonable expenses and $6 per day while in attendance at all meetings.

This is the outcome of a recommendation or hint bythe Chairman of the Council in bringing in the report, that it was hardly fair for members of the Council to come to Toronto and receive no remuneration, while others who are members of the Board of Examiners receive remuneration similar to what I have proposed here. I think it is now compulsory on the Council holding their meetings twice a year, at the same time as the meetings held by the Board of Examiners. The third meeting of the Council is at our annual meeting. The question may arise, why should the Council receive remuneration at the annual meeting, while other members of the profession, attending at their own expense, receive none ? Well, this is only one-third of the question. The remuneration for the other two meetings is not going to add materially to our expense, if we look at it in this way; the Board of Examiners pay probably two-thirds of the Council at those two meetings, and the only expense, coming on this Association will be for that part of the Council not receiving remuneration as on the Board of Examiners, so that though this may appear a tax on the Association, it is probably not more than a little over one-third of what it would appear here.

Mr. Abrey—I suppose it is not the intention where members of the Council are also members of the Board of Examiners to pay them twice for the same meeting ?

Mr. Foster—No, that is not the intention. It is only those members of the Council who are not on the Board of Examiners. The Board of Examiners get their pay irrespective of their being on the Council at all.

Mr. Winter—It strikes me that that motion leaves the matter in a rather unsatisfactory shape, because there is nothing to prevent the members of the Council, if they happen to be members of the Board of Examiners as well, receiving pay twice over. I believe that all our officers ought to be reasonably paid for all the services they perform, and I have no objection to the motion, but it leaves the matter rather doubtful. It would be better to add something to that motion to explain that point.

Mr. VanNostrand—I think it would be better to make the motion a little more explicit. Of course we don't suppose there will be any difficulty of that sort, but there may be objections from parties who do not understand this as well as we do ourselves.

The motion was then changed to "That the members of the Council of the Ontario Land Surveyors be allowed all reasonable expenses and $6 per day while in attendance in their capacity as Councillors at all meetings, except the general annual assembly of the Association."

Mr. Bowman—I move in amendment, seconded by Mr. Miles: That the members of the Council be paid all reasonable expenses in coming to, attending and returning from Council meetings. No member, also a member of the Board of Examiners, to be paid railway fare when attending a meeting of the Board of Examiners at the same time.

If the motion is carried, we don't know what sum we may be let into. A member coming from a distance will be a day here, a day coming and a day going back; and some of their railway fares will amount to $20, so we will have $40 or $50 apiece for every meeting, and we don't know how the members will attend, there may be 6 or 7, so it will take a large sum to pay them. I am quite in favor of paying all reasonable expenses, but for the first year, I think that is quite sufficient. If we find after the first year that we have a big balance on hand and don't know what to do with the money, then it will be time enough to pay the Council.

Mr. Winter—My experience in matters of this kind is this, that if we undertake to shave down too closely the fees of the officers that are to do our business, we are making a great mistake, because we will never have our business properly attended to. I am fully convinced in my own mind, that if the revenue of the Association is not sufficient, according to the present arrangement, to pay a reasonable remuneration to the officers that attend to our business, we had better make such amendment as will make it sufficient, in order that we pay reasonably for all services and have them performed in a proper manner, and be under obligation to nobody.

Mr. Bowman—We had better find out something about what is done in other societies. It is a matter that is going to affect this Association a great deal one way or another, and I would like to know what is done in the Canadian Society of Civil Engineers.

Mr. Walker—As far as I know, there is no salary attached to the Council of the Canadian Society of Civil Engineers. They do not even receive travelling expenses; it is all done for the honour.

Mr. Morris—It is true it is all done for the honour, but the Association of Civil Engineers so far is all honour and sentiment. This is hard work. The officers of this Association have a great deal of work to do that the Canadian Society of Civil Engineers have not. And it is more of a democratic institution in this way, that the officers are taken from all over the province indiscriminately, whereas in the Civil Engineers it is more centralized and the officers are chosen so that there will not be too much travelling. I don't think they are at all parallel cases.

Mr. Walker—I think Mr. Morris is a little mistaken about the officers being selected in that way. The Council, I think, as far as I recollect, is selected from each of the provinces. There are members of the Council who live in British Columbia, there are other members in Nova Scotia.

DISCUSSION ON MR. WILKINS' LETTER *re* UNLICENSED SURVEYORS.

In regard to Mr. Wilkins' letter as to unlicensed surveyors, also the signing by Ontario Land Surveyors of plans certifying to surveys made by unlicensed persons,

Mr. Bowman said—I was under the impression that the Act named an officer to look after and prosecute unlicensed surveyors, but I can't find it just now. I think there should be some one appointed to act on behalf of the Association and prosecute these persons. There is a great deal of farm surveying done by persons who are not licensed, and we cannot take it up ourselves, because the whole neighbourhood would be down upon us; but if an official of the Association were to prosecute them, there would be nothing thought of it, and it is no more than right that it should be stopped. I would move that an officer be appointed in compliance with the request of Mr. Yarnold to prosecute on behalf of the Association the unlicensed surveyors throughout the province.

Mr. VanNostrand—I think that matter is being touched upon if not covered by the by-laws.

Mr. Tyrrell—It is a matter that concerns us all more or less, and is rather important, so that I would be very much pleased to hear that the matter is put in such a shape that it will be enforced. I know just around the district where I practice there are, at least, four such men, who are continually practising, doing anything they can get hold of in the way of surveying.

Mr. VanNostrand—I think that our members are liable to lose sight of the fact that we are not acting for our own interests alone, we are acting partially in the interests of the public. We are servants

of the public in a sense, and it is certainly in the interests of the public that unregistered or unlicensed surveyors should be prevented from practising. The law distinctly states that they shall be licensed, and the law is passed, not in the interests of the surveying profession alone, but in the interests of the public generally, and I think there is a little danger of our losing sight of that fact; but there is no doubt that the rights of the profession demand that something should be done in the matter.

Mr. Niven—I would just say in reference to that communication of Mr. Wilkins' that I know of cases where an engineer has made the whole survey of a right-of-way for a railway and got a surveyor to certify to it who never was on the ground. We cannot do anything with those who are not members, but certainly I think no member of our profession should do such a thing as that. Then, with regard to unlicensed persons, we find them in various parts of the country. I know of a case in the County of Hastings, where a surveyor was called in to run some lines, and, owing to the depth of snow, adjourned the line-running until a more convenient season. In the meantime, before that more convenient season arrived, along comes a bush-ranger, who possesses a compass and chain, and he runs all these lines for $2.50 a day; and I have no doubt that that sort of thing is going on in different parts of the province. So that I think the suggestion that we should appoint some one to look after these parties is a very good one.

Mr. Gibson—I think that the simplest way to get at matters of this kind is for each surveyor who knows of a person who is inclined to practise without a license to send a notice to the Secretary at once. And then any surveyor who signs plans in the way Mr. Niven speaks of should have his name reported also, and his attention brought to the fact that he is doing what is wrong and contrary to the law. Probably the best way to get at it is just to frighten them with the majesty of the law. A list should be made of all those who practise in that manner, and also the names of persons who are practising without a license, and should be sent to them, with the warning that in case of their repeating the offence proceedings would be taken.

Mr. Tyrrell—On one occasion, I was asked to sign right-of-way plans for a railway, and I declined positively to sign the plans without having made the survey. I had been doing work for the company up to this time, but when I declined to sign the plans they had no further use for me, and I believe they got some other surveyor to sign them.

Mr. Gibson—They should be warned, and in case of their repeating the offence, they should be prosecuted. There are lots of constables all through these counties who would take the job very quickly.

Mr. Tyrrell—I have had the question raised sometimes as to what is land surveying. Is not laying out a water course, where you have to determine the areas of properties affected, land surveying?

Mr. Gaviller—That comes under the Ditches and Water Courses Act.

Mr. Tyrrell—I think land surveyors should be required to do that work.

Mr. Gaviller—I think we are a little ahead of time in this discussion, considering that this is our first meeting, and we have not even got our by-laws brought up for revision yet I think the gentlemen will be perfectly satisfied that we will appoint a man, and will also be perfectly satisfied as to how he will act.

If I recollect right there was at one time a form sent around by the Crown Lands Department—I remember getting one once—asking us all as surveyors to put down any information as to surveyors in our locality, and also anyone who was practising without a license Why should not we have a form of that kind and send it around to all the members, say once in two years or so, or oftener if necessary, and let them fill it in and send it to the secretary, and he could act on it?

DISCUSSION ON COMPILED PLANS AND SUBDIVISION OF TOWN LOTS.

Mr. Wilkie—There is a matter I wish to speak about; it is in connection with getting up a new plan of the town of Almonte in accordance with the Registry Act. I went before the local Registrar there, asking for information as to how he wanted it done, and he could not give me any information, but he said that the Inspector of Registry Offices wished to see the plan before it was finished; and, as I thought of coming up here, he said if I could bring it with me and show it to the Inspector it would be a good idea. I have done so, and one suggestion that the Inspector has made, and the principal one, is that we change the numbers of the lots; he suggests that we begin with 1 and number the lots continuously throughout the town. As it is now, every man that got a little survey made began with lot No. 1, and numbered as far as his lots went. I don't think there is a number at present above 300, and there are probably 1,500 or more lots in the town. He suggests that we begin at some convenient point, following it out systematically either by blocks or rows, or whatever way would be most convenient. Then, with regard to the difficulty in the abstract of title it can be overcome by furnishing a new set of abstract index books. In carrying it from the old book to the new, he would start off by heading a page lot No. —, Wilkie's Survey of the town of Almonte, and under that he would say Old lot No. —, so that it could be traced back to the original. The Inspector told me that that was being done at present with a map of the town of Picton, and he was endeavouring to have such legislation made on the subject as would enable him to carry out this throughout the different parts of the province, where they chose to adopt it.

Mr. Gaviller—I happened to get into the first law suit I ever got into in my life on that same subject. In the village, in this case, a great many of the lots had never had any original numbers, and the

corporation requested me to put numbers on these lots which were not numbered on the plans in the registry office, and in fact to compile these from the descriptions in the deeds. It was the first case of the kind I was on, and I thought my best plan was to submit it to the council, and it was stuck up for months before I was to get any pay. Every man was to look at this to see if he thought it was all right I submitted to this, and they accepted my plan and paid me for it. The next thing, I was summoned to court ; they said my plan was useless. It went on, and was thrown out two or three times. In that case the judge ruled that as far as the numbering was concerned in that plan it had nothing to do with the law, in fact, if the numbers were left out, the plan would have been just as legal, and I consider so myself. As far as numbers were concerned, they were simply put there at the request of the corporation. They threw the case out, and there was an end of it.

Now, as to the Inspector's idea of numbering lots, that is his idea, but what in the world that has to do with the law, as it stands now, I cannot see. It cannot possibly have anything to do with it. The corporation has nothing whatever to do with the sub-division inside ; as far as that is concerned it is simply information given to them which they are supposed to pay for and is given to them by the surveyor ; and when that is put in the registry office it is simply filed, it does not register any lot on that plan which was not formerly registered ; and more than that, it does not nullify any plan that has been in the registry office. The Act calls for the registration of the boundaries.

Mr. Sankey—I am sorry to say I have some experience in matters of this kind. I have been for the last three years trying to prepare a plan of the City of Toronto to comply with the Registry Act and Municipal Act ; and if the legislation outlined by our friend who has just spoken is going to be carried out, I am afraid we will have to pass a very big debenture by-law to pay for the cost of it. I don't suppose anyone has the slightest idea of the number of plans I have to deal with. I am preparing it on a scale of 100 feet to the inch, and if the plans were all numbered on one sheet at that scale, it would be about 35 feet long and 15 feet deep. I don't doubt at all that the idea is a very good one if it will work. As I understand it, the plans that are required under the Registry Act and under the Surveyors' Act of incorporated villages, or even of unincorporated villages, are simply maps on which the various registered plans are compiled all on the same scale ; but that the surveyor who compiles that plan should be held responsible for all measurements, bearings, courses, distances, etc., on that, the same as on a registered plan—it is simply impossible for him to do it. It is not hundreds of plans we have here in Toronto—they are in the thousands now. I have got to go back to the very first plan that was ever registered in the city, and bring it right up to date, and show every plan or sub-division of every plan on that, and surely it is not expected that any one man can be responsible for every measurement on that. All the surveyor can be held responsible for is that he has copied the plans in the Regis-

try Office. Then the difficulty comes in of making them all fit together, and I need not detail the trouble that that alone entails. Then the next difficulty that comes in—and this is one I am not personally quite satisfied as to how it should be treated—is where there is no plan at all. On the compiled plan what are you bound to show? I mean a block inside a corporation of which no registered plan exists other than the plan in the Crown Lands Department. We have several such blocks in the city of Toronto. There are some blocks, considerable blocks too, on which no registration, as far as plans are concerned, has ever taken place; and a person searching the title on that block, until very recently, at any rate, had to go back to the original patent. Every time a block was sold the lawyer, if he did not know the title previously, thought it was his duty to go back to the original plan. In this city the way they have done is this, the Registrar has blocked out the city into certain blocks, and in each block are put all the titles that refer to that particular block, and when a lawyer comes to search a title, he looks that up and takes the Registrar's certificate as true that only certain numbers affect that block, and he need not go into any of the others. That is a point as to which I don't know exactly how far I can make the plan, I am now preparing, satisfy the Registrar; as far as I can, I am perfectly willing to do so; but if in the city of Toronto we are going to re-number all the lots, as the Inspector of Registry Offices suggests, I don't know where it is going to end, and what is going to be law for one part of the province ought to be law for the whole. In smaller places it is probable there are not more than two or three sub-divisions of any one original plan.

I am very glad the subject has been brought up, because I would like surveyors to discuss this matter; and I think if there is going to be an amendment in the Act that the surveyors ought to have a strong word to say as to how this is going to be carried out. Now, in the Registry Act it says, a plan shall be made showing everything registered inside the corporation. Does that mean everything registered inside the corporation, or a survey of everybody's lands who has not had a registered plan? That is where the difficulty occurs. Of course if the Inspector of Registry Offices tells us I want this, that and something else, and the surveyor can get the muncipality to pay for it, I say by all means do what the Inspector asks for. We have a great deal better chance of getting the corporation to pay for it if he says he wants it.

Mr. Chipman—I think this section that is under discussion is capable of a broader interpretation than has been put upon it by the previous speakers. I think this means as it states here, "Where an incorporated city, town, or village, or village not incorporated, comprises different parcels of land owned at the original division thereof by different persons, etc." It strikes me that a surveyor when he is called upon to make a compiled plan of a village is obliged to show upon that plan every sub-division at the time the survey is made whether such sub-divisions were shown on any previous plan or not. I have had some experience in this work, and in one large town two

or three sub-divisions were never shown on the plan in the heart of the town. The lots were sold by metes and bounds starting from certain points. I show each of those as a distinct lot, exactly as if they had been surveyed and shown upon plans and filed. I think that is what the Act contemplates.

I don't think it would do at all to number the lots consecutively from the first. It would lead to confusion and considerable unnecessary work in the registry offices and to the surveyor, and would possibly lead to litigation. I am somewhat surprised to hear that the Inspector of Registry Offices has suggested that method of numbering lots.

The President—I think there is perhaps, on the other hand, a great deal of confusion in some towns by lots being numbered, even on the same street, with the same numbers. I know in our town it is so, on the same side of the street. I understood the way the Registrar wished it was, that these lots ought to be numbered consecutively, but that the old numbers certainly would not be abolished. They would have to be retained, for they are in the deeds.

Mr. Wilkie—I understood Mr. Johnston (the Inspector of Registry Offices) to say that it was not necessary to show the old numbers on the plan ; they could be followed back from his proposed system of abstract indexing.

Mr. Chipman—There is nothing in the Act to prevent a man from sub-dividing the city, or town, or village, as the case may be, into blocks, and he can make his blocks conform as nearly as possible to the registered plans filed previously; or to taking several streets together, so that there will not be two No. 1's or two No. 2's. That appears to be the simplest way to do it.

Mr. Sankey—I would like to ask Mr. Chipman, what has the surveyor got to do to get this information ? Has he got to turn himself into a conveyancer and examine every deed in the Registry Office and find out exactly how it is last held? At what date is he going to say: This is the final description of this lot. If you have not got them on the registered plans, you have got to go to the deeds, and where is that going to end ?

Mr. Chipman—The day you put your name to the plan.

Mr. Sankey—I don't want for one moment to say that a big city like Toronto should govern the rest of the province, but what I am afraid of, is that the municipalities will not pay for the work of doing this, they will go on and get the Registrar to do it. In Toronto they are dividing up the city into blocks, and if I can make my plan coincide with those blocks I am going to do it, and if I cannot, I am not going to take the responsibility. The Act should be amended to make it clear as to what should be shown on this plan. If a surveyor has got to search all sub-divisions and put them all on a plan, it is a never-ending job I think it would be a very good plan for surveyors to put their heads together and outline some plan as to the matter.

Mr. Kirkpatrick—Would it not be a good idea if this Association could formulate some proposal that could be submitted to the Inspec-

tor of Registry Offices? It struck me when Mr. Sankey was speaking, why would it not be possible in this way to exempt the cities in Ontario from the particular features that would be necessary for towns or incorporated villages. As far as the incorporated villages and most of the smaller towns are concerned it would not be so difficult to sub-divide in the way Mr. Wilkie has told us of, but anybody can see that if you take the cities of Hamilton, London, Toronto, or any one of them, there would be no end to the work. If the Association could appoint a committee to just think it over and see if they could formulate some proposal, I should think it is very likely Mr. Johnson would be only too glad to fall in with any practical suggestions; because it certainly is in the interests of the surveyors themselves not to, what they practically call it, kill the goose that lays the golden egg. On the other hand, it is not wanted to make it so cumbrous that it will not be put in force by the different corporations. If there was any good plan suggested, I have no doubt that the Inspector will be able to get legislation in that direction. I don't know myself exactly how it could be done, but there should be special legislation for the cities, or something of that kind, I think.

Mr. Bowman—From what Mr. Wilkie said, I think that the Inspector leaves it optional with the corporation to adopt this new system or not, as they please, and I imagine that only the smaller places would adopt this system of consecutive numbering. That would get over the difficulty of preparing a plan with registered surveys on it, and at the same time a large number of small pieces that have been sold by metes and bounds that have not any number. I know in my first year of actual practice I prepared a plan of the village of Elmira. About half of that had been surveyed and plans filed, and the other part had been sold off by conveyancers with a tape line. Half the plan was taken up with these little chunks, some of them over-lapping each other, but there was no way of telling one from the other. They were simply part of lot No. so and so, in township so and so; and I think that this system would be only adopted in these small towns I think, however, that the Surveyors' Association might do something in the way of correcting abuses in preparing these compiled plans. The Inspector orders a plan, then the town or village council gets tenders from different surveyors what they will do it for, and they have no more idea when they start how they are going to do it than the man in the moon. I think a good move would be, if new legislation is to be introduced on this subject, to have the renumeration left with the Inspector at so much per day, what he judges the actual time to be put in by the surveyor.

Mr. Niven—I don't think there is any part of surveying that gives more trouble than the compilation of these plans. A number or years ago I compiled a plan of the town of St. Marys. I don't remember now the exact number of registered plans I found there, I think somewhere about 30, and the town council got it into their heads that they wanted a complete map. They advertised for tenders, and my tender was $300 and another one was $200. It took the council a whole year to decide which they would give it to, but finally I got the

contract, and I am sure I put $600 worth of work into it, and in the end found it very unsatisfactory. These plans in the first place would not fit together. Then, there were large pieces that they did not cover at all, and I had to make an actual survey of the whole corporation, had to put in the river and Trout Creek that runs through there, and fit in the railways, and had an immense amount of labour over it. It was not satisfactory in the end, and it is not satisfactory to this day, and I think they are now about devising some scheme to get a re-survey of the town. I think if this Association could appoint a committee to look this matter up and make some suggestions in the line that Mr. Kirkpatrick has suggested, that they would be doing a good work.

The President—There is no question at all, there is a great deal of confusion at present in the towns in the country, and the assessors have great difficulty with two or three lots having the same number. There is no question at all, but that if you could get those consecutive numbers it would be the best thing, if it could be done. In the north-west the system is blocks and numbers; block No. so and so, and then the numbers don't run so high.

Mr. Foster—I think the Inspector's idea of consecutive numbering is not a bad one in small places, but in a place such as a town the size of Chatham or London it would be perfectly impossible. I suppose the entry books would be made with two columns, one with the old number and the other with the new one, and it could be easily referred to. But where blocks are laid out by descriptions it would be very different; it would be then very hard to follow. I cannot suggest just now any way of getting over the difficulty entirely, but I think some system of having both the new and the old numbers could be carried out.

DISCUSSION IN REGARD TO FEES CHARGED BY SURVEYORS.

Mr. Dickson—Is there no way of disciplining members of our profession who work below the usual charge? I charge $6 a day in my locality, but I know other surveyors who actually work for $5, though they profess to charge $6. Is there no way of giving these gentlemen a hint that it is unprofessional or unbecoming a member of the profession to bring down the charges for surveying. I don't know if there is any way of reaching them, but if there is, it should be done.

The President—I think there is one clause in the by-laws referring to that; when any surveyor knows of any illegal practice by any surveyor or unlicensed practitioner he is to report it.

Mr. Dickson—I mean licensed practitioners working for less than the regular charge. As I understood it, that point just covered men not licensed. These gentlemen are of the same standing as myself, and they come in and work for improper fees. I think it is very unfair, and should be frowned down. Go to the lawyers and they have their prices, go the doctors and they have all the same prices for attending a person; the surveying profession is the only one I know of that does not.

The President—The draft of the bill presented to the Legislature provided for our charging the usual fees, but it was impossible to get this through the House. The only thing is to discipline the members.

Mr. Niven—Some years ago, we appointed a committee to bring in a tariff of rates in the old Association, and they gave $6 a day as the minimum, and we are supposed to be working under that tariff. Now, as the President has stated, it was proposed to give the Association power to fix their fees by the Act, but Hon. Mr. Hardy advised us, that that Legislation would not pass the House, and we had better strike it out; we could accomplish the same end, by bringing the members under discipline. That is, if this Association will now appoint a committee to bring in a tariff, or adopt a tariff, then every member is in honor bound to observe that tariff, and should he not do so, he could be called to account by this Association. That is how I understand the Act.

Mr. Butler—I don't entirely see how you are going to be able to tell a young man starting out that he shall work for so much or starve. I think every surveyor in the room believes that he should not work for less than the schedule, but still I don't see that you have any right to punish him, if he sees fit for the purpose of making his living to work for somewhat less till he gets a start. Young men cannot be expected to come in on a level with the old men, and I think these things are fixed largely by supply and demand. Other than the expression of the Association against accepting less, I do not see that we have any power, or that we ought to exercise any authority in regard to the matter.

Mr. Winter—It strikes me very plainly that if we are to keep up the standing of the profession at all, it will never do for us to run down the price for which we are working. I can understand very well, that it is not well to overdo a matter of that kind, but before I became a member of this Association at all, I understood what the feeling of the Association was, that the charge should be $6 a day, and I have adopted that for years back, when not a member of the Association at all. And although I did so, I know members of the profession in the western part of the province, that are working for less than $4 a day now. Now, is this sort of thing to go on, when the incorporated Association has made known to the members that it should not be continued? If something is not done, or if this Association does not see fit to exercise its influence in some way to prevent it, I fail to see how we are going to succeed in keeping up the standard of the profession.

Mr. Chipman—This is a vital question, but as a matter of policy I think we had better leave it alone this year. We are only just now incorporated, and to put the thing on the shelf till next session I would move, seconded by Mr. Butler, that the incoming Council be hereby instructed to report upon the question of a minimum tariff at next annual meeting.

Mr. Winter—I would move in amendment that if the matter is taken up by the Association or by the Council of the Association, that

in no case shall they fix the fees below what the Act allows the members of the profession for attending court as witnesses.

Mr. Bowman—I have had cases as to that where lawyers look up the Revised Statutes of 1877 and say it is $4, but it has been fixed at $5.

Mr. Winter—I had occasion for a lawyer to look up that question this very day, and after looking it up he paid me $5.

Mr. Morris—There is great danger in fixing a minimum tariff, lest those who charge a higher rate should have it pulled down. Now in my locality I am competing with men who charge $10 a day, In the Association of Quebec they charge $1 an hour and for 10 hours they charge $10. The Ontario Surveyors who hold the Quebec certificate have fixed the rate in that locality at $10 and nothing less; so if you fix a rate it is going to have a bad effect.

Mr. McAree—The fixing of a minimum might have a tendency to hamper those who are charging more. I think, looking at the thing altogether, we had better leave it alone for another year.

Mr. Chipman—We find lawyers commanding their own prices, engineers command prices, perhaps not what is due them, but relative to their attainments anyway, and I think surveyors, if they are to be a profession at all, should stand on the same basis. A man will be paid about what he is worth. I think this matter should be left for the Council to report on at the next meeting, and by that time the members will have thought the matter over. If we now fix a tariff of fees, or a minimum tariff without due consideration, and in a thin meeting like this, we will rouse the opposition, not only of the Legislators and the public generally, but perhaps among the members of our own Association.

(Mr. Chipman's motion was then carried.)

DISCUSSION IN REGARD TO A STANDARD MEASURE.

Mr. Dickson—About the old standard measure, some are of the opinion that if it were possible to get 66 feet steel tapes made and furnished to surveyors, marked with links on one side and feet on the other and stamped, it would be a good thing. They could be kept and only used for the purpose of testing the chain. I don't think there are any of them in existence, but I don't see why they should not be.

Mr. Abrey—Those tapes are already in existence. The Dominion Lands Office have them and I think the price is $8. They are made at Ottawa, under the authority of the Office there, and all Dominion Land Surveyors can get them, and I presume anybody else can too, by simply remitting the price. They are 66 feet long and stamped by the Dominion Government.

Mr. Butler—I am under the impression that we are all liable to be fined for using unstamped chains. I think we are compelled to submit them to the Inland Revenue Office and have them stamped.

Mr. Chipman—Now that we have a testing apparatus in the school of Science, we have the means of testing standard measures. That is under the control of our Provincial Government, and we are under the wing of our Government, and I think it is a good move for the Board of Examiners to furnish standard steel tapes. We have outgrown altogether these pine window sticks that they have sent around to us, furnished with little brass squares on them. I never heard yet of a surveyor comparing his tape with them.

PRESIDENT'S ADDRESS, 1893.

GENTLEMEN OF THE ASSOCIATION OF ONTARIO LAND SURVEYORS:

Permit me in the first place to thank you for the honor you have conferred on me, in electing me as your first President under the Act of Incorporation, and to crave your indulgence for any errors that I may make in filling so responsible a position.

It is my sad duty to refer to the loss which we, as a society, have sustained, through the death of two of our members, viz: Mr. D. S. Campbell, of Mitchell, and Mr. I. L. Bowman, of Berlin; both of whom were honored members of our profession and respected and esteemed members of society. Mr. Campbell was present on the first day of our meeting a year ago, when he was taken suddenly ill and died shortly after reaching his own home.

On behalf of the Association, I welcome those of you who are here for the first time to-day, and trust that year after year our annual gatherings will continue to be not only pleasant, but also profitable, and tend more and more to the elevation of the profession to which we belong. I think we have good reason to congratulate ourselves on the position that we now occupy.

About seven years ago a voluntary Association was formed, composed of a considerable number of the Provincial Land Surveyors of Ontario. In the formation of that Association it was thought that nothing but good could result from interchange of thought between its members, and with that idea in view, annual gatherings were brought about. The proceedings of each of these meetings were embodied in a report and printed, and by means of these we were enabled to make exchanges with similar Associations, both in Canada and the States, and thus to furnish most valuable information to our members, worth many times the small cost of membership. Then there were important amendments in the old "Act respecting Land Surveyors and the Survey of Land" necessary, and through the exertions of that Association, these were obtained; and finally, during the last Session of the Ontario Legislature, with the assistance of the Government and especially of the Commissioner of Crown Lands, the important step in advance was taken, by which we became a corporate body, with powers and responsibilities similar to those enjoyed and assumed by other professions, and it is in that capacity that we meet for the first time in our history to-day.

Now, there is one point regarding this matter that I wish to emphasize, and it is this, that the old Association, recognizing that the legislation asked for, affected, not only those of the profession

within, but also those outside, the Association proceeded with the utmost caution in every step taken. It was considered not only advisable, but essential, that there should be no opposition in our own ranks, and with this in view, a copy of the draft of the Bill was sent to every member of the profession, whose address could be obtained, asking his opinion regarding it. The result was practical unanimity, and I believe to-day we start with a body united in its loyalty to what has been done, and prepared to carry out, and not only to carry out, but to assist in working out and perfecting what has been done ; for it must not be assumed, that now, that we have become incorporated, we can rest and be thankful and cease our exertions in behalf of our welfare. On the contrary, we have only obtained a vantage ground which will enable us to do more than was possible heretofore for our advancement.

As you are aware, we have now practical control of the examination of candidates desiring to enter the profession, and it will be our own fault if the standard of admission is not kept sufficiently high to enable us to take rank with the other learned professions of the land. There is another point that might be mentioned, in the legislation that we have obtained, we believe that it will not only be beneficial to us as a body, but that it will be found to be in the public interest as well. On this point, there was, I believe, some misapprehension. It was thought that we were asking the Legislature to grant us powers under our by-laws by which we might profit to the detriment of the community In reply to this, we have only to refer to the Act itself, which certainly gives no such arbitrary powers, either directly or indirectly.

While acting as a voluntary Association, we became affiliated with the Association of Dominion Land Surveyors. I am happy to say that our relations with that body have always been most cordial, as certainly becomes two bodies so closely related, and I trust that in the future the same harmony may always continue.

It has occurred to me, that we might profitably reciprocate still further with our sister Associations, by inviting each one to send a representative to visit us at our annual gatherings and to be a guest at our dinner. This is not an uncommon practice with other societies, and I am confident that it would add very much to the interest of our meetings if we could have with us professional brethren from other fields than our own, and I presume that they would be quite willing for us to send representatives to their meetings, and the reports of the latter would also be interesting and profitable to us.

In addition to the ordinary business you will have at this session the ratification of by-laws, in accordance with the provisions of the Act. Other matters necessitated by the change in our status will require your attention, and, in view of this, I feel that I would be trespassing on your time by detaining you longer ; but I cannot close without expressing a hope that our deliberations may be conducted in the same spirit in the future that they have been in the past While we have had many discussions where difference of opinion was entertained and expressed, yet during all those years I do not recollect

any member ever violating the amenities of debate, or being called to order by the chair.

In this respect I feel like challenging any body of men, either lay or clerical, to show such a record, and with such an example I shall feel that if there unhappily should in the present session be a departure from it, it will have to be attributed to your presiding officer.

I will now, gentlemen, ask your attention to the various subjects on the order paper.

I thank you, gentlemen, for the kindness you have shewn me, while I have been presiding over this meeting. There is just one little matter that I think in the future, perhaps, we might attend to and it would expedite business very much, that is, that all motions be written out and handed in before being put. I know it would save a good deal of trouble. There has been no change, I am happy to say, in the cordial relations that have subsisted in the past between us. As I said in my address, I don't think there is any other body that can shew such a record as we have shewn. We have never had any discord whatever, either in committee meetings, so far as I know, or in open session, and I am very glad to know that this meeting has been no exception to the rule, and I hope concord may continue in the future.

PAPERS.

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

GEOGRAPHICAL SURVEYING.

By L. B. STEWART,

O. L. S., D. T. S., Toronto.

During the past summer I was one of a party of five that made an exploratory trip through that portion of the Rocky Mountains lying between the Bow and Athabasca rivers. Although our chief business was pleasure, each member of the party undertook some special work, so that we might bring back some results worth preserving. Two undertook to look after the geology of the country passed through, and another agreed to act as photographer, while I took upon myself the duties of topographer. We expected to travel at the rate of fifteen or twenty miles per day, so I set to work to devise some means of making a rapid survey of our route, unaided, at that rate. Doubtless many surveys of the sort have been made in a systematic manner, but very few making such surveys, I think, have committed their methods to writing, so that others may have the benefit of their experience; at least I was unable to lay my hands on anything that was of any service to me. I resolved, therefore, to adopt the following method:—I provided myself with a prismatic compass, a pedometer, and a sextant and artificial horizon; the pedometer to be used in making a rough traverse of our route, and the sextant in determining time, latitude and azimuth. The distance given by the pedometer would of course be greatly in excess of the straight line distance between two points, but the ratio between the two would be pretty nearly constant, and a plot of a traverse joining two points at a moderate distance apart would give the direction of the line joining those points with considerable accuracy, though its length might be greatly in error. The determination of the latitudes of the two points, however, would serve to correct the distance, as long as the line did not make too large an angle with the meridian. The pedometer was adjusted to my pace before leaving Toronto, though I did not expect that adjustment to hold good for distances along an Indian pack trail.

On July 8th we left Morley, a point on the C. P. R. forty miles west of Calgary, and for the first few days kept among the foot-hills. On reaching the Red Deer river we followed that stream for some distance, entering the mountains, passed the forks of the river, and kept to the north-westerly branch for about twenty miles. We then left

the Red Deer and struck across a height of land and reached the Clearwater. I found the method of survey admirably adapted to the country through which we travelled, the valleys of the rivers extending in long, straight stretches for many miles, so that sometimes it was only necessary to read the pedometer at the beginning and end of a day's march, and to take the general bearing of the valley through which we had come, while at other times it was necessary to take bearings every mile or two from one rise to another over which the trail passed. The bearings could best be taken backwards, as it was easier to tell the direction from which we had come than that which the trail was going to take in advance of us. Bearings were taken also to prominent mountain peaks, which served both to locate those points and also as checks on the general traverse. The topography was also sketched in detail.

Observations for latitude and time were taken whenever possible; where neither of these was known I found a good method to be as follows:—At noon a number of altitudes of the sun were measured, and the time noted, and also the greatest altitude for latitude, and towards evening a number more were taken for time. A value of the latitude was found from the maximum altitude, which was used in the reduction of the time observations, thus finding the watch correction. The circum-meridian altitudes were then reduced, employing the corrected times, thus finding a value of the latitudes from each. I preferred to reduce each altitude separately to taking the mean of the altitudes and the mean of the times, as any one altitude giving a result differing widely from the others could then be rejected in taking the mean. In the case of the circum-meridian altitudes it would not be correct to combine several by taking their mean before reducing. After having determined the latitude and the watch correction, the variation of the compass was easily found by taking a number of bearings of the sun, noting the times; then the latitude and declination being known each observation gives a value of the azimuth, which, compared with magnetic azimuth, gives the variation. This method, it is true, involves a good deal of calculation, but this can be left to some future time; the present and not the future is to be considered in such field operations. The following are the results of a set of observations taken at one camp:—

CAMP 28 (APPROX. LONG. = 7 h. 45 m.)

Sept. 4, 1892.

2—alt. $\overline{\odot}$	Watch time.	Latitude.
90° 12′ 50″	12 h. 28 m. 40 s.	51° 56′ 38″
14 0	30 18	56 40
14 30	31 28	56 47
15 50 (max.)		56 46
	Mean =	51° 56′ 43″

Index Error = + 35″
Watch corr'n = − 37 m. 40 s.

Sept. 5.

2—alt. $\overline{\odot}$	Watch time.	Corr'n.
32° 49′ 20″.....	7 h. 47 m. 32 s.	A. M. – 37 m. 31.9 s. (?)
33 16 40	" 49 2	37 37.2
33 36 40	" 50 10	37 39.2
34 7 10	" 51 52	37 41.3
34 26 50	" 52 58	37 41.3

Mean = – 37 m. 39.7 s.

Watch time.	Mag. Az.	Ast. Az.	Variation.
8 h. 8 m.	A. M ....80°.2	104°.6.....	24°.4 E
8 h. 9 m. 20 s.	" ....80°.5.....	104°.9.....	24°.4
8 h. 11 m. 50 s.	" ....80°.7.....	105°.3.....	24°.6

Mean = 24°.47 E

The method given above of course cannot be used where it is inconvenient for the explorer to stop during the day to observe. For night observations he may proceed as follows:—Measure a number of altitudes of Polaris and also of some other star or stars near the prime vertical, noting the watch times. If the pole star is not far from its elongation any one of the altitudes may be used as the latitude in the reduction of the observations of the time stars, and the watch correction thus determined—if near the prime vertical the error resulting from an incorrect latitude is very small. The times of the pole star observations are then corrected, and form each a value of the latitude deduced. If the mean of the values so found differs much from the assumed value it may be necessary to reduce the time observations afresh, and then find the effect of the alteration in the watch correction on the latitude. This may be done conveniently by the differential formulæ :—

$$dt = -\frac{d\rho}{\cos\phi \tan A}$$

$$d\phi = -\cos\phi \tan A . dt$$

in which

$d\phi$ = the correction to the latitude.
dt = the correction to the hour angle reckoned east or west from the meridian.
ϕ = the latitude.
A = the azimuth.

In the first formula of course A is the azimuth of the time star, and in the second that of Polaris.

I was obliged to take my observations during the day, being provided with a glass horizon, which, being levelled by means of a small

spirit level laid on its surface, had to be watched continually to guard against a change of inclination ; with a mercury horizon this difficulty is obviated.

After reaching the Clearwater our trail followed that river for about twenty miles and then struck over a height of land about 7,000 feet above sea level, and a few miles further we reached a stream flowing into the Saskatchewan, which we reached on July 18. We then crossed the Saskatchewan and followed it down stream till we were among the foot-hills again ; we then turned sharply to the left and travelled in a north-westerly direction through a country distinguished by its numerous swamps, muskegs, and mosquitoes, till the Brazeau river was reached. We now re-entered the mountains, keeping to the Brazeau, which we explored nearly to its source. About thirty miles above where it leaves the mountain the river forks, the more northerly branch flowing from a lake of considerable size, which we named Brazeau Lake, as it was not shown on our maps. From this lake we crossed a height of land and soon reached a small stream flowing north-west, and we concluded that we had crossed the divide between the Saskatchewan and the Athabasca systems. This stream led us finally to a large river which the Indians call the Sūn Wapta, and which is probably the Athabasca. After following this stream for about twenty miles our trail became impassable, so we carried on our explorations on foot about fifty miles further and penetrated to a large lake, in latitude about 52.° 18′ N., that discharged towards the west, and which therefore must be situated at or near the summit of the Rockies. Provisions now began to run low, so we were obliged to beat a retreat, and by forced marches reached Morley in ten days, after an absence from there of two months and two days.

I have given merely a hurried account of the trip as there was little to distinguish it from similar expeditions through a mountainous country. We had two Stoney Indian guides, who required the usual amount of humouring to keep them from deserting us.

During the progress of the trip the courses of the rivers were sketched from some convenient height, and rough surveys of the lakes were made in the following manner : Having climbed to some point at as great an elevation as possible that commanded a view of the whole shore line, the height above the lake was determined by means of the barometer, and then compass bearings were taken to prominent points along the shore and the angles of depression of those points measured with a clinometer level, thus fixing completely the positions of those points with reference to the station point. In this way a tolerably accurate survey of a lake ten miles in length may be made in about fifteen minutes after having reached the station point, and with more accurate instruments the method is susceptible of a considerable degree of accuracy.

On my return to Toronto I found myself in possession of quite a mass of notes and observations, from which I proceeded to construct a map. I first plotted in the Polyconic projection the meridians and

parallels of the region traversed, and then fixed the position of the starting point from a reliable source. I then plotted the traverse of the route beginning at that point, reducing the pedometer distances by one-third and correcting the bearings for variation until the first point whose latitude had been determined was reached. A straight line was then drawn connecting the extreme points of the traverse, and the parallel of latitude of the terminal point, found by observation, also drawn; the point of intersection of these two lines fixed the true position of the terminal point. This method was continued until the whole was plotted. I found the mean value of the ratio of the straight line to the pedometer distance to be about six-tenths. After the traverse line was plotted and corrected the topography was added.

It is readily conceded that the method described above is only applicable under certain conditions. The nearer the general course comes to being due north or south the better the check the latitude is on the distance, but if the direction be nearly east or west the method fails altogether. In the latter case it would be necessary to depend upon longitude determinations, and these are acknowledged to be rather unsatisfactory with portable instruments. A good lunar observation would give the longitude to within five or six miles, and this does not compare with a latitude determination with the same instruments, and chronometers are too delicate to be of any use on a rough expedition. The following method might be used to advantage when the party intends to return by the same route:—Let each member of the party be provided with a good watch, whose correction is found at the starting point before leaving and also on returning, and let their corrections be also found at as many intermediate points as possible along the route on the way out, and also at the same points on the return trip; a comparison of the two corrections found at any one point together with the interval of time between them will give a value of the watch rate, and a value of the rate can be thus found from each pair of observations, and an idea of its regularity in this way gained. The watch that shows the greatest uniformity in its rate may be used in comparing the local times of the initial and terminal points, and also those of the intermediate points.

By some system such as I have outlined here a survey of a large extent of country sufficiently accurate for a great many purposes might be made in a very short time, and throughout large sections of the Rocky Mountains land will never be valuable enough to justify a more accurate survey.

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HISTORY OF THE TACHÉ GOLD FIELD.

By HENRY Deq. SEWELL,

O.L.S., A.M.I.C.E., ENG., D.L.S., Port Arthur.

THIS promising gold field was first discovered during the construction of the Canadian Pacific Railway, in the year 1882, by a Mr. Baby, who found a very promising vein on the north side of the railway track, and early in the year following several good-looking veins were located by the author, Mr. Halstead, and several others. All the locations being situated about 4 miles east of Taché Station, or 177 miles from Port Arthur, or 121 miles from Rat Portage, the first place where gold was found in Western Ontario (in which place it was discovered a few months previously).

Unfortunately for Taché, it has no inhabitants other than the few employees of the Canadian Pacific Railway, Taché being only a small side station, whereas Rat Portage is an important division station, with considerable lake traffic, and consequently it has a population of several thousands. It is, therefore, not to be wondered at that whilst the richness of the "Lake of the Woods" or "Rat Portage" gold field, has been prominently and persistently kept before the public, the claims of the rich but comparatively unknown Taché Gold Field, with a very limited number of persons interested in its development, has easily been kept almost a profound secret, until it has suited the purposes of the few, who all along were acquainted with its wonderfully large and profitable veins, and which compare most favourably with the better known, but more refractory gold ores of the Lake of the Woods, to say nothing of the more advantageous position for shipping by rail of the Taché gold field. The Lake of the Woods ores having to be shipped by steamboat prior to being transhipped by rail.

After the discovery of the first claims and their subsequent location, nothing was done towards their development, beyond a small amount of stripping on some of the veins, until the summer of 1889, when the "Maple Leaf Gold Mining Co." commenced operations on the "Wawbeek" (one of the original finds) under the able management of Mr. S. V. Halstead, who commenced operations by sinking at the junction of two veins, with the satisfactory result of the assay value increasing from $2.00 gold at the surface to $15.00 gold at a depth of 12ft., the vein being about 2′ to 4′ in width, the quartz being of a greyish white colour, carrying iron pyrites; when work was suspended owing to water coming into the shaft.

The company having been organized as a development and exploring company, and having carried on an extensive exploration of the surrounding country, whilst mining on the "Wawbeek" were fortunate in discovering the " Black Fox" situated about 2 miles further east, or 175 miles from Port Arthur. The company have sunk two shafts on the main vein, and did some stripping of the vein, the work coming to an end about Christmas of the same year, after which all work was suspended pending an attempted sale of the property, the capital of the company being insufficient for anything beyond preliminary exploration. In the summer of 1892, however, the company was reorganized with a larger capital, under the name of the " Taché Gold Mining Company" and the " Jumbo" and " Dolina" claims, which are adjoining the " Black Fox" have been added to the company's property, thus providing for mining operations an exceedingly strong vein, varying from thirty to one hundred feet in width and averaging at least from forty to fifty feet in length, which extends throughout the " Black Fox" and "Jumbo" locations for a length of over four thousand feet, although it is capped over with soil and trap in places. The gangue of the vein consists of a very fine grained flour quartz. On the surface in some places it is somewhat discoloured from exposure, but its natural colour appears to be almost a pure white. The gold contained in the ore is extremely fine, so much so that but little mineral can be seen with a magnifying glass. The average of six assays taken indiscriminately from the vein amounts to $7.15 of gold and silver, mostly gold —some of these assays showing no silver. The walls of the vein are clear and well defined and the vein runs with the formation, which consists of Huronian blue trap, at an angle a little north of west and south of east. The vein dips 10° to 20° to the north, and shows a strong tendency to widen out as it goes down. There are also two very nice looking veins on the " Dolina," as shown on my plan, that are well worth prospecting with every probability of their turning out valuable.

The property is very advantageously situated, being about six miles east of Taché Station, on the Canadian Pacific Railway, and about half a mile south of the track, from which a spur or side track could easily be constructed to the Minne-ha-ha River, a rapid running stream about seventy feet wide, which flows through the " Dolina," and on which location there is a nice waterfall of over twenty feet that is capable of supplying considerable power for at least half the year.

The enormous quantity of ore in sight, and the ease and cheapness with which it can be literally quarried is so great, that the author considers that it could be crushed and handled very economically on the ground, for which purpose he has recommended the erection of a ten stamp mill of the latest and most approved style of seven hundred and fifty pounds per stamp, with engine and boiler, automatic feeder, breaker, two electric plates, two pulverizers and blankets over sixteen inch sluice to catch the concentrates, and with ample provision for the addition of an extra ten stamps, which could be erected and put up on the ground, say close to the waterfall, for $13,000, and

the additional ten stamps, with accessories, would cost an extra $6,000, erected on the ground when required. Such a plant, which is similar to those used generally throughout the United States, should save from 95 per cent. to 98 per cent. of the mineral contained in the ore, and as such ought to commend itself in preference to the many new-fangled experiments which are constantly being offered to the public.

The author has also proposed the sinking of a shaft in pit No. 2 to a depth of fifty or sixty feet to meet a drift run in simultaneously from the foot of the hill along the course of the vein, which should be done within a length of two hundred to two hundred and fifty feet, which procedure would open up a large body of ore sufficient to meet all the mining requirements for several years to come, besides affording ample drainage for the mine, after which the author considers that the ore could be mined at a cost not exceeding 25 cents per ton, and taken on a tramway with a down grade to the mill at the falls, where it could be treated for fifty cents a ton, thus costing 75 cents per ton for milling and treating. On this basis a ten stamp mill working, say, three hundred days per annum and crushing twenty tons a day, would crush annually six thousand tons, worth, say, seven dollars per ton, would yield $42,000 less, say, $5,000, as cost of mining and milling equals $37,000, and with an additional ten stamps, this yield would be doubled. Of course this is contingent on the assumption that the ore does not increase in richness as it goes down (a very improbable event). Also to this estimate would have to be added the cost of superintendence and contingencies, which would be the same in any event, together with the interest on capital; but from this it can be easily seen that the annual yield, even under the most adverse circumstances, would be so large as not only to cover the contingent expenses, but to leave very handsome dividends.

In addition to the development work by the "Taché Gold Mining Co.," a very important discovery, called the "Mastodon," has been made about four miles west of Taché Station and about two miles south of the railway, which the author surveyed for Mr. Arthur, of Detroit, and Mr. Halstead. The property consists of two wide veins about three-quarters of a mile apart, varying from about 50ft. to 130ft. in width. Development work is being vigorously carried on under the supervision of Mr. Halstead, with the object of placing the property on the English market during the coming summer. The formation here differs entirely from the properties of the "Taché Gold Mining Co." and all previous discoveries in that locality, where the veins run through the Huronian Blue Trap and Slates, whilst at the "Mastodon" the veins are entirely in the Huronian Talco Schist formation. The veins are composed chiefly of white quartz with streaks of mineral containing a large percentage of copper, banded with vertical seams of Talco Schist, which latter decreases considerably as the shaft goes down, giving place to the quartz.

After some surface blasting, with the view of discovering the most favourable spot for sinking a shaft, a place was selected where the vein is about 90 feet in width, at a point a little north of the centre of the

lode or vein, where a shaft has been sunk 7'x5', work being commenced on the 1st November last. The shaft is at present 40 feet deep, the vein showing so far no appreciable dip, the course of the vein being about 10° north of east. The streaks or seams of quartz average about five inches apart going in and out in a wavy manner, but keeping a straight course down, becoming thicker as depth is attained. The mineral has thus far seemed equally divided between the quartz and Talco Schist, though the iron pyrites are chiefly contained in the latter. There are also two seams carrying sulphide and copper pyrites containing gold, and are about four inches wide, narrowing and widening in places from two to ten inches, which also keep a straight course down, but twisting in and out; the two streaks being about four to five feet apart. At 35 feet down silver began to suddenly increase, taking the form of small nuggets, a very remarkable feature in a gold mine. At 38 feet down a third, though very narrow, similar streak of sulphide and copper pyrites has begun about the centre of the shaft and is increasing in width with depth.

At a depth of 40ft. the vein has been cross cut on each side of the shaft to ascertain the true width of the vein, which has thus been proved to be 28 feet wide, although from surface indications it appears probable that there may be one or more parallel veins in the lode; but be this as it may, the present ascertained width, is ample for very extensive mining operations. The main streak which occurs in the centre of the vein is 12ft. wide, and is composed principally of quartz; between that and the side walls are streaks 8ft. wide on either side. These side streaks are both highly mineralized, and are composed of mica schist full of numerous quartz stringers. The work of sinking is being carried on as fast as possible, the quartz constantly increasing in width, and the mica schist decreasing as the work goes down on the vein. The average assays at the surface were $3.00 per ton, ($2.00 gold and $1.00 silver); at 12 feet the average assay was gold $6.00, copper $8.00, total $14.00, the gold being evenly distributed, and the copper being confined to the seams, carrying sulphide and copper pyrites already described. At 30 feet, gave gold (average) $44.50, copper (from the streak) $48.87, silver 83c., and platinum a trace, total value $94.20 per ton; an increase from the surface of $91.20, and of $80.20 from the depth of 12 feet.

The general features of the country surrounding Taché would seem to indicate, that it has been subjected to great denudation during the glacial period, the country being exceedingly flat for a mineral district, and what few rocks are to be seen, are mostly low and surrounded with swamps or muskegs. Consequently it is very difficult to discover and follow up the different mineral veins in that country, and hence it is not surprising, that only a very few really good veins have so far been discovered. Generally speaking, the best veins appear to lie to the south of the railway; those found to the north of the railway being mostly north and south veins, whilst those south of the railway, are chiefly east and west veins, and generally of a greater width. There is also in the neighbourhood of Taché a very decided change of formation. From east of the "Black Fox" to

about 3 miles east of Taché Station, the formation consists of Huronian Blue Trap and Slates, where a narrow belt, running about north and south, and varying from one to two miles in width, of Laurentian Gneiss, that almost approaches to granite in appearance, comes in. This formation is followed again by the Huronian Blue Trap and Slate, which extends westward to the north of the railway, and also to about two miles south of it, where the Huronian Talco Schists comes in. It will thus be seen that the country surrounding Taché is peculiarly interesting from a geological and mining standpoint, and presents a rich field for both the miner and geologist, and one which will amply repay the careful examiner, for his labor and trouble in exploring this interesting country.

In conclusion, the author wishes to say that in the foregoing pages, he has attempted to present a short account of the mineral resources of a comparatively limited and unknown district. His remarks on the extreme difficulty in giving publicity, to the mineral resources of Taché applies with equal force to many other comparatively unknown and unvisited mineral belts, which cross and recross at intervals in near proximity to our great Canadian highway, the Canadian Pacific Railway, many of which would richly reward the patient miner, and the aristocratic geologist, in their search for mineral wealth, and geological formations ; and would also tend largely to produce the early development of our vast mineral wealth, and add greatly to the prosperity of our beloved country.

DISCUSSION.

Mr. McAree—I have never been so far west as Tache, except passing through on the C. P. R. One thing I thought was very encouraging, was the width of the veins. When you get a vein as wide as those that Mr. Sewell has described, carrying $6 or $7 a ton, it is a very rich yield.

The President—The question struck me whether it was not too wide for a well defined vein. Then again he spoke of it running with the formation ; is that a good indication ?

Mr. Sewell—Yes, I consider that is one of the best indications.

The President—I thought a fissure vein crossed the formation.

Mr. Sewell—Some of them do, but not necessarily.

Mr. McAree—I would ask if these widths that he gave include any country rock ?

Mr. Sewell—There is sometimes a little in them.

The President—I don't know whether any gentleman here knows anything about this wonderful Ophir mine—that is a mine near Thessalon. I heard wonderful reports about it the other day. I heard that there was a pyramid being sent to the Mineral Exhibit at Chicago that would astonish the world.

Mr. McAree—I would like to ask about the dip of the vein ?

Mr. Sewell—About 10° to 20° from the vertical.

Mr. McAree—Are the wall rocks the same on either side?

Mr. Sewell—Yes.

Mr. Whitson—Is there not some difficulty in getting practical mining men to interest themselves in veins that would yield as low as $6 or $7 a ton? In my experience mining men care very little about going into a vein unless it averages $20 a ton. Take a vein 2 feet wide, it is quite a common thing to get quartz yielding $15 or $20, and mining men won't look at it at all.

Mr. Sewell—I don't think there is any difficulty where you get enough of it. If you have 30 or 40 feet it makes a great deal of difference; you can get it out easy and there is less expense in excavation.

Mr. Ledyard—Perhaps you might like to hear about some very low grade ores that have paid high dividends. I can give you a few that are working on a very large scale. The Homestake mine in the Black Hills yields $3.79 in gold, and after reducing, it leaves a profit of $1.19 per ton. It is only made to pay in that way by being worked very largely. Nearly a quarter of a million tons are treated per annum. Similar results in a small way have not proved satisfactory. Then there is another with a still lower yield, the Treadwell gold mine in Alaska. The second annual report for the year ending May 31st, 1892, shows a profit of $361,000 earned during the year. 239,633 tons were mined, yielding $707,000,—an average of $2.95 per ton only. The total mining cost was 64 cents per ton; wages of drillers and labourers were high, and blacksmiths were $4 and $5 a day, but notwithstanding this the total milling cost was 38 cents per ton; the total operating and reduction cost was $1.50 per ton. Haile gold mine, Lancaster Co., South Carolina, yields only about $4,50 a ton. They are working now, I believe, about 120 tons a day. They were working 80 tons a day and made it pay very handsomely. I think the Alaska Treadwell mine has gone down to a steady width of 45 feet.

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

TIMBER SURVEYS AND EXPLORATIONS.

By J. F. WHITSON,

O. L. S., Crown Lands Department, Toronto.

In this paper I desire merely to say something that may be of some practical benefit to the younger members of this Association who have not had any experience in this kind of work. As early as 1830 the survey and licensing of timber berths was begun by the Government on the Lower Ottawa. The system as then introduced was to lay out the timber in large blocks, occasionally very irregular in shape, having a frontage on the Ottawa River of various lengths, and running back a distance of from five to ten miles, the rear boundary being parallel to the general course of the water front, or midway between two streams. This system was continued up the Ottawa River as far as Lake Temiscamingue and westward to Lake Nipissing, and extending inland on either side of most of the larger tributaries; in fact, covered the greater portion of the Ottawa valley. In 1857, base lines were commenced north of Lake Nipissing and extended westward through Algoma. These lines formed the basis of a new system of township surveys, six miles square, which were sold as timber berths; the same surveys serving for both township and limit outlines. Large townships in the Huron and Ottawa districts that were sub-divided before the timber was disposed of, were divided into several blocks and sold as limits, the lot lines forming the boundaries of the different limits.

The old system of laying out timber along the different streams was an excellent one, but the block system, especially when large, has in many instances proved unsatisfactory to the lumbermen. Though it is not my intention here to suggest any improvement relative to the different systems, yet the assumption is that it might be more profitable to the Timber Department, and more satisfactory to those who purchase limits, owing to the rapid increase in the value of pine and other timber, if the unsurveyed sections of Northern Ontario, before being laid out in limits, were thoroughly explored by good practical lumbermen or surveyors, who have a practical knowledge of timber, and sketches furnished shewing the position of the lakes, streams, watersheds and all valuable timber, and the position of the most suitable boundaries of the different limits projected thereon; so as not to include, where practicable, on limit "No. A" for example, timber tributary to streams flowing through an adjoining limit and in an opposite direction from those flowing through the former. This

was the system adopted in the survey of limits in the District of Rainy River. A thorough exploration of the country was made in advance of the survey by thoroughly practical lumbermen, who examined carefully the position of the pine, lakes, rivers and water-divides, and furnished the surveyor from time to time, as the work proceeded, with sketches of the different sections explored, showing the position of all lakes, rivers, blocks of timber, etc., with the proposed outlines of the different limits projected thereon, leaving prominent marks along the streams or lakes where they should begin and end. Occasionally there is considerable trouble in locating the rear boundaries along the height of land, but by running trial lines this difficulty will be overcome, and in the end it will be found time profitably spent.

Each explorer should be accompanied by a good bush-man, who travels with him continually, besides other assistants necessary to keep his camp outfit and supplies near the work. One of those assistants should be able to cook. The camp outfit should be light yet comfortable. He should be provided with a large pocket compass, a field glass, a pair of climbers and a pedometer for estimating distances travelled. After exploring a section he should forward by his assistant his sketches, shewing all information that might be of assistance to the surveyor, who would retain the explorer's assistant as a guide while surveying that section, and return to the explorer one of his most intelligent axemen in exchange.

If estimators accompany the survey party they should each be accompanied by a good man, besides other necesary assistants to keep their camp outfit and supplies as near their work as possible. They should be each furnished with a tracing of the limit to be estimated, shewing, wherever possible, the area of the different parcels covered with pine, and where the limit is large and not divided by lakes or streams, cheap division lines should be run, dividing the limit into blocks of a reasonable size to suit the estimators, and the area placed on each block. Where the timber is unevenly distributed, the smaller those divisions the more accurate can the estimate be made, as the customary way of estimating is to first carefully travel each block of timber and then select an average acre, or part of an acre, in different parts of the block, estimate those carefully by counting the trees and estimating approximately the quantity in each tree, and by this means strike an average per acre of the whole block. From this it will be seen how important it is to have the areas placed on each block, as many an estimate has been incorrectly made, owing to the lack of information which should be supplied from the surveys. The writer is of the opinion that most men not accustomed to surveying, and even practical lumbermen, are apt to overestimate the area of small scattering groves of timber. All the information that can be procured from the survey, as well as from the exploration, should be furnished the estimators. If they accompany the surveyor much valuable assistance can be rendered them.

The plans of the survey are generally made on a scale of forty chains to the inch. All lakes and large streams within the limit should be traversed and shown on the plan. The astronomical course

and length of all boundaries, a description of all posts planted and how marked, the outlines and description of the different blocks of timber ; in fact, all information that might be of value to either the seller or buyer should be shown on the plans. On floatable streams be careful to note rapids, falls, or other obstructions.

It is of the first importance before starting on any survey to secure a good party, as on their exertions and to their intelligence depend a great deal the rapidity of your movements and the success of the expedition. The instruments I found most satisfactory and convenient for such work were : the solar compass ; Foster's improved micrometer, with base rod fifteen to twenty links long, with white porcelain discs for summer use and stained glass for winter ; a heavy steel tape ; a light compass, with four inch needle ; a link chain ; a folding drawing-table, and other necessary drawing material and instruments (do not take liquid ink for winter use.) The party should consist of the surveyor, a good assistant, who, besides being a chain man, should be able to take charge of the survey when required, a good cook with experience on similar expeditions, five or more good axemen, the more depending upon the number required in forwarding supplies.

If the survey is to be carried on in the summer season all of the party should be canoe men, if in the winter they should be able to snowshoe, pull a toboggan or drive a dog team. As the necessary camp outfit and supplies for a timber survey carried on in the summer is similar to that required in subdividing a township, and was very fully described by Mr. Burke in a paper read before this Association last year, I will therefore confine my remarks chiefly to the requirements of a winter outfit for a party of eight, the survey being remote from civilization in the northern districts of Ontario. Secure three square tents made of eight oz. duck or xxx, two of them 8′x10′, the other 10′x12′, with a two-foot wall ; three stoves made of light Russian iron 20″x12″x11″, with five feet of pipe for each stove, made so that one length can be slid inside another and all packed inside the stove. The pipes should be about three inches in diameter and each set supplied with a damper. Folding stoves, though more convenient to portage, do not give as good satisfaction. Two heavy double blankets for each man, and if possible each couple of men should secure a rabbit skin blanket, as there is more comfort in one of them than in two woollen ones of double the weight, and without your men are made comfortable you will have no end of trouble through sickness, or men deserting you. A folding reflector and two light sheet-iron bake kettles, beside the other usual cooking utensils.

If the survey extends over a large tract of country, where much moving about is required, procure two good dog trains (six dogs in all) and two large toboggans, eight feet long by fourteen inches wide, made of well-seasoned white oak or beech, made in two pieces of equal width, for if made of one board they become high in the centre and are apt to slide off the trail. Smaller toboggans, six feet in length, should be supplied to each couple of men, except the cook, whose work when moving camp begins when the others end. Three good dogs will draw from 300 to 450 pounds fifteen to thirty-five miles per

day, depending upon the condition of the trail. They are fed once a day, after their day's work is done, and will consume on an average per day a little over one pound of corn meal and a-third of a pound of tallow per dog; if fed on fish three pounds per day, but will not work so well on the latter as on the former. The dogs should be all chained up at night, as no matter how well they are fed they like a dessert of snowshoes, or poke their nose into the cook's affairs. On one occasion, while camped at Pine Portage on the Dawson route, the Hudson Bay Company's dogs unearthed the bean kettle from the hot ashes and were in the act of pawing off the cover when the cook arrived with his shovel. Each member of the party should provide himself with a pair of good snowshoes and sufficient showshoe filling for repairs during the expedition, three pairs of moose or caribou moccasins and a pair of seal moccasins for use during the soft weather in the spring, a pair of smoked glasses and some sulphate of zinc to prevent snow blindness during the latter part of February and March.

As to provisions, men will consume about one-tenth more in winter than in summer. It would be well to calculate on 1¼ pounds of flour, 1¼ pounds of bacon, and one-half pound of beans, besides the usual allowance of tea, sugar, evaporated apples, etc., for each man per day.

DISCUSSION.

Mr. Dickson—I have been a great deal out in the winter season, and I have never had any experience with stoves at all. Mr. Whitson says that each man requires two pairs of blankets; but I was out all last December and up to the 22nd of January, and I had no stove in my camp. I had a rabbit-skin blanket for myself and one pair of blankets under, and the other two men had three pairs between them, and I found that quite sufficient. Of course there is a great difference in men. If they have stoves in their tent, I suppose they would do with a good deal less. But I have no doubt Mr. Whitson speaks from practical experience. With regard to provisions, I find it very difficult to say what quantity of provisions to take. I sometimes take two or three men out and find myself run short, and then take two or three different men and the same quantity of provisions and have three or four days' rations left. With regard to getting good men, I cordially agree with him that the very best man is the cheapest; and above all you want a first-class cook, no matter what he costs. The provisions must be well cooked, and the utensils must be taken care of. I have had cooks that within a fortnight ruined a set of utensils altogether that would do other cooks six months, or perhaps two years. With regard to tents, I find that common double-twilled cotton is just as good as any heavy duck you can get, and much easier carried round.

The President—There is one point there that is worthy of attention, that is regarding the division of the limits so as to correspond with the water sheds. It is very important, indeed, that these limits when they are sold should be on the same water shed as much as possible.

The President—With regard to what Mr. Dickson says about stoves, my experience is that for the sake of fuel alone it pays to take a stove.

Mr. Dickson—I think if ever I am out over winter again I shall try and get a stove just for that very reason. I have never suffered from cold, but I am satisfied it would save a very large amount of labour to have stoves.

The President—Some years ago I made a trip from Rainy River to Prince Arthur's Landing, and I had stoves. We started through in the fall, and it took us until January to get to the Lake of the Woods. We met another party who had not stoves; they had a big log-heap and a big fire on, but they were nearly frozen that night. The man in charge told me he would not have stoves, and advised me to throw them away, but the man who was with me said he would turn back if I threw them away.

Mr. Morris—I have used them and found them very useful. They are made so as to fold up, and put together with pins along the side, and I think they weigh about six or eight pounds. The pipes fold together, and the whole thing takes up very little room.

Mr. Sewell—I have always found in my experience it is far better to have shed tents and a log-heap. I have tried the stoves, tried everything, and I believe in nothing but just simply having a nice sheltered tent made out of light cotton, as light as possible. It is best to put them up in pairs, one facing the other, with your log fire in the centre, something on the principle of the Indian wigwam, and I don't think there is anything so comfortable as that.

Mr. Kirkpatrick—My experience is this, the more comfortable you can make yourself on a winter survey the better work you will do, and the better you feed your men the better work they will do. I thoroughly believe in making yourself comfortable with stoves. I have been out in winter, on the north shore of Lake Superior, with the thermometer 35 degrees below zero, and we were always just as comfortable as anything, and we never had those beautiful inventions of now-a-days, rabbit-skin blankets. But I remember Mr. Pearce, who is one of those who do not care much for comfort, spent a whole winter in Manitoba and never had a fire at all. He had a bag, and he used to get into this bag and shut himself up in it, and lie down in the snow, and he came out of it perfectly well. But my belief is that surveyors have got to be like everybody else, they have to take care of their constitutions, because if they don't they will be miserable rheumatic individuals when they come to be old men. As to the division of timber limits to correspond with water sheds, we have had a good deal of trouble with the surveys in the Upper Ottawa district. Just as the timber gets more valuable, the lumbermen begin to question the validity of a survey, no matter when it was made or how long it has been there; they think if it is not exactly in the centre between two rivers it must be re-run, and they ask for instructions every now and then to re-run those lines, which, of course, were not

run absolutely and accurately to an inch. It is a very difficult thing to run such a line—in fact, it is almost impossible for two surveyors to run the line the same. They go to work and traverse a river, and use their best judgment. Their lines may cross and re-cross each other, it does not amount to very much in the end, but it makes the two lumber firms bad friends. My belief is this, that when these lines are run there ought to be legislation to make them permanent.

The President—Those descriptions went to the water shed.

Mr. Kirkpatrick—Yes; they don't allude to the line that was run at the time they were first commenced. Then the lumbermen get an idea, and I believe the courts have held too, that the descriptions will hold, and not the work on the ground. I am told decisions have been given time and again in Ottawa in these timber surveys in which the license holds against the work on the ground.

Mr. Morris—No; I think the impression now, is that the work on the ground will hold before the license, and I think the lumbermen are beginning to understand that. They are getting over this looking for flaws in the lines.

Mr. Dickson—I think one great difficulty is the lines not being well blazed when they were first run. I know I have followed some of those lines, and it was very difficult, because they had not been properly blazed. I don't think it is possible for any surveyor to be too careful in blazing his lines. Every tree should be well blazed with three blazes on it.

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THE DUTIES OF A LAND SURVEYOR ON THE MAINTENANCE-OF-WAY STAFF OF A RAILROAD.

By W. L. INNES,

O. L. S. London.

It is a somewhat difficult matter to define exactly what the duties of a land surveyor on the Maintenance-of-way Staff of a Railroad—in his official capacity—really are. He will be called upon, of course, to do everything that cannot legally be done by anyone but an authorized land surveyor, such as laying out boundaries of properties. Besides this, he will probably also be required to perform a great many other duties which merge into the engineering.

In this paper the writer will attempt to describe in a very brief and imperfect way what are usually taken to be his duties. His principal duty as an authorized land surveyor on the maintenance-of-way staff of a railroad is to look after the real estate of the railway company.

His first step should be (if indeed it has not already been done) to very carefully compare the right-of-way plans with the deeds, and see that they show correctly the land actually owned by the company, then to go carefully over the ground and see if the fences are in the correct positions.

It will not unfrequently be found (unless those in charge of construction are more careful than usual) that in a large number of cases the fences are not in the correct positions, and generally speaking, that they are not "out" far enough.

Having discovered that a part of the right-of-way fence is not in the correct place, the surveyor should take steps to have it changed to its proper position, if it has not been the undisputed boundary of the right-of-way for more than ten years, in which case, of course, according to the "ten years statute of limitation of action" it forms the unalterable boundary.

Sometimes the railway company will actually hold the deed of a strip of land on one side of the centre line, fifty feet wide, while the fence only includes thirty-three feet. If, as is frequently the case, this fence has formed the undisputed boundary of the right-of-way for more than ten years, the seventeen foot strip not included by the right-of-way fence, is lost to the railway company, and may be credited to those who had the fencing in hand at the time of construction. If, on the other hand, the fence has been the undisputed

boundary for less than ten years, the surveyor should have the fence put in the proper place, so as to include the fifty feet actually owned by the company, as before mentioned.

The question whether or not the loss of the land is greater than the cost of altering the position of the fence should be considered, as it may happen that the value of the land is less than the cost of altering the position of the fence. So that under these circumstances the fence should be left undisturbed and its position shown on the right-of-way plan.

It may seem peculiar that while there are a great number of cases similiar to the above, there are comparatively few in which the right-of-way fence includes more land than that actually owned by the company. When a railroad is first being put through, it is frequently more economical to cross a ravine with a trestle than with an embankment; this is also sometimes done for other reasons. At the end of the life of the trestle, of course it is necessary to either renew it or replace it with some other structure; usually, if circumstances will permit, a culvert of wood, or better, of stone, is made for the water, if there is any, or may be as a cattle-pass or undercrossing, and the trestle filled in. In all probability, if the trestle is at all high, it will become necessary to buy an extra piece of land on one or both sides of the track, in order that the new dump may not cover any land not owned by the railway. The surveyor will be required to make the necessary sketches and descriptions for the deeds of the extra pieces of land to be purchased; and after purchase to stake them out on the ground, so that the right-of-way fences may be put up in their proper positions. Speaking generally, the sketches and descriptions are simple, as the shapes of the pieces of land being transferred are generally rectangular, one side being the existing boundary of right-of-way, another parallel to it, and the other two perpendicular to it; however to eliminate errors, care is necessary.

In cities, towns or villages, the railway company may require a certain part of a building lot for right-of-way purposes, leaving the remainder of the lot of little value to the original owner; the owner will therefore generally under these circumstances require that the whole lot be taken. In the course of time, perhaps a manufacturer, a coal and wood man, or a grain merchant, may wish to locate somewhere convenient to the tracks of a railway company, and he may therefore wish to buy the portion of the lot not actually required for railway purposes. If it is decided to sell this land, the surveyor will be required to prepare the necessary sketches and descriptions for the transfer; or perhaps he may only wish to lease the land for a term of years, or the railway company may decide to only lease and not to sell the land. In this case also, sketches and descriptions are required for the lease similar to those for a deed.

Very often grain merchants and others seek permission to put up buildings on the railway company's property for the better carrying out of their own private business. The granting of such permission generally requires that they execute a lease for the land occupied by the site of the building, and of course a sketch and description is

needed for this. As these buildings are usually placed parallel with the track, a description by metes and bounds is not required as is the case in most of the foregoing examples: a much simpler form of description may be adopted. The following blank form for such cases is very convenient.

Description of Site of....., at.....,
to be leased to.....

In the.....of.....,County of.....
and Province of Ontario, being part of the.....Station grounds of the said Lessors, situate on.....Lot Number.....
in the.....Concession of the said Township of.....
and described as follows:—

A rectangular shaped parcel of land,.....feet.....
inches in length, and.....feet.....inches in breadth,
the.....side being parallel to the centre line of
.....of the Railway of the said
Lessors. The.....boundary thereof is distant.....feet
.....inches,.....at right angles from said
centre line, and the.....boundary thereof, produced, is
distant.....feet.....inches.....
along said centre line from the.....
.....
.....

Said parcel being shown coloured pink on the attached sketch.

Sig.....

Engineer's Office,.....
.....189

As already stated, the principal duty of the surveyor is to look after the real estate of the railway company, and he may have to do this under the head of "extra land for numerous purposes," such as, for instance, ballast pits, road diversions, at bridges, at stations, for sidings, etc.

The right-of-way of branch lines a few miles in length is generally taken up by the company's surveyor, and have to be dealt with as new lines. For full particulars on this important subject, Right-of-way Surveys, you are respectfully referred to three valuable papers read before the Association of Provincial Land Surveyors of Ontario, at its fourth annual meeting held in Toronto, in the year 1889, and now embodied in its proceedings, by Messrs. H. J. Browne, Jno. Davis and H. D. Ellis.

As the sketches of extra land, land to be sold, land to be leased, sites of buildings etc., are continually accumulating, it becomes quite an important matter to have them properly filed, so that they may be

easily and quickly found for future reference and for the purpose of making copies. A system that has proved to work very satisfactorily is to always prepare the sketches on tracing-linen in such a way that clear and distinct blue-prints may be made from them; file the tracings by pinning them to the leaf of a blank circular book of proper size, with the pages numbered, and index this book.

In order to obtain clear blue-prints, fairly heavy opaque lines must be used on the tracings, and for this reason black lines are to be preferred. It may be assumed that if the tracings with all black lines (except dimension lines, and they may be of carmine) are sufficiently clear, the blue prints also will be sufficiently clear.

The tracing should never be allowed outside of the office; send instead a blue-print which is just as good. Keep the tracing as the original, as a photographer does (or should do) a negative. Then, years afterwards it may be, when a copy of the sketch is required, it is only necessary to look up the index, unpin the tracing and make a blue-print to obtain an exact copy of the original sketch, and that too without any comparing, which is necessary when a tracing is made. By this system a great deal of time may be saved and mistakes avoided, as also a great deal of annoyance. It may also be added that this system of filing plan complies exactly with section 70, chapter 152, of the Revised Statutes of Ontario, a part of which reads: "Every land surveyor shall keep exact and regular journals and field notes of all his surveys, and file them in order of time in which the surveys have been performed."

A very convenient method of filing field-notes, is to number the field-note books and also the pages, and index up the notes under the head of the nearest station, using of course sufficient particulars to define what the notes are about.

A good method of filing all plans larger than those already referred to, whether they are rolled up or not, is to attach to the upper left hand corner of each plan, a small ticket with the number of the plan and number or other designating mark of the drawer or pigeon-hole to which it belongs, and by observing always to put the ticket on the same corresponding corners of the plans; in the index to place the number of the plan and number of the drawer or pigeon-hole opposite the corresponding entry, and to place the plans in the drawer in the same relative positions, so that the tickets with the numbers on are always together in the drawers, and in the pigeon-holes always on the outer end, no difficulty will be experienced in quickly finding them again, providing always, of course, that they are properly returned to their proper places.

DISCUSSION.

Mr. Morris—With reference to that description, the custom, specially in the city of Toronto, I understand, has been to give a description not by metes and bounds but with reference to the centre line of the railway without any tie to any concession or road allowance, that is a governing boundary. I have had a good deal to do with

making these descriptions and duplicate plans for railways, and it was with the greatest trouble that I was allowed to expend the time in preparing proper descriptions; and I make it a point to make the description for a right-of-way property similar to a description of any other piece of land, so that it can be defined on the lot just the same as you could take a description from the registry office of any piece of property by metes and bounds. What made me think of that was, that not long ago a lawyer came to me and referred to that point, saying that it was impossible in some cases, in giving a title to a lot through which a railway ran, to define where this right-of-way was, that it might go through a valuable part or not. There was no way unless by going on the ground. So I have always made it a custom to give a more complete description, tying the ends of the centre line to some governing boundary.

Mr. Butler—Our deeds are all printed in that way. We attach a little plan to each deed, and the whole description is, the land shewn on the plan hereto attached coloured red, and those plans are filed in the Department of Railways and Canals. They are filed in the registry office for the county through which the railway runs, and on that plan is shewn the tying of the centre line to all the township and county boundaries.

Mr. Morris—Is the distance given in the description or on the plan?

Mr. Butler—Only on the plan.

Mr. Morris—Suppose the plan becomes detached from the description?

Mr. Butler—I hardly see how it could happen. We glue them all, and it has always worked satisfactorily so far.

Mr. Gibson—Would you make the location of the centre line to be governed by the corner of the lot?

Mr. Morris—Yes, the distance from the intersection of the lot boundary to the road allowance, whatever it might be.

Mr. Bowman—That is more or less quantities?

Mr. Morris—No, measure in most cases, and the survey made so as to make this accurate or nearly accurate. This distance is a check. I include the plans coloured red in the description also. The distances given might vary a foot or a few feet, owing to the concession lines varying in their course a little, which would be the difference.

Mr. Butler—There is one other duty a man has to see to, and that is that the taxes are paid.

Mr. Gibson—I have sometimes come across these descriptions. I remember one case in the county of York where the description referred specifically to the angles of the lots, and the centre line was governed by specific measurements, not plus or minus or anything of the kind, and you can just imagine what kind of a centre line that kind of a railway would have. I think both are necessary; it should refer to the corners of the lots by plus or minus. The possessory title and

the actual line of survey should correspond. I think the centre line should govern positively, but I think reference should be made to the corners of the lots, otherwise you can't locate the property. I know I would always insist upon that.

The President—Suppose you have *both* marked on the map, which is going to govern ?

Mr. Gibson—It is a wrong description, that is all. It should be marked plus or minus, because you cannot possibly shift that centre line.

Mr. Bowman—I have asked Mr. Butler whether he puts plus or minus to the distance of the centre line to the corner of the lot, and he says no. I think that is where the difficulty comes in, by not having a proper description by metes and bounds in his deeds. The plans might easily become detached from the deed, and they are not copied as the deeds, and that is why I think a description should be included with metes and bounds.

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

LOCAL IMPROVEMENTS.

By P. S. GIBSON,

O. L. S., C. E., Willowdale.

THE object of the paper is to refer to certain parts of the law and procedure as to Local Improvements in which we are now particularly interested when called to act as engineers, and which may give rise to a discussion on the system which will be of much more importance to the Association than what I may say.

That the Local Improvement System has, on the whole, been a success may not be questioned, and that it has been abused is beyond question.

While any one may be able to shew serious defects in the system, yet it would be difficult to suggest a system which would accomplish the objects in view much better.

1. The leading principles of the system are, that persons in a particular locality may have improvements made at their own expense, and that the cost of such improvements may be extended over a term of years; and that by the corporation furnishing or raising funds for the same, the rate of interest may be low, and that the payments to be made shall be according to the foot frontage of the real property fronting or abutting upon the road upon which the improvements are made; or in some cases, where properties are *specially* benefitted, but not fronting on the improved road, a proportional part of the cost may be put upon them. While, generally, the rate is according to the foot frontage, in some cases it may be according to the area.

2. Again, in order to relieve parties who have improved localities by a large expenditure of money by themselves, a provision is made that under certain conditions the corporation may pay for the improvements already made and charge the same on the lands benefitted.

3. Again, in some cases the corporation may pay a part of the cost out of the general funds of the municipality, and in others may not.

Again, there may be a general by-law passed, with the assent of the electors, by which all expenditures of certain classes shall be specially assessed upon the property benefitted.

4. The above reference to a few of the features of the system show how general may be its application.

Another point for consideration is, that while for a time the advantages of the system were confined to cities, towns and villages, they

were a few years ago applied to townships. So that the system is well worthy the careful study of every member of our association, whether he be located in a city, town, village or township. In making a study of the system the same difficulties arise as in the case of the Survey Act: the law has been so often amended and consolidated as to make it difficult to get a clear understanding of it, and yet it is of the utmost importance that the engineer shall have a clear and positive knowledge of the same, as it may be said that the success of the whole system depends on the knowledge and management of the engineer, as will appear.

5. Works may be commenced on petition or on initiative. In either case it is of the utmost importance that the council should pass a procedure by-law, setting forth clearly the duties of each official.

6. In this general by-law it should be provided as to the form in which the petition should be drawn up. While the statute does not state as to form of petition, yet if the petition sets forth specifically the lands to be immediately benefitted where the assessment is to be made on the immediate frontage, it facilitates the work on the part of the corporation engineer and other officials, and more particularly so when the cost of the works is to be assessed upon lands fronting on other streets; and in either case it assists very much in the work of the court of revision, as any one signing the petition cannot afterwards claim that he or they were not aware as to how the costs were to be assessed. It also is of the utmost importance to the clerk or assessment commissioner, who may have to certify as to proportion in number or owners who have signed and as to the proportion in value of lands owned by them, and without such a provision it would be impossible for him to say until the engineer should make his report as to the lands benefitted.

The petition should be signed by all the parties who are to be assessed if possible, instead as required by statute by two-thirds, or three-quarters, or a majority; it should also set forth whether the petitioners desire the council to pay a part of the cost of the work, and if the cost is to be extended over other lands than those fronting immediately upon the improved road.

7. Another point should be carefully noted, that the petition should not ask for work to be done as pavements and sidewalks in the same petition asking for bridges, culverts, embankments and such other works as may be and are required to have the cost extended over roads not immediately benefitted; and also not include in such a petition an application to pay back to certain parties the cost or por- on of the cost for work already done.

8. In the said general by-law the procedure should also be clearly stated as to the manner in which the council should act in initiating work, and the council should be careful to confine the initiation of the work to such as they have statutory right to do.

As a rule the initiation of local improvements should be avoided by corporations, as it is likely to give rise to the abuse of the system, and at same time cause litigation and a great deal of trouble to the council and officials.

The general by law should also provide that no petition should be referred to the officials for reports, or action taken by the council till a deposit of such a sum of money as may be considered necessary to cover the costs or expenses connected with reports of officials and advertising, and special meetings of council, where members of the council are paid. This will prevent many wild schemes being brought before the councils, and thus save much valuable time and also money.

It should also provide that such sums of money advanced should be recouped to the parties as soon as the works are proceeded with.

9. The flankage by-law may be included in the general by-law—the object of the flankage by-law being to make a suitable allowance for corner lots, by which say an allowance of 60 feet is usually made off the longer side of a corner lot, and in case of triangular or irregular shaped lots, a frontage of 1 foot is taken for each 100 feet of area. A question may arise in this connection as to what the frontage is of a goring lot, even if not a corner lot, where a street is on different bearings.

10. The general by-law should include the duties of the clerk and assessor or assessment commissioner, by which they determine if the petition be sufficiently signed, as whether two-thirds in number representing one-half the value of the property according to last revised assessment roll for ordinary local improvements have signed; or where lands, besides those immediately benefitted, as lands fronting on adjoining roads are specially benefitted and require three-fourths in number and representing three-fourths in value to sign; or in case of old works to be paid for, whether three-fourths in number representing two-thirds in value have signed; or in case of corporation initiating work and the owners of lands to be assessed, petition against, whether the majority of the owners representing at least one-half in value have signed. It is plain that for a clerk or assessment commissioner to decide as to the signatures as above he must have at hand a complete and exact assessment roll, which in cities and towns and villages, where complete plans of same have been made, or in which plans of sub-divisions have been obtained, it may be all right, but in cases where the plans have not been arranged, or in cases of townships where the assessments are not made according to statute, or any other rule, it is a work of great difficulty unless as heretofore suggested the petition be got up to show the lands to be benefitted. To avoid difficulties of this kind the general by-law should require the petitioners to have a plan attached giving the required information.

11. The most important part of the general by-law refers to the engineer, a part of whose duties may be as follows:—

So soon as the clerk or assessment commissioner gives a certificate that a petition for work has been sufficiently signed the petition is referred to the engineer, who should make a first or preliminary report, recommending or not the work. In preparing this report he

should carefully examine the petition, not only as to whether the work is advisable and necessary, but also as to the difficulties which may arise; as, for instance, damages to properties which, unless settled before the work commence, may amount to as much as all the work; in which case he should report recommending the work, provided parties who may claim damages agree to not claim the same, or are willing to accept a reasonable amount, which is to be charged to the local improvement.

Again, he may find that the petition asks for different kinds of work and that the cost of the whole shall be assessed over frontages besides those upon which the work is done, he should then report that as pavements or sidewalks, for instance, should only be assessed on the immediate frontage, while bridges may be built and also culverts and streets opened up and extended and cost levied on different roads; that the prayer of the petition is that the whole cost be spread over different roads, and where work not done, and in this case likely only the two-thirds in number, representing one-half in value have signed the petition, whereas three-fourths in number, representing three-fourths in value, is required, and then in townships only; that it would be advisable to have the petitioners put in two or more petitions, according to the class of works, and so the assessment may be suitably allocated, and debentures issued to be paid within life of the different works. Again, a petition may be put in for a sidewalk on one side of the road; if in a village or township a sidewalk on the other side may not be required for some time. Difficulties may arise in this case; both sides are benefitted, and if both sides to pay, the rate may be fixed for the side on which the sidewalk is to be laid, and the other side to pay one-half a rate, or in case only one side of the road is to be built on for a time and the other a side slope; in any of these cases it is well to have these difficulties pointed out in first report.

12. Again, a petition may ask for the opening of different roads, running in different directions, and asking to have certain lands assessed for such work; it would be well to ask that separate petitions be made for each road.

Again, a petition may ask for a road to be opened up over 66 feet in width in a township; it would be well to point out that the sanction of the county council will be necessary so the work may not be delayed.

13. Without further reference to difficulties to be attended to for making a first report, many of which will occur to you, let us assume that the first report required by the general by-law has been made by the engineer and approved by the council, he has next his second report which requires him to state in a simple case, (1) What real property will be immediately benefitted; (2) the probable lifetime; (3) the probable cost; (4) the proportion in which assessment is to be made; (5) to report total frontage or area, frontage or area exempt from taxation, and frontages or areas liable to assessment. A report of this kind to the engineer of a city or town where the plans of properties are available, and the assessment rolls are got up correctly, and

where an assessment commissioner is appointed, may not involve a great deal of work, but to a township engineer it is sometimes a formidable undertaking. In the first place, there is no complete plan of the part of the township, and likely few if any of the registered plans are in the corporation vault. Again, the township assessments are made in such a manner as to be practically of no use; so the engineer has to look up the plans and likely make a careful measurement of the whole frontages, from which he will prepare a plan shewing each individual front. The probable lifetime has to be fixed, as the running of the debentures depends upon that. The probable cost sometimes involves considerable work, where the improvements extend over a long road. As to the proportion in which the assessment is to be made, if the cost of the improvements is to be assessed over a wide tract of land, for improvements on one road, and nearly all the land is sub-divided into lots and streets, as in case of opening a new road, building bridges, culverts and embankments. If, on the road the improvements are to be made, one side for part of the way has a block of land not sub-divided, and the assessment is to be made according to foot frontage, the assessment may be made by fixing one rate for a particular frontage of lots, and then, in case of the block fronting on the improved road, put say two rates on that front, as it may have a very considerable depth, two or three times that of the ordinary town lots, and on the fronts of lots running into the improved road put two-thirds of a rate; and on lots fronting on roads running parallel to the improved road put one-third of a rate, and so on; sometimes one-twelfth of a rate, according to location and value of the land. It need hardly be said that in case of the assessment being spread over say 200 acres of land, which may have twenty registered plans, that a complete plan must be made, showing all the plans. From this complete plan all the other statements can be determined, and the plan can be referred to at courts of revision and used by the clerk.

The second report having been passed by the council, as per general by-law, the publication and holding the court of revision follow, after which the contracts are let and work carried on to completion.

DISCUSSION.

Mr. Butler—I would like to ask a question. Taking any town in a county, assuming that a majority of the residents on any street desire a sewer and petition the council asking for its construction under the local improvement plan, can the council be compelled to construct the sewer? I signed a petition myself without knowing all about the details to construct a sewer on the street upon which I live; all the ratepayers on the street signed the petition, and then the town council refused to put it in force or to order the construction of the sewer, declaring that they did not want to provide an outlet.

Mr. Gibson—Your scheme should include an outlet. The council are not bound to go and find an outlet. If you guarantee an outlet it is a different story. The courts will jump on them at once. The board of health is where you want to go to; get them to act.

The President—There was a remark made in relation to fractional parts in making assessments. I have always found it much easier for

calculation to keep fractions out. I remember a few years ago we had a drain running through part of the town. There were a number of lots affected, and the party who went over it first was not a professional, and he made an estimate of the cost and he took about 300 lots and divided them into two or three divisions and assessed them in that way. We did not think that was fair, and I went over it and I made I think ten the highest and one the lowest, graded them in that way, 1 to 10. It kept fractions out, and you can easily calculate at once what they would be.

Mr. Gibson—The trouble I find in that case is this, a man commences at one rate and tapers it down to half a rate and so on down, then he thinks it is all right, but if you put one man 12 times as much as another they won't stand it.

Mr. Ellis—In regard to what Mr. Gibson was saying about damages to property. Very often in the case of paving or grading a street you are bound to go above or below somebody's property, and in most of these cases we have been in the habit of making a tracing shewing the profile of the street as it will be when it is completed, shewing exactly where the toe of each slope will run out to, and the cutting on each property and then going to the petitioners and saying: You must sign this plan and waive all damages, or if not, come to a settlement, or else have a clause in the petition in which it is stated that they will waive all claims for damages.

Mr. Abrey—That is all very well if all sign the petition, but in no case do all sign the petition. Then the difficulty comes in with those who have not signed. In my experience there has been that clause, where any person signing the petition waives all claims for damages usually. Lately we have also drawn a profile as Mr. Ellis suggests; but there are always some that don't sign the petition and they are the difficult ones to handle, and I think the only good practice is to go slow in that. This summer we have been sending agents around in all cases. For instance, a place like the Davenport Road where there are a great many persons interested and buildings have to be torn down, and three-quarters I suppose have signed the petition without any trouble; there are a few of them though that claim damages; some have their lots too long, others have their lots too short. We have been bargaining with these people all the summer and all the winter and we have reduced them down to four or five that have not come to some bargain. Formerly we rushed along too fast. Take Keele Street, it cost about $60,000 for work and $250,000 for damages. We have learnt better than that though, for this summer we have had no damages whatever; and I think by going slow and using a little more discretion, in nearly every case damages could be got rid of.

Mr. Ellis—In regard to the assessment of damages I find that sometimes if you will explain to the petitioners that every payment for damages is going to be assessed against everybody on the street and not paid out of the town or township rate it has a very cooling effect.

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

A PLEA FOR A TOPOGRAPHICAL SURVEY.

By WILLIS CHIPMAN,

O.L.S., C.E., Toronto.

WITHOUT due consideration (in a "moment of weakness," as we Engineers put it) I yielded to the solicitation of our esteemed Secretary and offered to present a paper at this meeting on "Summer Resorts." For reasons which will soon be apparent, the paper to be presented, if under its advertised title, would resemble Josh Billings' lecture on "Milk," which no doubt some members of this Association have listened to. Not wishing to appear as an imitator of this great American "moralist," I will take the liberty of changing the title of my paper to that of "A Plea for a Topographical Survey."

In commencing my investigations *re* our summer resorts, I very naturally began to study the "Map of the Province of Ontario, shewing counties, townships, railways and post offices, 1889," issued by the Department of Crown Lands. In examining this map previously I had discovered several errors, chiefly clerical errors, if they may be so called. In lithographing the draughtsmen who prepare the drawings on the stones may misinterpret the copy sent in, and during the printing some defects may make themselves manifest, from abrasions on stones, faulty manipulations, etc.

I was wholly unprepared, however, for the unpardonable and unexplainable blunders exhibited in this map of our Province that is now being presented to the civilized world, and is to be found hung in the offices of surveyors, lumbermen, capitalists, tourists, and persons who are sufficiently patriotic to be proud of their country.

I will now call your attention to some of the inaccuracies, beginning with that which first arrested my attention when investigating our summer resorts.

The Lake of the Thousand Isles is famed the world o'er for its beauty, and attracts thousands of tourists every year, yet there is no trace of it on our Crown Lands map.

Passing down the St. Lawrence, where are the great rapids, and those river expanses Lake St. Francis and Lake St. Louis?

Travelling up the Ottawa, where are the beautiful Lake of Two Mountains, the Chien Lake, Lac du Chat, Lac Allumette, Lac Calumet, and the Coulonge?

In my native county, if the township of South Crosby were cut out from the map and the names erased, I am convinced that there is not

a resident of the township that would recognize it. The central part of Frontenac is a *terra incognita.*

About twenty-five years before the present map was perpetrated, the greater number of the older counties in the eastern part of the Province were mapped by private enterprise and sold by subscription. Glengarry, Stormont, Dundas, Grenville, Leeds, Frontenac, Addington, Lennox, Lanark, Carleton, Russell and Prescott, in the east, were so mapped, and much credit is due to the publishers for the way in which they performed their work. The basis of all these maps were the plans in the Crown Lands Department, but the straight concession lines and boundary lines of the Crown Lands Department plans were shown as they were actually run. By a house-to-house canvass for subscriptions, information as to depths and widths of township lots, lands in surveyed lines, location of streams, sketches of lakes, etc., etc., was obtained.

Why did not the Crown Lands Department avail itself of these old and comparatively reliable plans in compiling its new plan of the Province? If this had been done there would now be little to make complaint about in the eastern part of Ontario.

In our Canadian North-West Territories, and in a large part of the area between the Rocky Mountains and the Mississippi River in the United States, the aridity of the climate produces many lakes and ponds without outlet, which thus become alkaline. A person settling in this alkaline country, unacquainted with Ontario, would from a glance at our Crown Lands map infer that a great portion of Northern Ontario was an alkaline desert, dotted with innumerable lakes and ponds without outlets, a region unfit for the abode of man.

In Frontenac examine the townships of Miller and Barrie; in Lanark the township of Levant; in Hastings the townships of McClure, Faraday, Limerick, Herschell and Cashel; in Peterborough the townships of Galway, Chandos and Methuen; in Victoria the townships of Carden and Longford; and in Renfrew the townships of Radcliffe, Jones, Wilberforce, McKay, Buchanan.

Are the physical features of these townships as shewn on the original plans of the surveyors who made the survey? If so, re-surveys are needed.

I believe that better plans of these townships could have been compiled by the bush-rangers of the various districts, without reference to the surveyors' plans in the Department.

In the Haliburton District we find in the following townships evidences of errors that would be apparent to an aborigine or a school-boy: Havelock, Eyre, Lawrence, Hindon, Guilford, Harburn, Bruton, Harcourt, Cardiff, Dudley and Anson. One of our ex-presidents has work enough here in his native district to keep him fully employed for the remainder of his natural life.

In the Muskoka and Parry Sound District we come to surveys of recent date, where the surveying instructions are more concise, the compass not used exclusively, yet we find in the following townships errors of the same nature as those referred to in the preceding counties and districts: Hardy, Mills, Gurd, Brown, Wilson, Strong, Lount,

Ferrie, Burton, Hagerman, McKellar, Spence, Chapman, Proudfoot, Christie, McMurrich, Perry, Bethune, Humphrey and Foley. Mowat is all right apparently, also Laurier.

In the Muskoka District glance at the townships of Wood, Morrison, Oakley and Stisted. Are they correctly mapped?

In the south part of the Nipissing District please examine Lyell, Preston, Freswick, Cameron, Osler, Guthrie, Biggar, Butt, Hunter, Sproule, Canisbay, Master, Bishop, Murchison, McLaughlin, last but not least, the two townships named after two renowned (for different reasons) surveyors, Niven and Fitzgerald.

I doubt if there is a township in this southern part of the District that is correctly mapped.

In Figure 1 the township of Biggar, as shown on this Departmental map, is given, and in Figure 2 the principal lakes and water-courses, as given in the returns. This township was surveyed in 1882.

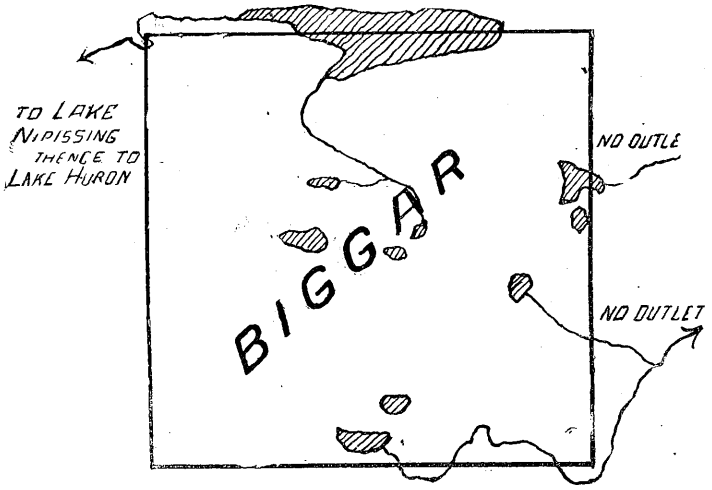
TO LAKE
NIPISSING
THENCE TO
LAKE HURON
BIGGAR
NO OUTLE
NO OUTLET

FIG. 1.

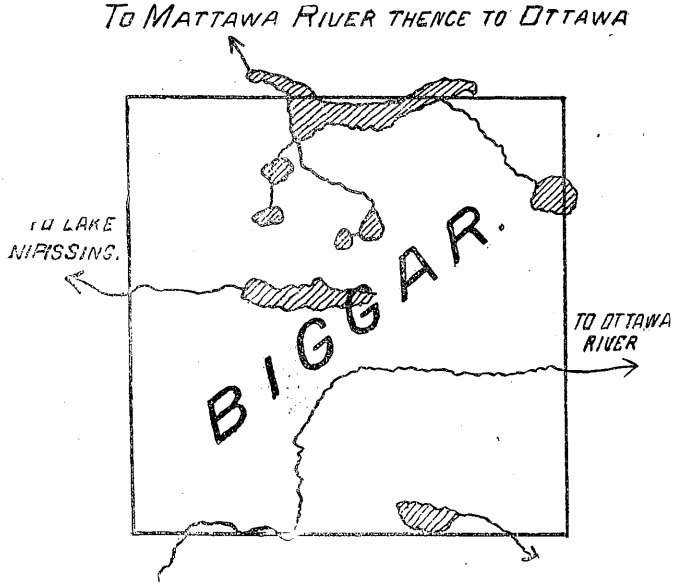
TO MATTAWA RIVER THENCE TO OTTAWA
TO LAKE
NIPISSING.
BIGGAR.
TO OTTAWA
RIVER

FIG. 2.

In the north part of the District, where I have surveyed four townships, the same gross mistakes appear. For example, here are the two townships of French and Muloch, surveyed in 1884 and 1886, several years before the map of the Province was issued. Figure 3 gives the physical features as shown in the Crown Lands map. Figure 4 gives the physical features as they actually are and as returned to the Department.

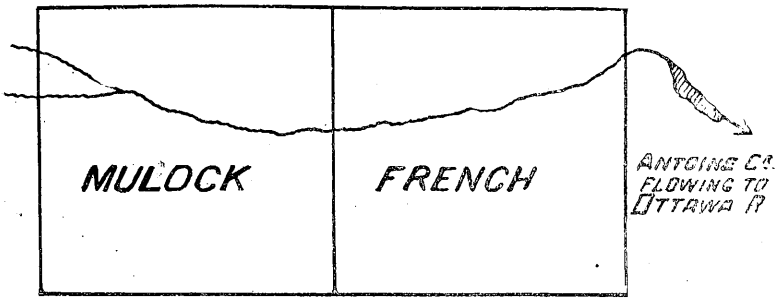

FIG. 3.

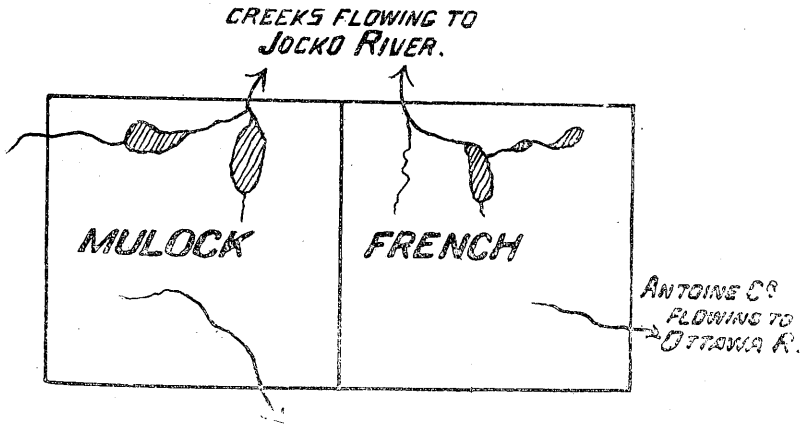

FIG. 4.

Hawley, Broder, Grant, Phelps, Widdifield, Olrig, Kirkpatrick, and many others are blanks. (Kirkpatrick has a railroad.)

In Eastern Algoma the many surveyed townships that are "waterless" is astonishing, while Mack, Plummer, Meredith, Galbraith, Waters, Ermatinger, the land of Goschen, and dozens of others are alkaline deserts.

Through all the northern districts of Ontario are lakes from five to twelve miles in length, nameless.

Even in older Ontario we fail to find the following rivers:—the Petawawa, the Clyde, and the Carp.

In the west and central:—the Eremosa, the Conestoga, the Nottawasaga, and the Saugeen are not named.

Endeavour to trace on the map the watershed between the rivers flowing into the Ottawa and those flowing into Lake Huron, or the watershed of the Madawaska from that of the Bonnechere or the Petawawa.

Is it of no value to our mill-owners and our capitalists to know this? Is not a thousand square miles of watershed of great importance in determining the value of a water power?

I think I have adduced sufficient evidence to convince any member of this Association that the best map we have of our Province, and issued by the Department, is grossly incorrect, and is misleading to the settler, the prospector, and the investor.

I would not dwell at such length upon this matter, nor would I specify particular townships that are in error, if I did not feel that some portion of the disgrace attending this matter falls upon this Association, many members of which have furnished the Government with correct plans of the surveys made by them, and the public should know that the surveyors of this Province are not responsible for the grosser errors the map contains.

Since 1887 the Dominion Association has been urging upon the Federal Government the importance and necessity of a triangulation survey of Canada, but so far their efforts have not been crowned with success. During these five years our Association has done nothing, leaving this matter entirely in the hands of our Ottawa brethren.

I now propose that this Association devote a portion of its energy in educating our legislators and the public in this important matter, without infringing on the rights and duties of the Dominion Association.

The determining of the latitude and longitude of several principal points in the Province, and the primary triangulations, I would place in the hands of the Dominion Topographical Surveyors who are members of the Provincial Association. The hydrographic work might also be placed in the hands of the Dominion Government.

The secondary triangulations and all topographical work should be done by the Provincial Government, the degree of minuteness depending in general upon the density of population.

We must have a topographical survey made of our Province—the sooner the better—and I believe that this incorporated Association is the proper body to take the initiatory steps. Our Legislature will not proceed with the work until it is demonstrated fully that it will pay to have this work done, and it lies with us to compile facts and figures to show the cost, the method in which work is to be done, and its utility when completed.

I am of opinion that our Standing Committee on Engineering should be abolished and that we appoint in its place a Standing Committee on a Topographical Survey.

DISCUSSION.

Mr. Dickson—I have been struck myself with the number of akes in that plan that are not as accurate as they might have been. The route of streams is not shown. I have always maintained, and I think I mentioned it once before this Association, that all the water should be shewn connectively as it runs through the townships. A great many of our surveyors don't do that; they simply shew a body of water without any outlet. It is not at all difficult for them even to trace creeks with dotted lines.

The President—I think that perhaps Mr. Chipman is not finding so much fault with the plans in the Crown Lands' Office, as with the compiled plan here. Is that not so, Mr. Chipman?

Mr. Chipman—Yes.

The President—Well, when we look at the size of this plan it would be impossible to put all the topography in correctly.

Mr. Kirkpatrick—With a great deal of what Mr. Chipman says I cordially agree, but as I had a good deal to do with the construction of that map I may say that the fault lies with the surveyors themselves. The inception of that map took several months, and I was so particular that every county should be accurate that we sent pieces of each county to every surveyor in that county asking him to put on everything topographically that he knew of, every post office and everything; we sent to each post office inspector of the province copies of the map, asking that all the post offices and all information of any value should be given; and we sent to every railway company copies of the map, asking that all the railways should be put on. In the Ottawa and Huron districts there are thousands of lakes which could not be shown on that map. All the maps on which alone we could act in the eastern territory were the original maps in the Department of Crown Lands, and on these there are no outlets shewn. Lakes are unnamed, and the lakes that are on the map I am perfectly well aware, just as well as Mr. Chipman, that they form no resemblance to the lakes on the ground. That is no fault of the Department; it simply shews the necessity of a topographical survey. Unfortunately, we have only been able to act on the information that we have. With regard now to copying county maps, that might be very well as a private speculation, but it would be utterly impossible for the Department to take county maps over which they have no control and lay down information from these county maps, because we are not aware how much labour has been expended and we have not the local knowledge of how much these county maps show accurate surveys, or are drawn on the imagination of the canvasser who went through the county. In the Huron and Ottawa Territory a great deal of what Mr. Chipman has mentioned is perfectly true, that the lakes are unnamed; but we have not got a microscopic press, and if we named every lake in the Parry Sound district there would be nothing but a succession of names. It is utterly impossible. I am aware that those lakes spoken of are the head waters of the Madawaska, but I cannot undertake to make the

maps shew what the maps in the Crown Lands Department do not shew. Mr. Dickson has brought it to our attention before this, and we have put it expressly in the instructions, "You will please shew courses of the streams with the inlets and outlets of all lakes." But the point I want to make is this, that to every surveyor that we knew of—and most of them that are here will bear me out in remembering it—copies of these were sent, because I sent them myself, with the request that they would put on all the information they could so as to make the map perfect. Of course it will bear criticism, but I have also been told over and over again that it is the best map that has ever been published in Ontario, with all its faults. But we hope to make it better with every edition.

Mr. Chipman—While it is perfectly true that in the older parts of the province this is probably the best map that has ever been published, I can see no reason why in the northern portions the map does not shew the water sheds of the chief rivers as the surveyors reported them to the Crown Lands Department, as shewn on the original surveys of these townships. In three townships that I surveyed the physical features were correctly noted, and so returned to the Government, but they are shewn quite differently on that plan; and these surveys were made several years before the map was published —one seven, and the others four or five years. I can see no reason for that. I don't complain about the small lakes not being shewn, you cannot expect that, but there are lakes shewn 8, 10 and 12 miles long that have no name at all. I think it would be much better if we named the larger ones and omitted the small ones altogether. Then there is no reason for not shewing which river is the Madawaska and which is the Bonnechere. It is known by every bush-ranger up there which is which, and which lake is which. I went over the County of Renfrew with Mr. Morris yesterday or the day before, and we found it was full of inaccuracies. There are large lakes in there that have been known for years, all about them, which way the outlet is and everything, but they are not so shewn on the plan.

Mr. Niven—As far as names of lakes are concerned, I think sometime ago a paper was read before the Dominion Land Surveyors' Association suggesting that the lakes of our country should be named after some system; it was very confusing putting down the names of lakes as they were named by surveyors. You will find a dozen Loon lakes and a dozen Bear lakes, and Crow lakes innumerable, and all sorts of names I have in many instances refrained from putting a name of a lake on my plan at all. I think, unless the proper name is known, it is better to let the name go. The Indian name should be retained when practicable.

Mr. Chipman—In tracing water sheds for ascertaining and determining the volume of water in our great rivers I found it impossible to determine which was one river and which was another.

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

SHALL IT BE A TILE DRAIN?

By HERBERT J. BOWMAN,

A. M. Can. Soc. C. E., Berlin.

THIS question arises in connection with the drainage of a number of farms at the headwaters of Cedar Creek, in the Township of North Dumfries, in the County of Waterloo.

In a cedar swamp, just south of the road allowance between concessions 11 and 12, is the actual and never failing source of the creek, but the lands to be drained are situated above this, where there is in reality no creek at all, but simply a run of water in the spring and after very heavy rains. This flood-water is carried off in a shallow ditch joining a series of marshes, as shewn on the accompanying sketch; but as the fall is very slight, less than 1 in 1,000, the low ground along this watercourse dries out very slowly, and chiefly by evaporation, which by its chilling effect renders the ground too cold to grow any crops successfully. This low ground extends all along the watercourse, widening out at the marshes, and is estimated at about 200 acres requiring underdraining. All the land is cleared along the watercourse.

There is no doubt but that a large open drain could be dug to carry off the flood-water in the spring, and at the same time afford the necessary outlet for the lateral tile drains required through the low ground. Objection is, however, made to this plan on account of the trouble and expense in keeping the ditch open, especially through the several marshes, where the ground is soft and peaty, and where cattle will be pastured. Another objection advanced against the open ditch is, that it adds greatly to the labor of working a farm, more particularly where it runs diagonally across the fields; also, if the ditch is deep and has proper side slopes the land taken up by it is considerable.

Hence a number of the owners of these farms are desirous of having a covered drain, if one of sufficient capacity can be constructed at a reasonable cost. In fact they have been figuring on a drain to be made of 10-inch ordinary agricultural tile, and have put the cost at about $2,000 for the 18,000 feet required.

Before going into the question of the required capacity of the tile drain, it will be necessary to know the amount of the rainfall in this district, which may be obtained from the following table kindly furnished by the Director of the Meteorological Service:—

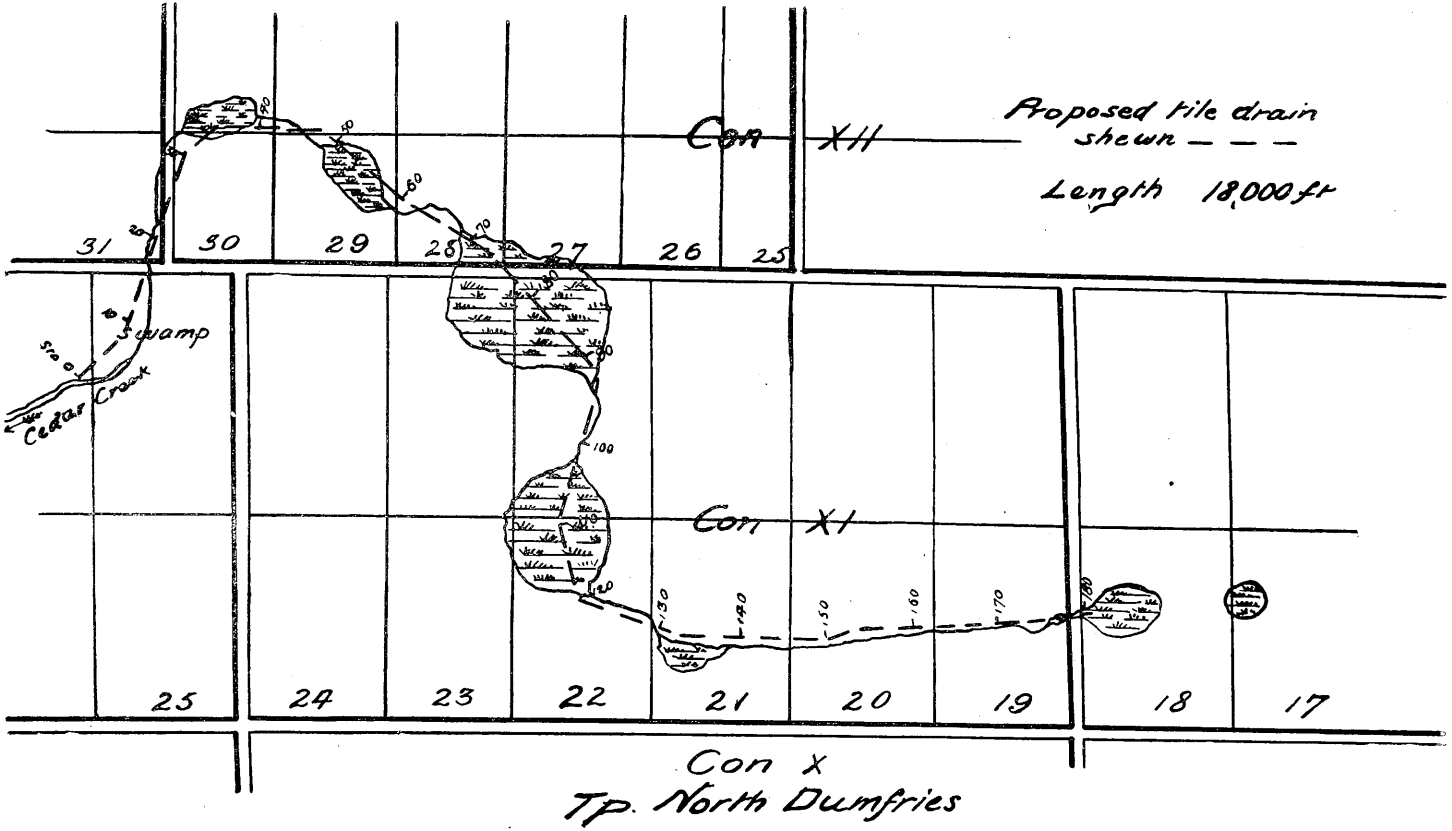
Proposed tile drain shewn - - -
Length 18,000 ft
Con XII
Con XI
Con X
Swamp
Cedar Creek
31
30
29
28
27
26
25
25
24
23
22
21
20
19
18
17
Tp. North Dumfries

TABLE GIVING AVERAGE TOTAL PRECIPITATION (rain & melted snow).

STATION.	YEAR.	JAN.	FEB.	MAR.	APR	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
Guelph	1881-92	2.32	1.78	1.67	1.45	2.07	2.73	2.12	2.51	2.07	2.11	2.37	2.42
Galt	1878-90	2.25	2.66	2.20	2.29	2.34	3.13	2.88	2.48	3.12	2.52	3.42	3.00
Fergus	1883-90	4.09	3.65	3.00	2.70	3.20	3.83	2.58	2.34	2.48	2.93	3.58	3.96
Conestogo....	1880 90	3.35	3.10	2.61	2.11	2.95	3.94	1.96	3.14	2.26	2.94	3.39	3.22
Stratford.....	1860-87	3.36	2.94	3.21	2.45	2.89	3.35	3.19	3.36	3.16	3.56	3.63	3.87

10 inches of snow is taken as equivalent to 1 in. of water.

Meteorological Office. CHARLES CARPMAEL,
Toronto, 2nd Feb., 1893. *Director.*

In this part of Ontario, during the months of December, January, February and March, the ground is frozen and does not absorb the precipitation, which is mostly in the form of snow. Part of this is evaporated, as it is a well-known fact that a block of ice will diminish in size even in the coldest weather, but by far the greater part is carried off over the surface of the frozen ground by the spring freshet. Hence the rainfall of only the remaining eight months of the year will be carried off by a tile drain, and perhaps not even all of that, for in the heaviest storms some of the water will flow over the surface and be carried off by the present shallow drain. From the table it will be seen that at Galt, less than five miles from the drain, it was found by systematic gauging for 13 years, that the rainfall averages 22.18 inches in depth for the eight months, April to November, both inclusive. This depth will be found to be almost exactly equal to the average of all the other stations given in the table, these stations being all within a distance of thirty miles of the drain.

Now 1.00 in. of rain on 1 acre of land yields 22,622 gals. Imp. of water.
" 22.18 " " " " " " 501.755 " " "
" 22.18 " " 200 acres " 100,351,000 " " "

which may be taken as the amount of water to be discharged by the main drain in a year.

There is no doubt, however, that in very heavy rains, some additional water will reach the area requiring drainage from the surface flow off the adjoining high lands, but the greater part of this will be carried off, as before mentioned, by the present shallow drain. Provision should be made to retain the rainwater on the high land, so that it may be absorbed, or it will carry off the finer or more soluble parts of the land over which it passes. This may be done by running the furrows, in plowing, horizontally along the hills; and in grass lands, by having frequent, small, horizontal ditches, for the same purpose, for, "in descending through the soil, this water, in summer, gives up heat which it received from the air and from the heated surface of the ground, and thus raises the temperature of the lower soil. The fertilizing matters which it has received from the air—carbonic acid, ammonia, and nitric acid—are extracted from it, and held for the use of growing plants."

Again, some additional water will reach the area requiring drainage, from below the surface; that is, from springs, being in reality rainwater which has already given up all its fertilizing matters to other soils more or less distant. Its effect is chilling and hurtful, and it should be kept down from the surface and removed as rapidly as possible.

On the other hand, the quantity of water to be removed by the tile drain is lessened by the amount taken up by the growth of the crops raised on the land, but of this there does not seem to be any available data. Evaporation also lessens the amount to be removed. It has been found from experiments made in England that the average evaporation of water from wet soils is equal to a depth of two inches per month, from May to August; and in this country it must be even greater—in the summer months, in all probability, being nearly equal to the rain-fall, besides removing the dew which is no inconsiderable item. However, in well-drained land the amount of water evaporated is reduced to a minimum, and will not be sufficient to so lower the temperature of the soil as to retard the growth of the crops; but at the same time a large portion of the rainfall must be removed in this way.

From the foregoing it will be seen, that although there are additions to the actual rainfall on any area of ground, which vary according to the surroundings, at the same time there are forces always present tending to lessen the amount of water to be removed by the tile drains. It must also be borne in mind that the main drain will not remove the total rainfall in the summer months unless the whole area is thoroughly drained by a system of lateral drains. Where the depth of these drains is four feet, the distance apart may be forty feet, and on this basis each acre would require 1,100 lineal feet of lateral drains, and 200 acres, the area in question, would require 220,000 feet, or upwards of forty miles of drains. It is very doubful, however, if even half of this work will be done within the next score of years, so that ample capacity will be obtained if the main drain is designed to carry off in the 365 days of the year, the water resulting from the rains in the months of April to November, both inclusive.

Therefore, the question becomes one in hydraulics, and is: Will a 10-inch common tile, which is about the largest size made, carry off 100,351,000 gallons of water in a year, the available fall being only 1 in 1,000.

From Chezy's general formula we know that where

A = area of cross section of conduit in feet,
C = co-efficient determined by experiment,
R = hydraulic mean depth in feet,
S = fall in any distance divided by that distance, being the sine of the slope.

Then the discharge in cub. ft. per sec. $= AC\sqrt{RS}$

$$= AC\sqrt{R} \times \sqrt{\tfrac{1}{1,000}}$$

$$= 20.095 \times \sqrt{\tfrac{1}{1,000}}$$

This value of $AC\sqrt{R}$ is taken from a very handy little book of tables by P. J. Flynn, C. E. (VanNostrand's Science Series), calculated by Kutter's formula for finding value of C. The highest value given in these tables, however, for the co-efficient of roughness is $n = .013$, which is probably rather low for a tile drain. Therefore, to be on the safe side, about 10% has been deducted from the calculated discharge, leaving it at 300,000 gallons (Imp.) per day, at which rate the 10-inch tile drain will discharge the rainfall from the 200 acres, namely: 100,351,000 gallons of water, in considerably less than a year, or to be more exact in 335 days.

DISCUSSION.

Mr. Tyrrell—Would not the greater part of the water be required to be carried off in the spring when the snow melted, during a very small fraction of the year?

Mr. Butler—It always seems to me that the problem is not what is the annual rainfall? but, what is the maximum rainfall within a given short period of time? Perhaps within a couple of hours some inches of rain might fall, and that is the rain that does the damage. Without going into the calculation for the size of the pipe, which seems to be ample for the purpose according to the calculation there shewn, still the question would rise naturally, if two inches of rain fell on that area, say during the night, would that ground be saturated to such an extent as to scald and destroy the crop? That is the way I would approach the solution of a problem of that kind. If it could not be relieved within the next four or five or six hours, at the outside, I would consider that the drain was inadequate.

Mr. Miles—According to that demonstration the rainfall that took place in 240 days will take 335 days to carry it off?

Mr. Bowman—Yes. In regard to the question Mr. Tyrell brought up, I assumed that during the months of December, January, February and March the ground would be frozen, and I think you will find that in frozen ground very little of the water would be absorbed; it would go off over the surface instead of sinking in. Of course some of these marshes might absorb more, but that is just a suggestion of mine, and I would be glad to have your opinion on it. I don't think it comes to a question of the rainfall of one day being discharged in that day. We will suppose we have the soil well drained to start with, the water being well drained off, as in summer. (Draws diagram on the blackboard.) Here is a tile drain every forty feet. Supposing an inch of water-fall in 24 hours, which is about as large a quantity as we need figure on—there are heavier storms sometimes than that, but still there are some years without even an inch in 24 hours. It has been found that that inch of water will sink down through the ground four feet, in perfectly well drained soil, and that one inch can be taken up between the particles of the earth in about four inches of depth, so that it would not effect vegetation at all; it would be down three and a-half feet anyway below the surface. I don't expect the rainfall of one day

will be carried off in that day. Tiles run all the time, so I was giving the whole year, 365 days, to run off the rainfall, and you will find it will do it in 335 days.

The President—You did not make any allowance for evaporation.

Mr. Bowman—I allowed evaporation and water taken up by the plants to counter-balance the water from springs and any surface water that might come in from the higher ground at the side.

Mr. Abrey—The assumption would be that the drain would be running full all the time?

Mr. Bowman—It would be making its maximum discharge.

Mr. Abrey—In dry weather it would not be doing that, therefore in the balance of the season it would not carry it off.

There is no reason why it would not be running full all the time if there is water there to carry off. In fact it might be running under a slight head sometimes, in which case it would discharge more.

Mr. Winter—I think you will find that that drain is not large enough. I think the principle of the paper is wrong. It would have to be calculated so that when there would be a heavy flood for a short time it would carry off that water. When there would be a heavy fall of rain one day you could not give it more than another day to run off. I think the principle of taking up the full year would not give you a large enough drain.

Mr. Tyrell—As far as my experience goes, I may say that it appears to me that the great bulk of the water flows away in the spring and fall of the year. In low, swampy ground the frost does not go into the ground to any extent. I know in a swamp out in Wentworth of about 2,000 acres, which I drained two or three years ago, during the summer months very little water passes down the drain, whilst in the spring of the year it always has been full up to the top. However, it is just an open drain about six miles long.

Mr. Morris—I think from the information we have got you would expect in certain wet seasons of the year quite a large lake to form at the upper end of that drain with probably a washout, because you can hardly calculate the drain to even up the time during the whole year to discharge the water, especially in large quantities. In a level country like that it would hardly be carried off by a drain of ten inches.

Mr. Bowman—I think you have not quite got the situation. There is a shallow ditch there now, and this land gets along very well in the flood time now. They plowed this low land, but the water comes up and so chills the ground that they cannot raise any crops on it. This man that owns it says it is not worth $10 an acre to him now, but if he can have it thoroughly drained it will be $70 an acre.

Mr. McCulloch—You propose to put it so that it will absorb the rain and prevent the water accumulating on the surface?

Mr. Bowman—Yes.

Mr. McCulloch—I was hoping Mr. Bowman would give some solution of the question whether it should be an open or tile drain. I happen to know a little of that locality myself. He seemed to object to the tile drain for the reason that he could not get water in during the time the ground was frozen. I think by putting in catch basins along that drain the water can be taken off very quickly in the spring without having that objection, by building branches on the surface of the ground to these inlets.

Mr. Ellis—How do you propose to lay those tiles?

Mr. Bowman—I propose to lay them very carefully by putting up sights for them every 500 feet and then with a boning rod, and then probably have an inch plank, six inches wide, under them the whole distance. They have to be laid very carefully. A few inches of fall lost would seriously retard the flow. There is only one foot fall in 1,000. I have found that tile drains work very well at one in 1,000, Central Park, New York, has its main drain laid one in 1,000, and I think they are 10-inch too.

Mr. Ellis—In Central Park they lay them with tar paper at the joints.

Mr. Tyrell—I think with Mr. Bowman's explanation that the surface drain could still be maintained to carry off the flood water, that it would no doubt be a good thing for agricultural purposes.

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THE MEXICAN AMALGAMATION PROCESS.

By SAMUEL BRAY,

C. E., O. L. S., Ottawa.

It is to be hoped that in the near future surveyors will be called upon to make surveys of mines and mineral properties more often than in the past. Surveyors are fairly versed, at least at the time we pass our examinations, in the general characteristics of minerals, and I have no doubt that some of our members will drift from the survey of mines into the actual working of them, either as owners or as managers.

For years, for centuries rather, the mines of Mexico supplied more than one-half of the silver used throughout the world. Practically the whole of this silver was extracted from its ores by the process known as the "Mexican Amalgamation Process." This process was eminently adapted to a warm country where wood and water were scarce and where it was consequently necessary to resort to animal power. It is not adapted to Canada, and will probably never be adopted, but as silver has been found in large quantities and will probably be found in the future in much larger quantities in different parts of the Dominion, I have thought that a description of this process may be of some interest to our members.

Those ores of silver, commonly known as "chlorides," can be successfully treated by this process, and sulphurets, after having been submitted to a continuous heat in a reverbratory furnace, also yield good results.

The ores are crushed under the ordinary dry stamps and passed through $\frac{3}{8}$ inch sieves; they are then ground to an impalpable powder, or rather fine mud, in very primitive, but very effective mills, called "arastres." These mills are circular, usually 12 feet in diameter and paved with rough granite blocks two feet long and eight inches thick, set on end. An upright axle in the centre of the mill carries four arms; to each arm is attached, with plugs and ropes, a large rough granite block, about four feet long and two feet through. These blocks are dragged around and around on the paved floor of the mill by a pair of mules hitched to one of the arms, which projects for this purpose beyond the rim of the mill. The rim of the mill is made of three-inch stuff set upright and close together like the staves of a cistern. The mules are blind-folded, otherwise they will require constant driving to keep them moving. Two pairs of men, who relieve each other every 12 hours, are usually in charge and do all the work required in con-

nection with twelve of these mills. The mules are also in two sets, but they relieve each other every six hours. A large silver reduction works or "Hacienda de Beneficio," as it is called, will have about 70 heads of stamps, and 70 of the above described mills, which will crush and grind about 30 tons of ore per 24 hours.

About half a ton of crushed ore is placed in each mill, water is added from time to time, and finally, when the grinding is complete the mass has become very thin mud. This is now run off into tanks of masonry and allowed to settle, the water drawn off, and the residue spread out in the amalgamation yard into large circular or oblong masses about 10 inches thick, called "tortas."

Common salt is now scattered evenly over the torta; the quantity required is in proportion to the richness of the ores, which is previously ascertained by assay—6¼ per cent. may perhaps be an average. Also the quantity of salt required is regulated by its pureness. If the common "sal tierras" are used a larger quantity will be required, and as these "sal tierras" vary exceedingly in the percentage of pure salt contained in them, it is well to assay them before deciding on the quantity required.

The salt and all the other ingredients used are mixed into the mass or torta by horses or mules treading through it. A torta of 120 tons will require about 20 or 25 animals; these are driven by one man in continuous circles around himself, he takes care to keep moving over the torta in order to insure that the whole of it is evenly and thoroughly mixed. This man is provided with a long whip and simply holds a rope as a halter-strap, about 15 feet long, leading from the head of a leading horse of five-abreast, which are simply tied together by a rope from neck to neck, sufficiently short to keep the horses together and yet allow them room to move freely; from the neck of this leader a rope passes back to the second leader of a similar set of horses, five-abreast; and similarly a rope passes from this leader to another behind him and his set of five horses, and so on. I have seen fifty horses driven in this manner by one man on especial occasions and for a short time, but it is not advisable to allow more than 25 to be driven by one man.

In a large hacienda, such as I have mentioned, about twelve tortas will generally be under treatment at one time. These are mixed in the above described manner on an average of every other day for about one month, so that six or seven of these tortas are being trod by horses and mules every day—say 130 animals plod through this mud day after day driven by only six or seven men. It is surprising how rarely an accident occurs, especially when it is to be borne in mind that the animals detailed for this service are those that are either unbroken or nearly worthless for any other work. Sometimes a couple of animals will quarrel and mix up the whole lot in almost inextricable confusion, or perhaps one may fall and entangle the others; in these cases the driver and the other men at work at the torta have to be as quick as possible in untieing and cutting the tangled ropes, as in less than one minute a horse might be lost by having his head pinned down into the mud by his companions.

The day after the salt is applied, sulphate of copper is added to the torta, either in a pure state, as obtained from the Mint, where it is a necessary residue in the operation of extracting the gold contained in nearly all bars of silver received at the Mint, or it is applied to the torta in a finely pulverised and calcined ore of copper, called "magistral." In case magistral is used it is advisable to assay it in order to ascertain the percentage of sulphate of copper it may contain. As pure sulphate of copper cannot always be obtained, all large silver reduction works using the Mexican Amalgamation Process are provided with reverbratory furnaces for the purpose of preparing their own magistral. The copper ore is stamped, ground in the arastres and allowed to dry. In the dry state it is necessarily in small hard lumps. In order to pulverise these lumps so that the ore may be evenly acted on by the heat in the furnaces, a mill is commonly used; probably the same style of mill was used in Eastern countries two or three thousand years ago. It consists of a large circular stone through which a wooden axle passes; the stone is about 5 feet in diameter and 2 feet thick, standing on edge; it revolves around near the outer end of the axle, which is drawn around in a circle of about 25 feet in diameter by a mule attached to its outer end. The pulverised ore is dark grey, but when sufficiently acted on by the heat in the furnaces it assumes a dull red colour. A very simple test is necessary to ascertain when the ore is sufficiently roasted; a small quantity, after being allowed to cool, is held in the hand and dipped into water, a considerable quantity of heat will be evolved but not nearly as much as in the slaking of lime. The magistral is of a painfully disagreeable odour and the particles are so fine that the slightest movement stirs them up, consequently the workmen while spreading it over the tortas have to tie cloths over their mouths in order not to inhale the particles. The quantity of magistral required may amount to $2\frac{1}{4}$ per cent. and if pure sulphate of copper is used the quantity required rarely exceeds one-fourth per cent.

Immediately after the sulphate of copper is mixed into the torta, quicksilver is added, about $1\frac{1}{2}$ lbs. for each "mark" (8 ounces) of silver the mass contains; more quicksilver is added from time to time until the whole amounts to about 3 lbs. per mark. The quicksilver is added to the mass by being strained through canvas. It is first weighed and distributed around the torta in the common iron quicksilver bottles; several workmen are each provided with a square of good thick canvas; a quantity of quicksilver is poured into each square of canvas, the four corners being held by the workman, thus making a bag which he swings about him as he walks over the torta; the quicksilver is thus spread over the torta in very minute particles.

It requires a very considerable amount of absolutely necessary experience to manage the reduction of these ores by this process. If sufficient salt is not used the whole of the silver will not be extracted; if too much, the excess of salt is a loss and salt was not a cheap article in Mexico before the advent of railways; if sufficient sulphate of copper is not used the silver will not be extracted at all, or at best, only what native silver the ores may contain will amalgamate with the

quicksilver; and if too much sulphate of copper is used a serious loss of quicksilver is the result, although this mistake may be counteracted to a great extent by the judicious use of some common ashes or quicklime, or better still, a small quantity of precipitate of copper; but should the quantity of sulphate of copper be far in excess of the quantity required the result will not only be an irretrievable loss of a large quantity of quicksilver but the process will be retarded for an indefinite length of time.

Six to seven men are required to attend to the torta while it is being mixed by the horses; their duties consist of applying the salt and other ingredients as ordered; of adding sufficient water to keep the torta at a proper consistency, otherwise the heat of the semi-tropical sun would soon dry up the mass; to throw back with flat wooden shovels the edges of the torta as they spread under the feet of the horses, and to bathe the horses every day when their work is finished. If this were not done the mud carried away by the horses would be a very serious loss. Each set of horses is bathed in a temporary bath constructed by the men adjacent to the torta; the whole of this bath is distributed over the torta the next time it is under treatment.

From time to time a trial, called a "tentadura," is made to ascertain the condition of the torta. This tentadura consists of washing carefully in a black saucer or gourd a large handful of the mud gathered evenly from every part of the torta. The globule of quicksilver obtained by washing should be covered with a gray scum, and the residue of sand should have a rim of fine gray particles of silver and quicksilver; these will gradually disappear, and the quicksilver will become more and more dense as it amalgamates with the particles of silver. When the tentadura shows that all the silver has become amalgamated, this part of the process is complete.

The chemical action that takes place is, I believe, somewhat as follows: the sulphate of copper acting on the salt liberates muriatic acid, which acts on both the quicksilver and on the chlorides of silver contained in the ores and these through what is termed "electro-chemical" action combine, making the amalgam or form in which the mercury and silver now appear.

The mud is now carried, usually in primitive hand-barrows, to be washed in a large tank constructed for the purpose. This tank is usually about eight feet square, and three feet deep; a small stream of water is kept constantly flowing into the tank and from one to four men stand in it bare-footed and bare-legged who keep stirring the mud up in the water with their feet. The particles of mud are carried away with the water leaving amalgam only at the bottom of the tank; quantities of amalgam and light particles of silver and mercury are also carried away with the water, but these are caught in long continuous launders constructed with ridges and with troughs at intervals. Some quicksilver is poured along the launders before the washing begins with which the floating particles of silver and quicksilver will unite. Boys, bare-footed, are employed moving up and down in the launders to prevent the heavier particles of the mud

from settling in the form of sand, as in this case the particles of silver would pass over the sand without coming into contact with the quicksilver.

When the washing is completed the amalgam is emptied into a long conical bag made of extra-thick canvas. About 75 per cent. of the mercury will oose through the canvas in practically a pure state which is caught in receptacles usually made of raw-hide supported on frames of wood. A very thick dry amalgam is left in the bag; this is packed solidly in triangular bricks; these bricks are carefully built into a circular prism 18 inches in diameter, leaving spaces between the bricks, on an iron rack standing over an iron cup through which a small stream of cold water is made to run and to discharge into a tank. A large iron cup, called a " campana " or bell, is then placed over the prism, its lower edge is carefully cemented to the floor with bone dust and ashes. An open dry wall of fire-bricks is built around the bell at about one foot from it and a fire of charcoal in this space is kept at white heat for about 12 hours. The fumes of quicksilver coming into contact with the stream of cold water are immediately condensed into quicksilver, which is caught in the tank into which the stream of water discharges. After being allowed to cool, the bell is lifted off, the prism of silver is now found in a very porous form and much reduced in size ; it is broken up and cast into bars of about 120 marks (60 lbs) each and in this form it is sent to the Mint. Nearly the whole of the silver contained in the ores is extracted by this process and in a very pure state, and the entire loss of quicksilver amounts to about 12 per cent. of the quantity employed.

The water after leaving the launders above mentioned discharges into a large tank of masonry where the heavier portions of the mud (tailings) are allowed to settle. This is concentrated in a very primitive manner and when a sufficient quantity has been concentrated from a number of washings it is re-ground in the arastres, spread into a torta and treated in precisely the same manner as above described.

This process, as I have before stated, requires about a month and is well adapted to a warm country and where only animal power is available. A similar result is obtained in 24 hours by placing the finely ground ores with the necessary salt, sulphate of copper and quicksilver, in barrels which are constantly kept revolving by steam, water or other power, but the resulting amalgam is frequently charged with a very undesirable amount of iron, copper or other metals, thus making the subsequent process of purifying the silver very expensive.

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

PERMANENT STREET PAVEMENTS: THEIR DURABILITY AND COST.

By J. W. TYRRILL,
O. L. S., C. E., Hamilton.

THESE are not the only characteristics to be considered in order to be able to arrive at a wise solution of one of our most urgent municipal questions of to-day, namely: "What description of pavement should we adopt?" but they are certainly two of the most important.

Other considerations should be, cleanliness and sanitary conditions, resistance to traction, foot-hold afforded for horses, facilities for removal and repair, amount of noise created, and appearance; but as a volume of no small proportions would be the outcome of an exhaustive paper upon the whole subject of permanent street pavements, we will confine our remarks at this time to the questions of durability and cost.

WOODEN PAVEMENTS of various designs have been tried in many of our cities, but they have failed to give satisfactory results, and most grievously so, upon streets of very heavy traffic. In any case, wooden pavements have proved to be most expensive luxuries on account of their necessity for constant repair and frequent renewal. They have, however, served a purpose in educating us to the point of realizing the necessity of something a step farther in advance. Wooden block pavements have, beyond doubt, some admirable qualities possessed by few, if any other pavements; but, upon the whole, experience in this country has proved them to be sadly lacking in many important respects. We will not make further mention of wooden pavements, as they do not properly belong to the subject of this paper.

Neither will we take into consideration MACADAM or GRAVEL PAVEMENTS, for, though when properly constructed and cared for, they are well adapted to the requirements of many localities, they are not suitable or economical upon city streets of comparatively heavy traffic, and it is for such streets especially that we shall endeavour to reach a solution of the question.

It remains for us, therefore, to make our selection from pavements constructed of STONE BLOCKS, of BRICKS, or of ASPHALT.

The *durability and cost* of a pavement are in a sense inseparable characteristics, from the fact that the annual cost necessary to perpetuate a pavement depends largely upon the durability or number of years the pavement will wear; and also from the fact that a pave-

ment of inferior durability, requiring constant repair and frequent renewal, is an abominable nuisance to the travelling public, and the cause of serious loss to local business.

Durability is of itself, therefore, a quality of the greatest importance, and, consequently, with the object of arriving at some reliable comparison between a number of available paving materials, the following experimental tests were made by the writer:—

THE SPECIMENS. The specimens procured for the tests were as follows:—

No. 1. Grey Aberdeen Granite. Two small pieces, weighing about four pounds, were procured from local dealers. I endeavoured to obtain a piece large enough from which to have an ordinary granite block, such as is generally used for paving purposes, cut, but was unable to do so.

No. 2. New Brunswick Red Granite. Of this a roughly-squared block about half the size of an ordinary paving sett was used.

No. 3. Stanstead Grey Granite. This sample was a roughly-squared block about $6'' \times 5'' \times 1\frac{3}{4}''$. It was of much finer grain than the New Brunswick granite, but much similar in appearance to those from Aberdeen.

Nos. 4 and 4A. Hamilton Limestones. These were two specimens obtained from quarries in the neighborhood of Hamilton ('4' from Mr. Galagher's quarry, and '4A' from Mr. Handcock's). They were roughly dressed to the form of rectangular blocks. No. 4 was of a dark steely grey colour, and '4A' was of a lighter bluish grey.

No. 5. Hamilton Freestone. This specimen was a rectangular block, $8'' \times 6\frac{3}{4}'' \times 3''$, but, judging from its sad experience under test, I am inclined to believe that it could not have been a fair sample.

No. 6. Hamilton Vitrified Brick. This brick was furnished me by Mr. Campbell, of the Hamilton and Toronto Sewer Pipe Company, and was said to have been manufactured from Hamilton clay by that Company. The brick measured $8\frac{1}{2}'' \times 4'' \times 2\frac{1}{2}''$, and was of a dark, reddish brown colour. Sixty-one of them laid on edge would make a square yard of pavement.

No. 7. Hamilton Sand Brick. This was a sample brick manufactured from Hamilton sand and Hamilton cement, but made in the United States by some patented process. It was a handsome-looking brick of a brownish colour, resembling a good deal in appearance Credit Valley stone. It was not recommended to me as a paving brick, being manufactured only for building purposes.

No. 8. Hamilton Common Hard Brick. This was an ordinary hard building brick.

No. 9. Metropolitan Block. This block is manufactured in Canton, Ohio. The several samples, which were expressed to me upon application, were of exactly the same size, measuring $9\frac{3}{16}'' \times 3\frac{5}{16}'' \times 3\frac{3}{16}''$. It is a very handsome specimen of a repressed brick, having smooth surfaces, rounded corners, and being of a chocolate brown colour. The rounding of the corners, it is claimed, prevent the edges from becoming chipped by the pounding of the horses' shoes, and also affords good foothold. The blocks are exceedingly hard and fracture

with a smooth surface, being thoroughly vitrified. In the process of manufacture they are brought to a white heat and kept in that condition for six days. Forty-four blocks will lay one yard of pavement, and their cost, delivered at cars for shipment, is $14.00 per 1000.

No. 10. Imperial Block. This specimen was virtually the same as the Metropolitan Block, with the exception of being smaller, it only measuring $8\frac{1}{4}'' \times 4\frac{1}{8}'' \times 2\frac{1}{2}''$. It, and the block just described, are manufactured in Canton, Ohio, by the same Company. Sixty-five of these would lay one yard of pavement, and they are delivered at cars for shipment at a cost of $10.50 per 1000.

No. 11. Vitrified Brick, also from Canton, Ohio, and the manufacturers of the last two numbers; but in appearance it is a very different brick from either of them. It is not what is known as a repressed brick, and is much rougher looking. Its corners are not rounded, and it breaks with a rougher fracture—not being so highly vitrified. Its colour is of a dark reddish brown. Size, $8\frac{1}{4}'' \times 4\frac{1}{8}'' \times 2\frac{1}{2}''$, and cost, delivered at cars, $9.50.

No. 12. Hallwood Block, from Columbus, Ohio. This block is of peculiar construction, and is patented by the makers. It's dimensions are $9'' \times 4'' \times 3''$. It is made by the re-press process, and is finished with glazed surface, which feels decidedly oily to the touch. The angles are rounded off slightly more than those of the other repressed blocks above described, and passing longitudinally around the block are two grooves, which, it is claimed, give additional strength to the joints of the pavement. Forty-four blocks lay a yard of pavement, and their cost at cars is $18.00 per M.

No. 13. Vitrified Brick, also from the manufacturers of the Hallwood Block. The sample was a large brick, measuring $9'' \times 4\frac{5}{16}'' \times 2\frac{7}{8}''$, but inferior to the block, being only once pressed and of rougher appearance, with sharp angles. Price, $12.00 per M.

No 14. Fire Brick, from New Brighton, Pa. This was the only specimen of fire brick received. It was of a light buff colour; measured $8\frac{3}{8}'' \times 4\frac{1}{8}'' \times 2\frac{3}{8}''$, and was of the single pressed description, with square angles.

No. 15. Dry-pressed Building Brick. This sample, with a variety of other very handsome building bricks, was kindly furnished me by Messrs. Taylor Bros., of the Don Valley Brick Works, Ontario. It was subjected to my tests out of curiosity to see how it would compare with the vitrified bricks, rather than with any expectation that it would be suitable for paving purposes. I might just remark here in this connection, that Messrs. Taylor Bros. are at present putting up a new plant for the special manufacture of paving bricks.

Having collected the above fifteen varieties of paving materials, the weight of each specimen was carefully noted.

The use of an ordinary cast-iron "rattler," such as is commonly used in foundries, was then procured, and the specimens—together with about two hundred pounds of coarse shot and small scrap iron—placed therein.

The rattler, or cylinder, which was about two feet six inches in diameter by four feet in length, was then given 500 revolutions at the rate of about twenty turns per minute, and the sample taken out and again weighed. The object of this first rattling was merely to reduce all specimens as nearly as possible to the same condition, preparatory to receiving a second and severer test. More iron was then placed in the rattler with the specimens, and pieces of larger size and greater weight. The broken castings, for firepots of stoves, and sharp angular pieces, varying in weight from 5 to 15 pounds, were made use of.

The cylinder was then given 1,500 additional revolutions, after which the surviving samples were again taken out and carefully weighed.

I may just mention here that this was the second time that I had performed these tests. In the first instance the per centage of loss in the granites was remarkably small, as I had depended upon the samples themselves, and the iron shot, to produce the wear. But, in considering the matter afterwards, it occurred to me that this would not be a fair test, for the softer samples would be reduced by the harder ones, but the hard ones would be but little affected by the hammering of the softer ones. Therefore, I repeated the tests with the addition of the scrap iron, as above described, with the result that the loss of weight of the granite was increased 700%, whilst the increase in the loss of the bricks was not more than 25%.

I have, therefore, adopted the second tests for the purposes of any comparison, excepting when otherwise noted. Tables numbers 1 and 2 have been prepared, shewing the results of my experiments.

In table No. 1 the first column gives the numbers of samples for convenience of reference, and the letter A affixed means a second sample of same material.

The second column gives names of the specimens and places where manufactured, or from which obtained. The 3rd, 4th and 5th columns give the weights noted before and after each rattling. The 6th, 7th and 8th columns give the percentage of loss of the original weight in each case, but it is upon the figures given in the 7th column that I have based my estimates of durability, as they represent more fairly the comparative loss under similar conditions than the next table, giving total losses. And in the ninth column is noted the mean losses of specimens in second rattling, when two samples of the same kind were used.

In table No. 2 the surviving (I say surviving because in some cases the specimens were hammered out of existence) specimens are re-arranged in the order of merit. In the second column are given the comparative losses in terms of Aberdeen granite; and in the third, the estimated life of pavements constructed from the various materials tested. My reason for adopting Aberdeen granite as my standard of comparison is, not that it possesses any special merit or superiority over many other granites, but because it, having been in use in the city of London and elsewhere for a great many years, experience has taught us what its capabilities of endurance are. Although, when we attempt to seek for records of the *amount of wear* for a *certain traffic*,

even for this extensively used paving material, it is remarkable how scant such information appears to be. There is no trouble in finding records of the amount of wear of a pavement on a certain street in a given time; for instance, we are informed by various authorities, that on Blackfriars Bridge, London, setts of Aberdeen granite wore down one and a half inches in thirteen and one-fourth years, and that Guernsey granite wore only one-fourth of an inch in the same time, but the amount of traffic passing over the pavement is not given. The information is only valuable, therefore, to show the *relative* durabilities of the two stones. We are also informed of the results of Mr. Walker's experiments with several varieties of granite setts, which he placed under heavy traffic for a period of seventeen months; but, again, no idea of the weight of traffic, producing the results noted, is given, from which could be estimated the lives of the pavements for different degrees of traffic.

Though I have searched eleven or twelve authorities upon street pavements, the best information to the point that I have been able to find is given by A. T. Byrne. On page sixty-eight of his valuable book upon Highway Construction, published in 1892, he states that "On London Bridge, which has a traffic of over 15,000 vehicles in twelve hours, the wear of granite blocks has been found to be at the rate of .222 of an inch per year, or that the number of years required to wear away one inch, is four and one-half." Even in this case the description of the granite is not given—though it is doubtless the Aberdeen stone, as it is used now almost entirely in London—nor is the width of the bridge. It would evidently make a very great difference whether the 15,000 vehicles passed over a width of thirty feet, or were distributed over a width of say seventy-five feet. However, I have—without going over to measure it—been able to discover the width of the bridge which is given in the Encyclopedia Britannica as being 53 feet between the parapets. This would probably mean thirty-three feet—room for four vehicles, in the centre, and a foot-walk of ten feet on either side. Working upon this assumption, we have the amount of traffic on London Bridge as 1,364 vehicles per yard of width per day of twelve hours, and it has been observed that under that amount of traffic granite blocks have worn down to the extent of .222 of an inch in a year. From what has thus actually been observed to take place, it is a simple matter of calculation to determine what should be the amount of wear for any given traffic, and thus to determine the life of the pavement for that traffic.

In order to apply this theory to practice, I have kept count for several days in succession and ascertained the amount of traffic upon two of the principal streets of Hamilton—James and York streets.

The number of vehicles passing on either street was found to be about the same, being 135 per yard of width per day of 12 hours—exclusive of portion of street occupied by street railway tracks.

Upon James streets about 82% of the traffic was observed to be light, the remaining 18% being medium and heavy; but on York street the percentage of medium and heavy was about 35% of the whole.

As we have, however, no information as to the character of the

traffic upon London Bridge, we will disregard that consideration, and deal also only in numbers of vehicles.

Now, if the wear for a traffic of 1,364 vehicles per yard of width per day has been found to amount to .222 inch, the amount of wear for the same pavement (granite) for a traffic of 135 vehicles would be .022 inch; or, for the traffic of James and York streets, it would require in order to wear the pavement down to the extent of two inches, a period of 91 years, which would represent the life of the pavement for those streets; for experience has shewn that by the time stone block pavements have become worn to the extent of two inches they require to be taken up, though after being dressed they may be relaid.

Then, assuming that the durability of the pavement is proportioned to the durability of the specimen tested—and I think this should be a fair assumption—we can readily calculate what should be the life of each pavement constructed of materials such as our samples. For example, the wear of Aberdeen granite being taken as 1, that of a specimen of Vitrified Paving Brick, made by the Hamilton & Toronto Sewer Pipe Company, was found to be 1.44; therefore, the life of the brick pavement should be $\frac{1}{1.44}$ of that of the granite, which would amount to 63.2 years. In this way the lives of pavements constructed from such several materials as tested have been computed and noted in table No 2. It may be remarked by some, that in the estimates of durability thus obtained no account has been taken of the influences of the weather; but it will be readily seen that this is not the case.

Whatever effect the weather or atmosphere may have upon the granite pavement, such effect will be applied to each of the other pavements just in proportion to the wear of the specimen in the rattler test. For example, the influences of the weather upon the granite would be multiplied by 9.93 in the case of the common hard brick; that is, my estimates of durability include the assumption that the common hard brick would be affected by the weather to the extent of about ten times that of the Aberdeen granite.

This would probably closely represent what would actually take place, so that, with perhaps the exception noted in the table, I think we have good reason to believe that the durability of pavements estimated as above described, and as noted in table No. 2, should be attainable in practice.

By way of supporting this opinion, I will again quote from A. T. Byrne, who says that "Brick has been used for upwards of a hundred years in the Netherlands, and pavements laid half a century ago are still in good condition. There are several brick pavements in the United States from ten to eighteen years old, which are still in good condition."

ASPHALT. As to the durability of asphalt pavements, experience has shewn that their life is not by any means proportional to the traffic they sustain. In fact, even an extremely heavy traffic appears to produce scarcely any perceptible wear.

An asphalt pavement in Cheapside, London, after fourteen years traffic of 13,772 vehicles per day having passed over it, was found to

have been reduced in thickness by only seven-eighths of an inch, and this reduction was chiefly due to compression.

Another asphalt pavement, which has sustained a very heavy traffic for sixteen years in the city of Paris, was found when taken up, to have lost only five per cent. of its original weight, though twenty-five per cent. of its original thickness. Some of the streets of London, carrying the heaviest traffics of any streets in the world, have been paved with asphalt and been in constant use for from 16 to 19 years before having been renewed. Similar pavements, sustaining very much lighter traffics, in other cities in England and America, have exhibited no greater powers of endurance, so that I think we may reasonably agree with Mr. Haywood, who, as Mr. H. P. Bulnois, City Engineer of Liverpool, informs us, places the life of a good asphalt pavement at seventeen years—and as it appears, irrespective of the traffic it has to sustain.

Conclusion. With regard to durability we are, therefore, bound, from the foregoing, to draw the following conclusions namely: that for extremely heavy traffic such as exists on some of the streets of great cities, asphalt stands far ahead even of granite blocks; but that for streets of somewhat lighter traffic, say 700 vehicles per yard of width per day and less, granite blocks would give better results, and for more ordinary traffic, of say 500 vehicles per yard of width per day and less, a good quality of vitrified brick pavement should give excellent results, and be preferable to asphalt.

Cost. As to the cost of pavements, I cannot do better than simply give a table of the prices which have been paid during the past few months for different pavements in various places in this country and in the United States.

The following table, giving the first cost only of work, has been compiled chiefly from the contract prices reported from time to time in the *Engineering News:*

LOCALITY.	COST OF BRICK.	COST OF GRANITE.	COST OF ASPHALT.
Anderson, Ind	1.73		
Avondale, O	2.53 to 2.80*		
Burlington, Ia	1.53 to 1.65		
Buffalo	.....	.....	3.00
Chicago	2.00	3.13	
Detroit	2.80	.....	2.78–2.85
Huntingdon, Pa	1.80		
Montreal, P. Q	.....	.....	3.43–3.97
Moberly, Mo	1.35†		
New York	.....	2.50–4.50*	3.25–4.50
Philadelphia	.....	.....	2.50
Rochester	2.25*		
Toronto	.....	3.00–3.80	2.50–3.00
Wilmington	1.98–2.26		
York, Pa	.....	.....	2.43–2.97

* Concrete foundation.

† Sand foundation and exclusive of grading and curbing.

It would now be interesting and instructive from the above figures of the cost, and my table of comparative durabilities, to make out a table of annual costs necessary to perpetuate the different pavements for various degrees of traffic, but in preparing this paper I have not had the time to devote to this. Anyone who may be sufficiently interested can, from the data furnished, make these calculations for himself, or I may have an opportunity of taking up the subject again at some future time.

TABLE No. 1.

TABLE GIVING LOSSES OF SAMPLES OF PAVING MATERIALS SUBJECTED TO RATTLER TEST.

No.	Name and Locality.	Weight in Ounces.			Percentage of Loss.			Means of 2nd.	Remarks.
		Original	After 500 turns.	After 2,000 turns.	In 1st.	In 2nd	Total.		
1	Grey Granite from Aberdeen.	32.75	32.50	31.25	.76	3.81	4.58	3.06	Slightly worn.
1 A	" " " "	32.50	32.00	31.25	1.54	2.31	3.85		
2	Red Granite from N. B.....	66.75	66.25	65.00	.75	1.84	2.62	1.84	" "
3	Grey Granite from Stanstead	69.00	68.50	67.50	.72	1.45	2.17	1.45	" "
4	Limestone from Hamilton....	91.00	90.00	87.00	1.10	3.30	4.40	.....	Broke at "dry."
4 A	" " "	204.00	199.50	192.50	2.21	3.43	5.64	3.37	Worn smooth.
5	Freestone from Hamilton....	190.00	171.50	.....	9.74	.....	.....	.....	Broken to fragments.
6	Vitrified Brick from Hamilton	113.00	107.00	102.00	5.31	4.42	9.73	4.42	Corners evenly worn.
7	Pat'd Sand from Hamilton...	110.00	96.00	.....	12.73	.....	.....	.....	Ground to powder.
8	Common HardBrick Hamilton	77.30	57.50	34.00	25.61	30.40	56.01	30.40	Broken and worn evenly
9	Metropolitan Block, Canton, O.	159.50	156.00	144.50	2.19	7.21	9.40	.....	Spalled. Not worn.
9 A	" " "	161.30	155.50	146.00	3.60	5.88	9.48	6.55	" " "
10	Imperial Block, Canton, O...	115.50	114.00	108.00	1.30	5.19	6.49	.....	" " "
10 A	" " " ...	112.50	103.00	98.50	8.44	4.00	12.44	4.60	Fractured in 1st test.
11	Vitrified Brick, Canton, O...	113.00	108.00	103.50	4.42	3.98	8.41	3.98	Evenly worn on corners
12	Hallwood Block, Columbus, O.	137.50	131.00	124.50	4.72	4.72	9.44	4.72	" " "
13	Vitrified Brick, Columbus, O.	139.50	136.50	124.00	2.14	8.97	11.11	8.97	Chipped and worn.
14	Fire Brick, New Brighton, Pa.	103.50	99.50	91.00	3.87	8.21	12.08	8.21	" " "
15	Pressed Building Brick, Don.	97.50	77.00	50.00	21.03	27.69	48.72	27.69	Fractured and worn.

TABLE No. 2. (7) B

Names and Localities in Order of Merit.	Loss in Terms of Aberdeen Granite.	Life of Pavements for a Traffic of 135 V. per yd.
Grey Granite from Stanstead.....	.47	193.6 years
Red Granite from N.B.....	.60	151.6 "
Grey Granite from Aberdeen.....	1.00	91.0 "
Limestone from Hamilton.....	1.10	*82.7 "
Vitrified Brick from Canton, O.....	1.30	70.0 "
Vitrified Brick from Hamilton, Ont..	1.44	63.2 "
Imperial Block from Canton, O.....	1.50	60.7 "
Hallwood Block from Columbus, O..	1.54	59.1 "
Metropolitan Block from Canton, O.	2.14	42.5 "
Fire Brick from New Brighton, Pa...	2.68	35.0 "
Vitrified Brick from Columbus, O...	2.93	31.0 "
Pressed Building Brick, Don.....	9.05	10.0 "
Common Building Brick.....	9.93	9.2 "

* This estimate is probably too high, as experience tends to show that limestone does not wear well as a paving material.

DISCUSSION.

Mr. Dickson—What is the asphalt composed of?

Mr. Tyrrell—I am speaking there of Trinidad asphalt. Of course it is not used in its natural state; it is mixed with oils to bring it to its proper consistency.

Mr. Abey—I may say in reference to those vitrified paving bricks, I put some of them in water for 36 hours, and they absorbed about half an ounce of water in that time. They are very hard; quite as hard I think as granite. The ordinary brick such as we use for sewers will take in a pound or two of water.

Mr. Chipman—In speaking of the relative values of the different pavements, I think there was one matter that was not taken into account in determining the value, that is, the sanitary aspect of the question, and I may be pardoned, perhaps, for drawing the attention of the Association to it. It is something that should not be overlooked in my opinion. A wooden pavement should never be laid in any city, especially in large cities. I believe that the brick is the coming pavement.

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THE EDUCATION OF OUR DRAUGHTSMEN.

By F. L. FOSTER,

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As the subject of the early training of the students of our profession has, I think, not been touched upon, or at all events, not treated of to any extent in our discussions and reports hitherto, and having been requested to contribute a paper for this meeting, I have ventured to choose the topic of education with special reference to draughtsmanship, in hopes of its being followed by contributions from other members, giving their views regarding the other branches of training, so desirable in forming the finished practitioner.

In answer to the possible question, "of what practical use is this subject, seeing that we have Schools of Technology, and Universities to teach all that is required in this connection?" I will say that many of our students at a distance from centres of education have not an opportunity of benefiting by these institutions, and to such, some practical hints may be useful.

The utility of a certain amount of artistic training for our students will, I think, be readily conceded by at least some of the veterans of our profession, when referring to their field-notes, plans and sketches of old but important surveys; and many a strong expression of regret has been uttered that they had not been more carefully instructed when young, in the art of note-keeping and sketching.

It goes without saying that good and useful field-notes must be taken clearly and legibly, but the application of the artistic faculty is not so apparent.

The knowledge of the most rapid and correct methods of conveying to the senses the appearance of objects by a few strokes of the pencil, is to my mind, an acquisition worthy of much study and practice, enabling one as it does, to note facts and figures, ideal as well objective, in the best and most convenient form. It is the shorthand method of the artist, and will serve the purpose of the surveyor and engineer just as well.

The practical application of this knowledge may be illustrated by supposing an exploration survey to be in progress for the location of a railway line.

How much more rapidly taken, and perfect will the notes of the location engineer be, when sketched by means of the artistically trained eye and hand.

From any suitable points on his exploration lines he can make rapid sketches in any required direction, and by adding approximate heights and distances to the points in his sketches, can in a short time record all necessary information, both in plan and perspective view—

In taking notes of most, if not all kinds of surveys, this knowledge can be usefully applied.

The fundamental rules and principles of geometrical and isometrical perspective should be taught the student of surveying or engineering, and the rapid estimating of angles and distances as well as the judgment of proportions between objects should be frequently practised, so as to give facility in placing the shape, apparent size and approximate position of these objects rapidly on paper by a few strong and firm outlines. The knowledge thus attained is the ground work or basis of the most important part of every artist's education ; and it is principally by the out-door study of the outlines and interior structural lines of natural and artificial objects, more, perhaps, than to their light, shade and colour, that he gains the power of transmitting his views of the character of each object to his paper.

We all know how much expression can be given by a few lines, but the power of doing this is only attained by careful study and considerable practice.

The trained eye will see more in an object than that of one unused to sketching, because of the frequent observation with a view to transmitting objects to paper. This training also improves the memory so much that objects, and even scenery of a complicated nature, can be readily recalled and sketched with a fair amount of accuracy many years after being seen.

The utility of the photographic camera, although very great, cannot obviate the necessity or desirableness of the training just mentioned.

Successful photographs require conditions of light and atmosphere not necessary to the sketcher. The camera, we know, records all in view—the sketcher, only the few objects which he may require. In fact, so widely do the two methods of recording objects differ, that a comparison is obviously unnecessary ; however, the fact that an instrument like the camera can be used for so many purposes in the practical work of surveying and engineering, with such a little expenditure of skill, or even thought, should not, I think, prevent our students from cultivating the artistic faculty, for by doing so they develop latent possibilities that cannot but be a benefit to them, apart from their strict application to the duties of their profession.

In conclusion, I wish to state my opinion, that the subject of draughtsmanship has never had the attention it deserves from our Board of Examiners, and that as the power is in their hands to compel the attention of students to this necessary branch of education, the subject should be placed on the list of requirements, from the candidates for final examination. I think that a knowledge of the rules of perspective drawing should be required, and that a fair proficiency in free-hand lettering, and whatever constitutes the Topo-

graphical Draftsman's Art, should be shewn and tested by the construction of finished plans from given field-notes in a stated period—say one day during the progress of the examination.

By means of these requirements, students would necessarily educate themselves accordingly, and a corresponding benefit to the profession would in time undoubtedly follow.

DISCUSSION.

Mr. Niven—The suggestions thrown out, I think are worthy of consideration. So far as the Board of Examiners are concerned, of course that is one of the subjects, but it has never been looked at in the way that Mr. Foster suggests. I think the suggestion is a good one, and I shall have much pleasure in bringing it before the Board at their first meeting.

Mr. Morris—A better knowledge of drawing would give to the surveyor a means of giving information that to many is not now possible. So many of us have to appear before the judges of the province to give information as to questions in dispute, that very often the surveyor not in a position to show in some artistic way, a rolling country, or a country diversified with water is at a disadvantage, and experts who are called in sometimes, throw the surveyor in the shade; so that if we were in a position to give this information in explanation of our notes, it would improve our standing very much.

Mr. Winter—It strikes me very forcibly that if there is to be any move made towards getting a topographical survey of the country, it is a matter of very great importance indeed, that our young surveyors coming into the profession now should be equal to the occasion. At all events we should not be content to sit down and make no progress. The country is progressing and the world as well, and we ought to keep up with the age.

Capt. Gamble—I feel that Mr. Foster has expressed in his paper almost everything that need occupy our attention. As he suggested, a day or half a day might be given at the examination to a practical exhibition of the students' ability in that direction. It is a very different thing I think for a man to be able to plot correctly from field notes in a short time, to sitting down and preparing a map, which most people can do if you give them time enough. The examiners should have an opportunity of seeing what facility a young man possessed as to expressing himself on paper in short time. I think this is a very important thing. And as Mr. Winter has just said, should we be instructed either in the near or distant future, to make a topographical survey of the Province of Ontario, it would be very necessary that we should have many who would be properly instructed in the art.

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

THE TRANSIT, AND HOW TO USE IT.

By CYRUS CARROLL,

O.L.S., C.E., Hamilton.

I SHALL endeavour to confine my remarks to such ideas and knowledge as I have gained in an experience of over thirty years, avoiding as much as possible anything you may find in books concerning the Transit.

In the first place, let us consider the tripod. This should be good and strong, the wood tops of legs at least 2 in. square, in correspondingly large brass bibles, the bolt to have washers and thumb-nuts, to be relaxed every time the legs are folded together. I once bought an imported transit for $225. The tripod was much the same as is used with English Dumpy-levels—small top, small brass bibles, and brass ends of legs fitting between them. It worked well in the office, and for a few days in the field, after which it was unsteady. This was not annoying to the maker nor to the dealer, but was decidedly inconvenient on the plains of Manitoba, 500 to 1,000 miles from an instrument repairer.

In a triangulation with a good instrument I found the resulting triangles generally 3′ short of 180° in the 3 interior angles. This was the experience of Mr. H. Munro McKenzie, Mr. John Robinson, Mr. C. W. Biggar, Mr. Marcus Smith, and other eminent engineers.

In the imported instrument the plumb-bob was suspended from a hook rigidly fixed into the tripod-head, and extending 4″ down. I had of course to remove the hook.

As to the instrument itself, there is no need of having a great quantity of metal. The weary transit-man has weight enough to carry in any case. Light, well made transits are the best. My own predilection is for 6″ limb, inside verniers splayed both ways, reading to 15 or 20″, Verniers marked A and B.

Graduation one way zero to 360°, *i. e.* to the left; an inner numbering zero to 180° to the right. This will be of great use in setting out curves to the right, as it saves a very laborious and awkward figuring out of the Tangential Angles, which must be done with an instrument reading only one way. But should you have an instrument reading only one way, I would say so choose your first sight that in turning off your angle you can read it direct. Avoid any manner of working by which you have to figure out results, not so much on account of

the labour involved, but chiefly, because by so doing you increase the chances of error.

Have the compass-card read 0 to 90 degrees each way from north and south, for the same reason. A card reading 0° to 360 is a first class nuisance

Have the axle boxed in tight. Never buy an instrument with the axle in wyes, to separate in boxing up. If you use such a transit three weeks in succession in hot weather the small rubber tips over the axle will give out. Then the axle will rise and ride in the wyes. Do you say you would prevent that by packing it down? Well, perhaps you would, and perhaps you would not. Generally speaking in such a case you have to interview the instrument-maker—perhaps 1000 miles away—while you have a party on your hands, say eight men at round wages, eating your pork that stands you 40 cents a pound, and grumbling at its flavour. Instrument makers do not care about these things, but you do.

In chosing an instrument, see that the tube travels truly in line. In my imported instrument, the tube was drawn only—not bored out; the wires wobbled off the line in fixing the focus for long and short sight. Vertical circle should be not less than five inches, with two verniers, reading to minutes.

All tangent screws should have compensation springs to even the motion and prevent jumping.

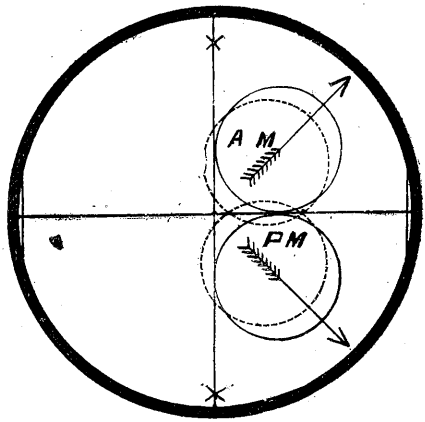
You may make a very useful michrometer by placing vertical spider's lines as near the outside of the tube as you can see a small portion of them, one on each side. Set up your instrument on a level piece of ground and measure say 1,000 feet straight away from its focus, then place a picket very carefully in line of each of these outside wires, the line joining pickets of course being at right angles to the line from transit. Suppose the distance between centres of pickets is forty feet; $1{,}000 \div 40 = 25$, which is your scale; that is to say, one foot in width for every twenty-five feet length of base. It follows that if we measure the distance between centres of pickets within one inch, we have the distance within twenty-five inches. If we measure it within one-fourth of an inch, which we can, then we have the distance within six inches.

In crossing quaking bogs or deep beaver ponds it is much quicker and more accurate than direct measurement. It is doubly as correct as the michrometer which reads the vertical rod, on account of subtending double the distance. You have of course to find the true value of your scale, and so use it whatever it may be.

As you intend your transit to be fit for all uses that such an instrument can be put to, do not have any but horizontal and vertical wires.

The inclined or × wires cannot be used in observations of the sun for azimuth, as you must take the direction of the sun as well as its altitude at one observation. Besides the central vertical wire is useful in keeping the picket plumb.

In observations of the sun in the forenoon, use only the lower and following limbs, applying the semi-diameter of course to suit the case. In the afternoon use only the upper and following limbs.



The reason for always using the following limb, is that you can plant the vertical wire × × on the sun (as shown by the dotted line,) and take the observation the instant the sun quits the wire. You can always do this more accurately than you can place the wire ahead of the sun, and note the contact.

The lower and upper limbs are to be used in the forenoon and afternoon respectively, for the same reason, namely : that the sun is receding from under the wire, so that the last contact can be anticipated, and got and used more easily and accurately than can the first contact.

In the diagram, the arrows show the direction of the apparent motion of the sun at each observation.

With the fingers of the right hand on the horizontal tangent screw, and the left on the vertical tangent screw, the observer can so range the wires that the sun will pass off from them simultaneously. Having taken and read the vertical and horizontal angle, and noted them, take another observation—take several in fact—and, so far as practicable, with the same intervals of time between each.

The results can be easily worked out on the spot. All this is very convenient in practice, as it is done in the best part of the day.

The only objection I have to observations of the pole star, is the miserably, untimely hour of the night at which, for the greater part of the year, the observations have to be made. Often in desolate places, difficult of access, with the after long cold drive through bad roads, rousing up sleepy toll-keepers, porters, livery-men, etc.

It often happens, that within an hour's time of the elongation, or perhaps within a few minutes of it, a cloud obscures or covers the star, and the observation is lost.

The same thing may, and often does happen, for several nights in succession. If any other surveyor gets paid for all his work of this nature, I want to hear from him.

Now let us enquire whether it is necessary to lose the observation, if we have the instrument set up, and are following the star for an hour, more or less, before or after an elongation.

By calculating the azimuth, not only for the elongation period, but for intervals, from a few minutes to an hour before (and after) I find, that although there is a very perceptible motion of the star in azimuth, right up to the time of elongation, the amount of such motion in azimuth for the last few minutes, is very small—so small in fact, that it may be entirely neglected.

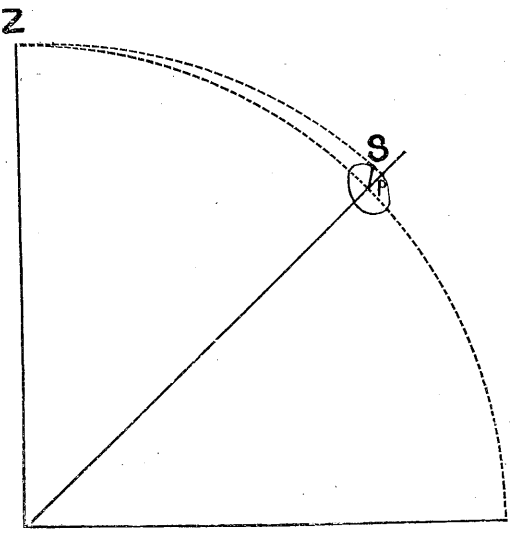
Also, that an error of five minutes in the time of observation, at about one hour from elongation, is only about half a minute of

azimuth. This is the maximum error to be allowed for, and is equal to only nine inches in a mile, or say one inch in every ten chains; which is nearly always quite close enough for our work. But the error in the time need not exceed two minutes, which would reduce error in azimuth to less than one-fourth of a minute, say four inches in a mile. Let us therefore take our observations, if we choose, any time within an hour of the elongation. Will it be necessary to get special legislation to make this lawful?

While on the subject of the meridian, allow me for once to digress a little.

Cannot we surveyors make it necessary to have all our surveys give the astronomical bearing, and discard the "magnetic?" At present, bearings are mixed, confusing, and of but little use.

Let Z represent the Zenith, $Z\,P$ represent the Co Latitude, S represents Polaris at five hours after Transit.



To find the Azimuth SZP—

We will assume the Latitude as 43° 39′ 40″ N that being about the mean of Toronto.

90°–lat. 43° 39′ 40″ = co lat ZP = 46° 20′ 20″ SP = polar distance per almanac 1° 15′ 28″.

The hour angle SPZ = 5 hours = 75° 0′ 00″.

Thus in the triangle PZS, we have given ZP, PS, and the included angle ZPS.

To find the Azimuth PZS:—

Log secant	$\frac{1}{2}\,z\,p + p\,s$	= 23° 47′ 54″	= 10.038594
: " cosine	$\frac{1}{2}\,z\,p - p\,s$	= 22° 32′ 26″	= 9.965488
:: " cotangent	$\frac{1}{2}\,s\,p\,z$	= 37° 30′	= 11.115020
: " Tangent	$\frac{1}{2}\,z\,s\,p + s\,z\,p$	= 52° 45′ 35″	= 10.119102
Log cosecant	$\frac{1}{2}\,z\,p + p\,s$	= 23° 47′ 54″	= 10.394136
: " sine	$\frac{1}{2}\,z\,p - p\,s$	= 22° 32′ 26″	= 9.583577
:: " cotangent	$\frac{1}{2}\,s\,p\,z$	= 37° 30′	= 11.115020
: " tangent	$\frac{1}{2}\,z\,s\,p - s\,z\,p$	= 51° 04′ 17″	= 10.092733

$\frac{1}{2}\,z\,s\,p + s\,z\,p$ = 52° 45′ 35″
$\frac{1}{2}\,z\,s\,p - s\,z\,p$ = 51° 04′ 17″

1° 41′ 18″

That is to say, the Azimuth at one hour from elongation, is 1° 41′ 18″.

Now let us try fifty-five minutes from the elongation, using the same rule.

L sec	23°	47′	54″	= 10.038594
" cos	22°	32′	26″	= 9.965488
" cotan	38°	07′	30″	= 10.105238
tan	52°	8′	10″	= 10.109320

AND

L cosec	23°	47′	54″	= 10.394136
" sine	22°	32′	36″	= 9.583577
" cotan	38°	07′	30″	= 10.105238
" tan	50°	26′	20″	= 10.082951

52° 08′ 10″
50° 26′ 20″

Azimuth 1° 41′ 50″ for 55 minutes before elongation.
" 1° 41′ 18″ " 1 hour " "

32″ difference of azimuth in 5 minutes of time.

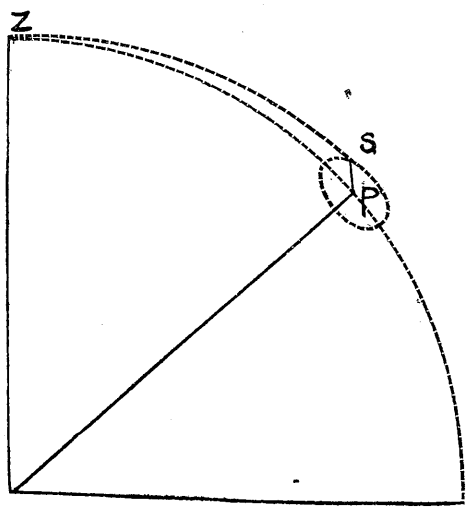
This is about 9 inches in a mile, or say 1 inch in 10 chains; which is I think near enough for general use.

I find that 15 minutes from the time of the elongation, there is a variation of azimuth of only 22″—say one-third of a minute.

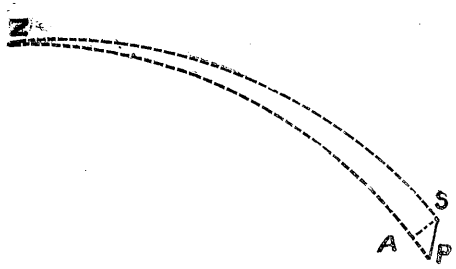
Here an error of 5 minutes in time would octiate the result only about one-tenth of a minute.

I think I have sufficiently proved that we may use calculated azimuths up to 1 hour from elongation, at least.

Before closing this matter of calculcation let me suggest another mode as a check on our work.



Let $P = 5$ hours or 75°, and let fall the perpendicular SA.—



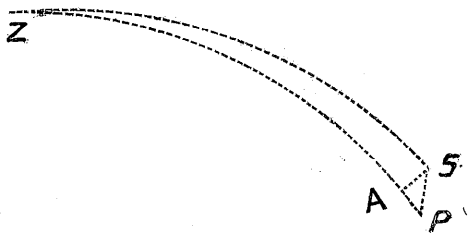
Find PA

cot $p\ s$ =	1° 15′ 28″ =	11.6584.78
: rad		10
:: cos p =	75°	9.412996
: tan $p\ a$ =	0° 19′ 32.4″ =	7.754518

Find AS

radius		= 10
: sine p =	75°	= 98.34144
:: sine $s\ p$ =	1° 15′ 28″ =	437
: sine $s\ a$ =	1° 12′ 53.6″ =	8.326381

To find ZA—



ZP = 46° 20′ 20″
$-PA$ = 0° 19′ 32″

$= ZA$ = 46° 0′ 47.6″

To find Z the Azimuth :—

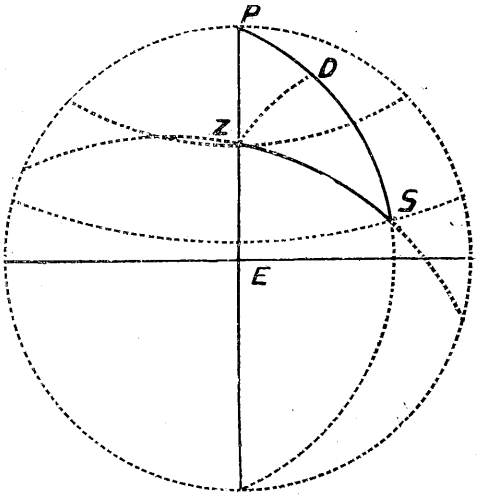
log tan	$a\ s$	1° 12′ 53.6″ =	8.326475
radius			10
sine	$z\ a$ = 46°	0′ 47.6″ =	9.857033
cotan	z =	1° 41′ 18″ =	11.530558

This is as easily done as the first method of computation, and is, as I said, a check on our work.

In observations of the sun for azimuth, we have as the result of knowing our latitude, and the declination (corrected for time of observation,) and the altitude by the observation—

the co latitude ZP
" co altitude ZS
" co declination PS

P being the pole, S the sun, Z the zenith of observer, E the equator, EZP being regarded as the meridian of the observer.



We have in fact the spherical triangle PSZ, in which all the sides are given, from which we find the angle PZS, which is the azimuth from the north.

Here again we may let fall the perpendicular ZD—find the segments SD, DP, with right angles at D—from which to find the angles PZD and DZS, as by Napier's rule of the circular parts.

But to return to the Transit:

Keep it clean, box it when not in use, oil frequently, but leave no surplus of oil. Have oil-silk cap with draw-string for it, to use on wet and dusty days; leave all clamps loose when carrying.

Caution assistants against setting the transit down roughly. I once had an assistant that let the tripod down on a rock heavily, after the manner of a drill. The rock was solid rock road-bed, and the man was tired. Now had I hit the tripod a smart blow on end with an axe, the man would have expected injurious results. It was not easy to convince him that he had subjected the instrument to the same sort of blow.

You take an engineer or surveyor a month out on the prairie where he can only travel 100 miles a week, and be 500 miles from anywhere, give him a watch telescope that he can easily attach to the lower plate of his transit, so that he can be sure of accuracy in his angles, no matter how shaky his tripod has become, do this and note his delight.

The writer once had to anchor a syrup keg firmly on posts, and with his transit secured on that, take an angle that had to be taken.

Instrument makers do not like watch telescopes, they refuse to put them on—pity they do not spend a summer on the prairie with a transit, it might be instructive to them. The last man I asked for a watch telescope, looked at me as Mr. Littimer looked at David Cop-

perfield; he looked as if he thought I was very young. He had no use for watch telescopes.

While making a pet of your transit, do not discard the compass.

You have to traverse the margin of a river or lake, amongst willows and water, where the general trend only counts—use the compass—tying on concession, section or lot lines as you can.

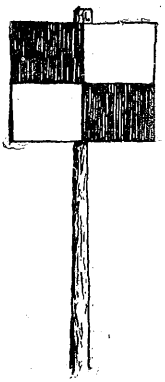
Exploring—traversing small lakes for area only—use the compass; it is rough and ready. Save your transit for its truer and better work.

Avoid perforated axis and lamp. A lantern held near the object-glass is better.

In the matter of taking angles, avoid the too common practice of taking a back sight, revolving the telescope forwards, and then taking the angle, as you incorporate thereby any error of adjustment.

Keep it in perfect adjustment, be satisfied with nothing less.

In producing lines forward, I will not repeat instructions that have been printed about setting two points on same hub, with the instrument reversed, and taking the middle point—I will merely ask you to read it again. But I will say that it is well if the ground will admit of it to set two points a head—one say at one-fourth mile and one at one-half mile, and after setting both again try if they are in line, then on going to the last point so produced, try the line backwards as far as you can see it. If you have long tangents, use targets at convenient points; you can make them by using 2 pieces of black silicia 6″ square, pinned on a piece of cotton 12″ square—the whole tacked to twigs and nailed to a picket to be left on the line.



Such targets can be carried in the pocket, cloth-pins and tacks.

When you traverse entirely around a piece of land, use latitude and departure not only for area, but to prove correctness of the work; or you may prove angles only by the rule that the sum of the interior angles of any rectilined figure is equal to twice as many right angles as the figure has sides, less four right angles.

Note the magnetic bearing of every line you sight on. It is a check and a very useful one on your reading and noting of the angles.

Keep full field notes on the spot, leave nothing to the memory or to be written down after getting back to the office. When the instrument is not in use, it is well to allow the needle to balance freely on the pin, but raise and secure it before carrying.

If in slipping or falling, you have to take a quick option between hurting yourself or damaging the instrument, I will not say you should hurt yourself, but you should save the instrument.

I have said that light instruments are best for general use. Aluminum on account of its lightness appears to be an excellent material for transits, though on account of its softness it has to be reinforced, and in some places replaced by brass.

I know of but one such instrument, it is owned by Mr. Abrey, of Toronto; it is a very fine instrument, but too expensive for general use.

A word as to impromptu repairs. It is never to be forgotten that repairs of many sorts are likely to be required when you are far from civilization; when to go home and return would mean to lose the season or be equivalent to ruin. Be prepared as best you can for such emergencies. Have with you more than one adjusting pin, large and small screw-driver, very small ones for the smallest screws, pliers, fine files, gum, spiders webs, copper wire, brass screws etc., oil, chamois, soft cotton, etc. Have with you a white silk handkerchief or white silk thread. In case you have no spiders line, dissect carefully with a fine needle a thread of the silk. It is often a good substitute. If gum fails, remove some from off the closing-flap of an envelope, place it on the ring, wash and dry the fingers, apply the line, stretching it straight, but taking care not to break it; hold thumbs on long enough to let it fasten, remove thumbs with a twisting motion to avoid detaching the line. Remember you can get the best of oil from the badger or coon or bear, any of which you may get while on your work. Have extra bubble-tubes along, in case you get a tube slightly cracked, cover the crack with white paint. If the liquid evaporates till the bubble gets too long to do its work, take a small needle, and by gentle tapping, drill a hole on top near each end of the tube. Make a cup of putty or white lead about each hole, pour in alcohol or water till the bubble is short enough, then put white lead on the holes, saturate a thread in white lead and wind a portion of the tube about each hole. A tube so repaired will last till you get ready to go to the repairer.

Use your transit yourself, never lend it. As a horse that is lent is spoiled for your driving, so is your transit after lending spoiled for your own use.

Have I said too much about the transit. Ask not the maker or the repairer, nor the mere tenderfoot theoretical engineer, no matter how high his attainments. Rather inquire of the hard-working surveyor, one who has worked for months together in the wilds, who had to meet emergencies as they occurred, one who has made his mistakes and paid dearly for them; he may tell you that if somebody had discoursed to him as fully as I have in this paper, he would have been saved many vexatious and costly mistakes.

DISCUSSION.

Mr. Abrey—Perhaps there are a few good points in the paper in reference to any person caught out some place where he is obliged to make the best of the circumstances, but otherwise I should not like to take the advice generally in reference to the transit. I don't like to criticise the instrument very much—perhaps I have done too much of that sort of thing heretofore, so I would like to hear some of the others. In reference to the aluminium transit, I might say that I think aluminium is good and will answer all purposes. The instrument is very light and it is strong, but it is very soft. The expense,

of course, at the present time is a mere nothing compared to what it was at the time I got mine ; at that time it was very expensive, but now the cost of it should be very little more than the ordinary brass instrument, so I think it is the coming metal for that purpose. I don't like to go into a general criticism of the paper without having seen it, but as to the method of taking observations, of course we don't all do that ; we take very much more refined observations than he speaks of there. Probably the paper was only intended for rough general work; I think we may assume that that was the case.

Mr. Niven—I don't profess to be an authority on instruments such as some of our surveyors, but I think there are many valuable hints in that paper to a man caught out in the woods, where he sometimes finds his instrument gets out of order. On the whole, I think that the intention of Mr. Carroll in sending his paper was good, and he has evidently given us a great amount of his experience.

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DRAINAGE DIFFICULTIES IN THE SOUTH-WESTERN MUNICIPALITIES OF ONTARIO.

By HENRY WINTER,
O.L.S., C.E., Thornyhurst.

1. The writer having learned from your Secretary, that the Association, at the next annual meeting thereof, contemplated taking into consideration the drainage question, with a view of suggesting amendments to the Drainage Laws at present in force in this province, has much pleasure in availing himself of the privilege of submitting for the consideration of the Association, a statement of a few of the difficulties that have come under his observation in connection with this question, during his residence in a part of the country in which extensive drains have been constructed and others are yet required; believing that the nature of the training required by members of the Association in order to enable them to become members of the profession, renders the Association competent to deal intelligently with this difficult question.

A number of the large drains in this section of the country were constructed by the Government, under the Act 36 Vic., C. 38, Sec. 6., and by township municipalities, under 36 Vic., C. 48, Sec. 451, which Acts required that the drains should be extended only far enough to obtain sufficient fall to carry the water beyond the limits of the locality to be drained, without any regard whatever to the effect produced upon lands in the vicinity of the terminus of the drain; and the drains constructed under the above Acts, almost invariably carried the water from the lands in one locality and flooded those in another, actually causing about as much damage to the latter as benefit to the former, and resulting in a great deal of trouble, litigation, and unnecessary expense.

2. The Amended Acts require drains to be extended to sufficient outlets; but as the party proceeding with the work is the judge of the sufficiency of the outlet, and those liable to sustain damage have no voice in the matter, the amendment has been productive of little benefit; and very few of the drains in this section of the country have been skilfully constructed, or extended to sufficient outlets, or so constructed as to benefit one locality without injuring another.

3. In proceeding with the construction of drains in which two or more municipalities are interested, the drainage laws now in force contain no adequate provision for restraining the municipality in

which the work is instituted from locating a drain and proceeding with the construction thereof in such a manner as will prejudicially affect the lands in another municipality.

4. In proceeding with the repairs of drains heretofore constructed, the same difficulties arise as in the original construction thereof; that is, the repairs, in many instances, are proceeded with in such a manner that the attempt to remedy one evil creates another.

It therefore appears to the writer, that while the drainage laws at present in force in this province, contain ample provision for equitably apportioning the costs of drainage works, and for the adjustment of claims for damages that may arise during the progress, or in consequence of the construction of such works, they contain no adequate provision for restraining those undertaking the same from proceeding with the construction thereof in such an improper and unskilful manner as to cause serious damage to those who have no right to interfere until the damages have been actually sustained, and then only by means of tedious and expensive litigation.

The difficulties that have arisen under the Amended Drainage Laws, have resulted in an attempt on the part of a number of township municipalities to divert the water from the natural water-courses or outlets, by means of cut-off drains on the limits between the localities benefited and those damaged by the construction of the original drains, under the Acts above quoted.

5. These cut-off drains have, almost invariably, failed to accomplish the purposes for which they were constructed, and have neither been successful as cut-off drains on the one hand, nor outlet drains on the other.

6. So that the drainage difficulties have passed through three stages, or rather have passed through two stages, and are now in the third stage of progress, viz:

1st. The drains constructed under the Acts above quoted, without sufficient outlets.

2nd. The attempt and failure to extend those drains to sufficient natural outlets.

3rd. The attempt, by the construction of cut-off drains, to avoid the expense of improving natural outlets or water-courses.

ADDITIONAL REMARKS BY MR. WINTER.

We have difficulties in the west with regard to drainage matters that I don't think you realize in this part of the country. I do not need to give any lengthy explanation to shew that difficulties do exist, because you can assume that from the fact that the Ontario Government found it necessary to appoint a commission to enquire into those difficulties.

(With diagram on blackboard.)

The law under the first drainage Acts required the drains to be constructed just far enough to drain the locality which was intended to be drained, without any regard to the effect these drains would have in another locality. They were constructed in accordance with the literal wording of the law. They were constructed without running

them to any natural or sufficient outlet. The natural consequence was that one part of the country was drained and the other part was flooded. Probably, when I stated that they did as much damage to one part as benefit to another, I hardly stated it correctly, because the area of the locality flooded did not equal the area drained, although the damages were so great as to render it perfectly useless for any purpose until the drains were farther extended. It would be naturally supposed by those who have not had any experience in the matter, or who have not personally observed the difficulties to be faced, that there would be no trouble in making arrangements to extend those drains to proper outlets, but in reality the municipalities met with a great deal of difficulty in this way; one section was drained and one section was flooded by the very drains that were drying the other section. And when the municipalities wished to extend those drains it had to be done by special rate upon the lands to be benefited. Well, the owners of the land up here say: We have our lands drained, we have all the relief we want; but these men down here were flooded by the water off those lands, and they urged the extending of those drains to sufficient outlets, which they had a perfect right to do. But the difficulty was, How were they going to compel the owners up here to assist? However, after a good deal of litigation and trouble, there was an attempt made to extend those drains to sufficient outlets, but the difficulty met with there was in apportioning the expense. They did extend a number of them until they came to natural water-courses that were sufficient to carry off the water before, but were entirely inadequate to carry off the water poured down by the drains above. The end of the story was that they were never extended far enough to reach sufficient outlets. The water-courses in that section of the country are quite different from what they are here. There they are only a few inches below the general surface of the country, so if water is poured in in greater quantities than the natural outflow it does a great deal of damage.

The muncipality, or the party constructing the drain, can locate and construct the drain just as they see fit, and any party who is liable to suffer in consequence of the construction of that drain has no voice to restrain them from constructing it in such a way as to produce that damage until the damage is actually sustained. That is the way I understand the Act, and that is the way I understand it to work.

It is the same in regard to a municipality. One municipality undertakes to construct a drain, and the adjoining municipality may be perfectly satisfied that the construction of that drain will damage lands within their boundaries, but they have no power to restrain the other municipality from proceeding with the drain. They have no power to act in the matter except to pay their share of the expense, until the damage is actually done, and then they must seek redress by litigation. This has caused a great deal of difficulty between municipalities there.

In order to avoid the difficulty in apportioning the expense of extending the drains a number of the municipalities, instead of going on to improve these natural water-courses, as should have been done,

undertook to make cut-off drains, to cut off the drains from the natural water-courses and run them east and west different from the natural flow of the water.

They have attempted to run drains east and west where there is no fall whatever except what they actually make artificially by the construction of the drain ; and in time of a freshet or flood the water pours down and fills up these drains and frequently gets over and damages the land down below. And besides that, in the construction of these drains, they throw up a dam that actually keeps the water back on the land that was dried by the original construction of the drains.

We are in the midst of the third difficulty now. The whole question now amounts to this : What amendment do the drainage laws require in order that that third difficulty can be got rid of? I am satisfied from my own experience that there is only one way of dealing with that third difficulty, because these cut-off drains, where there is no fall at all, will always be a failure ; they never can be constructed in such a way as to be a success. So that there will have to be some amendment to the drainage laws that will enable our municipalities to extend those drains and improve the natural outlets in order to make the drains successful, and specially rate all the parties that ought to pay for the work. I am anxious that this matter should be discussed and some opinion expressed as to what ought to be done, for this reason, that I have been in conversation with some of our legislators from the western part of the country and I am told that in taking up the question of the amendment of the drainage laws at the next session some members of this Association will be called before the Legislature and consulted in regard to this matter. The probability is that it will be some of those members who are not quite so far off as we are up in our end of the province, so that if I can manage to make the members here thoroughly conversant with our difficulties, then I have accomplished all that I have set out to accomplish. I speak particularly on this point, because in talking with our legislators in that section I have been informed that they have had some members of our Association up before them when dealing with this question, and that they did not seem to know anything more about the matter than the legislators themselves. Now, I have no doubt that there is a great deal of truth in that ; but I asked them whether they were able to explain to these professional men whom they called before them the cause of the failure in their drainage schemes and the nature of the difficulties under which we were laboring. Well, they said, they did not know that they were able to give those explanations or make it very clear. Now, there is the point ; they were never able to convey to you people here, whom they did call before them, the nature and cause of the difficulties, and therefore they could not get an intelligent opinion from you.

BIOGRAPHICAL SKETCH OF THOMAS RIDOUT,

Surveyor General of Upper Canada in 1810.

Thomas Ridout settled with his family in York, now Toronto, in 1797, and was therefore identified with the place from its earliest years. He was an Englishman by birth, from Sherbourne, Dorsetshire, where his forefathers had lived peaceful and uneventful lives. An elder brother of his had emigrated to Maryland in the old colonial days, had acquired a large property there, and also held an important position in the Government of that State. To this brother, Thomas, then twenty years of age, was sent in the year 1774. Of perils by land and perils by sea, during the stormy days of the Revolution, the young man had his full share, and a quaint account of his many adventures is still preserved in his own handwriting.

The obnoxious "tea duty" was still unrepealed, and in Boston and other colonial ports, scenes of riot and violence occurred whenever a tea cargo arrived. Mr. Ridout's first danger on landing arose from the "tea duty," and is told in his diary in the following language :—

"I took leave of my parents for the last time and embarked in the Downs, the 4th September, 1774, for New York, where I arrived after seven weeks' passage. In this vessel went also, as passenger, the merchant who had shipped, a few weeks before, some tea to Annapolis, in Maryland, against the express rules of the Convention, then sitting in Annapolis. His anxiety on his arrival was, I perceived, very great, but two days passing away, and hearing no news of his tea, he flattered himself that all things were well. The arrival of the post, however, undeceived him. He learned that his tea and vessel had been burnt by an enraged populace, and that in consequence of it his life was in danger. In an hour's time New York was in quest of him. He escaped, but I was in danger of feeling the effects of his indiscretion, to say no worse of it ; for having, since our arrival, been always in his company, and lodging together, I was by many looked on as an accomplice, and, as such, was forbidden entrance to the house where I lodged. A gentleman, Hugh Wallace, who was a member of the King's Council, and an acquaintance of my brother, hearing of my arrival, protected me, and by his attentions I was secured from insult."

His Maryland brother provided him with capital to engage in trade with the West Indies and France ; sugar, tobacco and wine were his merchandise, and Sindbad the Sailor's adventures were scarcely more exciting ; for on the high seas between the years 1775 and 1785, each trading vessel had to run the gauntlet of privateers bent on capturing prizes, and many a time an exciting chase helped to break the monotony of a sea voyage. In the year 1787, he set off from his brother's house in Annapolis, Maryland, on a journey to the western settlements of Kentucky. On the way, however, he and his party

were taken prisoners by a party of Shawanese Indians on the Ohio, and most of his companions were slain. His life was spared, either on account of an extraordinary liking with which he inspired one of his savage captors, who thenceforward became his protector, or because he was the bearer of letters of introduction from General Washington to General Scott, from Colonel Lee to General St. Clair, and to other well-known men in the western settlement. These letters, which were examined by the Indian interpreters, may have caused the Indians to expect a ransom.

It may not be inopportune here to give a few details regarding his capture by and experience amongst the Indians, during his captivity, as written by himself :—

"I set out myself on horseback and alone from Hancock, a town in Maryland, on the River Potomac, about five miles from the warm springs in Virginia, on the first day of January, 1788. The snow at this time was about three feet deep, and the weather clear and very cold. To Old-Town on the Potomac is about thirty-six miles, and from thence to the entrance of the Alleghany Mountains about thirty miles, the same road that General Braddock cut through the mountains to enable him to pass on to Fort Pitt, and near which latter place he met with so great a defeat. After dangerous travelling by a road which lay through dismal vales and led over frightful precipices, having crossed the Monongahela River on the ice, I arrived in Fort Pitt on the fourth day. There I lodged at a house of a Mr. Ormsby, where I found my friend Mr. Purviance, who had arrived a few days before. I received many civilities from the inhabitants of this place, who form a very agreeable society among themselves. Here I remained till the 12th of March following, when I embarked in one of the boats built at Red Stone for the conveyance of passengers, etc., to the falls of Ohio ; two days before the ice of the river broke up with a tremendous noise, and the waters rose in the space of three days twenty feet perpendicular. Mr. Purviance and myself, with one John Black—his servant—together with our horses and baggage, embarked at Fort Pitt. Many other boats were preparing to set out on the same route; although the ice was yet floating in large masses, we committed ourselves to the furious current. At a town called Wheeling, about 100 miles down the river, we were to take in the other passengers and their baggage. The second day, in the afternoon, we stopped at Wheeling, and immediately took on board those who were waiting for our arrival. We were in all about twenty persons and sixteen horses. The boat was exceedingly deeply laden. A boat, laden as we were, put off with us for Kentucky. The next day it rained throughout, and just at the close of the evening we reached the first settlement of Kentucky, called Limestone. Here we went on shore, and almost all of the party left us the next morning, taking their route by land to their respective homes. The other boat, whose company was also reduced to five or six persons, set out for the falls early that morning. We followed in the afternoon. The distance from the falls to this place was 170 miles. The weather was remarkably pleasant, and the moon being now full and the nights serene and

clear, added greatly to the agreeableness of our voyage. The spring, too, began to show itself, and the trees, especially those on the river, were already in leaf. Not often had I felt so much satisfaction or delight of heart as I did on the second morning, which was Good Friday.

"Our tranquillity, however, was soon to give place to the greatest anxiety and alarm, for on turning a point which opened to our view a considerable extent of the river, we saw, at some distance on the Indian or west side of it, a boat like our own amongst the bushes, which appeared to be the same which had left Limestone a few hours before we did. Whilst we were conjecturing the cause of such apparent delay, we perceived several people running about the shore, and a boat to put off full of people, whom we soon, to our surprise and terror, discovered to be Indians, almost naked, painted and ornamanted as when at war.

"They soon came up with us, and about twenty leaped into our boat like so many furies, yelling and screaming horribly, brandishing their knives and tomahawks, struggling with each other for a prisoner. A young man, painted black, first seized me by the arm, when another, an elderly man, who seemed to be a chief, took me from him ; this Indian was of a mild countenance, and he gave me immediately to understand I should not be hurt, holding me by the hand to show his property in me.

"As we neither did nor could attempt any resistance, none of us at this time suffered any injury in our persons, but they began immediately to strip us ; my companions were soon left almost without covering. Several attempts were made to strip me of my clothes, which were opposed by the Indian who held my hand. At length he acquiesced in the demands of one who began to be violent, and I lost my hat, coat and waistcoat. By this time we had gained the bank of the river, and were then led to a great fire, around which sat the war-chief, Nenessica, and about sixty Indians ; their whole party was ninety. To the chief I was presented by his brother, the man who had held my hand. After examining me some time with attention, and conversing with those around him, who eyed me with no less complacency, the chief gave mehis hand, and presented his pipe to me. He then made signs for me to sit down by him, which I did, when several chiefs introduced themselves and shook hands with me in particular a Pottawatamie, exceedingly well dressed after their manner, and who was one of the finest figures I had ever beheld ; he appeared to be about twenty-seven years of age, and to be upwards of six feet in height. No other prisoner received the civilities which I did. Whilst I was sitting by the chief I heard myself called by name, and looking around saw two young men tied and sitting at the foot of a tree; they had been taken early in the morning out of the boat which had sailed before us. They said a lock of hair had been taken from each of their heads, and that they had been tied several hours in the manner they now were, and apprehended they were doomed to be put to death, and as I seemed to be taken into favor, they begged I would intercede for them. Upon my requesting this favor the Indians released them.

" The prisoners were ordered to seat themselves in a row fronting to the west on the ground, having the woods immediately in their rear. On my left were two of my companions, next to me on my right was my friend Mr. Purviance, and next to him the other six : opposite to us, on the south-east, was the river. As soon as we were seated Mr. Purviance began to discourse with me of our present situation, and said that as hitherto we had not received any personal ill-treatment, he hoped we were not in any great danger; it was evident, however, that some change was to take place in our situations ; we remained not long in suspense. A sturdy thick-set Indian, painted black, of a very fierce countenance, with a drawn hanger in his right hand, came towards us, and addressing himself to the outermost man on the left hand, who happened to be the second from me, with a flourish of his weapon made him get up, giving him a kick drove him into the woods to the left of us.

" We all remained silent, everyone judging that his last moment of life approached. In a few minutes this savage returned and drove before him the man who had been sitting next to me on the left. Mr. Purviance then said to me, ' I believe, my friend, that we draw near our end.' These were my own sentiments also. I waited the return of the Indian for myself as his next victim ; words cannot express what my feelings then were, and when I saw him approach. He came and stood before me, and, after a moment's pause, beckoned me to rise and follow him, and turned round into the woods which were behind us. I saw my friend no more. I understood some time after that he was not killed on the spot, but was taken into the interior of the country and there beat to death.

" I followed the Indian step by step, expecting every moment that he would turn upon me and put me to death. After walking 300 or 400 yards, I perceived the smoke of a fire, and presently several Indians about it ; my alarm was not diminished, but as we came nearer, a white man, about twenty-two years of age, who had been taken prisoner when a lad and had been adopted, and was now a chief among the Shawanese, stood up and said to me in English, ' Don't be afraid, sir, you are in no danger, but are given to a good man, a chief of the Shawanese, who will not hurt you ; but after some time, will take you to Detroit, where you may ransom yourself. Come and take your breakfast.' What a transition ! passing from immediate danger and apparent certain death to a renovated life ! I saw no more of my savage guide, but joined the party seated around the fire taking their breakfast, of which I partook, which consisted of chocolate and some flour cakes baked in the ashes, being part of the plunder they had taken from us. Whilst I breakfasted, an Indian, painted red and almost naked, had seated himself opposite to me and eyed me with fierceness of countenance inexpressible ; his eyes glowed like fire, and the arteries of his neck were swollen and nearly bursting with rage ; he said something to me in a tone of voice corresponding with his appearance, which was interpreted to me by the white man in the following words : ' He says that you are his prisoner, and that it is more easy for him to put you to death than to tell you so.' I an-

swered calmly (for the extreme danger of the situation from which I had just escaped had prepared me for every event) that I acknowledged myself to be in his power, and that he could do with me as he pleased. This reply being made known to him his rage seemed to subside, and he said no more to me.

"The white man now informed me that in an hour or two we should begin our march, together with the other Indians and prisoners, to the village, which was about five days' journey from that place.

" About noon we began our journey into the wood, in company with about ninety Indians. The weather was dark, gloomy and cold. We passed over a rapid river on the body of a tree, which had fallen over it at a considerable height from the water. In passing my head became giddy, and I apprehended I should fall, but recollecting the yet greater dangers that beset me, I recovered a firmer step. About five in the aftornoon, we came to a valley through which ran a rivulet, the land rising gently to the westward, full of large timber, but without underwood. At this place, I understood, the Indians intended to pass the night in feasting and drinking a part of the spirituous liquors they had taken from us. As the Indians intended to regale themselves and drink to intoxication, a party of Cherokees, to the number of twelve, who had deserted from their own nation to reside amongst the Shawanese, were appointed to take charge of the prisoners during the feast, of which they, the Cherokees, were not to partake, but were to keep themselves sober. We were, therefore, committed to these Indians, who withdrew to a small eminence, a few hundred yards distance from the main body.

" When they had kindled a fire they threw a few half-worn undressed deer-skins on the ground, for us to lie upon, on the west side of the fire, and then began to secure us from making an escape. They began with me, by passing a cord round the body, then between my legs, and under that part of the cord that surrounded the body, and forcing a stake six or seven feet into the ground, they fastened the cord to it, and on the top of the stake they fixed a small bell, so that I could not stir without its ringing. Lest I should make use of my hands, they put my fists into a small leather bag which they had tied round the wrist ; then they drew the string round the wrists so tight that I was instantly in an agony of pain. It was to no purpose to complain. I could not prevail upon them to slacken it, but ordering me to lie down, they threw over me a small, old blanket. My place was the outermost of the row, next to the drunken Indians, exposed to the weather, which was very cold and tempestuous. There fell much sleet, but the agony I suffered in my wrists, hands and arms made me insensible almost to everything else.

" About midnight, I was roused by the screams and whoops of an Indian from the other encampment, who seemed coming towards us. His yells and shouts became more and more loud and terrific ; and turning my eyes towards the valley, I perceived, by the glimmering lights of the fires and of the moon, an Indian staggering with drunkenness, brandishing a knife in one hand and a tomahawk in the other, making all the haste he could towards us, and shrieking most horri-

bly as he approached where I lay. I have no doubt but that he was bent upon murdering the prisoners, and that I should be his first victim. He had already come within one step of me, and his hand was lifted to give me the fatal blow, when one of Cherokees sprang from the ground and caught him round the waist, and after some struggling mastered him and obliged him to retreat, which he did muttering.

"As my sufferings were extreme from the strictures round my wrists, I entreated the Cherokee to loosen them, but giving me a look of savage fierceness, he laid himself down again unconcerned at the tortures I endured. In the space of about an hour the drunken Indian made a second attempt to execute his purpose; but as he approached yelling and shouting, two Cherokees laid hold of him as soon as he came near the fire, and tying him neck and heels together, left him wallowing in the snow for the remainder of the night. At length the long-wished-for morning came, and my hands were set at liberty; but they were so swollen and black with the stoppage of circulation, that some hours elapsed before I could bend my fingers or use them. Soon after the sun had risen, the Indian chief to whom I had been given made his appearance. He seemed about fifty years of age, was a tall, slender man, and of a very pleasing and animated countenance. He, smiling, took me by the hand, called me 'Nacanah,' or his friend, and seeing my attention fixed on a wound, over one of his eyes, he, pointing to it, said, 'Ah! matowesa whiskey,' meaning he had got drunk with wicked whiskey or spirits, and that the wound was the bad consequence of it.

"When the evening of our day's journey drew nigh, I dreaded lest I should be treated as I had been the preceding night; but when we lay down, which was before a good fire, my friend covered me with a blanket, and only fastened me round the body with a rope, which he drew under himself and lay upon. He never afterwards used this precaution, leaving me at perfect liberty, and frequently during the nights that were frosty and cold, I found his hand over me to examine whether or not I was covered. I think it was towards the third evening of our march that we came to the banks of the great Miami, a very rocky and rapid river, which empies itself into the Ohio, and whose waters were very high. My friend, another Indian, and myself begun to make a small raft to pass over this rapid stream, which was about 300 feet wide. I went awkwardly about my work. The Indian smiled, and allowed me to desist from working. They soon prepared a small raft, and we all three placed ourselves upon it, and with the help of a pole by way of paddle, we soon gained the opposite shore, having been carried a short distance down the stream. Soon after we encamped on the left bank of a small river, having a steep hill covered with woods on the left side. A good fire was kindled, and we supped heartily on some roasted venison, part of our day's sport—for these woods were full of the finest deer, buffalo and wild turkeys.

"When the next morning came, I found myself so extremely weak and bruised, that upon making it known to my friend, he took my

burden upon his shoulders, in addition to his own, without making the least reproach. I was, however, so much exhausted, that I was but little relieved by this kind action, yet I advanced as well as I could till about ten o'clock.

" My friend was then at some distance before us, not out of sight, and the great war chief immediately following me. I found my strength entirely gone, and turning round to the chief, made a sign that I wished to sit down. He pushed me on very angrily. I found I could not proceed, and turning again, made another attempt to obtain his consent to sitting down. With great anger he again pushed me on, and made a stroke at me with his tomahawk, which I avoided by exerting all my strength, and springing forward.

" At this critical moment I recollected that when they took my coat from me, I secured my pocket-handkerchief and half a guinea, which I put in a knot in one corner of it, and tied it around my waist, where it now was. With some difficulty and much agitation I loosened the knot, took the half guinea, and turning round, held it up between my finger and thumb. The savage smiled and beckoned me to seat myself on the ground, on which I fell and immediately fainted.

"When I recovered, I found the great war-chief and my friend both sitting by me. They spoke kindly to me, and gave me to understand by pointing to where the sun would be at two o'clock, that I should then arrive at the village. Immediately on entering the village we were conducted to the council-house, at the door whereof we were obliged to sing and shake the rattles for half-an-hour, and then entered the house (without suffering any ill-treatment), in the centre of which was a fire, and over it hung a kettle with venison and Indian corn boiling.

"On arriving at his hut, my master presented me to his wife. She appeared to be forty years old and rather corpulent. Her looks were extemely savage, and she eyed me with contempt ; the chief, on the contrary, was of the most mild and intelligent countenance. I shall in this place declare that during the whole of the time I was with the Indians, I never once witnessed an indecent or improper action amongst any of the Indians whether young or old.

" At the end of three weeks from my capture, the whole village having collected their horses and peltry, began their journey towards the Wabash and Detroit. I travelled, at my ease, on foot, carrying an unbent bow in my hand. We seldom travelled more than fifteen or twenty miles a day, setting out after breakfast, about an hour after sunrise, and encamping about the same time before sunset, and if we came to good hunting ground, reposed ourselves for the day.

" My dress consisted of a calico shirt, made by an Indian woman, without a collar, which reached below the waist ; a blanket over my shoulders, tied around the waist with the bark of a tree ; a pair of good buckskin leggings, which covered almost the thighs, given me by the great war-chief ; a pair of moccasins, in which I had pieces of blue cloth to make my step easier ; a breech-cloth between my legs ; a girdle around my waist ; and a small round hat, in which the Indian placed a black ostrich feather by way of ornament (the smaller the hat the more fashionable.)

"We at length drew nigh to a village, where I was informed a great council was to be held concerning me, and for the examination of my papers and letters. We encamped within five or six miles of it, and the next day my friend the chief, accompanied by half-a-dozen more Indians and myself, all mounted on horseback, rode to the village where the council was to be held. On our way thither we put up a flock of wild turkeys. Having no fire-arms, we hunted them down, and having caught a very large one, weighing about twenty-five pounds, it was tied, alive, to my back as I rode, and thus we galloped to the village.

"Upon our arrival, several chiefs, to the number of fifty or upwards, opened the council. My papers were read by an interpreter, a white man, who several years before had been taken prisoner. After much sober discussion, in which it was declared that I was an Englishman and not an American, they broke up, after allowing my master to take me to Detroit, and there to receive my ransom.

"We continued to pursue our route by easy journeys. I remarked that our numbers daily diminished, but was told the reason was that provisions began to be scarce, the woods not affording the usual quantities of wild animals. The small party I was with bore a share of this scarcity. We had killed two wild cats, and though not esteemed by the Indians as good food, they were very acceptable at this time. At length our family, consisting of the chief, his wife, myself and negro, travelled alone. In the usual manner we encamped early in the evening, and set forth again in the morning after breakfast.

"One delightful morning, as the sun rose, my friend walked a few paces from his tent (for occasionally he made use of a Russia sheeting one), and seemed to address himself to that glorious orb in a manner, style of words and accent that I had not witnessed before. His manner was dignified and impressive.

"Having arrived within half-a-mile from the village, situated on the White river, which empies itself, six or seven miles down, into the Wabash, he directed us to stop, and went himself to the village to prepare for me, as I afterwards learnt, a good reception. At the place we stopped there were two poles, fifteen or twenty feet high, standing upright, the bark stripped off, the one painted red and the other black. They were called war-poles, and indicated that prisoners had been brought to that village.

"About sunset of the same day we arrived I heard the Indian war-whoop on the other side of the river, at the village through which we had passed. Immediately my friend, his wife, and the negro, left the hut and went to the opposite side of the river, and I was soon left alone in the camp. During that night I did not see anyone moving, but about two hours after sunrise the next morning I perceived several Indians assembled at the door of a house near the water's side, opposite to where I was, and soon after I saw a young man run out of the house naked, his ears having been cut off, and his face painted black; the Indians following with the war whoop and sang, driving him before them, through a valley. They then ascended a hill, a little lower down the stream, distant about four or five hundred yards. As soon as they

gained the summit of the hill, I heard the young man scream, and the Indians give a shout. I perceived a smoke, and judged that the fire was preparing. After a short interval I heard the poor victim utter a dreadful shriek. They were repeated without intermission for a few minutes. The Indians shouted during the interval of tortures. I heard the groans of the poor sufferer, and then his shrieks recommenced under new tortures. These tortures, with remissions, continued about three hours, when his cries ceased. The Indians then returned. To express my feelings during this scene would be impossible, and I began to think that my own fate might be similar.

"After three or four days my friend collected his horses and peltry, and with his wife and negro, set off with me for Detroit, by way of the Miami villages, where I understood was a trading port; several traders, English and French, living there. I was on horseback; we all soon entered the woods. The mosquitoes were so troublesome that we got no rest night or day, notwithstanding the smokes we made to drive them away. After, I think, four days' journey, we arrived at a branch of the Miami river, much swollen with rain. We crossed it with difficulty and encamped on a plain, where I saw several Indian huts scattered. I slept soundly that night, in the pleasing expectation that I was drawing near my deliverance.

"During this time I was informed that another council would be held upon me, in which it was to be determined whether I should be permitted to be taken to Detroit and ransomed. The day accordingly came in which the council was to be held. The Indians having assembled, I was also conducted thither. The council was under the authority of a Captain John, a Shawanese chief, before whom my case was to be decided. One Simon Girty, an Indian interpreter, now living on the Detroit river, was present. I perceived my master and friend was much dejected, and did not speak to me. Several women endeavored to cheer me by saying I should not be hurt. The council was at length opened, and the Indian who had burned the young man contended for me. He insisted that I was a spy and that I knew the whole country. Much was said, and my papers and letters were again brought forward, read, and explained. At length, after a cool and deliberate hearing, the chief pronounced my discharge, and told my friend that he might set out with me as soon as he chose. His eyes sparkled with joy when relating the result of the deliberations of the council. He would have deferred our departure till the morrow, for the Indian traders who lived on the other side of the river, which also formed a junction here with the other two, had long expected me, but dared not intercede for me whilst my life was at issue. After urging with all my power to set off immediately, my friend got a canoe and took me over to the traders' village, called Fort Miami; and both the English and French gentlemen were waiting, with open arms, to receive me, as they had been acquainted with the chief's decision in my favour. The names of the English gentlemen of this place were: Sharpe, Martin, Parkes and Ironside. Mr. Sharpe conducted me to his house, gave me a shirt, and Canadian frock and hat, trousers and shoes. I remained here three days. It was here I found my Bible,

several books, a German flute, and some few other articles; but a tortoise-shell box inlaid with pearl, in which was my mother's wedding ring, and a gold coin of the Emperor Nero (weight about four pennyweights, and in great perfection), given me by a lady of Lisborne, in France, were lost to me forever. The coin had been found with many others at Saint Onge, in France. A French gentleman of the Miami lent my friend, on my account, his large canoe to carry us, with the peltry, to Detroit, distance about 250 miles by water.

"We embarked early on a Sunday morning, took in the peltry, his wife, myself and negro, and descended the Miami river, taking also two Indian women, whom we were to put on shore at an Indian village two miles down the river. We did so, and proceeded. After descending about fifteen miles, we stopped at a white man's house, who was an interpreter among the Indians. I naturally spoke of my deliverance in terms of joy, but I thought he seemed not much to encourage my hopes, for he knew the dangers which yet surrounded me, whilst I was happily ignorant of them. On our way to the mouth of the Miami river, which empties itself into Lake Erie, we passed several parties of Indians returning from Detroit. They were generally drunk, and I was in continual terror until we separated. At length we got to the falls, where there was a house belonging to a Captain McKee, Deputy Superintendent of Indian affairs, and a Mr. Elliott. They were not there, but we received kind treatment and victuals from the Indians of their respective families. Soon after leaving these houses we reached the lake, and after coasting the west end of it for about thirty-eight miles, we entered the Detroit river. A few miles up this river there was another house of Mr. Elliott's. He did not happen to be at home, but we were kindly treated. The next day we descended the River Detroit, and passed the night upon an island, where there were several Indian families.

"Early the next morning, being Sunday, we arrived at Detroit. My friend introduced and presented me to Captain McKee, who received me with civility, and with whom I breakfasted. He then accompanied me to the commanding officer, Captain Wiseman, of the 53rd regiment, and introduced me to him. By this gentleman, and by all the regiment, I was received as a brother.

"N.B.—In the year 1799 my friend Kakinathucca and three more Shawanese chiefs came to pay me a visit at my house in York. They saw me and my family with pleasure, and my wife and children contemplated, with great satisfaction, the great and good qualities of this worthy Indian. He did not return home without bearing a testimony of my gratitude. He died about five years ago, under the hospitable care of Matthew Elliott, Esq., Superintendent of Indian affairs at Amherstburg, at the entrance of the Detroit river."

After a captivity of four months, he was brought to Detroit, then an English garrison. Here the officers of the 53rd regiment received him as a brother, clothed him, filled his purse, and as the regiment was about leaving for Montreal, they invited him to accompany them thither. On the way they stopped at Fort Erie and Niagara, and at the latter place were hospitably entertained by Colonel Hunter, of the

60th, who commanded a battalion there. This officer was afterwards Lieutenant-Governor of Upper Canada and Commander-in-chief of the forces in both Canadas.

They arrived in Montreal about the middle of July, 1788, and Mr. Ridout was kindly received, as his old journal relates, by Sir John Johnson, Captain Grant, and Lord Dorchester, then Governor-General, residing at Quebec. On the 26th May, 1789, he married Mary Campbell, daughter of Alexander Campbell, a U. E. Loyalist, settled at the Bay of Quinte. Soon after he received an appointment in the Commissariat Department and removed to Newark, now Niagara.

He was next employed in the office of D. W. Smith, Surveyor-General in 1793, and from 1799 to 1807 he was employed jointly with others as Acting Surveyor-General. Afterwards, in 1810, he was finally appointed Surveyor-General of Upper Canada. At this time he resided in York, which was then a rising little town, and is now the important City of Toronto. Here he remained until his death in 1829.

He was a kind and exemplary father of a numerous family, who loved and revered him and mourned his departure, the faithful servant of Government for nearly forty years, he endeared himself to the inhabitants of Upper Canada, and so won their affections by his unremitting attentions to their interests and unwearied courtesy to themselves, that they justly considered him an ornament to the colony. To a highly cultivated mind he added the most polished manners, and, what was far better, the meekness and the humility of a Christian looking forward in faith to a blessed immortality.

OBITUARY.

We have this year to record the decease of one who was a prominent member of the Association of Provincial Land Surveyors of Ontario from the date of its inception until physical infirmity demanded his retirement from active life. Mr. Isaac Lucius Bowman died at Berlin on the 3rd of February last, after a prolonged illness.

He was born on the 23rd of May, 1830, near Freeport, at the Grand River, and was the second son of the late John B. Bowman, who came to Canada from Lancaster County, Pennsylvania, in 1816. At the age of 20 he entered upon a course at Rockwood Academy, near Guelph, where he spent two years, at the end of which time he went to Oberlin College, Ohio, and devoted four years to the study of mathematics and classics. Returning to Canada he became interested in school work, and had charge of several schools in the county of Waterloo. In 1861 he was appointed School Inspector of that county, which position he filled until about 1870. From 1867 to 1872 he was principal of the Freeport Academy.

In 1873 Mr. Bowman began the study of Land Surveying, receiving his commission as Provincial Land Surveyor in 1876, and the remainder of his career was devoted to this profession, he having been frequently in the employ of the Ontario Government. He also enjoyed other trusts of a public nature, his being a familiar face during 26 years at the sessions of the Waterloo Township Council.

A member of the United Brethern Church, he also held the position of local minister in the conference in which he resided.

Mr. Bowman left a widow and four sons. Of the latter, three, like himself, are Surveyors and Civil Engineers, and are engaged as follows: L. M. Bowman, Sanitary Engineer in the Health Department, Toronto; A. M. Bowman, Assistant Engineer at the Government improvements on the Ohio River, at Pittsburgh, and F. M. Bowman, chief Draughtsman for Messrs. Riter and Conley, at Pittsburgh, Pa. His fourth son, H. M. Bowman, is an under-graduate in Arts, in attendance at Toronto University.

OBITUARY.

Since the date of our meeting this year, one of the patriarchs of our profession has passed away. Mr. Thomas Fraser Gibbs, of Adolphustown, died on the 15th of April, in his 82nd year.

He was born in Edinburgh, Scotland, on the 6th Dec., 1811, and came with his parents to New York when about 11 years of age. Here he received a liberal education, and having special talents for mathematics and mechanical drawing, particular attention was paid to these branches, leading to his adoption of Land Surveying as his profession. Before, however, he was legally qualified to practise, Mr. Gibbs removed in 1840 to Kingston, U.C, and having in the following year passed his examination before the Surveyor General, he received his commission as a Provincial Land Surveyor from the then Governor-General, Baron Sydenham, bearing date 31st May, 1841. Since that date Mr. Gibbs has been known as one of the foremost Land Surveyors in the Province, and in 1864 he was honored with an appointment as member of the Board of Examiners for Provincial Land Surveyors, at the hands of Rt. Hon. Viscount Monk, which position he continued to hold during his lifetime. A year or two previously he had purchased and removed to the property bordering on the Bay of Quinte, which has been his home ever since.

Mr. Gibbs was a registered member of the Association of Ontario Land Surveyors, and about two months before his death addressed a letter to the Association, expressing his hearty approval of the aims and objects of that body, and regretting the fact that he was unable through physical disability to take part in the annual meeting. Arrangements were being made whereby his name would have appeared in the honorary list of those who were granted exemption under the Ontario Land Surveyors' Act, but these were terminated by the news of his death.

He was of a retiring disposition, yet genial and warm-hearted with those who had the pleasure of his intimate acquaintance. Among his earliest friends and patrons were the late Hon. John Macauley, the Venerable Archdeacon Stewart, Thomas Kirkpatrick, Sir John Macdonald, Sir Alex. Campbell and Sir Henry Smith, all of whom remained his friends through life.

In his religious views he was brought up a Presbyterian, but there being no church of that denomination convenient to his home, he gave of his means to the support of the Church of England, of which Church his family were members.

A widow, one son and two daughters are left to mourn his loss.

APPENDIX.

BY-LAWS.

Definitions in the following By-laws as defined by the "Ontario Land Surveyors' Act."

Definitions

The word	"Association"	means	The Association of Ontario Land Surveyors.
"	"Council"	"	The Council of Management.
"	"Board"	"	The Board of Examiners.
"	"Chairman"	"	The Chairman of Council.
"	"Secretary"	"	Secretary-Treasurer.

PREAMBLE.

Authority for By-laws.

The following By-laws are enacted under the powers granted by the "Ontario Land Surveyors' Act"—(Cap. 34, Ont. Stat. 1892.)

THE ASSOCIATION.

Annual Meeting of Association.

1. The Annual General Meeting of the Association shall be held (as provided by said Act) in the City of Toronto, on the fourth Tuesday in February in each year, at such place as may be selected by the Council.

Special Meetings.

2. Special meetings of the Association may be called by the President, or shall be called by him at the written request of ten or more members.

Notice to be given by Secretary.

3. Due notice of such meetings shall be given by the Secretary to each member of the Association by circular letter posted to his registered address at least 10 days before any such meeting.

Constitution of quorum.

4. Fifteen members shall form a quorum at any meeting of the Association for the transaction of business.

THE COUNCIL.

Duties of Council.

5. In addition to the duties assigned to the Council by said Act, it shall have the direction and management of all the affairs of the Association, and shall appoint the several Standing Committees and name the Chairman of each.

Regular meetings of Council.

6. 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 said Act.

Special meetings of Council.

7. Special meetings may be called by the President or Chairman.

Notice to be given by Secretary.

8. Due notice of every such meeting shall be given by the Secretary (as above provided) to each member of the Council.

Constitution of quorum.

9. At any meeting of the Council when business relating to the property or to the financial affairs of the Association is transacted, five members shall form a quorum; for the transaction of any other business three shall form a quorum.

Annual Report of Council.

10. The Council shall make a report of the affairs of the Association at the Annual Meeting, which report shall include the report of the Secretary and also of the Board of Examiners.

Board of Examiners to report to Council.

11. The Board of Examiners shall make a report to the Council at the meeting held in November in each year.

STANDING COMMITTEES.

Standing Committees.

12. The Standing Committees shall be as follows: each shall be composed of not less than 5 and not more than 9 members.

Committee on Land Surveying.
" Drainage.
" Engineering.
" Topographical Surveying.
" Entertainment.
" Publication.

Duty of Standing Committees.

13. Each Standing Committee appointed by the Council shall endeavour to advance the interests of the Association in that branch allotted to it.

Provision for meetings.

Meetings of any Standing Committee shall be held at the call of the Chairman, three members to form a quorum.

Standing Committees to report to Association.

Each Standing Committee shall present to the Association or to the Council an Annual Report on the work done by said Committee.

ORDER OF BUSINESS AT MEETINGS OF ASSOCIATION.

Order of business.

14. The following shall be the order of business at the meetings of the Association:—

1. Reading of minutes of previous meeting.
2. Reading of correspondence and accounts.

3. Reports and papers.
4. Unfinished business.
5. New business.
6. Nomination of officers (if at the General Annual Meeting).
7. Adjournment.

RULES.

Procedure. 15. All motions must be in writing, and shall contain the names of the mover and seconder, and must be read from the Chair before being discussed.

Reports of Committees. 16. Reports of Committees must be in writing and signed by the Chairman thereof.

Rules of speech. 17. No member shall speak on any subject more than once, except the introducer of the subject, who shall be entitled to reply; every member, however, shall have the right to explain himself subject to the discretion of the Chair.

Discussion closed. 18. When a motion has been finally put to the meeting by the Chairman, all discussion thereon shall be closed.

Majority vote may re-open any motion. 19. Any motion may be re-opened by a majority vote of those present.

Appointment of Scrutineers. 20. The Chairman of the meeting shall appoint two scrutineers when a ballot is taken, as defined in sec. 22 hereof.

Speakers to address the Chair. 21. Every member while speaking shall address the Chair.

Voting at General or Annual Meetings. 22. All voting at any General or Annual Meeting shall be by standing vote, unless a ballot be demanded by at least two members.

Parliamentary rules to govern. 23. Parliamentary rules to govern in all cases not provided for in preceding sections.

DUTIES OF OFFICERS.

Presiding officer at Association meetings. 24. The President, or in his absence the Vice-President, shall preside at all meetings of the Association; in the absence of both, the meeting shall appoint a Chairman.

Presiding officer at Council meetings. 25. The Chairman shall preside at all meetings of the Council; in his absence the meeting shall appoint a presiding officer.

Duties of Secretary-Treasurer. 26. In addition to the duties assigned to him by said Act, the Secretary-Treasurer shall keep an accurate record of the proceedings at all meetings of both the Association and the Council in separate books, conduct all correspondence, announce all meetings, receive all fees and subscriptions and other moneys.

He shall, under the direction of the Council, deposit all moneys in such bank or other financial institution as it may select. He shall pay no bills unless sanctioned by the Council and signed by the Chairman. All payments of $10.00 and upwards to be made by cheque, signed by the Secretary and countersigned by the President, or in his absence by the Chairman of the Council. He shall submit an account of all moneys received and paid by him under the said Act and these By-laws to the Council at the Annual General Meeting of the Association, and shall perform such other duties as may from time to time be assigned by the Council.

27. The Secretary-Treasurer shall give bonds in the usual form to the amount of $1,000, such bond to be in the custody of the President, and deposited in the bank where the funds of the Association are kept.

EXAMINATIONS.

The Sec-Treas. to give bonds. Where they shall be deposited.

28. Candidates for admission to apprenticeship are to be examined as follows, in the subjects prescribed in Rev. Stat. Ont., C. 152, S. 7.; and no candidate will be admitted unless he obtains at least the minimum marks set opposite each subject, and at least a total of 350.

Examination of candidates for apprenticeship

Subject.	Max. Marks.	Min. Marks.
1. Penmanship	50	30
2. Orthography	50	40
3. Arithmetic (Fractions, Decimals, Square Root)	100	40
4. Logarithms, Algebra (including Equations 1st degree)	100	30
5. Euclid, (Books 1, 2, 3 and 4.)	100	40
6. Plane Trigonometry and Rules for Spherical	100	30
7. Mensuration of Superficies	50	25
8. Linear Drawing (use of ruling pen and construction of scales)	50	25

29. Candidates for admission to practice are to be examined as follows, in the subjects prescribed in Rev. Stat. Ont., C. 152, S. 10.; and no candidate will be admitted unless he obtains at least the minimum marks set opposite each subject, and at least a total of 900.

Examination of candidates for admission to practice.

Subject.	Max. Marks.	Min. Marks.
1. Geometry, including the first 6 Books of Euclid, excepting the last thirteen propositions of the 5th Book	100	50
2. Algebra (Simple and Quadratic Equations, Progressions and Exponents)	100	40
3. Trigonometry (Plane and Spherical)	100	50
4. Mensuration of Superficies and laying out and dividing land	150	75
5. Descriptions by metes and bounds	100	75

SUBJECT.	Max. Marks.	Min. Marks.
6. Use and adjustment by instruments for surveying and levelling	100	70
7. Laying out of Curves	50	20
8. Practical Astronomy, including finding of Time, Latitude, Longitude, Azimuth Var: of compass and drawing meridian lines	150	
9. Survey Act	150	
10. Mining Act, Registry Act, Municipal Act, Ditches and Water-courses Act (so far as they relate to surveys and drainage)	100	35
11. Levelling	50	40
12. Principles of Evidence and drawing up affidavits.	80	30
13. Taking of field notes and preparing of plans	100	60
14. Geology and Mineralogy, Rudiments of	75	25

30. If a candidate for admission to practice obtains at least the total of 900 marks, but fails to obtain the minimum marks in at most two of the subjects, such candidate may at a subsequent examination be examined only in the two subjects in which he has failed.

The Council to regulate examinations.

31. The Council may make from time to time such regulations as it considers necessary for the proper carrying out of these examinations.

Complaints against members or any unlicensed practitioner to be filed with Secretary.

32. Any complaint against a member of the Association or against any unlicensed practitioner shall be filed with the Secretary, who shall immediately forward the same to the Chairman.

The Chairman may call a special meeting.

If the matter complained is of a serious and pressing nature, the Chairman may at his discretion call a special meeting of the Council for the purpose of hearing said complaint; if not so acted on, the complaint shall be heard at the next regular meeting of the Council.

Procedure where the delinquent is a member.

In the case of a member of the Association, the Council shall take action as defined in the said Act.

Procedure where the delinquent is an unlicensed practitioner.

In the case of any unlicensed practitioner, the Council, if satisfied as to the justice of the charge, shall name a prosecutor and direct him as to his action in the conduct of the case, and shall allot such portion of the penalties, or authorize the payment of such fees as it may deem expedient.

The Council has power to pass By-laws.

33. The Council shall have power to pass any By-law which it deems expedient for the good of the Association, and such By-law shall have the same force until the next Annual Meeting, as if it had been passed by the Association. Such By-law must be reported to the Association at the next Annual Meeting, and action taken thereon. All members of the Association shall be notified by the Secretary of the passing of such By-law by the Council.

RULES AND REGULATIONS

Adopted by the Board of Examiners and ratified by the Council under the authority of By-law 31.

1. The examination sittings shall commence each day at 9.30 a.m., continue until 12.30 p.m., recommence at 1.30 p.m., and continue until 4.30 p.m., day by day until completed.

2. All the papers will be collected at the close of each sitting, and candidates will not be permitted to write on any question on such papers at any future sitting.

3. Any candidate obtaining assistance, during the hours of examination, by copying the papers of another candidate, or otherwise, will at once be dismissed, and any candidate who shall permit such copying or give such assistance, will be considered equally guilty and treated similarly.

4. Each sheet of paper shall have at the top the subject and number of question and shall be signed and folded by the candidate, and endorsed with his name and the subject and number, and not more than one answer shall be written on the same sheet of paper.

5. The candidate shall not write on one line more than one step in Geometrical or Algebraic work. A single step may cover several lines, but two or more should in no instance be put on the same line. They should be written thus:

Because A = B
And B = C
Therefore A = C

6. No other person than the examiners, Secretary and the candidates shall be admitted into the examination room.

7. No books or diagrams of any kind, except those allowed by the Board, shall be brought into the examination room.

8. Candidates are to present themselves punctually at the hours appointed for the commencement of the examinations, and no candidates will be allowed to enter the examination room later than fifteen

minutes after that time, nor will any candidate be permitted to leave the room during a sitting, but so soon as he has finished his papers he may hand them to the examiner, after which he will not be allowed to re-enter until the next sitting.

9. A candidate rejected by the Board shall not be entitled to a new examination before the next regular meeting of the Board.

10. Each candidate for " Admission to Practice " shall bring with him an instrument suitable for taking the necessary observations required in sec. (8), By-law 29, which he shall submit to the Board for their examination and approval, and he shall also submit a plan and field notes of a survey, all made by himself, which will be filed with his papers.

11. Each candidate for admission to apprenticeship shall bring with him a ruling pen and scale.

LIST OF CANDIDATES who have passed the Preliminary Examinations for Land Surveyors in Ontario, since 1885.

NAME OF CANDIDATE.	ADDRESS.	Date of Preliminary Certificate.	TO WHOM ARTICLED.	DATE.	Term of Service	Date of Final Exam.	GENERAL REMARKS
Ludgate, Bruce Allin	Peterboro'	6th Jan., 1885	T. R. Hewson, Peterboro'	5th May, 1885	1 year	8th July, 1886	Grad. S.P.S., 1885
Ross, David Andrew	Mount Forest	9th April, 1885	Hugh Wilson, Mt. Forest	10th April, 1885	3 years	11th Apr., 1890	
Stephens, Lewis Frederick	London South	9th April, 1885	J. M. Moore, London	12th Aug., 1885	3 years	11th Apr., 1890	
Farncomb, Frederick Wm.	T'p of London	9th April, 1885	C. A. Jones, London	12th Aug., 1885	3 years	6th Nov., 1889	
Booth, George Algernon	Sydenham	9th April, 1885	C. E. S. Booth, Kingston	9th April, 1885	3 years		
Decker, Edwin Stanton	St. Thomas	7th July, 1885	A. W. Campbell, St. Thomas.	8th July, 1885	3 years	12th Nov., 1888	
Stewart, Walter Edgar	Aylmer, Ont	7th July, 1885	J. A. Bell, St. Thomas	7th July, 1885	3 years	12th Apr., 1892	
Gurd, John Abrom	London West	7th July, 1885	C. F. Cox, London	30th Sept., 1885	3 years		
McKay, Owen	Forester's Falls.	7th July, 1885	Speight & VanNostrand, Tor.	19th Dec., 1885	1 year	7th Jan., 1887	Grad. S.P.S., 1885
Robertson, Alex. Morton	Goderich	7th July, 1885	Not articled				
Bowman, Herbert Joseph	Berlin	6th Oct., 1885	P. S. Gibson, Willowdale.	30th Dec., 1885	1 year	7th Jan., 1887	Grad. S.P.S., 1885
Matthews, Herbert Edward.	London	6th Oct., 1885	J. M. Moore, London	6th Oct., 1885	3 years		
Fitzgerald, James	Peterboro'	4th Jan., 1886	J. W. Fitzgerald, Peterboro'	7th Jan., 1886	3 years		
DeMorest, Richard Watson.	Toronto	5th April, 1886	Speight & VanNostrand	5th April, 1886	3 years	9th Apr., 1889	
Bowman, Arthur Meyer	Berlin	6th April, 1886	I. L. Bowman, Berlin	1st June, 1886	1 year	11th Nov., 1887	Grad. S.P.S., 1886
Cameron, Alfred John	Peterboro'	7th April, 1886	T. R. Hewson, Peterboro'	15th April, 1886	3 years	9th Apr., 1889	
Laird, Robert	Toronto	6th July, 1886	P. S. Gibson, Willowdale.	15th Sept., 1886	1 year	11th Nov., 1887	Grad. S.P.S., 1886
Sherman, Ruyter Stinson	Brantford	6th July, 1886	T. H. Jones, Brantford	6th July, 1886	3 years	12th Apr., 1890	
Nie, Josiah Andrew	Toronto	6th Oct., 1886	G. B. Abrey, Toronto	6th Oct., 1886	3 years		
McCulloch, Andrew Lake	Hawksville	6th Oct., 1886	H. J. Bowman, Berlin	30th June, 1887	1 year	16th Nov., 1888	Grad. S.P.S., 1887
Rorke, Louis Valentine	Heathcote	5th Jan., 1887	Stewart & Whitson, Collingwo'd	5th Jan., 1887	3 years	14th Apr., 1890	
Taylor, Thomas Herbert	St. Jas. Pr'k, Lon.	5th April, 1887	C. A. Jones, London	16th June, 1887	3 years		
Weekes, Abel Seneca	Glencoe	5th April, 1887	Coad & Robertson, Glencoe	15th April, 1887	3 years	12th Apr., 1890	
Griffin, Albert Dyke	Woodstock	7th Nov., 1887	W. M. Davis, Woodstock	7th Nov., 1887	3 years	11th Nov., 1890	
Kirkpatrick, Robert	London	9th Nov. 1887					
Gibson, Harold Holmes	Willowdale	4th April, 1888	P. S. Gibson, Willowdale.	4th April, 1888	3 years	8th Sept., 1891	
Knight, Merle Shafto	Woodstock	4th April, 1888					
Moore, Thomas Alexander	London	4th April, 1888	J. M. Moore, London	9th April, 1888	3 years	12th Nov., 1892	
Ollerhead, George Elliott	Brampton	5th April, 1888	C. J & C. R Wheelock, Orangev'le	12th April, 1888	3 years		
Robinson, John Kimpton	Essex Centre	5th April, 1888	J. S. Laird, Essex Centre	7th April, 1888	3 years	11th Apr., 1891	Dead.

LIST OF CANDIDATES who have passed the Preliminary Examinations for Land Surveyors in Ontario—*Continued.*

NAME OF CANDIDATE.	ADDRESS.	Date of Preliminary Certificate.	TO WHOM ARTICLED.	DATE.	Term of Service	Date of Final Exam.	GENERAL REMARKS
McMullen, William Ernest.	Toronto	6th Nov., 1888	Speight & VanNostrand, Tor...	6th Nov., 1888	3 years	11th Nov., 1892	
Naismith, Peter Lawrence..	Pembroke	6th Nov., 1888	.....	.....	.....	.....	
Wallace, Charles Hugh	Port Arthur	6th Nov., 1888	H. DeQ. Sewell, Port Arthur..	6th Nov., 1888	1 year	9th Nov., 1889	B.E. Trin. Col. Dub
Anderson, John Drummond	Delaware	1st April, 1889	J. A. Bell, St. Thomas	3rd April, 1889	3 years	13th Apr., 1892	
O'Hara, Walter Francis	Chatham	1st April, 1889	A. McDonell, Chatham.	3rd April, 1889	3 years	14th Apr., 1892	
Bowman, Leander Meyer...	Lindsay.....	2nd April, 1889	A. M. Bowman, Lindsay.....	2nd April, 1889	2 y.5m	14th Apr., 1892	
Harvey, Thomas Alexander	London	2nd April, 1889	J. M. Moore, London	9th April, 1889	4 years	.....	
Heathcote, Wm. C. Percival	Peterboro'	2nd April, 1889	.....	.....	.....	.....	
Sharpe, Geo. Alexander	Cannington	2nd April, 1889	John Vicars, Cannington.....	7th April, 1889	3 years	.....	
Watson, John.....	Orillia	3rd April, 1889	C. E. Fitton, Orillia.....	10th April, 1889	3 years	13th Apr., 1892	
McLennan, Murdoch John..	Williamstown ..	9th Nov., 1889	D. R. Brown, Cornwall.....	5th Oct., 1891	1 year	.....	B.A. Sc., (McGill)
Grenfell, Joseph Henry	London	9th April, 1890	J. M. Moore, London.....	19th April, 1890	4 years	.....	
Hill, Victor	Toronto.....	9th April, 1890	V. M. Roberts, Toronto Junc.	9th April, 1890	3 years	.....	
McFarlane, Malcolm Cameron	Brockville	9th April, 1890	B. J. Saunders, Brockville....	6th Aug., 1890	1 year	.....	B.A. Sc., (McGill)
Mackenzie, Wm. Innes, jun.	Toronto	5th Nov., 1890	Speight & VanNostrand, Tor..	5th Nov., 1890	3 years	.....	
Munro, John Vicar.....	London	5th Nov., 1890	F. Henry, London.....	10th Mar., 1890	3 years	.....	
Farncomb, Ernest Alfred...	London	7th April, 1891	F. W. Farncomb, Exeter.....	2nd May, 1891	3 years	.....	
Hall, Walter.....	London	7th April, 1891	.....	.....	.. ....	.....	
McCubbin, George Albert...	St. Thomas	5th April, 1892	A. W. Campbell, St. Thomas .	6th April, 1892	3 years	.....	
Abrey, George Spencer.....	Toronto Junct'n	9th Nov., 1892	G. B. Abrey, Toronto Junction	9th Nov., 1892	3 years	.....	
Code, Abram Silas	Glencoe	9th Nov., 1892	Coad & Robertson, Glencoe...	9th Nov., 1892	3 years	.....	
Hopkins, Marshall Willard.	Stony Creek....	9th Nov., 1892	Cyrus Carroll, Hamilton.....	9th Nov., 1892	1 year	.....	B.A. Sc., (McGill)
Bolton, Ellsworth Doan	Listowel	5th April, 1893	L. Bolton, Listowel.....	6th April, 1893	1 year	.....	B.A. Sc., (McGill)
Richardson, Jocelyn Johnston	St. Catharines..	8th April, 1893	E. Gardiner, St. Catharines...	20th May, 1893	3 years	.....	

LIST OF MEMBERS.

Names marked thus * were granted exemption under authority of Sub-sec. 4 of Sec. 10 of the Ontario Land Surveyors' Act; and those marked † registered, but withdrew from practice.

Abrey, George Brockitt ..... Toronto Junction.
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Aylsworth, John S ..... Selby.
Aylsworth, Charles Fraser, Sr. ..... Madoc.
Aylsworth, Charles Fraser, Jr ..... Box 60, Madoc.

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Bazett, Edward ..... Burks Falls.
Browne, Wm. Albert ..... 17 Toronto Street, Toronto.
Biggar, C. A. ..... 68 Daly Ave., Ottawa.
Bray, Samuel ..... Department of Indian Affairs, Ottawa.
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Brown, David R ..... Cornwall.
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†Coleman, R. H ..... 204 King St. E., Toronto.
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Deans, William J. ..... Oshawa.

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†Tracy, Thos. H.....Vancouver, B.C.
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Turnbull, Thomas ..... C. P. R. Office, Winnipeg.

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Ure, Frederick J.....Woodstock.

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VanBuskirk, W. F.....Stratford.
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Warren, James.....Walkerton.
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Walker, Alfred P.....C. P. R. Eng. Dept., Toronto.
Wadsworth, Vernon B.....103 Bay St., Toronto.
Williams, David.....Kingston.
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Watson, John McCormack.....Box 224, Orillia.
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Weekes, Abel Seneca.....Clinton.
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Winter, Henry.....Thornyhurst.
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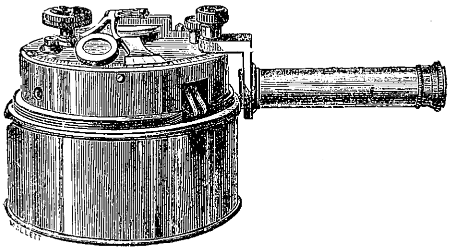

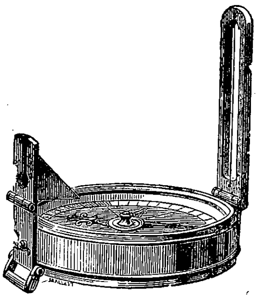

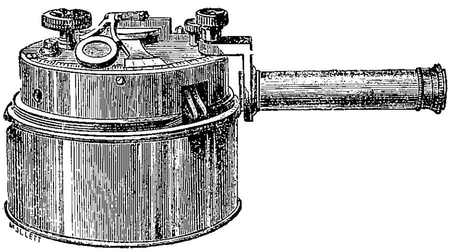

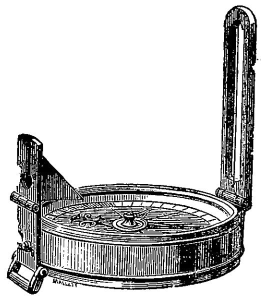

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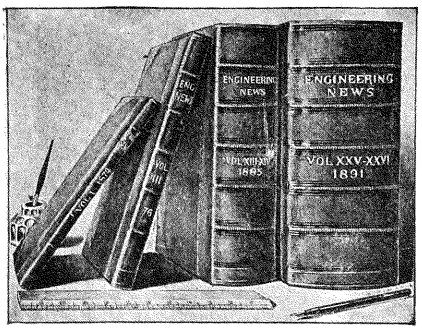

Engineering News

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	Reading	Advertising	Advertising Accounts open, end of each year	Subscripti'n
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PROCEEDINGS

OF THE

ASSOCIATION OF

ONTARIO LAND SURVEYORS

AT ITS SECOND ANNUAL MEETING, SINCE INCORPORATION,

HELD AT TORONTO, FEBRUARY 27TH AND 28TH,
AND MARCH 1ST,

1894

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

The Third Annual Meeting (Tenth Annual Meeting of the Association of Provincial Land Surveyors of Ontario) will be held in Toronto, commencing on Tuesday, 26th of February, 1895.

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

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 can be supplied with copies of the Proceedings for 1886, 1887, 1888, 1889, 1890, 1891, 1892, or 1893 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.

PATRONIZE OUR ADVERTISERS.

PREFACE.

To the Members of the Association of Ontario Land Surveyors.

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

Appended will be found By-laws passed since the publication of the last Annual Proceedings.

Each member is requested to remember, that the success of an Annual Meeting depends largely upon the exertions of individual members to produce an interesting programme.

Respectfully submitted on behalf of the Council,

A. J. VANNOSTRAND,
Secretary.

CONTENTS.

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(Incorporated 1892).

ORGANIZED 23RD FEBRUARY, 1886.

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P. S. Gibson, Willowdale } For 1 year, appointed
A. Niven, Haliburton } by Council.

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PROGRAMME OF THE

Association of Ontario Land Surveyors

(INCORPORATED)

AT ITS SECOND ANNUAL MEETING HELD IN TORONTO, FEBRUARY 27TH AND 28TH, AND MARCH 1ST, 1894.

PROGRAMME.

Tuesday, February 27th—Morning, 10 o'clock.

Meeting of Council.
Meetings of Standing Committees.

Afternoon, 2 o'clock.

Reading of Minutes of previous meeting.
Reading of Correspondence and accounts.
Report of Council of Management.
President's Address.
Paper—"The Eskimo," J. W. Tyrrell, O.L.S., C.E., Hamilton.
Paper—"House Drainage," M. W. Hopkins, O.L.S, C.E., Hamilton.

Evening, 8 o'clock.

Paper—"Lake of the Woods as a Mining Camp," Henry DeQ. Sewell, O.L.S., C.E., Port Arthur.
Paper—"Annuities," M. J. Butler, O L.S., C E, Napanee.

Wednesday, February 28th—Morning, 10 o'clock.

Report of Committee on Drainage with "Question Drawer," H. J. Bowman, O.L.S., C.E., Chairman.
Paper—"Pelee Island Drainage Works," Wm. Newman, O.L.S., C.E., Windsor.
Paper—"The Grand Bend Cut," R. Coad, O.L.S., C.E., Glencoe.
Letter—"The Little Bear Creek Drain," W. G. McGeorge, O. L.S., C.E., Chatham.

Afternoon, 2 o'clock.

Report of Committee on Topographical Surveying, Willis Chipman, O.L.S., C.E., Chairman.

Report of Committee on Land Surveying, with "Question Drawer," M. Gaviller, O.L.S., Chairman.

Paper—"Nipissing and James' Bay Railway Survey," J. A. Paterson, O.L.S., C.E., Toronto.

Paper—"Descriptions of City Properties," T. B. Speight, O.L.S., Toronto.

Paper—"The New Regulation Mile Track of the Windsor Driving Park Association," O. McKay, O.L.S., C.E., Windsor.

Paper—"Photo-Topography," Otto J. Klotz, O.L.S., D.T.S., Ottawa.

Evening, 8 o'clock.

ANNUAL DINNER.

Thursday, March 1st—Morning, 10 o'clock.

Report of Auditors.

Paper—"Cedar, Macadam and Gravel Roadways," P. S. Gibson, O.L.S., C.E., Willowdale.

Paper—"Protection of the Source of the Owen Sound Waterworks System," R. McDowall, O.L.S., C.E., Owen Sound.

Afternoon, 2 o'clock.

Ratification of New By-laws

Report of Committee on Publication, H. L. Esten, O.L.S., Chairman.

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

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 SECOND ANNUAL MEETING

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

FEBRUARY 27TH AND 28TH, MARCH 1ST, 1894.

The meeting was called to order at 2 p.m. on Tuesday, the 27th of February, in the lecture room of the Canadian Institute, 58 Richmond Street East, Toronto.

The President, Mr. Elihu Stewart, in the chair.

Moved by Mr. VanNostrand, seconded by Mr. Niven: That the minutes of the last meeting of the Association of Ontario Land Surveyors, as printed in the Proceedings, be confirmed as read. Carried.

The Secretary read letters from Messrs. J. W. Fitzgerald, Peterborough, and Joseph Kirk, Stratford, expressing regret at their inability to attend the meeting.

The President then delivered his Annual Address.

Mr. J. W. Tyrrell, of Hamilton, read a paper prepared by him, entitled "The Eskimo."

Moved by Mr. Sankey, seconded by Mr. Niven: That Mr. Tyrrell's paper on "The Eskimo" be received, and the thanks of the Association tendered him for the same. Carried.

A paper on "House Drainage," prepared by Mr. M. W. Hopkins, of Hamilton, was read by Mr. Sewell, owing to Mr. Hopkins' absence.

Moved by Mr. Tyrrell, seconded by Mr. Gibson: That Mr. Hopkins' paper on "House Drainage" be received, and the thanks of the Association tendered him. Carried.

A discussion took place on some questions submitted to the Land Surveying Committee; after which the report of the Committee on Topographical Surveying was read by Mr. Willis Chipman, Chairman of the Committee.

On motion of Mr. Foster the meeting then adjourned. 5.15 p.m.

Tuesday Evening Session.

Business was resumed at 8 p.m., the President in the chair.

Mr. Henry DeQ. Sewell read a paper on "Lake of the Woods as a Mining Camp."

Moved by Mr. Tyrrell, seconded by Mr. Wilkie: That Mr. Sewell's paper be received, and that the thanks of the Association be tendered him. Carried.

Mr. J. D. Evans read a paper on "The Genesis and Development of Mining in the Sudbury District."

Moved by Mr. Gaviller, seconded by Mr. Niven: That Mr. Evans' paper be received, and the thanks of the Association tendered him. Carried.

A discussion, introduced by Mr. Gaviller, then took place, as to the employment of unlicensed surveyors, which, it was alleged, was carried on to a considerable extent in some parts of the province.

The Secretary, having received a copy of a memorial from the Provincial Land Surveyors' Association of Manitoba to the Dominion Government, asking that the duty on surveying instruments be reduced, it was moved by Mr. Sankey, seconded by Mr. Niven: That the Secretary be instructed to forward a memorial to the Minister of Finance in Ottawa, on the same lines as the one presented by the Manitoba Association; and also that the co-operation of the other Surveyors' Associations in Canada and the Society of Civil Engineers be asked. Carried.

On motion of Mr. Niven the meeting was adjourned. 10 p m.

WEDNESDAY MORNING SESSION.

Business was resumed at 10 a.m., the Vice-President, Mr. M. J. Butler, in the chair.

The report of the Committee on Drainage was read by Mr. H. J. Bowman, Chairman of the Committee, and discussed at some length, its adoption being deferred until the arrival of Mr. McGeorge, who was expected at the meeting.

A paper, prepared by Mr. Wm. Newman of Windsor, on "Pelee Island Drainage Works," was read by Mr. Wilkie, Mr. Newman not being able to attend the meeting.

The President, Mr. Stewart, having arrived, took the chair.

Moved by Mr. Bowman, seconded by Mr. Gibson: That Mr. Newman's paper be accepted, and the thanks of the Association given him for the same. Carried.

Mr. R. Coad, of Glencoe, read a paper on "The Grand Bend Cut."

Moved by Mr. Ellis, seconded by Mr. Ross: That the paper be received, and the thanks of the Association tendered Mr. Coad. Carried.

Mr. M. J. Butler then read a paper on "Annuities," for which, on motion of Mr. Sankey, seconded by Mr. Ellis, he received the thanks of the Association.

Mr H. J. Bowman read a letter received from Mr. W. G. McGeorge, of Chatham, giving a description of the Little Bear Creek Drain.

Moved by Mr. Ross, seconded by Mr. Sewell: That the letter of Mr. McGeorge be received, and the thanks of the Association tendered him for the same. Carried.

The meeting then adjourned. 12.45 p.m.

Wednesday Afternoon Session, 2 o'clock.

The President in the chair.

The report of the Committee on Drainage not having been disposed of at the morning session, it was then taken up, and on motion of Mr. Bowman, seconded by Mr. Wilkie, was received and adopted.

A question which had been submitted to the committee for solution was also discussed at the same time.

Mr. Paterson read a paper on "Nipissing and James' Bay Railway Survey."

Moved by Mr. Tyrrell, seconded by Mr. Niven: That the paper be received, and the thanks of the Association tendered Mr. J. A. Paterson for the same. Carried.

The report of the Council of Management was then presented by the Chairman of the Council, Mr. Sankey, who moved its reception; after which it was discussed at length.

Moved by Mr. Sankey, seconded by Mr. Sewell: That the report of the Council of Management be adopted. Carried.

Moved by Mr. Sankey, seconded by Mr. Chipman: That the thanks of this Association be tendered to the Iowa Society of Civil Engineers and Surveyors, for their kindness in sending the extra copies of their report without cost; also to the editor of the *Surveyor*,

London, England, for the gift of a volume containing issues of that paper from January to June, 1893; also for weekly issues subsequently received. Carried.

Moved by Willis Chipman, seconded by G. B. Abrey: That the question of reducing the expenditure *re* Examinations be referred back to the Council to report at the next annual meeting; but that the Council be urged to reduce the expenses as much as possible in the meantime. Carried.

Moved by Mr. Sankey, seconded by Mr. Gibson: That By-laws Nos. 33 and 34, as passed by the Council, be ratified. Carried.

Moved by Mr. Ross, seconded by Mr. Paterson: That the Council is hereby requested to procure from our exchange societies a sufficient number of copies to afford a complete set to each of our members at a minimum cost. Carried.

The report of the Committee on Land Surveying was then read by Mr. Gaviller, Chairman of the Committee, and the answers of the Committee to the questions submitted to them.

Moved by Mr. Chipman, seconded by Mr. Tyrrell: That the report of the Committee on Land Surveying be adopted, and that a copy of the same be sent to each member of the Association on or before September 15th, 1894. Carried.

Mr. O. McKay, of Windsor, read a paper on "The New Regulation Mile Track of the Windsor Driving Park Association," which, on motion of Mr Sankey, seconded by Mr. Gibson, was received, and the thanks of the Association tendered Mr. McKay.

Mr. Speight read a paper on "Descriptions of City Properties."

Moved by Mr. Sankey, seconded by Mr. Wilkie: That Mr. Speight's paper be received, and the thanks of the Association tendered him. Carried.

A paper prepared by Mr. Otto J. Klotz, of Ottawa, on "Photo-Topography," was read by Mr. M. J. Butler, Mr. Klotz not being in attendance at the meeting.

Moved by Mr. Niven, seconded by Mr. Foster: That the paper be received, and the thanks of the Association tendered Mr. Klotz for the same. Carried.

It being 6 o'clock, the meeting adjourned.

The Annual Dinner took place in the evening (see report of Entertainment Committee).

THURSDAY MORNING SESSION.

Business was resumed at 10 a.m., the Vice-President, Mr. M. J. Butler, in the chair.

The report of the Auditors was read, and, on motion of Mr. Sewell, seconded by Mr. McAree, adopted.

Mr. G. B. Abrey, Chairman of the Committee on Engineering, announced that no questions had been submitted to them, and the Committee were not prepared to make a report.

Mr. P. S. Gibson read a paper on "Cedar, Macadam and Gravel Roadways."

Moved by Mr. Niven, seconded by Mr. Sewell: That Mr. Gibson's paper be received, and that he be tendered the thanks of the Association for it. Carried.

Mr. R. McDowall read a paper on "Protection of the Source of the Owen Sound Water Works System," which, on motion of Mr. Hopkins, seconded by Mr. Gibson, was received, and the thanks of the Association tendered Mr. McDowall.

The following resolution was then carried: Moved by Mr. Willis Chipman, seconded by John McAree: Whereas the northerly part of the Dominion of Canada has not as yet been thoroughly explored, and its valuable resources are not as yet an available asset; and, whereas other nations are turning their attention to this part of our country with views of expropriation; therefore the Association of Ontario Land Surveyors at this meeting deems it desirable that a Special Committee be appointed for the following purposes:—1st, To report upon the most economical methods of surveying and marking, by permanent monuments, a meridian line to serve as a basis for future surveys and explorations, this line to be run north from some point on the north-westerly shore of Baffin's Bay in the Dominion of Canada. 2nd, To give an estimate of the probable cost of such a survey. 3rd, To recommend some practical scheme for defraying the cost of the work. And that Messrs. William Ogilvie, O. J. Klotz, J. W. Tyrrell, L. B. Stewart, M. J. Butler, and the mover and seconder be and are hereby appointed as such Committee to submit a report at the next Annual Meeting of this Association.

The question of preparing papers for the next meeting having been introduced, a number of subjects were suggested to assist the Secretary in preparing the programme, and "Our Standards of Measurement" being one of them, suggested by the Chairman, a discussion took place on that subject.

Moved by Mr. Chipman, seconded by Mr. Sewell, and resolved: That a Committee be formed for the purpose of reporting on our Standard Measures; and that the members of it be Messrs. Abrey, Niven, Burke, Hopkins, McAree and Gaviller. Carried.

The meeting then adjourned. 12.30 p.m.

Thursday Afternoon Session.

Business was resumed at 2 p.m., the President in the chair.

The report of the Committee on Publication was read by Mr. Speight, in the absence of Mr. Esten, the chairman of that Committee, and on motion was adopted.

Moved by Mr. VanNostrand, seconded by Mr. Speight: That the report of the Committee on Entertainment be received as read and printed in the Proceedings. Carried.

In reply to an enquiry from Mr. Chipman, as to inviting representatives from other societies to attend the annual meeting, the Secretary said that he had sent such an invitation to each of the exchange societies, but had received replies from only two, Ohio and Michigan, and they stated they were unable to get any one who could leave his business for such a length of time. A representative, Mr. A. J. McPherson, had been in attendance from the Ontario School of Practical Science, however, during the whole meeting.

Moved by P. S. Gibson, seconded by M. J. Butler: That we have to regret the death, since our last meeting, of Mr. Thomas Fraser Gibbs, whose obituary appears in our published report of Proceedings for 1893; and we desire to convey to his family this expression of sympathy with them in their bereavement; and that the Secretary be instructed to forward to them a copy of this resolution. Carried.

Moved by Mr. Sankey, seconded by Mr. Abrey: That the President appoint a committee to collect information regarding the appointment, practice and history of the early surveyors of this Province, and present the same at the next annual meeting, so that a synopsis may be published in the reports. Carried.

The President then appointed the following gentlemen to act as such committee, with power to add to their numbers:—Messrs. Chipman, Kirkpatrick, Esten, and W. R. Aylesworth.

Moved by Mr. Speight, seconded by Mr. Murphy: That any omissions or clerical errors in the record 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.

Before beginning the nomination of officers for the ensuing year, on motion of Mr. Van Nostrand, seconded by Mr. Gibson, the meeting adjourned for 10 minutes.

On re-assembling, Mr. Gibson moved, seconded by Mr. McAree: That Mr. M. J. Butler be President for the ensuing year.

There being no further nominations, Mr. Butler was declared elected.

For the office of Vice-President, Mr. M. Gaviller was nominated by Mr. Sankey, seconded by Mr. Niven; and as there were no other nominations he also was declared elected.

Mr. Gaviller, being a member of the Council and having still one year to complete his term as such, thereupon resigned his position on the Council, which made the election of three Councillors necessary. The following were the nominations for the Council, the retiring members being Messrs. McAree, Sankey and Gaviller:—

Mr. Chipman, nominated by Mr. Butler.
Mr. Speight, nominated by Captain Gamble.
Mr. H. J. Bowman, nominated by Mr. Speight.
Mr. John D. Evans, nominated by Mr. Sankey.
Mr. E. T. Wilkie, nominated by Mr. McAree.
Mr. V. Sankey, nominated by Mr. Niven.
Mr. McAree, nominated by Mr. Tyrrell.
Mr. Henry Winter, nominated by Mr. McAree.
Mr. J. W. Tyrrell, nominated by Mr. Wilkie.
Mr. R. Coad, nominated by Mr. Niven.
Mr. W. R. Burke, nominated by Mr. Chipman.

Mr. E. Stewart, the retiring President, was nominated by Mr. Gibson, but asked to have his name withdrawn, which was accordingly done.

The President then appointed Mr. H. J. Browne and Captain Gamble scrutineers for the ensuing year.

Moved by Mr. Sankey, seconded by Mr. McAree: That Mr. A. J. VanNostrand be re-elected Secretary-Treasurer for the ensuing year. Carried.

Moved by Mr. Chipman, seconded by Mr. Niven: That the Secretary-Treasurer be paid the sum of $120 for his services during the past year. Carried.

The following were then nominated for the position of Auditor, two being required:—

Mr. G. B. Abrey, nominated by Mr. Niven.
Mr. Foster, nominated by Mr. Gaviller.
Mr. Traynor, nominated by Mr. Gaviller.
Mr. Hopkins, nominated by Mr. Speight.
Mr. Proudfoot, nominated by Mr. Niven.
Mr. T. Harry Jones, nominated by Mr. Chipman.

Mr. G. B. Abrey asked to have his name withdrawn, which was accordingly done.

Moved by Mr. Gaviller, seconded by Mr. Traynor: That the Chairman do now leave the Chair, and that Mr. Gibson take the Chair. Carried.

Mr. Gaviller then, seconded by Mr. Niven, moved a cordial vote of thanks to Mr. Stewart, the retiring President, for his services to the Association, which was carried by a standing vote, and to which Mr. Stewart made the following reply:—

MR. CHAIRMAN AND GENTLEMEN,—I thank you sincerely for this expression of your feelings towards me. I appreciate the honor of being a past president of the Association, but I appreciate this vote of thanks even more. It was said to-day that I was always giving

" taffy " to the members, but I think you have been returning the compliment now. I certainly think, as I have said before, that it is a very strange thing that such a large body of men could so long work together so harmoniously. I never saw even a party of a dozen without there being some cranks, and I thought before that it was impossible to be without some who would be always trying to find fault. I have been in similar positions to this in other societies even with a much smaller membership, and I have generally noticed that a certain amount of jealousy and that sort of thing crept in, but I have never seen anything of the kind in this Association. I remember very well the first meeting to organize the old Association. We felt sanguine then that by union we could do more than we had done separately, but I don't know that any one expected that we should arrive at the status we now have. I thank you again, and if I can be of any service in future I shall be most happy to do so.

On motion of Mr. Butler, seconded by Mr. Chipman, the meeting was declared closed. 4 p.m.

MEMBERS IN ATTENDANCE AT THE SECOND ANNUAL MEETING.

Abrey, G. B.
Bowman, H. J.
Bray, E.
Browne, H. J.
Browne, W. A.
Burke, W. R.
Butler, M. J.
Chipman, W.
Coad, R.
Davis, J.
Ellis, H. D.
Esten, H. L.
Evans, J. D.
Foster, F. L.
Gamble, K.
Gaviller, M.
Gibson, H. H.
Gibson, P. S.
Hopkins, M. W.
Hutcheon, J.
James, D. D
Johnson, R. T
Jones, T. H.
Kirkpatrick, G. B.
Lumsden, H. D.
McAree, J.
McDowall, R.
McKay, O.
McMullen, W. E.
Miles, C. F.
Murphy. C. J.
Niven, A.
Paterson, J. A.
Proudfoot, H. B.
Ross, G.
Sankey, V.
Saunders, B. J.
Sewell, H. DeQ.
Silvester, G. E.
Smith, H.
Speight, T. B.
Spry, Wm.
Stewart, E.
Stewart, L. B.
Traynor, I
Tyrrell, J. W.
Unwin, C.
Ure, F. J.
VanNostrand, A. J.
Walker, A. P.
Whitson, J. F.
Wiggins, T. H.
Wilkie, E. T.

RESULT OF ELECTIONS.

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

Councillors elected for ensuing three years.

V. Sankey, H. J. Bowman.

Councillor for one year.

Willis Chipman.

Auditors for ensuing year.

F. L. Foster. H. B. Proudfoot.

I hereby declare the above named Councillors and Auditors elected.

A. J. VanNostrand,
Secretary-Treasurer.

Certified correct.

H. J. Browne.
Killaly Gamble.
Scrutineers of Ballots.

REPORT OF THE COUNCIL OF MANAGEMENT.

The Council of Management beg to submit the following report on the work of the past year, being the second Association year. At the April meeting, the Secretary was instructed to purchase extra copies of the exchanges so that each member may be furnished with a full set; from his report it will be seen that this has cost the sum of $58.13. The action of the Iowa Society of Civil Engineers and Surveyors in gratuitously furnishing the extra copies required, is greatly to be commended, and the Board would suggest that a resolution of thanks be forwarded to the Secretary thereof by our Secretary. The opinion of the Association is asked as to the advisability of this outlay.

With regard to bonds of the Secy.-Treas., amounting to $1.000, the President has reported that the same were received by him and are now deposited with the manager of the Yonge St. Branch of the Imperial Bank of Toronto and has produced a receipt, dated March 3rd, 1893. The Council after due consideration instructed the Secy.-Treas. to place the sum of $500 in the Savings Department of the Imperial Bank, Yonge St. Branch, Toronto.

The subjects for examination of candidates as prescribed by statute, and the marks to be obtained as submitted by the Board of Examiners, received careful consideration and were finally adopted as now printed in the By-Laws. The Council concurs in the recommendation of the Board with regard to the minimum marks for levelling, and would advise that they be reduced from 40 to 35.

The various standing Committees, as provided by By-Law No. 12, were appointed.

The Council passed the following By-Laws under the authority of By-Law No. 33, and now report the same for ratification, or otherwise, by the Association:—

By-Law No. 34.—"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, Ontario Statutes, 1892, Chapter 34—viz.: Henry Strange, Milton C. Schofield, William Robinson, Joseph Kirk, Charles Fraser, Joseph M. O. Cromwell, H. O. Wood, F. H. Lynch-Staunton and E. C. Caddy."

By-Law No. 35.—"The annual fees to this Association, paid by candidates who are admitted at the November examination in each year shall cover all annual dues for the remainder of such current Association year and for the Association year following the same."

The following resolutions were also adopted with regard to the registration of Surveyors who are not now practising in the Province, or who are living out of the Province, and others who through inadvertence failed to register in the prescribed time.

(*a*) "The Registrar is hereby instructed to admit to enrolment and withdrawal from the registered list of practitioners, any duly authorized Provincial Land Surveyor for Ontario, who shall make application for the same, prior to the first day of January, 1894, upon such applicant furnishing a declaration that he has not practised as a Land Surveyor since the passing of the Ontario Land Surveyors' Act, and upon the payment of one dollar with such application."

(*b*) "The Registrar is hereby instructed to admit to enrolment any duly authorized Provincial Land Surveyor for Ontario, who shall make application for the same prior to the first day of January, 1894, upon such applicant furnishing a declaration that he refrained from practising as a Land Surveyor during the first Association year (ending 1st April, 1893), and upon payment of five dollars with such application."

(*c*) "The Registrar is hereby instructed to admit to enrolment any duly authorized Provincial Land Surveyor for Ontario, who shall make application for the same prior to the first day of January, 1894, upon payment with such application of the sum of nine dollars, being the registration fee and annual dues for first and current Association years."

A resolution was also adopted instructing the Registrar to accept the fees for the current year, of any member who had registered prior to the first election, but who had not paid any annual fees since; on the member furnishing a declaration that he had not practised in Ontario during the previous years.

The Council think it wise to treat all these cases on their merits, and are glad to be able to report that the number of Surveyors now unregistered is very small. The Council would urge the members of the Association to do their utmost to get any Surveyors whom they may know to be unregistered, to become enrolled at once

With regard to the cost of the examinations, the Council wish to draw attention to the remarks made by the Board of Examiners in their report. The following are some of the points which should be considered in dealing with the matter:—

1. At present two examinations a year must be held, as provided by statute.

2. Each successful candidate must be sworn before the Board.

3. There are now 14 subjects for examination, in each of which an oral is necessary as well as a paper.

The following suggestions are submitted for consideration with a view to the reduction of the cost:—

1. Have only one examination in each year.

2. Have only three members of the Board present at each examination, but let them be summoned in turn, or as convenient.

3. Have the papers prepared by the other members, and the answers marked at their homes, afterwards to be returned to the Secretary, with any remarks they may see fit to make.

4. Arrange so that successful candidates may be sworn in before any Surveyor appointed by the Board, or before a County Judge; the papers, etc., being filed, as at present, with the Provincial Secretary.

5. Reduce the fees payable to the examiners to $5.00 per diem, leaving the travelling and hotel charges as at present, and get the Government to regulate the amount of the annual grant, having regard to the number of candidates.

6. Pay the members a fixed sum for each paper prepared, and for each set of answers corrected.

The above suggestions are made for the consideration of the Association, but the Council would urge that they be carefully considered, and that no hasty action be taken thereon.

The report of the Board of Examiners is herewith presented, having been adopted by the Council; also the report of the Sec.-Treas. The latter report will show what a large amount of work is done by that officer, and the Council take this opportunity of expressing their thanks to him for his uniform courtesy and untiring energy.

In order to relieve him of some of the labour, the Council think that an assistant Secretary should be appointed, who could give great assistance in the issuing of circulars and other routine work.

With regard to the tariff question, the Council are not yet in a position to report, and would ask for further time.

Respectfully submitted,

VILLIERS SANKEY,
Chairman of Council.

REPORT OF THE SECRETARY-TREASURER.

MR. CHAIRMAN,—I beg to submit the following report of the business of the Association between 27th February, 1893, and 26th February, 1894:—

The total number of those who have applied for registration is 246. Of this number 33 have "withdrawn from practice," and 9 have been exempted from dues under by-law. Eleven members are in arrears of dues for first and current association years, and thirty for one year only, but in both cases a large percentage of those so in arrears are practically retired from practice, out of the country, or had been Provincial Land Surveyors of thirty-five years' standing before the passing of the Ontario Land Surveyors' Act.

Through information, kindly furnished by members of the Association and others, I have ascertained that the majority of unregistered Provincial Land Surveyors whose names appear in the list at the Crown Lands Department have died, left the Province, or become engaged in other pursuits, so that the number of Provincial Land Surveyors still carrying on a practice without having become registered and thus "duly authorized to practise," may be assumed to be very small.

The instructions of the Council of Management to procure, if possible, from our exchange societies, a sufficient number of copies to afford a complete set to each member, when possible, were carried out. The additional expense thereby incurred amounted to $58.13.

The Iowa Society of Civil Engineers and Surveyors generously furnished the required number without charge, the cost of those from our other exchanges varying from 16½ to 33⅓ cents per copy.

The following circulars have been issued:—

No. 8.	Ballot for 1893-4	200 copies
" 9.	Explanation of Ballot	200 "
" 10.	Announcement to unregistered Surveyors	150 "
" 11.	Surveyors' Register	300 "
" 12.	Announcement of Annual Meeting, 1894	300 "
" 13.	Programme for " " "	300 "

Of the 1000 copies of Annual Report for 1893, 971 were sent to exchanges, members, advertisers, libraries, newspapers, etc., and 29 remain on hand.

As the membership of all the societies with which we exchange, appears to be increasing it will be necessary to have 1,100 copies of the forthcoming report printed.

Letters and accounts sent from Secretary's office	775
Postal Cards	46
Letters and Postal Cards received	455

The average amount of postage per member is about 25 cents, being probably greater during this period of general financial depression that it would have been had our members' clients been in better circumstances.

I would respectfully request our members to carefully examine the advertisements appearing in our annual reports, when contemplating purchase of any of the articles there represented.

Our columns have been liberally patronized by advertisers, and we trust with good results.

The thanks of the secretary are due to the chairman of Council and the several standing committees, special efforts having this year been devoted by them to the work of their various departments.

Accompanying this report is a statement of the financial transactions of the Association during the past year, which when duly audited will be presented.

All of which is respectfully submitted,

A. J. VANNOSTRAND,
Secretary-Treasurer.

STATEMENT OF RECEIPTS AND EXPENDITURES, BETWEEN 27TH FEBRUARY, 1893, AND 26TH FEBRUARY, 1894.

1892-3	RECEIPTS.		
To Balance on hand 27th February, 1893			$715 37
" Amounts collected from advertisements in '93 Report			85 50
" Proceedings sold, one copy			50
" 18 Registration fees at $1.00		$18 00	
" 3 Balances of $1.00 each, dues for 1st Association year		3 00	
" 10 Annual dues for 1st Association year, $4		40 00	
" 156 " 2nd " "		624 00	
" 4 " 3rd " "		16 00	
			701 00
" Fees and dues tendered, subject to acceptance by Council			16 00
" Interest accrued on $500 deposited in Savings Bank			11 09
Total			$1,529 46

1892-3	EXPENDITURES.		
By Postage			$ 66 75
" Printing Circulars, Stationery, etc			20 40
" Publishing Report of Proceedings '93 Annual Meeting			244 30
" Express, Freight and Cartage *re* Exchanges			12 04
" Customs Brokerage on Exchanges received			2 25
" " " for Export entries on Exchanges sent			75
" Amount paid to Secretary-Treasurer for 1892			120 00
" " Stenographer for '93 Meeting			35 00
" Rent of Rooms for '93 Meeting			10 00
" Amount paid as balance of Board of Ex's. account			215 10
" " Seal and Stamp			7 50
" Blank Books, Stationery and Binding Case			6 40
" Duty on volume of "The Surveyor,"			30
" Amount paid for extra numbers of Michigan exchange			18 33
" " Expenses of Council Meetings, April and November			17 40
" Balance on hand in Savings' account		$511 09	
" " " Current "		241 85	
Total balance			752 94
Total			$1,529 46

A. J. VANNOSTRAND,
Secretary-Treasurer.

TORONTO, 26th February, 1894.

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.

We find the expenditure of Board of Examiners for the year to have been $583.10, of which amount $150.00 was paid by the Provincial Government, $218.00 paid by fees from candidates; leaving a balance of $215.10, which was paid by the Association.

We are of the opinion that the expenditure of the Board should be kept within the sum collected as fees from candidates.

WILLIS CHIPMAN, }
H. B. PROUDFOOT, } *Auditors.*

27th February, 1894.

REPORT OF THE BOARD OF EXAMINERS.

During the past year the Board of Examiners held the two meetings as provided by Statute.

At the April meeting the following gentlemen presented themselves for examination, and passed in the order mentioned:

APRIL 1893.

Preliminary.

ELLSWORTH DOAN BOLTON.
JOCELYN JOHNSTON RICHARDSON.

Final.

H. J. BEATTY (not sworn in).

At this meeting the Board had under consideration for revision the list of subjects for examination, as set out in the Statutes, and the marks assigned to them, the results as finally adopted by Council being now printed in the by-laws.

At the November meeting the examination was conducted strictly as laid down and was found to work satisfactorily, with one exception, that is, the minimum marks for levelling appeared to be too high. The Board would therefore recommend that this be reduced from 40 to 35.

The following gentlemen presented themselves and passed in the order given:

NOVEMBER, 1893.

Preliminary.

JOHN ALEXANDER HEAMAN.

Final.

THOMAS ALEXANDER HARVEY.
MURDOCH JOHN MCLENNAN.
MARSHALL WILLARD HOPKINS.
HERBERT JOHN BEATTY (sworn in).

On an inspection of the cost of examinations, it will be seen that the Association has had to pay a considerable sum out of its funds for this purpose over and above the fees collected from candidates and the grant given by the Government, which latter is now only $150. This is due to the following causes: 1. The fees payable by Statute to the examiners are "at least $6 per diem, and also travelling and hotel expenses." 2. The attendance of nearly all the Board is necessary, owing to the practice hitherto followed of having the papers marked as soon as written, which involves a large amount of work, and is more than one or two members could perform during the time.

The Board would suggest that some method be devised whereby the above difficulties may be overcome.

Respectfully submitted,

VILLIERS SANKEY,

Chairman Board of Examiners.

DISCUSSION ON THE REPORT OF THE COUNCIL OF MANAGEMENT.

Mr. Chipman—With respect to our exchanges, if you will refer to our published reports for 1887 and 1888 you will find that in those years we gave many more reports than we received. In 1886 we sent to the Michigan Society 200 reports and received only 75 in return; to the Ohio Society we sent 110, receiving 75; Indiana, we sent 110, receiving 75, and so for several years. I think if the attention of the Secretaries of these societies was called to this fact that they would certainly reciprocate now. Our Association has grown more rapidly than any of the others, and I do not see why they would not do so if it were pointed out to them, we should not be called upon to pay any such sum as $50 for these exchanges.

The Secretary—A suggestion was made in our report of last year, and as our membership was so very much in excess of that of any of the other Societies, and as all our members were entitled to copies alike, I asked for instructions as to what should be done with regard to the exchanges, and I was instructed by the Council to procure them if they could be had at all. In writing to the Secretaries of the different Societies I mentioned the fact that we required them, even if at an expense, and in five cases out of six they agreed to supply them on payment. The other society sent them free. Of course, as Mr. Chipman says, these exchanges have been unequal since the beginning, but on the other hand for several years past our membership has been somewhat in excess of the other societies though of course nothing like what it is now, and I think really the difference is rather too great to ask them to send such expensive publications as theirs are free. Of course whatever the instructions of the Association are to the Secretary he must carry them out, but I think we could scarcely expect all these extra exchanges for nothing.

Mr. Ross—I think these reports should be purchased at the present, or even at a greater cost. It is very interesting to have them and it is one of the benefits derived from belonging to the Association. I commend the Committee for expending the money, as it was necessary.

Mr. Sankey—They have simply charged us what they cost them and I think it is due to these Associations that this should be mentioned. They are not charging us fifty cents a copy as they would an outsider, but sixteen, or thirty-three cents as the case may be.

On motion of Mr. Ross, the Secretary was instructed to procure the copies necessary at a minimum cost.

Mr. Gibson—I believe one of the most important parts of that report is the instructions received by the Council from the Board of

Examiners. It seems it has been necessary to encroach upon the funds of the Association to defray the expenses of the Board. Well, whether it would be a matter of pride in the Association to keep up the payment of the members, or a matter of policy and good example, etc., is a matter for consideration. I think it may be that in first getting the Board of Examiners into working order, and perfecting the system which has been adopted, more expense has been incurred than will be necessary in future. Then I think in future we will have a larger number of candidates for examination and that would reduce the cost at once, and I am certain that the working of the system can be perfected and the expenses lessened after a little practice. Some of the members of the Board suggested that they themselves should reduce expenses by simply saying they would take less. Of course the statutory rule is that $6 a day is the lowest that can be charged, and in view of the previous fees, and the suggestion that the fees of the surveyor should be raised, they thought that that was the minimum that a member of the Board should take. Of course individuals who have never been on the Board can hardly realize the amount of work connected with it. If it was like one of the school examinations it would be a different thing, but this is a professional examination on a great variety of subjects ; and to really appreciate the labors of that Board you would have to experience them.

Now, one suggestion as to how to reduce the expense was that we have one examination a year, another suggestion was that we reduce the pay of the Board, and instead of $6 make it $4 or $5 a day and expenses, and another I think was that, a fewer number of members of the Board should attend, but the Board should be at liberty to pay those who do not attend for preparing and revising papers. I would rather have the members of the Board present. So that altogether it becomes quite a problem, and I would like to hear some of those present express their views on the matter.

The President—I think it is very praiseworthy indeed in the members of the Board to make propositions to reduce their own remuneration in the way they have.

Mr. Tyrrell—Was it stated to what extent it was necessary to draw on the funds of the Association ?

The President—I think about $215 last year. It certainly seems to me that for the last year the expenses have been more than the Association can afford to pay, though you must remember that there were very few up for examination last year, so in future if there were more candidates the fees would amount to more.

Mr. Gibson—To examine one is just as great an expense as to examine half a dozen. So if half a dozen passed there would be a larger income and no greater outlay, but in future I don't think it will take nearly as much time, for we have got things into working order now.

Mr. Sankey—This is the first "snag," so to speak, we have run against in the carrying out of our new code of by-laws adopted under the authority of the Act. Probably many of the members are not aware that when we applied for legislation one of the things we asked

to be allowed to do was to charge candidates at their final examination $50 apiece. Some of the members of the Government, in fact the Government themselves, objected to that ; they said it was an unreasonable charge, that it was too high. Previous to our obtaining incorporation the Government had to bear all the expense except what the fees covered, and some years I fancy it cost them a good deal more than they got, but in other years perhaps they made a little money. However, in order to get our bill through we had to consent to a reduction from $50 to $30, and unfortunately for us the Government have been also reducing their grant ; the first year we got $300, and this year it was $150. So that really it is not the failure of our Act, but we must make the two ends meet in the most advisable way.

Mr. Chipman—I may say that I for one am not in favor of reducing the fees to be paid to the examiners. I think $6 a day is little enough for that work. It does not represent the time they are at work here, it means a considerable time besides.

Mr. Butler—I support a reduction to $5 a day as a means of enabling the Association to swim clear. I don't think the Board of Examiners ought to sink the Association, and I think it carries with it a certain amount of honor which will compensate, perhaps, for a slight reduction in the earnings of the members.

Mr. Gaviller—I quite agree with Mr. Butler. We proposed that so as not to be such a strain on the Association.

Mr. Ross—I don't think we should begin by reducing the fees of the examiners. $6 a day is supposed to be the least anybody will work for, and we should not ask the examiners to work for less than the minimum tariff. I don't think we ought to entertain it at all, it is a bad precedent.

Mr. Hopkins—I also think it would be a bad precedent.

Mr. Coad—I think the honour is sufficient to make up for the dollar we knock off.

Mr. Chipman—I don't think it is the wish of the Association that the Board of Examiners should reduce their fees to less than the junior men that they turn out at their examination charge. I don't think it is right at all, and I think there are other means by which the cost of the examinations might be reduced materially, for instance by the reduction of the number of the examinations. One per year I think is quite sufficient for an association such as this is. Even if legislation is required to make the change, the cost of one examination will be much greater than the cost of preparing a bill to amend the Act.

Mr. Gibson—As to reducing the number of members attending the examination, I would desire to have not less than four or five of the Board present. Three are not enough. The secretary is always as busy as he can be, and the papers have got to be prepared and gone into carefully. When a young man studies three years he wants fair play in every way. And I always like to have a representative from each section of the province ; there ought to be four at least.

On the motion of Mr. Chipman the question was referred back to the Council to report at the next annual meeting.

REPORT OF LAND SURVEYING COMMITTEE.

MR. PRESIDENT,—Your Committee, in submitting their Report, wish to impress upon all members of the Association the importance of advising, without delay, the Executive of any proposed amendments to the Statutes under which we work.

Also, your Committee would suggest that the Secretary be instructed to send, in the month of September of each year, to all the members of the Association, a circular as follows :—

Give the names of all practising O. L. S. in the county in which you reside.

Give the names of all persons whom you know of who are practising surveying without license.

Name any municipal surveys in your county that have been confirmed by the Commissioner of Crown Lands during the present year.

Give any decisions, in cases of importance, that have been given at sittings of the High Court, relating to the Survey or Drainage Acts.

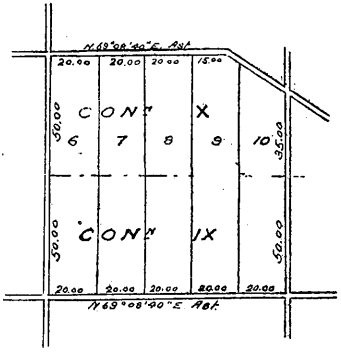
A number of questions, as to field work, have been submitted ; said questions, with decisions by your Committee, are annexed. We recommend all to aid heartily this important department.

All of which is respectfully submitted.

M. GAVILLER,
Chairman.

QUESTION DRAWER.

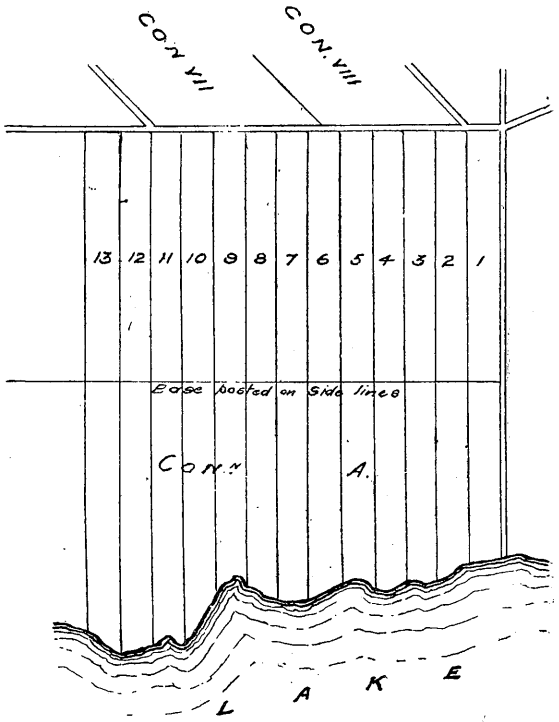
FIG. I



Question 1.—How would you establish the blind line across lots 9 and 10, between concessions IX. and X.?

Answer.—Divide proportionally.

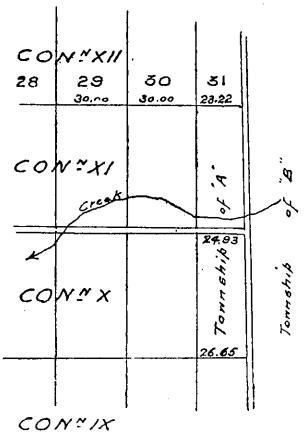
FIG. 2



Question 2.—The side lines of lots 1 to 13 are posted on the Concession Line, called in the notes "the rear of Con. A." The sides lines were also posted on a base, run parallel to the Con. line in the rear, as shown in the notes. No posts were planted on the lake front. The settlers have built to the posts on the base. How should the side lines be run?

Answer.—There is not sufficient data given. Apparently post on Rear Concession Line should be used.

FIG. 3.



Question 3.—In the annexed sketch: How would you fix the line, lots 30 and 31, Con X.?

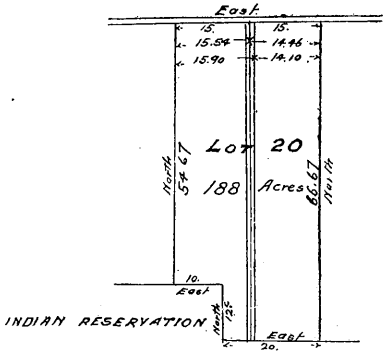
In the original survey, post was planted in Line Cons. X and XI. at Lots 28 and 29; and the surveyor continued:—"1.70 links to a creek trend south-west, and large open marsh with deep water: so much so, that it is impossible to run this line any further through."

Thus it will be seen that in the original survey no posts were planted at Lot lines 29 and 30, or 30 and 31, or at the Town line.—The width of Lot 31, given on the sketch, is from the Plan.

By actual measurement on the ground the distance from creek to town line is about two chains short of Theoretical measure.

Answer.—Divide distance on ground from post, at 28 and 29 to town line proportionately to that intended in the original survey for the lots and proportionately at each lot line for the concession.

FIG. 4



A bought lot 20, containing 188 acres, and sold to B the east half, containing 100 acres more or less—no other description ; and to C the west 95 acres—no other description. Required to run the dividing line.

Legal opinions No. 1—That the dividing line should be run from the middle point of front limit of lot, giving B 100 and C 88 acres.

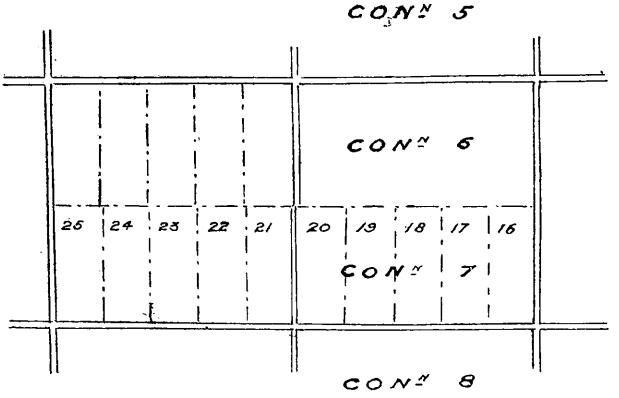
No. 2—That the dividing line should divide the 188 acres in proportion to the quantity mentioned in the respective deeds of conveyance to B and C which would give B 96-41 acres, and C 91-59 acres.

No. 3—That the dividing line should make an equal division of the lot, giving each of the parties 94 acres.

Question.—Which of the opinions is the correct one, or how shall I run the dividing line ?

Answer.—Opinion No. 3 correct.

FIG. 5



On the side road between lots 20 and 21 Con. 6 and 7 in the Town-

ship of Egremont, in the original survey the side road is shown to be straight. Some years ago there was a dispute as to the location of the road between these lots near the line between Con. 6 and 7. and H. Wilson, P.L.S. was instructed by the Com. at the request of the Council and he located the side line with a jog of some 50 links.

Question.—How should the division lines between lots 21 and 25 be run. No posts were planted on the limit between Con. 6 and 7 on the side roads in the original. Wilson has set two stakes on the blind line.

Answer.—From all information given there should be no jog on the side road between lots 20 and 21. The lot lines should be run from the posts in front of the concessions to the depth of the concession and parallel to a line drawn between lots 20 and 21 across Cons. VI. VII., Sec. 55 and 56 Survey Act, 1887.

Tp. Chinguacousy was in original survey laid out at two different dates :

First survey, called " Front Half," or " South Half," seventeen lots in each Concession across the Tp.; a side road at lot 15 and at every fifth lot ; also a side road at north boundary of lot No. 17, called " 17 Side Road."

Second survey, called the " Rear half," or " North half," consisting of fifteen lots in each concession, across the Tp ; northward from this " 17 Side Road " with a side road at lot No. 20 and at each fifth lot. The Tps. of Nassagaweya and Esquesing, immediately west, were, in the original surveyed in the same manner. Separate plans and field notes were returned of these south and north portions of these Tps. Original field notes of Tp. Esquesing show this Side Road 17 straight across the Tp. Original field notes of Tp. Nassagaweya show this Side Road separating " Front " and " Rear " halves. No original field notes of this Side Road in Tp. Chinguacousy can be found. All these original field notes and plans in C. L. Dept. show this Side Road at 12 miles (or 32 lots, road allowance extra) northward from the rear of the second concession north of Dundas St , shewing it as intended for a straight line across the three Tps.

Question.—How should an obliterated portion of this 17 Side Road in the Tp. of Chinguacousy be established ?

Answer.—" Side Road 17," as stated, would be similar to a town line of a Township, and should be established as if intended in the original survey to be straight ; under Sec. 38 (Chap. 152) Survey Act.

REPORT OF COMMITTEE ON DRAINAGE.

To the President and Members of the Association of Ontario Land Surveyors.

GENTLEMEN,—Your Committee on Drainage beg leave to report that they have examined the two bills now before the Legislature, to amend the drainage laws of this Province as recommended by the late Drainage Commission.

And whereas said bills were sent out to councils, surveyors, public officers, etc., with a view to the expression of opinion thereon.

And whereas it is desirable that the opinion of this Association should be expressed thereon through the report of your Committee on Drainage.

Your Committee therefore suggest the following changes :

In " An Act respecting Ditches and Watercourses."

1. That Sec. 3 be amended to read " engineer " shall mean civil engineer or Ontario Land Surveyor.

2. That Sec. 5 be amended so as to read " every ditch constructed under this Act shall be limited in length to one-and-a-half miles."

3. That Sec. 11 be amended by striking out the word " five " and inserting instead the word " two."

4. That Sec. 12 be amended by striking out all the words after the word " service " in line 34.

5. That Sec. 22 be amended by striking out the word " required " in line 18 and inserting instead the words " notified in writing "

6. That in Form " G " the Award of Engineer, it is neither necessary nor advisable to include an estimate of the cost of the materials required if any, and your Committee therefore recommend that the words " all of which, according to my estimate, will amount in value to $—," be struck out.

Your Committee also make the following suggestions in regard to " The Act to consolidate and amend the Drainage Laws :"

1. Sec. 3—It frequently happens that the " majority *in number* " of the owners in any described area to be drained represent only a very small part of said area although they control the whole drainage question in that area, in justice therefore to the minority who may own nine tenths of the land the following words should be inserted (on page 2, line 2), after the word city, viz., " or upon the petition of the persons owning at least two-thirds of the land within said described area."

2. That it is not advisable to bind down the Engineer to the method of stating the proportion of the cost of any work to be paid for " benefit," " outlet liability," and " injuring liability " and your Committee would recommend that the Bill be amended throughout to make this method optional with the Engineer.

3. Sec. 12—Your Committee recommend that this Section be struck out.

HERBERT J. BOWMAN,
Chairman.

Toronto, Feb. 28th, '94.

DISCUSSION ON PROPOSED CHANGES IN DRAINAGE LAWS.

(As to the change suggested with regard to the meaning of the word " Engineer.")

Mr. Gaviller—I heard it remarked when that proposed change was made that the object of wording it in that way was to cover the case of townships situated in a territory where surveyors were very scarce. It might be very difficult to get that clause amended in the

shape in which it is put there, but the amendment might be worded in such a way that when a surveyor was living in the vicinity they should employ that man, and when it is impossible to get him, it could be put in such a shape that they could employ another person.

Mr. Gibson—How would you make out who a civil engineer is, a graduate?

Mr. Bowman—The courts would say.

Mr. Butler—It should say a civil engineer in some connection with the Canadian Society of Civil Engineers.

Mr. Sewell—But there are engineers who have no connection with the Society. Now, I am in connection with the English Institute, which I consider sufficient.

Mr. Bowman—It is simply to prevent townships employing some carpenter or handy man around the place when they can get an engineer.

Mr. Gibson—My impression is that the suggestion is very good if we could only get the matter in shape.

Mr. Gaviller—I entirely approve of it, but can we get it through?

(As to suggested amendment to Sec. 5.)

Mr. Bowman—We recommend that Section 5 be amended so as to read, "Every ditch constructed under this Act shall be limited in length to one and one half miles." It is "five lots" in the bill now, but that is very vague because there is nothing said about a road allowance. The ditch might go through two or three lots and run down the road allowance two or three miles, and the committee thought it would be better to limit the actual length of the ditch. In the report of the Drainage Commission a good deal of the evidence taken seemed to bear that out. One man gives that very opinion, W. Lounsborough, Cannington.

Mr. Gaviller—One and a half miles would cover a five lot block. The wording of the Act intends five lots straight ahead but it does not say so.

(As to the proposed amendment to Sec. 11.)

Mr. Bowman—We recommend that Sec. 11 be amended by striking out the word "five" and inserting instead the word "two." The committee thought five days was longer than was necessary, and it is only delaying matters, and often in the fall of the year it is a serious question.

Mr. Gaviller—I think that is looking to the postal service, to give time to communicate.

Mr. Bowman—They ought to be at the meeting. There is no time now at all, if they don't agree at the meeting any owner may go next day and ask the clerk to send a requisition. However, it is a trifling matter.

(As to the proposed amendment to Sec. 12.)

Mr. Bowman—We recommend that Section 12 be amended by striking out all the words after the word "service" in line 34. It appears that now the owner who serves these notices on the parties to

come to the meeting has to endorse on the back of one of them the time and manner of service, and then he has to go away back to the engineer, who may be 20 miles away, and give that back to him again. Well, if the time is already fixed there seems very little use in that, he can endorse it on the back, and the committee thought it better to strike out all after "service." Instead of simplifying the Act that seemed to have complicated it. The idea was that this commission would recommend a change in the Act to simplify it, but they have done the very reverse.

(As to the proposed amendment to Sec. 22.)

Mr. Bowman—We recommend that Section 22 be amended by striking out the word "required" in line 18.

Mr. Gaviller—In the old Act notice in writing was required. Why should that be changed at all? A man might come to your place some day when you were not there and tell anybody about the place that he wanted the engineer to come.

Mr. Bowman—We recommend that they be notified in writing.

Mr. Gaviller—Certainly, and leave the old Act as it was.

(As to change in Form "G.")

Mr. Bowman—The committee recommend that the words "All of which, according to my estimate, will amount in value to $—," be struck out. There is no necessity for that clause; it is just complicating the matter.

Mr. Gibson—There is one point; supposing you should get a notice and in some way or other a mistake is made, is there any arrangement under this bill by which the surveyor can get his pay when he goes out?

Mr. Bowman—I don't think so.

Mr. Gaviller—The old Act says you are to levy the costs on the party.

The Chairman—I think it rests with the engineer to see that the formality has been complied with.

Mr. Wilkie—Is not the burden of that thrown on the Clerk of the Council? When the requisition is made to him and he passes it on to the engineer, does not the engineer go to work and it goes through all right.

Mr. Bowman—I think that must be the understanding, because that is probably why they inserted that requirement of bringing the endorsed copy of the notice back to the engineer. Up to the time the clerk sends you the requisition he is responsible for the formalities.

A Member.—It is the duty of the engineer to ascertain whether or not the proper proceedings have been taken. I understand there has been a decision to that effect, and I always take care to find out from all parties whether they have received the requisite notice.

The Chairman—It seems to me if the party who is beginning the whole proceedings neglects any part he is liable for the whole thing. In an action at common law he would be.

Mr. Gibson—I think something should be put in, that in the case

of an irregularity on the part of the party applying, then the engineer shall be granted his expenses anyway.

The Chairman—I am afraid if you put in a thing like that it would look too much like class legislation, and the temperament of the times is against it.

Mr. Saunders—I have had cases brought to my notice in which the engineer could not make his award within the thirty days required by the statute. A man at the present time has filed a requisition to make an award in a case, and what are you to do at this season of the year ?

The Chairman—There is one maxim laid down in all laws that no man is required to do what is impossible.

(As to the Act to Consolidate the Drainage Laws.)

Mr. Bowman—We recommend that on page 2, line 2, the following words should be inserted after the word " city :" " or upon the petition of the persons holding at least two-thirds of the land within said described area." At present it goes entirely by numbers, a majority of the people living in the described area. There may be two parties who own about 500 acres with a number of small pieces around it of an acre or ten acres each, and the small owners really control the whole drainage question. They may want to obstruct it, they are not interested to any great extent for their one acre, yet they have as much to say as the other man with 500 acres. Now this alteration does not take away their rights of petitioning if they want the drain, it does not give the power to the larger land owners to block the thing, it simply makes it possible where the larger land owners want a drain for them to petition for it.

Mr. Tyrrell—I think that would be very advisable. I knew of a case where a drainage scheme was obstructed just in the way you suggest by some small owners.

(As to outlet liability and injuring liability).

Mr. Bowman—We recommend that it be amended throughout to make it optional with the engineer. Though engineers differ very little in results they differ a good deal in the methods of arriving at the result.

Mr. Gibson—I think the object of that is in case of a suit in court they can simply refer back to the engineer's report as to damage.

Mr. Ross—As regards outlet liability, it seems to be something similar to section 3, for injuring liability. Sections 3 and 4 refer to practically the same thing. There seems to be a fine shade of difference in the two, but it is very hard to get at. If you cause water to flow from any lands on to lower lands it would be apt to injure them, so that assessment for outlet should cover the whole thing. Sub-section 4 is almost similar, and if we had one section covering both and make no difference between injuring liability and outlet liability it would be better.

Mr. Coad—We have had a good deal of experience in our section where you very often have to lay out a drain in a low lying section or

the country that has got water discharging from a higher part of the country. The high land has sufficient fall, so that they are not depending on the drain constructed in the low lying lands to carry off the water. The object is to make the engineer state where he draws the line between the lands that are directly benefited and where the water is caused to flow off more freely from the construction of the work, and where the liability comes in of the man from up stream as to water flowing down, and as to helping to carry it off. The man up country is liable to help to carry the water off the low-lying land, so that he is not assessed for direct benefit. My opinion always has been that what is asked for there in that Section to a certain extent is necessary, but they carry it too far and ask the engineer to state in dollars and cents how much this lot is assessed for liability and how much for benefit. That should not be the case, but the engineer should be compelled in his report to outline the manner in which his assessment is made. For instance, he may say all the lands lying within a certain district, mentioning the lands, are assessed entirely for benefit ; then another section is assessed for both liability and benefit—sometimes part of a lot is benefited and part liable. The report should outline roughly the engineer's views with regard to his assessment. I think if the report sets forth clearly what land he assesses for liability and what for benefit, that is all that a man ought to expect. Then if he wants to go into the question of the engineer's ability to assess the property he has a chance to go and do that in court. The Commission have got information out of a great deal of controversy that has come up before Judges and Referees and they have come to a conclusion, but I think it is too much to expect. The engineer ought to be a man reasonably up in his work, to assess the land properly, and he should outline his reasons for assessing it, but they should find out how many dollars and so on in another court.

Mr. Ross—I would ask whether Mr. Coad is in favor of dividing this into two—injuring assessment and outlet assessment ?

Mr. Coad—I don't see for the life of me why a man should say it is injuring liability. It strikes me a man is either directly benefited by water being caused to flow off that land or by the construction of that work he has obtained a better outlet. He is either directly benefited or else he is not. For instance, supposing before the drain is dug, a man has five feet of fall from his farm on to the next farm, then that man should not be assessed for direct benefit because he says I am independent of that drain. But then the man that owns the low lands has a right to say: you have no right to throw your water on top of my land. It seems to me injuring liability and assessment for indirect benefit are one and the same thing.

Mr. Chairman—Don't our statutes tend to set up that the low land owes servitude to the higher land ? Do you mean to set that aside and say that the high land has got to pay for the lower land ?

Mr. Coad—What the statutes want to get at is this, so long as the man up stream does not meddle at all with nature he is under no liability to the man below, but just as soon as he interferes with nature and causes a larger and quicker discharge of water on to his neigh-

bour's property he is liable. But assessing a man for indirect benefit where he is assessed merely for liability and is not benefited by the construction of the work is one and the same thing.

The Chairman—I think perhaps it might mean that you strike a piece of low land and by doing so flood it and injure it, and you want to say how much you are going to allow for that injury.

Mr. Ross—No, you say how much the high land is going to pay for being relieved.

Mr. Gibson—In the paper I have prepared on roads I have taken up that matter of flood water. The English practice, as I understand the law, is this, that whatever falls directly above or springs from the land below may take its natural flow from the land in a state of nature, but if you collect that water on a roof or any other way and put it on your neighbour's land you have to take care of it. In the United States I understand you have a right to reasonable drainage, collecting your water and running it off in that way.

The Chairman—This section 5 uses the expression "injured lands." So that if you do not injure lands there is no injuring liability

Mr. Ross—Well any water brought from higher lands by any means would have a tendency to injure the lower lands, and why are you going to make a difference between outlet liability and injuring liability ?

The Chairman—If it flowed out and drowned the land it would be injuring liability, and if it merely interfered with the subsoil drainage it would be outlet liability.

Mr. Ross—There might be floods at one time that would drown the land and at other times would not. It would be pretty hard to make a difference between those two.

Mr. Coad—I cannot see that there is any difference between injuring liability and outlet liability, and assessing for indirect benefit, it is one and the same thing.

Mr. Bowman—(Reading a letter from Mr. H. Winter). Mr. Winter's idea seems to be that the municipality starting the proceeding should carry the work out right to the outlet instead of compelling the lower one either to take it up or be flooded out ; and thus to have it all under one control instead of divided.

Mr. Gaviller—In the old Act it says it must go to a proper outlet.

Mr. Bowman—The new Act says the upper one can get sufficient outlet and the lower one can take care of itself.

The Chairman—It seems to me the onus is on the engineer.

Mr. Ross—I think this Act provides for just going far enough to relieve the upper township, and then the lower township can go ahead and assess the upper township, but the engineer need not take into account the lower township. I think that is a good feature in this new Act. In the upper township perhaps there is a small area of land that they want to drain but to do that they might have to drain five times as much in the lower township and perhaps would not go on at all. Now you can only assess for benefit in the lower township and it is an injustice to the upper township, so I think this is a very good scheme.

Mr. Hopkins—It seems to me that there is some defect in the Act when there would be any injuring liability. As I understand that, it is allowable to run water down on somebody else's land, flooding it, and I don't see why they would have any right to do that at all, even if they did pay.

Mr. Bowman—They have got to go on the principle of the greatest benefit to the greatest number. It is almost impossible to carry out any work without making it disagreeable for some part of the country, and they try to benefit the largest area. The work is not necessarily a failure if in some parts the land is flooded.

Mr. Coad—I think the changes proposed in that respect are good. If it were not for those changes the up-lying township might carry out a very large work through the low-lying township and yet drain a very small portion of the township initiating the work.

Mr. Bowman—The Committee also recommend that Section 12 be struck out.

Mr. Hopkins—I think there are some good points about that. A man has to know what he is doing; he could not guess at his report then.

The Chairman—I think the Act will render it impossible for an incompetent man to do it all.

Mr. Bowman—It seems to be the opinion that to divide up the assessment into three heads will be rather an impossibility. Nine-tenths of the engineers do not seem to understand how, and a great many object to being required to do so. The Act now divides it into three columns, and our report is that that method be left optional. This is really the only point we suggest should be amended in the "Act to Consolidate and Amend the Drainage Laws."

The report of the Committee was then adopted.

QUESTION AND ANSWER.

The Tps. of A and B are both doing drainage work. The water flows from A through B and C to river for an outlet.

Township A requests Tp. B to dig their drain a certain depth at the town line between A and B, which causes B to have a much deeper drain than would otherwise be necessary; also requiring the drain through B and C to be much wider to provide room for the flow of water as the drain in A is some miles in length.

Question.—How should the cost of the extra digging, etc., through B and C be assessed on the property in A. Should it be assessed as the cost of the drain in A has been done, or in what way?

Answer.—The engineer should make his assessment on A for outlet as he sees fit. He may be guided by the former assessment.

DISCUSSION.

Mr. Traynor—The drain runs up in A three or four miles. I made an assessment of the township of B, and it took a considerable depth of drain at the townline, starting at four feet six inches. For

the drainage of B it was not necessary to have it anything like that depth to commence with. I assessed the extra cost of digging as a percentage on the engineer's assessment of A, and they are trying to hold that I had no right to assess anything unless a few lots immediately adjoining, that I had no right to follow it back for miles. My contention is that that was really a part of the cost of the drain, and that if his assessment was right the cost of the outlet should be assessed on all the property.

Mr. Coad—It seems to me there is no doubt the assessing of A would be right and proper, but whether that assessment should be in proportion to the assessment for the works done in A would be a different question. It would strike me that some of the adjacent lots next to the the townline in the township of A should be assessed for the work done in B a good deal higher than probably the man constructing the work in A for the simple reason that the drain without having an outlet would benefit the lots to a small extent next the townline in A whereas they might be benefited considerably farther up stream. I think the principle of assessing the township of A would be good, but not all the detail.

The Chairman—A shallow drain would have been sufficient for these lots adjoining the townline in A.

Mr. Traynor—I might state that some of the lots adjacent to the townline were not assessed in the drainage system by the engineer of A. They were not included in that portion of his assessment that formed a portion of my assessment.

Mr. Coad—That would carry out exactly the principle that I wished to explain. You would be assessing them under that section of the Act where they propose to divide it up into several parts, and so you assess a man for outlet, and you assess him for indirect benefit, and for injury and so on.

Mr. Traynor—I fail to see why you would assess him for injury in that case, because I don't believe it would be much injury to him.

Mr. Coad—The township of A is liable to pay money to do away with the injury. The work that you would construct in the township of B would be for the purpose of taking away an injury that existed. That injury would be caused no doubt a great deal by the township of A, and in paying for the removal of that injury they would be paying their liability which they want to describe in the new Act as assessing them for injury caused by their waters coming down on the lower township. The great trouble seems to be the name you give, whether it is for outlet, or injury, or indirect benefit, or whatever you like.

Mr. Burke—I would be inclined to assess those lots adjoining the townline there, higher than I would assess all the way up for extra digging. I don't know whether I would be right or not, but I think that is the way I would do it. That is for outlet.

Mr. Bowman—From what the committee members here have said I think that the engineer on B should make his assessment and be

guided in some way by the assessment that the engineer of A made, but need not necessarily follow it entirely. It seems only right that the lots down at the townline should pay more than those at the extreme end of the township. He would have to make an entirely separate assessment.

Mr. Traynor—I made an entirely separate assessment, but their contention was that I had no right to assess any but a few lots right at the townline.

Mr. Bowman—If they bring some water here through the construction of this drain they have got to pay for part of this drain. If they want a greater depth than nature has afforded they have got to pay for that greater depth, and if they bring a greater volume of water they have got to pay for the extra size of this drain to take that volume of water away. This extra depth here at the townline benefits those away at the upper end.

REPORT OF THE COMMITTEE ON TOPOGRAPHICAL SURVEYING.

MR. PRESIDENT,—At the last annual meeting it was resolved to appoint a Standing Committee on Topographical Surveying. In due time the members of this Committee were notified of their appointment but no instructions were issued to us by the Council or by the Association.

The Chairman of this Committee sent a circular to each member requesting replies to the following questions:

1. Under what authority or authorities should the work be proceeded with?

2. (*a*) What would be the cost of the primary triangulation, (*b*) secondary triangulation and (*c*) the Topographical work?

3. How is the cost to be defrayed?

4. What financial benefits will the settled parts of the Province derive from such a survey?

5. Can you give conclusive arguments why our Government should proceed with the work?

From the replies received, it is evident that more time is required before deciding upon a definite line of action.

The memorandum on a trigonometrical survey of the Dominion, prepared by a Special Committee of the D.L.S. Association in 1888, and printed in the Report of the Association for that year should be read carefully by every member of this Association. This carefully prepared memorandum represents a great amount of labor by the Committee, and to them must be given the credit of taking the first steps towards bringing this important matter to the attention of the Government.

Members of Special Committee:—Otto J. Klotz, D.T.S., W. F. King, D.T.S., W. S. Drewry, DL S., E. J. Rainboth, D.L.S, J S. Dennis, D.T.S.

For a few years, the work of our Committee must be of a missionary character. The members of the profession must first of all divest themselves of the idea that when this work proceeds a great number of O. L. S's. will be employed. Patriotism and professional pride must be our only motives in urging on this necessary work.

We must discuss the problem among ourselves and when we become somewhat well posted, we may venture to broach the subject to others. The following questions will at once suggest themselves :

1. Is the work necessary ?
2. What will it cost?
3. Will it pay ?
4. How is the cost to be defrayed ?

Every member of this Association must have logical answers to all of these questions before we can expect our Legislators to pay any attention to a Topographical Survey.

A paper on " Topographical Surveys " prepared for the International Engineering Congress of the Columbian Exposition, 1893, by Herbert G. Ogden, Assistant U. S. Coast and Geodetic Survey, gives the cost of different surveys as follows :

SURVEY	COST PER SQ. MILE.	SCALE	REMARKS
France	$186	1:50,000	Ordnance Survey,
Great Britain	244	1:25,000	" "
Germany	79	1:25,000	
Austria	400	1:25,000	All expenses
Holland	16½	1:25,000	Revision only.
India	11	1: equal 1 mile.	
"	26	2: " "	
"	400	6: " "	
Massachusetts	13	1:30,000	Geological Survey.
Connecticut	9 80	1:30,000	" "
Rhode Island	9.00	1:30,000	" "

In New Jersey the cost was about $7.00 per square mile.

We believe it to be the duty of this Association to act as an Advisory Board to the Department of Crown Lands and to bring to the the notice of this department any improvements that we may consider necessary respecting methods of survey, or to recommend to the Department any change in policy that will tend to keep our professional work abreast with that being done by other civilized nations. We also believe that our Legislature will welcome any assistance we can offer, but we must first become a united body, and be able to present our request to the Legislature so intelligently, so forcibly and so justly that they cannot do otherwise than comply." (Page 20, 1886, Report of Provisional Executive Committee on Incorporation. Our Bill of Incorporation was passed April 1892, thus representing a labor of six years.)

This Province has been expending annually about $40,000 in Crown Surveys for a great number of years. Generally this money has

been spent economically, and if it has not all been spent wisely, the members of this Association and therefore the Association itself, must assume the responsibility to a considerable extent.

Would it not be better to spend half of this sum on a Topographic Survey of the older portions of this Province? We think it would. At $20 per square mile, this would represent a completed survey of 1000 square miles per year an area approximately equal to the County of York, the County of Lambton or the County of Carleton. We are of opinion that the following is an outline of how the work should be proceeded with:

(*a.*)—The International boundary lines, the coast lines and the primary triangles to be surveyed by the Dominion Government and permanent marks left of the work done.

(*b.*)—The Provincial Government to proceed with the Secondary Triangulations and the Topographic work.

(*c.*)—Plans to be drawn on a scale of 1:25,000 and contours shown at every 20 feet of elevaion.

(*d.*)—The cost of the Provincial work must be kept below $20 per square mile, and the total yearly provincial expenditure should not exceed $20,000.

WILLIS CHIPMAN,
Chairman.
JOS. COZENS,
A. L. RUSSELL.

DISCUSSION.

Mr. Chipman—I might add that some of the views expressed here are somewhat radical, and we must approach this subject in a very careful way, but I don't think it is a more difficult problem than that of incorporation, which has been so successfully consummated. That was looked upon as something beyond our reach altogether a few years ago; in fact when this Association was organized it was looked upon as rather a precarious undertaking, but we have succeeded, and I think we can succeed with this other matter if we approach it in the right way and become perfectly *au fait* in the matter ourselves before we go to the Legislature.

Mr. Gibson—There is no question in the world about a Topographical survey being a good thing. In the United States, where they call it their Coast survey, it is of the utmost importance The Dominion wants the same thing, but how are you going to get it? It is a good thing to be hoped for and prayed for and talked about. It would be a move in the right direction.

The President—I would like to ask Mr. Chipman, if in preparing the report, they considered how the surveys were done in the United States. I was not aware until recently that a triangulation survey had been continued right across from the Atlantic to the Pacific. I was at the World's Fair, and they had a globe there nearly as large as this room, showing all the triangles from the Atlantic to the Pacific,

and all the principal base lines, where they were chained, were set in brass. Was the Coast and Goedetic survey taken up by the individual States or by the United States Government ?

Mr. Chipman—I think the Coast survey was done by the Federal Government, but the filling in of the triangles and other work was done by the States afterwards. In New Jersey it was done by the Geological Survey Department. In New York it was done by special survey.

The whole point is just this: Our Provincial Government is spending $40,000 a year on surveys; wouid it not be better to spend half of that on a Topographical survey rather than spend so much in Algoma ?

Mr. Gibson—Suppose we sent you as a deputation up to them how would you put the matter so that they would see the advantage of it?

Mr. Chipman—The best evidence we have is given in that little report of the Dominion Land Surveyors' Association of 1888.

The President—In some of the American publications there is a report, that in Massachusetts State if there had been a Topographical survey made in early times, it would have saved fabulous sums in the way of locating railways. If we had one when a line of railway was proposed they could just refer to it and see how it would be, and the same with drainage works.

Mr. Chipman—Such surveys would be useful in every class of engineering work. We would need no preliminary surveys at all. In England there is no such thing as preliminary survey.

The President—I thought perhaps you had the idea of the Province following up and filling in, as it were, the work of the Federal Government. I think perhaps you will find that the United States have done that.

Mr. Chipman—They have done that generally.

The President—Are you aware why the Dominion Government gave up the Triangulation survey in the North-West? They followed it up to Fort Pelly and then left it off.

REPORT OF PUBLICATION COMMITTEE.

MR. PRESIDENT,—Your Committee have to report as follows :

The " Proceedings " for 1893 were printed by C. Blackett Robinson, as usual.

Our exchanges are as follows :

EXCHANGE LIST.

	SENT.	RECEIVED.
Michigan Engineering Society, F. Hodgman, Sec., Climax, Mich	140	195
Iowa Engineers and Surveyors Society, Seth Dean, Sec. and Treas., Glenwood, Iowa	55	195
Indiana Engineering Society, W. P. Carmichael, Cor. Sec. Williamsport, Ind	130	195
School of Science Engineering Society, Jos. Keele, Cor. Sec.	150	194
Ohio Society of Surveyors and Civil Engineers, Chas. C. A. Hudson, Sec. and Treas., Sandusky, Ohio	130	195
Illinois Society of Engineers and Surveyors, S. A. Bullard, Ex. Sec., Springfield, Ill	110	134
Association of D. L. Surveyors, J. I. Dufresne, Sec-Treas., Ottawa	10	10

A copy has also been sent to each of the following :

Public Library, Toronto, J. Bain, Jr., Librarian.

Cornell University, Ithaca, N. Y., Prof E. A. Fuertes, Director, college C. E.

Mass. Inst. of Technology, Boston, Mass., Clement W. Andrews, Librarian

Engineers' Society of Western Penn., 5th street, Pittsburg, R. N. Clark, Secretary.

Professor Carpmael, Toronto Observatory.

"The Surveyor," 24 Bride Lane, Fleet Street, London, E. C., England.

John W. Suggett, Sec. Local Board State Normal and Training School, Cortland, Cortland Co., N.Y.

Your Committee would like to draw the attention of the Association to the amount received for advertisements, and point out that it goes a long way towards paying for publishing the Report. They hope the profession will continue to patronize those advertising with us, and give any assistance in their power to getting new advertisements.

Your Committee would also like to call the attention of those reading papers to their report of last year with reference to plans and diagrams attached to papers.

Respectfully submitted,

H. L. ESTEN,
Chairman.

REPORT OF COMMITTEE ON ENTERTAINMENT.

MR. PRESIDENT,—The Entertainment Committee for 1893-4 beg to report as follows :

The place of meeting of the Association having given general satisfaction, the same rooms in the Canadian Institute were engaged for this year's convention, and upon the same terms.


SPRING
SUMMER
AUTUMN
WINTER

Annual Dinner

of the

Association of

Ontario Land Surveyors

held during the 2nd Annual Session

At H. Webb's Restaurant

Toronto, Feb. 28th 1894

Thomas Mitchell O.L.S.

As the usual form of entertainment, the annual dinner, had been decided upon at a meeting of Toronto members of the Association, arrangements were made with Mr. H. Webb for that purpose, and on the evening of the 28th February it took place at his apartments on Yonge street.

The only invited guests able to be present were Mr. Aubrey White, Assistant Commissioner of Crown Lands, and Mr. A. J. McPherson, representing the Engineering Society of the School of Practical Science.

Letters were received from the other invited guests, Hon. A. S. Hardy, Commissioner of Crown Lands, Professor C. Carpmael of the Toronto Observatory, and Mr. E. H. Keating, C E, City Engineer of Toronto, regretting their inability to attend and expressing good wishes for the enjoyment of all.

The members present consisted of yourself as Chairman, Mr. M. Butler, as Vice-Chairman, and Messrs. Niven, Chipman, Kirkpatrick, Galbraith, Sankey, VanNostrand, Lumsden, Abrey, Bowman, Tyrrell, Evans, Ross, Jones, Speight, Walker, McKay, Wilkie, Miles, Proudfoot, McMullen, Ellis, Esten, Hopkins, Traynor, Burke, Sewell, Hutcheon, Whitson, Foster, making with the two guests present thirty-three in all.

After due appreciation was shown for the excellent menu provided by our host, the usual toasts were in order, proposed by yourself, the Vice-Chairman and others.

"The Queen" was drunk by all and "God Save the Queen" sung with the usual fervency characteristic of our members, after which followed "The Ontario Legislature" responded to by Mr. Niven and Mr. White; "Sister Societies" by Messrs. McPherson, Galbraith, Lumsden, and Butler; "The Militia of Canada," by Messrs. Jones and Sankey; "The Mining Interests of Canada," by J. D. Evans; "The Association of O. L. Surveyors," proposed by Mr. Galbraith, responded to by yourself and Mr. Kirkpatrick; The "Father of the Association," proposed by Mr. Niven, was responded to by Mr. Chipman; "The Entertainment Committee," proposed by Mr. White, was responded to by Messrs. Foster, Ellis and Speight; The "Geological Survey" was responded to by Messrs. Galbraith and Tyrrell; "The Secretary," by Mr. VanNostrand; "The Ladies," proposed by Mr. Butler and responded to by Messrs. Hopkins and McMullen.

Between these toasts several songs were sung by Messrs. Niven, Foster and Sewell and a recitation by Mr. T. H. Jones, giving a pleasing variety to the entertainment, after which "Auld Lang Syne" was sung and an adjournment was made to the ante rooms where social conversation was continued till a late hour.

A detailed account will be deposited with the Secretary of the Association showing the receipts and expenditures of the Committee.

All of which is respectfully submitted.

On behalf of the Committee,

FRED. L. FOSTER,

Chairman.

NEW BUSINESS.

RE REPRESENTATIVES FROM OTHER SOCIETIES.

Mr. Chipman—Has there ever been any move made towards getting representatives from the other societies to be in attendance at our meeting.

The President—I took the liberty of writing to the Secretary a short time ago suggesting something in the line of my address last year, that it would be advisable perhaps to communicate with the different Associations with whom we exchange proceedings, inviting them to send a representative to our meetings, who would also be a guest at our dinner.

The Secretary—In accordance with the suggestion of the President I wrote to the Secretaries of all our exchange societies inviting them to send representatives for the annual meeting and dinner, and we received two replies, from Ohio and Michigan I think. I received letters to-day stating that they had delayed replying in the hope of getting someone who would be able to attend, but they finally found that they had no one who could leave his business for such a length of time The School of Practical Science here, however, has been represented during the whole meeting, and also at the dinner last evening.

RE BIOGRAPHICAL SKETCHES.

Mr. Chipman—There is another matter which has suggested itself to me, that is the compilation of biographical sketches of the early surveyors of this country. We are making an attempt at it year by year, but I think an organized effort should be made. We should ask each of the older members of the Association to send in a short sketch of his own professional career and also of those to whom he was apprenticed or articled. These older members probably served their time with some other surveyor whose name appears upon the list of surveyors in the Crown Lands Department. I know in the east there are several men now practising who remember the preceding surveyors whose works are now practically forgotten, we only know them by seeing their names on the list. I think an effort could be made, and should be made, to communicate with these older members by circular and to mention the names of the surveyors of whom we wish them to write a biographical sketch. It would become an interesting feature in our reports.

Mr. Sankey—We have received a letter from Mr. Sherman Malcolm, one of the very oldest members of our Association, which would very properly form the preface of the subject Mr. Chipman has just referred to. He says he has been connected with the practice of surveying for thirty or forty years and gives an interesting history of the surveyors in his locality. He mentions a number of names and refers to the time when there were not enough surveyors in the country to do

the work and the Government had to appoint deputy provincial land surveyors to perform services in various parts of the Province. We have the preface at any rate of what Mr. Chipman asks us to do, and I certainly quite agree with what he says. It would be a most interesting feature of our report if we can get such information. I think within the next year or so we might get a great deal of material in that line, which after that time would be lost altogether. I agree with Mr. Chipman that something definite should be done. We cannot ask our Secretary to hunt up this ancient history for us because he has enough modern history to attend to. I think a committee should be appointed for that purpose.

A Committee was then appointed in accordance with Mr. Sankey's suggestion.

RE POLAR EXPEDITION.

Mr. Chipman—This scheme may prove not so impracticable as might be supposed at present. It is quite possible I think to organize an expedition ; it is just a question of dollars and cents. Many of those whom I have named on the Committee have had experience in our northern country and they know what the hardships are, and I believe that the hardships farther north are not in proportion to the latitude, and that they will find no greater difficulties north of the Arctic Circle than immediately south of it, perhaps they may be lessened. The land scheme is in my mind, from what I have read, more practicable than depending on boats and vessels. I believe, if we could induce the government of this or some other country to assist in some way to raise the money to pay for such an expedition, and for commencing a regular survey, that there are members of this Association who are so wedded to the profession that they would brave all the hardships ; follow the line of collimation of their transits and be at the North Pole perhaps before they realized it.

DISCUSSION AS TO THE PETITION ER REDUCTION OF DUTY ON SURVEYING INSTRUMENTS.

The President—I think perhaps it would be in order for the Association to express their views regarding the memorial from the Provincial Land Surveyors' Association of Manitoba. They have sent us a copy of the petition they sent to Ottawa, asking that the duty be reduced on surveying instruments ; and I have a letter here from the Secretary. The memorial is as follows :—

MEMORIAL OF THE PROVINCIAL LAND SURVEYORS' ASSOCIATION OF MANITOBA.

To the Honorable the Minister of Finance, Ottawa :

Your Memorialists would respectfully show that they are an Incorporated Body having a membership of nineteen members in good standing.

The work of Land Surveying necessarily involves the ownership by

each Surveyor of about one thousand dollars in Instruments for the purpose of surveying—field and office work—composed chiefly of transits, theodolites, levels, compasses, sextants, field glasses, telescopes, levelling-rods, chains, tapes, draughting instruments, and material, including drawing paper, tracing linen, cross section paper and blue process paper.

The tariff upon these articles ranges from 25 per cent. to 35 per cent. ad valorem. The work required from a surveyor is necessarily one of the greatest precision, on account of the very important interests to private and public rights which are involved ; and every surveyor in order to do justice to the public and to his profession must procure the most modern and complete instruments of the several kinds wherever manufactured.

The manufacture of surveyors' instruments is not carried on as a business by any person or firm in Canada, and we respectfully submit that to produce successfully the higher class of instruments required for our profession would necessitate a very much larger market than is at all likely to be afforded in Canada for many years to come.

Your Memorialists would point out that the tariff in this way bears unduly upon them and would respectfully submit that in the reconsideration of the list of dutiable goods the instruments and material required by Surveyors should be placed on either the free list or under a schedule at a much lower ad valorem duty than is now charged on such goods.

Your Memorialists will ever pray.

(Signed) R. E. YOUNG,
President.

J. W. HARRIS,
Secretary.

WINNIPEG, NOV. 1, 1893.

Mr. Sankey—What we did was this : It seemed to be necessary to take some action before our annual meeting, and we sent a copy of the petition to each member of the Council, asking his opinion thereon. The answers we received were unanimous, so we sent a letter to the Minister of Finance, saying that we had received this Memorial, and that the Council was unanimous in asking that it should receive due consideration ; and that it would be brought up before the Association of Ontario Surveyors at the next annual meeting. We also informed him that we had about 200 members in good standing, and about 33 members who had retired from practice. I proposed to bring this matter before you, and to suggest that we might also prepare a memorial and send it down, and, also, that we might request the Association of Quebec, British Columbia and other provinces to join us. I think it would perhaps be advisable, also, to bring it before the Engineers' Society ; they are equally interested in these matters with us. If that were done, there is no doubt it would ensure this memorial receiving more consideration than if it merely went from Manitoba alone, or from Ontario alone. I think we should do something to help each other in that way. I therefore move that the

Secretary be instructed to forward a memorial to the Minister of Finance, in Ottawa, on the same lines as the one presented by the Manitoba Association ; and, also, that the co-operation of other Surveyors' Associations in Canada, and the Society of Civil Engineers be asked.

Mr. Niven seconded the motion, and it was carried.

RE EMPLOYMENT OF UNLICENSED SURVEYORS.

Mr. Gaviller—There is a subject mentioned by Mr. Bowman today which I think might be discussed here, namely, that in some county in the west, he did not mention which, they are in the habit of employing what they call a road engineer. When a township council requires a deviation in a road or anything of that kind the road engineer goes to work, measures this road up, locates it and stakes it all out, makes a description of it by metes and bounds, and this description is put in the deed and the road is established by by-law, no licensed surveyor being consulted on the subject whatever. I should think this is a pretty plain case for the Act to be put in force.

Mr. Wilkie—The same thing is done down in our part of the country, the County of Lanark. Each township employs some farmer usually as a road surveyor, and he lays out the road and describes it after his fashion, after which a by-law is passed, and it is all fixed up in that way. However, these men don't seem to get along very well, and although they go out and practise surveying among the farmers, charging them about $1 a day for their services, as a rule I find that the farmers object to their work, there is generally something wrong, and they call me, or somebody else in, to establish it for them. So that as a general thing, down there I think instead of doing harm, they perhaps do us good, because we get more work. I was called on once last winter to correct an error one of these men had made of ten chains in three lots.

Mr. Tyrrell—I have some doubts of these outside practitioners doing us any good. I know in the County of Wentworth I could name half a dozen farmers and men through the county who do surveying habitually. They form a sort of intermediate step between the farmer and the surveyor. They are paid, I think, usually about $2 a day, and they do a great deal of work that surveyors should be called upon to do. I really think the Association ought to attend to them. Only last week up west of Hamilton, I was informed of a survey that had been made by a farmer, for a neighbor of the man I was working for, and I have met with that kind of thing constantly.

Mr. Sankey—As chairman of the council I am very glad to have heard these remarks. One of the benefits that we held out to surveyors who were not in our Association before incorporation was, that this sort of thing would come under the control of a responsible body, and that it would save the individual surveyor the personal trouble or onus, if I may put it that way, of prosecuting the unlicensed practitioner. Up

to the present we have not had any very definite charges in matters of this kind brought before us. There is one, but it seems to me one of the difficulties we will have,if we proceed with the prosecution is to prove the receiving of pay for the work done. As I understand it, the payment made in the case to which I am now referring was in the shape of work in connection with the survey. Certainly I was not aware that the evil was so wide spread as it appears to be, and if the surveyors of this Association find that their rights are being encroached upon, I am sure that this council will be only too glad to get any sort of authentic information on the subject. Of course we must get definite information that the survey was made, and, secondly, that it was paid for.

Mr. Gaviller—Acting as a Provincial Land Surveyor would not necessitate the actual payment of money for services.

Mr. Sankey—The difficulty is this: I presume a man, if he could chain correctly or run a line on proper bearing, and did it for his brother or uncle or cousin and did not charge for it, it might be a difficult matter for us to prosecute him before the courts and succeed, and if we cannot insure success, the Council is of the opinion that it is not advisable to just make a dash at a man, and then draw back because we have not got sufficient evidence. But certainly the desire of the present council is, that in the first case, in which we have a reasonable chance of convicting, to prosecute, in order to make an example of such practitioners. I think we are bound to do it from the representations that we made before incorporation, and I think it is in the interests of the Association and this profession at large that we should do so. We should make these unlicensed practitioners feel that our Association is something, that it is not merely for the interchange of ideas or intellectual talk, but it is for some real, reasonable purpose, and I don't think there is anything more reasonable than protecting the public and our own interests.

Mr. Chipman—I am somewhat surprised to hear that this disease has spread to the western part of the province. It has been quite prevalent in the east, but along the border counties it is pretty well stamped out. While I was secretary of the Association, there came to my notice the fact that a township clerk in the vicinity of where I was practising, was laying out and sub-dividing land, etc., so I wrote him a letter, and we were very shortly afterwards appointed township engineers, and called upon to do the work that this gentleman had been doing previously. He was working ignorantly, and was not aware of this provision in the Act. We must not assume that these gentlemen are wilfully encroaching upon our field of operations or labor, because if you consult the proceedings of Board of Quarter Sessions of the old district of Johnstown, they met quarterly in that district, and invariably appointed some one as road surveyor and this gentleman laid out the roads. Nearly all of the forced roads were laid out in that way, and the descriptions as printed in the proceedings are exactly on a par with what we read from that letter. The courses in the earlier ones, instead of running to stakes,

ran to beech trees and elm trees, etc., and the bearings were all wrong. The distances may have been wrong, or they may not, but in retracing these old roads it is practically impossible to see where they were laid out. I believe if the Council through their secretary would send to each party charged with doing this kind of work a very stiff, strong letter, written with a typewriter, and in a large envelope sealed with a good quantity of wax, that man would soon stop his operations.

Mr. Gaviller—I am very glad to hear that our late secretary has had an experience of that kind and that he was successful in being appointed township engineer. No doubt he was astonished, but I was astonished myself when I acted in the very same manner. I generally carry a copy of the Act with me, and I found out on one occasion in which I was sent for, that there was a bush ranger out ahead of me and he had actually been to the place, but when I quoted the Act, the bush ranger retired from the scene. I know he has never done any more work in that township, and I have been appointed township engineer myself.

Mr. Sankey—With regard to the suggestions made, I may say that if the members of the Association will give the Council any clue, we will pay for the wax and envelope.

PAPERS SUGGESTED FOR NEXT MEETING.

Mr. Gibson—It is a perfect burden to our Secretary to select individuals to prepare papers for the meetings, so I suggested to him that if he would mention the matter at the meeting of the Association probably we would have enough subjects suggested to last two or three years. Some are of the opinion that if a paper is a little outside of the surveying line it is not the thing, but I say whatever a land surveyor is engaged in let him tell it.

Mr. Chipman—I would like to hear a paper upon the boundary line between Ontario and Quebec. I don't know whether any of the present members of the Association were on that work or not.

Mr. Niven—I don't think so; it was run by Mr. O'Hanley on the part of Ontario and Mr. O'Dowd on behalf of Quebec. It was run about 30 odd miles from the head of Lake Temiscamingue and there it stops.

Mr. Gibson—I would suggest that Mr. Niven prepare the paper. He has been in that section of the country and I am sure he would prepare a very interesting paper.

Mr. Burke—It would be very interesting if we could get a paper on the Alaska boundary. Perhaps Mr. Klotz or Mr. Ogilvie will give that.

Mr. Sewell—Mr. Proudfoot and Mr. Whitson have been down Rainy River a good deal; they might tell us something about that part of the country.

Mr. Gibson—The Separate System of Sewerage, by Mr. Chipman, I think would be a good thing.

The Chairman—(Mr. Butler)—It struck me that a paper on our standards of measurement as governed by the Dominion and Provincial Acts should be dealt with. I think I spoke of it last year. Every surveyor or every other man using a measure of length is bound to submit it to the Department of Inland Revenue or be subject to a fine. It seems to me it really requires the action of the Association to draw the attention of the Department of Inland Revenue to the fact that they have no facilities whatever for making the test, and to suggest that the Act be changed in such a way that we can submit our measurements to a standard. At McGill College they have facilities for testing with the utmost precision.

Mr. Gaviller—That question came up before, and it was mentioned that there was a standard measure then under construction at the School of Practical Science. It is marked on stone and brick piers, 100 feet.

Mr. Niven—It was suggested in the discussion of this, last year, that we should get our standards from Ottawa. Mr. Dickson sent for one and before going out I took the precaution to test my chain by that one, and I found that the steel band that I purchased at Rice Lewis' was exactly correct. I may say also that I used a steel band for five years without testing it, and then when I tested it by a new one there was scarcely a hair's breadth of difference, it was simply due to the ends of the handles being worn. I think the standards at Ottawa answer every purpose and they can be got for $8 each.

Mr. McAree—Is there not some difference between the Dominion and Ontario Standard? I heard of a survey made in the north-west, and there was something like a difference of a link in a mile!

Mr. Butler—Has the Ontario Legislature jurisdiction over measures? I don't think they have; it is entirely within the powers of the Dominion Parliament to legislate in regard to that, and consequently we are in that sense subject to the Dominion.

Mr. Gibson—I think Mr. Kirkpatrick or Mr. Abrey should prepare a paper on that.

Mr. Butler—I would suggest that the metric system be outlined in connection with it at the same time. That is a reform more pressing and needy than any other.

Mr. Chipman—I would like to ask some member of the Board of Examiners to explain fully to the Association how members as they are graduated, and how surveyors are to test their band chains by means of the pine rods that are given to them?

Mr. McAree—I would ask by what authority these rods are issued at all.

Mr. Burke—Do you think that these band chains are much affected by the temperature? I was talking to Mr. Young of Winnipeg about it, and he has a chain made in the States, part of it is of aluminium, and it is very narrow. He has made measurements with it both in summer and winter, and he is making them this winter, he says the difference in these measurements is almost imper-

ceptible. He does not think that the difference in temperature is worth noticing at all.

Mr. Butler—When you come to geodetic measurements the elasticity of the material in the tape is a factor as well as temperature, and also the strain upon the tape.

Mr. Hopkins—When I was engaged at steel bridges we had to punch long plates 30 feet long, and in marking for these punches we never used a wooden measure because wood would not expand and the metal would. We always measured them with a steel tape so that each would expand in the same proportion. If you take a long steel bridge and mark out these rivet holes with wood, and the temperature varies from day to day, when you come to erect your bridge you will find that the rivet holes that ought to come right opposite one another do not concur.

Mr. Gibson—I have constructed a steel bridge 356 feet long and used a steel tape all the way and it turned out splendidly; every thing fitted, vertically, longitudinally, and every other way.

Mr. Smith—Somebody here has asked, "How would a person living in the country get this standard of measurement, if there be such?" That is the difficulty. It is a theoretical one, it is not a practical one at all to my mind, because everyone can get a Chesterman tape or a steel tape, and I have measured bridges hundreds of feet long, laid them out with a steel tape, and there was no practical difficulty at all. The question in my mind is, where can we reach that position where we can get a practical solution of the difficulty? What shall be the length and where shall we get it? To lay down any standard in any particular place to my mind is impracticable. You might as well lay it down in London, England, as in Ottawa or in Toronto for a great many people. Everybody knows that a Chesterman tape, or a steel tape, I don't care who is the manufacturer, is very much better than these short measures however accurate they may be. I think that some standard might be suggested at any rate by this Board, a certain tape of 66 to 100 feet in length wherever procurable; and when it could be established that a surveyor tested his tape, or whatever he is using, by this standard, it ought to be accepted as legal evidence that he used an accurate measure.

Mr. Chipman—I think the best thing we can do is to appoint a committee to bring in a report next year. For my part I think these iron-link chains should be abolished.

A committee was then appointed in accordance with Mr. Chipman's suggestion.

PRESIDENT'S ADDRESS.

GENTLEMEN OF THE ASSOCIATION OF ONTARIO LAND SURVEYORS:

I have much pleasure in welcoming you to this our Second Annual Meeting as a corporate body, and the ninth as an Association of Land Surveyors of this Province.

Since our last meeting we have lost by the hand of death, probably the oldest member of our Association, namely, Mr. Thos. Fraser Gibbs, of Adolphustown, who died in April last, in his 82nd year; an obituary notice of which was inserted in our report of last year. Mr. Gibbs stood in the front rank of the profession, and was for many years a member of the Board of Examiners. He heartily approved of the recent changes in our status as a body, as expressed in a letter which he wrote to the Secretary about two months before his death, and in which he regretted being unable through age to attend our last Annual Meeting. I think I can scarcely wish for us all a more lengthy pilgrimage than was his, accompanied similarly by the possession of our mental faculties to its close.

As we have now about completed the work in which we have been engaged for some time in organizing ourselves into a body corporate, and have got the new machinery into fair working order, we will be able to devote more time to technical and other subjects which may be of interest and profit to us. As I remarked, however, a year ago, we must not now allow ourselves to be persuaded that we have finished our work as an Association. The very idea of organization presupposes an object or objects to be attained entirely distinct and ulterior to the act itself. No body of men would be so foolish as to spend their time and means in perfecting an organization; and surrounding it with regulations, rules and by-laws, if it were not expected that by such means its members would be benefited.

The various societies that are organized throughout the land, and their name is legion, all have definite objects in view, and they are organized in order that they may the better succeed in the accomplishment of these objects; and so Gentlemen it should be with us. We are now in a position to speak with a united voice, and our numbers and the standing of our members throughout the Province are such as to command respect and attention whenever we as a body express our views on questions with which we are familiar.

Without pretending to dictate to those who are in charge of the administration of public affairs, either in the Dominion or in this Province, I think there are many things outside of the issues that divide men politically, that we could with the greatest propriety urge

on their attention. I might mention as a case in point, the desirability of proceeding as fast as possible with a topographical and geodetic survey of the Dominion. This matter I believe was pressed upon the attention of the Dominion Government by the Association of Dominion Land Surveyors, and I understand that the latter had received such encouragement as led them to believe that the matter would be taken up systematically in a short time. I would suggest that this Association take some means by resolution or otherwise to strengthen the hands of our sister association in so worthy an object.

Again there has been brought to our notice through the Secretary of the Association of Land Surveyors of Manitoba, a petition by that body to the Dominion Government, relating to the import duty on surveying instruments, and I would call your attention to the matter at present, as the time is opportune if you wish to forward your views to the Finance Minister on the subject.

There is too the old subject of the boundary commission which I think should not be allowed to drop. It is one of those subjects of proposed legislation that has only to be explained in order to be popular in the country, and I wonder that the Patrons of Industry have not adopted it as one of the planks in their platform. Probably the reason is that it has not been brought before their notice.

There is also a matter that I as a private member of the old Association brought up at one of our annual meetings some years ago. I refer to a regular systematic exploratory survey of the unsurveyed portion of this Province. At that time a motion was passed appointing a Committee to lay our views before the Commissioner of Crown Lands. You have somewhere, I believe, a report of that Committee. Since that time a limited amount of work has been done in the district of Algoma, but scarcely anything in the way proposed.

I question if there is any other civilized country in the world which possesses so little information concerning its own possessions as our own country. We resemble a man with a large farm who has been contented in working a few acres along his river front, but who has never taken sufficient interest in the larger part of his property in the rear to even explore it.

Now it may be asked: What is the use of gaining this information? I answer that the Government of this Province has exclusive control over its unoccupied domain, and it is their object as well as their duty to proceed in the most intelligent manner possible in its development. It is the part of wisdom to encourage and direct immigrants only into those parts where they will be able by industry and perseverance to prosper; to take means to preserve from destruction by fire any portions where the timber is valuable, and to encourage as far as possible the miner in developing the hidden resources of the country, but without information they are to a very large degree working in the dark.

The object of such a survey should be to furnish full and reliable reports on the country embraced, including its topography, its elevation above the sea; its climate and its agricultural, timber and mineral resources.

Such a survey would in no way interfere with the ordinary surveys now being made by the Crown from year to year, but be preliminary to them in the way of showing where the latter would be most necessary in the public interest.

These are but a few of the subjects that might be mentioned which I think might with propriety engage our attention.

In resigning the position of President, with which you have honored me for the past two years, permit me to thank you heartily one and all, not only for your uniform courtesy and kindness, but for the assistance you have rendered me in discharging the duties of the office, and the best wish I have for the Association is that the same unity of purpose and harmony of action on the part of its members may continue in the future, that has ever been characteristic of it in the past from its inception nine years ago down to the present time.

I have now much pleasure in asking your attention to the various matters before us for consideration.

E. STEWART,
President.

ESKIMO HUNTERS, CHESTERFIELD INLET.

Illustrations kindly loaned by
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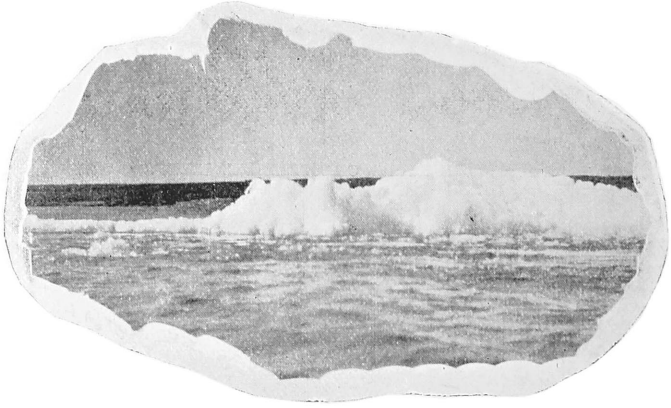
MR. J. W. TYRRELL IN ESKIMO GARB.



A LAKE SHORE IN AUGUST.

PAPERS.

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

"THE ESKIMO."

By J. W. TYRRELL,
O.L.S., C.E., Hamilton.

THE Eskimo—the most northerly inhabitant of this continent—is in many respects a very strange and most interesting character. Probably some of my readers had, within the past few months, an opportunity of seeing a party of them, who were on exhibition at the World's Fair.

It has been the writer's lot to have lived with and travelled amongst the Eskimos for about three years, and during that time he has become greatly interested in them and quite accustomed to many of their peculiar ways.

PERSONAL APPEARANCE.

In appearance these people are short, thick set fellows, with very round, fat faces, usually almost entirely devoid of hair. Their eyebrows and lashes are very small, and against their dark skins are scarcely discernible, so that their brown, oily faces and eyes without trimmings have often a very bare and homely appearance. Their hair, like that of the Indian, is black and straight, and by the women it is worn platted, and twisted up into three knobs, one at either side of the head and one at the back.

The men wear their hair short, cutting it occasionally with a knife, with heavy bangs in front to protect their foreheads from the cold in winter, and from the sun in summer. There are, however, some exceptions to the above description, the writer having met with some really handsome, stalwart men up to the standard height of Europeans, and some very pretty, charming women.

Most of the Eskimos have very bright, soft brown eyes, which of themselves are features of beauty, but they serve these savages a better and more useful purpose: they furnish marvellous powers of vision, enabling their owners to see objects clearly at great distances, when they would be quite invisible to an average white person. As an example of their wonderful powers of sight, the writer will relate a a little incident that once took place during his stay with them. At

one time a party of Eskimo hunters had gone out upon the heavy, but floating ice of Hudson Straits to hunt seals. The ice, on account of the strong tidal currents, was so broken and rafted into great piles that it made travelling very difficult and dangerous, but food being scarce, the hunters had determined to go in order to supply the wants of their hungry families. They took with them their kyacks, or skin canoes, to cross the open stretches of water. When walking upon the ice, these would have to be carried on their shoulders and so, alternately launched and hauled out, perhaps fifty times in a day. Such travel is necessarily very dangerous, as the currents caused by the tides are often as swift as those of a great rapid river, causing the ice to whirl, crush, and raft until it forms into immense piles.

No wonder, then, that the families of these bold men became anxious regarding their safety when their absence became prolonged, and days passed, but the hunters did not return,

The writer sympathised keenly with the poor people, and besides doing what he could to supply their immediate wants, walked up frequently with his telescope to a " look out " hill, to, if possible, discover some trace of the absent party. A little daughter of one of the hunters, seeing him one day thus looking for her father, came to where he stood ready to receive any news he might give her ; but she had no sooner reached the elevation of the " look-out " than she, leaping with delight, exclaimed : " Awunga tacko Itatta " (I see father). The writer asked " where," and she pointed away across the glistening field in the direction in which he had just been gazing with the big telescope, and had seen nothing but ice. At first he thought she was mistaken, but turning his telescope again in the direction she pointed, presently discerned away on the horizon a black speck, which sure enough proved to be the returning hunters.

To the writer's naked eye they were quite invisible, and almost so with the aid of the telescope. Soon afterwards as they came nearer he could make them out more clearly, but his eyes, together with the telescope, were not a match for the bright, brown orbs of the little Eskimo maiden, and she in this respect is only a type of her people.

CLOTHING.

The clothing of the Eskimo is made entirely of the skins of animals, chiefly of the seals and reindeer, seal skin being used for summer and reindeer skin for the winter. The skins are nicely softened and dressed with the hair on, and are neatly made up by the women, whose chief duty it is to provide clothing for their husbands and children. The cut of the Eskimo garb is somewhat peculiar, both for men and women.

The accompanying illustration, prepared from a photograph, will convey a better impression of the costumes, than could be given by words alone.

A man's suit may briefly be described as follows : Commencing at the foundation, it consists of a pair of fur stockings or duffles, covered by long waterproof moccasins which reach to the knees, and

are just met by short seal or deer skin trousers. The suit is completed by a jacket or jumper, made of the same material as the trousers, which is pulled on over the head, there being no opening in front to admit of it being put on like a coat, This jacket is provided with a hood, which takes the place of a cap, and may either be worn over the head, or pushed back when not required.

In the summer season, a single suit of seal skin, made as above, constitutes a man's entire clothing, but in the winter time he wears two of such suits of deer skin, the inner one having the hair on the inside, and the outer one having the hair upon the outside. The female costume is rather more curious in appearance than the above. The footwear is the same with both sexes, but in place of the trousers worn by the men, the women wear short leggins and trunks, and in place of the jacket a peculiarly constructed overskirt, having a short, hanging flap in front, and a long train, about the shape of a beaver's tail, just reaching to the ground, behind.

The back of the overskirt is made very full, so as to form a sort of bag in which the mothers carry their children; and like a man's jacket it is provided with a hood, but of a very much larger size, so as to afford shelter for both mother and child. The women are very fond of decorating their dresses with beads or other ornaments, and all the garments are made with great neatness.

ORIGIN.

As to the origin of the Eskimo people, very little is known, but the most probable theory accounting for their existence on this continent, is that they were originally Mongolians, and at some very early date crossed over Behring Straits and landed in Alaska. This theory is based on the fact that a similarity is traced between the Eskimo language, and the dialects of some of the Mongolian tribes of Northern Asia.

One of the Eskimo traditions would rather seem to bear out this theory. It is something like this: "A very long time ago, there were two brothers who were made by the beaver, and placed on an island in the Western sea. There they lived and fed upon birds which they caught with their hands, but at length food became scarce, and the brothers being hungry, fought for the birds they had taken. This quarrel led to a separation, and one brother went to live in the western portion of our Great North Land and became the father of the Eskimos in that region, whilst the other brother went still farther east and became the father of the Natives north of Hudson Bay and Straits."

IMPRESSION OF ESKIMOS.

The writer's first impression upon meeting Eskimos was that they were a wild looking set. There were thirty-six of them, all women and children, piled into one of their "oomiacks" or skin boats, and all were whooping and yelling at the top of their voices, whilst all who were not paddling were swinging their arms and legs, too, in the wildest manner.

They were natives of Prince of Wales Sound, Hudson Straits, and were coming out from shore to meet the S. S. Alert, which to them was a fiery monster of wonder.

They were accompanied by a party of men in their kyacks, and all were preparing to board the ship without invitation; but the first officer, by brandishing a cordwood stick, and threatening to hurl it at them if they came too near, and the liberal use of some very strong English, which they did not understand, induced them to await his convenience to receive them.

When past some shoals, near which the ship was steaming, and safely into harbour, the Natives were then allowed to go on board. They were a strange looking lot, and some of them were strangely dressed. One old, grey haired chief had apparently reached a stage of civilization in his attirement not common among the Eskimos, for outside of his seal skin clothing he wore a long, white cotton night shirt, of which he was very proud.

The Eskimos are always pleased with the acquisition of white men's clothing, but their ideas as to how and when they should be worn do not always agree with ours.

Early navigators have described the Eskimos of Hudson Straits and Bay as being savage tribes, greatly to be feared, and it is true that unfortunate crews have fallen into their hands and been murdered by them, but often such tales only come to us half told, the other half dying with the poor savage.

The writer has seen the poor Eskimo, because he was only a savage, receive treatment from white men that would not be tolerated in civilization, but would be met by nothing short of assassination.

No wonder then that these poor, untaught people should be led at times to commit deeds of desperation, for they have their own ideas of propriety and equity. They possess very simple, childish natures, but coupled with much quiet determination and deep jealousy, which, when aroused, is likely to lead to acts of violence. From the writer's experience, he does not think the Eskimos would, without considerable provocation or great temptation, harm any one falling into their hands.

Though not usually quarrelsome or vicious, they do fight with each other, but only at appointed times, when all old grudges and differences of opinion are cleared up at one time. On the appointed day all the disagreeing parties of the camp pair off, and standing at arm's length from each other strike turn about, and in this deliberate, systematic way take satisfaction out of each other, until one of the combatants cries "ta-bah" (enough).

RANGE.

The range of the Eskimo is very large, extending completely across the northern part of North America, and toward the south, to about the 60th parallel of latitude west of Hudson's Bay, but east of the Bay to about the 55th parallel, whilst towards the north their range is practically unlimited.

They are a very thinly scattered race, roving in small bands over a great, unlimited, treeless wilderness.

FOOD.

The food of the Eskimo, as his name implies, is chiefly raw flesh, so that the preparation of his meals is an extremely simple operation, and the culinary part of higher civilization has no place in his life. Reindeer, seals and walruses are to the Eskimo the staple articles of food, but Polar bears, Arctic hares and other animals, beside most of the Arctic birds are considered equally good.

It is rather a novel if not a somewhat repulsive sight, to witness an Eskimo Feast. The occasion of the feast is the capture of a seal, or, perhaps, a walrus, which, according to custom, during the winter becomes common property, and all are invited to the lodge of the fortunate hunter to share in the feast.

The carcase of the animal is trailed into the middle of his lodge, and when all the guests are assembled, they seat themselves on the floor about it. The carcase is then skinned by the host, and the pelt laid down to form a dish or receptacle for the blood.

All things are now ready, and the guests being armed with knives are invited to help themselves, and this they do with great dexterity, and continue to do so, not until they have had sufficient, but until the supply is exhausted, and absolutely nothing remains but the skin and skeleton.

The blood, being considered very fine, is dipped up with skin cups or horn spoons and consumed with the flesh.

The blubber or outer layer of fat, which is found on most Arctic animals, is separated from the skin, and cut into long strips about an inch square. Thus prepared, it is swallowed though not eaten. It is simply lowered down the throat as one might lower a rope into a well.

During the summer season the blubber is not used as food, but is saved for reducing to oil, to be used in their lamps during the long dark nights of the next winter.

An Eskimo appears to have no idea of a limited capacity for food, but usually eats on until the supply fails The writer knew of one exception however, where an old woman, after doing heroically, was forced to yield. A party of Eskimos were having a big feast upon the carcase of a whale, which they consider very good food, when she, in her ambition, over-estimated her capabilities, and ate until she became quite torpid. Her friends out of respect to the old lady, supposing her to be dead, trailed her out and buried her in the snow, but a day or two afterwards she kicked off the snow that covered her, and rejoined her friends.

Next to stowing capacity, an Eskimo's stomach is noted for its powers of digestion. For instance, both the flesh and hide of the walrus are common articles of food with them, and these are so hard and gritty that when skinning or cutting up the animal, one has to be continually whetting and sharpening his knife.

The skin of a walrus is a good deal like that of an elephant, and is from half an inch to an inch and a half in thickness; but notwithstanding this, and the hardness of the structure, the little Eskimo

children may often be seen running about, gnawing pieces of walrus hide as if they were apples. Sometimes, however, they have no walrus hide or meat of any kind to gnaw, for occasionally in the spring season the condition of the snow and ice is such as to render hunting impossible, and though they store up meat in the fall for winter use, it is often used up before spring.

When this state of things occurs the condition of the poor Eskimo is very deplorable. They are forced to kill and eat their wretched dogs, which are even more nearly starved than themselves, and next they resort to their skin clothing and moccasins, which they soak in water until they become soft, though, perhaps, not very palatable.

DWELLINGS.

Like many people of our own country, the native of the frozen zone possesses a summer and winter residence, and occupies each in turn as regularly as the seasons change. His winter dwelling is built of snow, whilst his summer lodge is made of oil-tanned seal or deer skins, neatly sewn together and supported by poles, if such can be procured, or pieces of drift wood spliced together. A flap is left for the door, but no opening at the top as in an Indian wigwam or tepee, for having no fire they have no need of a chimney.

THE TOPICK.

The atmosphere of these tents or "topicks," as they are called, is usually very sickening to one not accustomed to them, for the skins of which they are made are dressed in their natural oil in order to make them water-proof. This has the effect of making them very rank and odorous. Topicks vary in size according to the wealth or requirements of the occupants. Sometimes they are scarcely large enough to allow two or three little people to huddle into them, whilst others are quite commodious, capable of seating twenty people. The commonest form of a topick is that of a cone, very similar to an Indian tepee, but they are also built rectangular, and sometimes with vertical walls about four feet high.

The furniture of these dwellings is very simple, consisting usually of a few skins lying about the rocky floor to serve as seats in the day time and bedding at night; two or three seal skin sacks of oil, two shallow stone vessels used as lamps, a few hunting implements, some little deer skin bags, used as ladies' work baskets, several coils of seal skin line, a few pairs of moccasins scattered about, and at one side of the door, the somewhat repulsive looking remains of a carcase consumed at the last meal. Such is the Eskimo summer house.

THE IGLOE.

His winter dwelling in the snow is rather more interesting and curious. It is called an "Igloe," and is built in the form of a dome with large blocks of snow. A common size of the dwelling apartment of an Igloe is twelve feet in diameter and eight feet in height. This is approached by a succession of three or four smaller domes connect-

ed by low archways, through which one has to crouch low in order to pass. The innermost archway opening into the dwelling apartment is about three feet high, and as one enters, he steps down a foot or more to the level of the floor of the front portion of the dwelling. The back part, about two-thirds of the apartment is three feet higher than where one enters. The front or lower section of the Igloe corresponds to a front hall, and it is in it that the occupants as they enter beat the snow off their clothing, or remove their outer garments, when they wish to step up into the higher living apartment. The floor of the entire Igloe consists simply of snow, but in this upper apartment it is well covered with deer skin robes, so that it is not melted by the warmth of those who sit or lie upon it. Above the doorway of the Igloe is placed a window to admit light into the dwelling. This is formed of a large square slab of ice, neatly inserted into the wall of the dome, and it serves the purpose for which it is intended exceedingly well, admitting a pleasant soft light. Above the window a much needed ventilating hole is usually made. This, because of the passing current of warm air, becomes rapidly enlarged and requires to be frequently plastered up with snow. Sometimes one of the long approaches or corridor porches is made to serve for two or three dwellings, each of which is connected by low archways with the innermost of the smaller domes. Usually opening out of the smaller inner dome, each family has one or two small pantries, where they keep a supply of meat sufficient for a week or two.

ESKIMO LAMP.

The furniture of the snow house is much the same as that of the skin "topick" already described, but the stone lamps come more into prominence, contributing light to the dwelling during the long, dark winter nights. These lamps are simply shallow stone vessels, usually half moon shaped, and formed neatly of some description of soft rock. The rounding side of the vessel is made much deeper than the other, which gradually shoals up to meet the edge. The wick of the lamp consists of dried, decomposed moss, pressed and formed by the fingers into a narrow ridge across the shallow or straight edge of the lamp. In this position it absorbs the seal oil which is placed in the vessel, and when lit, burns with a clear, bright flame, free from smoke. The lamp is then made self-feeding by suspending above it, at a height varying according to the amount of light and consequent supply of oil required, a lump of seal blubber. This melts with the heat of the flame and drips into the vessel of the lamp, and keeps it supplied for a considerable length of time. The supply of oil, which means the intensity of light, is increased or diminished at will by lowering or raising the lump of blubber suspended above the flame. One lamp is usually placed at either side of the entrance in the upper apartment. Both are kept burning brightly the greater part of the long, cold, dark days of winter, but during the hours of sleep they are "turned down," that is the lumps of blubber are hoisted; or sometimes one lamp is extinguished and the other burned low. These lamps, though chiefly designed to furnish light,

do also furnish a considerable amount of heat to the Igloes. It is often necessary to " turn them down " to prevent the snow walls from being melted by the heat, though the temperature outside may be forty to fifty below zero.

Towards spring the snow houses become very damp, and to prevent the roofs from being melted away, fresh snow has to be added to the outside. Before they are abandoned for the skin tents, they sometimes become so soft that they cave in upon the occupants, and often cause much sickness in the form of colds, pneumonia or mumps.

The building of an Eskimo Igloe is by no means as simple a task as one might suppose. In the writer's first attempt to build even a little one, he grievously failed, and upon the next opportunity found it interesting to learn the art from the native workmen. The snow upon the bleak, barren lands is driven and packed hard by the cease-winds and gales, which hold high carnival in those regions, and is admirably suited for building purposes. The first thing to be done toward the building of an Igloe is the selection of a sheltered site, not in some thick woods, as there are no trees in the Eskimo country, but on the lee side of some convenient hill, if possible beside a lake or pond of deep water, which will not freeze to the bottom during the cold winter. The spot having been chosen, the snow is quarried from it in the form of large blocks from two to four feet square and eight or ten inches thick. The snow is thus excavated to within about one foot of the ground, and with this preparation the building is commenced by placing the blocks upon edge in the form of a circle, and closely fitting them together. As the Igloe is to be built in the form of a dome, the walls must all lean inwards towards the centre. It is this peculiarity that bothers the unskilful workman. The Eskimo overcomes the seeming difficulty, however, in a very simple way by carrying the walls up in the form of a spiral, so that each succeeding block is supported and held in position by the block previously laid. That is, each block is supported on two edges or rests in a notch, instead of on a level wall. By this method of construction the walls are readily and rapidly raised, until they are completed by one large crowning block. The doorway is cut in the wall after it is largely built, but before the roof has been closed in, and then the interior is shaped by excavating or packing in snow solidly where required. The outer passage way is then built in such a position as to best resist the influences of the weather. The cutting of the snow is done with long thin ivory knives, neatly made for the purpose, or sometimes with long steel knives or saws, when such can be obtained.

WORKMANSHIP.

In their workmanship the Eskimos are very neat. Wood is used for manufacturing purposes when it is available, but all they are able to procure is fragmentary pieces which have drifted from some far distant shore, or from the wreck of some unfortunate whaling vessel. It is from this rough material and very scanty supply that they make their sleds, frame their kyacks, get their tent poles, make handles for

their spears and harpoons, make their bows, and a hundred other things; and through their untiring perseverance and skill, they manage to produce marvellous results. For example, a paddle is often made of two or three pieces of wood, but so neatly joined together, that if it were not for the seal thong lashings, the joints would not be noticeable. The lashings are put on green, or after having been softened in water, and are drawn tightly, so that when they become dry and shrink, they produce strong and very rigid joints.

The processes by which these lashing thongs, and heavy lines for hunting purposes are manufactured, as well as the small thread for sewing, are very interesting. A heavy harpoon line used in the hunt for securing walruses, is made from the skin of the square-flipper seal, a large variety about eight feet long. For such use the skin is not removed from the body in the usual way by cutting it up the belly, but is pulled off without cutting it, as one might pull off a wet stocking. The whole hide is thus preserved in the form of a sack, which is placed in water and allowed to remain there for several days, until the thin outer black skin becomes quite decomposed. This, then, together with the hair is readily peeled off, and a clean white pelt remains. Two men then take it in hand, and with a sharp knife soon convert the sack into one long, even, white line, by commencing at one end and cutting around and around until at length the other is reached. One skin in this way will make three hundred feet of line. In this condition it is allowed to partially dry, after which it is tightly stretched and dried thoroughly in the sun. The result obtained is a hard even white line, three-eighths inch in diameter, but equal in strength to a three inch manilla rope.

The writer has seen such a line, when imbedded in the flesh of a walrus at one end, and spiked to the hard ice at the other by a stout iron pin, as well as being tugged at by six men, plough a furrow six inches deep through the ice, bend the spike and drag the six men to the edge of the ice, where the tug-of-war ended, the walrus being victorious, and taking the unbreakable line with him into the deep.

Smaller seal thongs, such as are very extensively used as lashings for komiticks, kyacks, handles, etc., are made in much the same way as the above, except that they are made from the hide of smaller seals, and often the process of removing the outer black skin is omitted, and the hair is simply scraped off with a sharp knife or scraper.

Finer lines, such as those used for fishing or winding a whip stock, and thread for sewing purposes, are manufactured from reindeer sinew, the best being that obtained from along the spine. The sinew from this part of the deer is always saved. It is prepared for use by first drying, and then rubbing it until it becomes quite soft, when it is readily frayed out into fibres, in which condition it is used for fine needle work; but when coarser thread or stout cord is required, these individual threads are plaited together, and with wonderful neatness and rapidity. One woman in a day can manufacture fifty or sixty yards of this sinew cord or thread.

Just here it would be well to note, that with the Eskimos all joints

of whatever kind are secured by these thongs, they having no nails or screws, such as we have, to supply their place. In making a sled or komitick, the cross slats are all secured to the runners by seal thongs. In framing a kyack the numerous pieces are all lashed together, usually with seal or deer skin, though sometimes, and preferably with whalebone.

THE KYACK.

The Eskimo " Kyack," or canoe, is a peculiar craft. It consists of a light frame neatly made from all sorts of scraps of wood, and strongly jointed together as stated. The frame having been completed, it is then covered with green skins, either of seal or deer, dressed as above described with the hair removed. The skins are joined to each other as they are put on by double, watertight seams, and are drawn tightly over the frame, so that when they dry they become very hard, and tight as a drum-head.

A full-sized kyack thus made is about twenty-two feet long, a foot and a half wide and a foot deep. They are completely covered over on the top excepting the small hole where the paddler sits, so that though they are extremely cranky crafts in the hands of a novice, they are commonly used, even in very rough water, by an expert. Indeed, the Eskimos have an arrangement by which they can travel whilst almost submerged in the water. They have a thin, waterproof parchment coat which they pull on over their heads in rough weather. This they place on the outside of the rim at the opening of the kyack and tie securely, so that if the boat were to turn upside down the water could not rush in. An Eskimo in his kyack can travel much faster than two men can paddle an ordinary canoe. The writer has known them make six miles an hour in dead water, whereas four miles would be good going for a canoe.

THE KOMITICK.

The Komitick is a sled of rather peculiar design. It consists simply of two parallel runners, twelve or fourteen feet long, built of wood, and placed about eighteen inches apart, upon the top of which are lashed a number of cross bars or slats. The runners are shod either with ivory or mud, the latter answering the purpose exceedingly well. The mud covering is, of course, put on in a soft state, when it can be easily worked and formed in proper shape. When the mud is on, and the surface nicely smoothed off, it is allowed to freeze, and speedily becomes as hard as stone. In order to complete the komitick and put it in good running order, there is one thing yet to be done The shoeing, whether of mud or ivory, has to be covered with a thin coating of ice. In order to do this the Eskimo overturns his komitick, fills his spacious mouth with water from some convenient source, and then from his lips deposits a fine, even stream along the runner, where it quickly freezes, and forms a smooth, glassy surface.

During the winter season the komitick forms an important factor in the Eskimo's life. It is drawn by a team, not horses, nor even reindeer, but of dogs. The number of animals forming a team varies

greatly, sometimes consisting of not more than three good dogs, but at other times fifteen or more are attached to a single sled. Each dog is attached to the komitick by a single line, the length of which varies directly as the merits of its owner. Thus the best dog in the team acts as leader, and has a line twenty or twenty-five feet in length.

THE WHIP.

In order to control the team the driver carries a whip of rather extraordinary dimensions. This intrument of torture has a short wooden handle only about eighteen inches long, but what is lacking in stock is more than made up in lash, for this latter, made of the hide of the square flipper seal, is about thirty feet in length. An Eskimo can handle his whip with great dexterity, being not only able to strike any particular dog in the pack, but any part of its body, and with as much force as the occasion may require.

The writer's first attempt at dog driving was anything but successful. The experience was gained in January, 1885, on Big Island, Hudson Straits. when one day, having been confined to the house for some time on account of the bad weather, which was still unpleasant, he determined to take recreation by going for a drive with his dogs. Accordingly after breakfast an Eskimo servant was instructed to harness the team, whilst he proceeded to dress himself warmly in deer skins. A few minutes later both dogs and master were travelling at a break-neck speed down the slope of the land to the harbor ice, but when the ice foot was reached, being the time of low water, a perpendicular drop of about thirty feet was met with, and very naturally the dogs refused to go down. A broken place in the icy wall was however found, and after a great deal of exertion on the part of the writer and a vigorous application of the whip, which more than once lashed his own face, the dogs were all safely landed on the level harbor ice. But here they were exposed to the sweep of a cold north wind, which drove the snow in their faces; and so they positively refused to go. The writer, however, having set his mind on crossing the island towards the north endeavored in every conceivable way to urge on his balky steeds, but unfortunately, being a novice at dog-driving and the use of the Eskimo dog-whip, he was forced, after two hours of desperate exertion, to acknowledge defeat, for then the stubborn animals breaking away, made a successful run, until they were again stopped by the perpendicular wall of the ice foot.

When the writer came up to his runaways, he did not attempt to again shape courses, but assisted them up the icy precipice and let them go, having obtained quite as much recreation from his drive as he had hoped for. In later attempts at the Eskimo mode of winter travel he has been more successful, and enjoyed many a komitick drive across the snowy wilderness.

DISCUSSION.

Mr. Sankey—In moving a vote of thanks to Mr. Tyrrell for his interesting paper, a few remarks may not be out of place. In the early

history of our Association all the papers read before it were more or less of a technical character, and I think, perhaps, we have fallen into the idea that every paper read before this Association should consist of something strictly technical, something that pertains to the duties of a surveyor as such, and, in fact, I think that this idea has gone so far that, perhaps, some people imagine we should not have papers, except on strictly surveying lines, that even matters relating to kindred professions, some of which our own members practise, such as engineering, etc., should not find a place on our programme; but I think we are most fortunate to have a member of our Association and profession, such as Mr. Tyrrell, who is able to give a personal guarantee of genuineness to the interesting paper we have just heard read. Surveyors in Canada and the continent of America have no doubt been the forerunners of civilization; much that is known of the early history of this country is associated with the surveyors, and I think we are most fortunate in having men like Mr. Tyrrell, and others whom I might mention, members of our Association, to write such papers as this, and I hope the day is far distant when papers like this and others on similar subjects will not be gladly put on our programme and cordially received.

The President—I think we are very much indebted to Mr. Tyrrell, for this paper. There is one question I would like to ask, that is, how do they light their fires, do they use matches or what?

Mr. Tyrrell—They use a flint and steel when they can get it, but, perhaps, more commonly produce a flame by the rubbing of one stick upon another. It is not an uncommon thing in the neighborhood of old Eskimo camps to find fragments of wood having round charred holes worn in or through them by this fire-producing method.

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

HOUSE DRAINAGE.

By M. W. HOPKINS,

O.L.S., C.E., Hamilton,

The drains of a house should be kept from underneath a house as much as possible, and all pipes inside of the walls of the house should be above ground, and easy to be seen, when circumstances will permit.

They should not be run along close to the foundation and parallel to it; because this would cause the foundation walls to be undermined in time. When they enter underneath the house they should be made to pass under a window or door to lessen the pressure on the drain. Drains are very likely to become leaky by the pressure of the wall crushing them out of shape, as the house settles after some years.

Outside of the house the drains can well be composed of fireclay, provided the iron is run out from three to ten feet from the wall. But inside of the foundation walls the drains should be composed of iron, because :

(1) Iron is stronger and will not break.

(2) The joints can be made to endure.

The soil-pipes should be composed of iron. We generally find soil-pipes leaky, because lead soil-pipes are usually made too light, and those that would be thick enough to stand would be very costly and not so efficient, all things considered, as extra heavy cast iron, well jointed with lead and gasket. The latter if periodically examined and repaired will remain reasonably tight. A soil-pipe of good drawn lead and seamless, if heavy enough, is good. Galvanized iron soil-pipe ventilators are untrustworthy, and cannot be depended upon to remain tight for any length of time, even if tight when constructed. They should be condemned.

It is seldom necessary to make the drain of a private house greater than four or five inches in diameter, and it should never be less than three inches, as it is liable to become choked with sticks, etc.

Many house drains in Montreal, and some in Hamilton are nine inches in diameter, which become foul unless they have a great fall and even then. The trap on the main drain should never be greater than six inches in diameter. A larger one is very liable to choke for it contains more water than any flush of fixtures in the house will supply, and hence it cannot be properly flushed out.

The soil-pipe should not be less than three inches in diameter, nor more than five inches.

The waste pipes of basins, baths, sinks, etc., should be one and a half or two inches in diameter.

GRADIENT.

The minimum gradient for a drain is about one half inch in a yard or 1 in 72. A good rule to find the gradient for a drain is to multiply the diameter in inches by 10. For example: A four inch pipe should have a fall of 1 inch to 40, etc. This rule will apply to drains or sewers of very large dimensions as well as to the smallest pipes. Of course it only holds where the drains ordinarily run about half full. It will not apply, for example, to a nine inch drain with only enough water running through it for a four inch drain.

The least admissible for a lead waste pipe is about 1 in 100. Iron requires more.

In a position where it is impossible to get sufficient gradient for a pipe with a given diameter, it may be possible to lay one with a smaller diameter, as between the ceiling and the floor of the next ceiling, since;

(1) You can get more fall with the smaller pipe.
(2) A small pipe gives a greater velocity.
(3) It has less surface to clean.

JOINTS.

All joints between iron and lead should be made by means of a brass thimble soldered to the lead, and the space between the brass and iron should be run in with lead and hard staved.

Joints between iron should always be soldered with lead if they are connected with the drains.

We find a good many slip joints between iron and galvanized iron soil-pipe ventilating pipe, and they always leak badly of course.

Joints of fire clay pipes are made by means of oakum or hemp and cement, or by Portland cement mortar. Red lead may be used for joining outside iron pipes; but neither this nor putty should be used for joints between two metal pipes inside of the house if the pipes are connected with the drains. Rosin and grease, or red lead and putty are sometimes used to join the earthenware water closet to the soil-pipe branch. There are better methods now.

TRAP VENTILATION, ETC.

Every drainage system should be ventilated by continuing the soil-pipe, full diameter, up through the roof, and fresh air should be admitted into the drain by an inlet pipe, at least as large as the soil-pipe, taken from the drain a few feet above the trap. If this is done fixtures near the soil-pipe need no other ventilation; but if at a distance from it, a $1\frac{1}{2}$ or 2 inch air pipe should be taken from the crown of the trap and run through the roof or into the soil-pipe above the highest waste connection, or an air pipe can be passed up beside the soil-pipe and receive the smaller pipes from the crowns of the

respective traps. Smaller pipes should be increased to four inches diameter above the roof to prevent them freezing. Experience has shown that the fresh air inlet will not freeze in Montreal or Hamilton, and it should be taken from the drain a few feet above the trap to prevent the water therein freezing. Besides the top of the soil pipe ventilator is not so apt to freeze with the current of air in it caused by the fresh-air inlet. The trap should be from $3\frac{1}{2}$ to 5 feet below the surface to prevent the water in it from freezing.

Rain conductors should not be used as ventilators for the drains, but should be tapped at the foot if near any window. Rain conductors will not act as ventilators while it is raining, and they invariably burst in the winter in cold climates if they are on the outside of the house. Cess pits should not be permitted in cities as a rule, but as they do exist, they are somewhat a lesser evil when ventilated by two good sized pipes, a high one and a low one—one for exit and the other for entrance of air.

Water-closet apartments should be carefully ventilated. Of course no ventilator of the drains should be run into a room ventilator, which we have sometimes found to be done.

Foul air pipes are sometimes erroneously run into the chimney, when a down draft will fill the rooms with sewer gas. Sometimes the pipe is continued inside of the chimney to its top in order to get an upward draft in the ventilating pipe. This is objectionable as the pipe is soon eaten through, and the foul gas escapes into the chimney.

LOCATION OF FIXTURES.

Wash-hand basins are objectionable in bedrooms unless their waste pipes discharge openly over the bath, tubs or some other appliance as a specially trapped funnel. All the basins may be run into a single larger pipe, and this latter pipe made to discharge openly as described above.

No fixture should be placed in a dark corner, because it is likely to be neglected and become unsanitary; besides it will often be but little used when so situated, and if it is but seldom used it had better be cut out. Water closet apartments should not be too small, and, if possible, receive light from a window in the outside wall.

Water closets should be provided with a safe tray. We have seen water closets on one floor directly above the cistern on the floor below, not provided with a safe tray. The foul water from around the water closet leaks down into the cistern below, and mingles with water that is sometimes used for drinking and cooking purposes.

TRAPS.

Disconnection from the public sewer is one of the most important points in a good system of house drainage, and when there is a trap between the sewer and the house, there should also be a fresh air inlet to give a circulation of fresh air in the pipes. If there is no trap, of course, there will be a circulation of air from the sewer, but this will be foul air, and in case of a leakage is liable to spread disease from

the lower and disease producing part of a city. The best trap for this purpose is the " Buchan " trap.

(1.) This trap shuts off the disease from the sewer.

(2.) It gives an opportunity to have a circulation of fresh air in the drainage system.

(3.) It gives a convenient point and excellent opportunity for inspecting and cleaning the drain.

(4.) It makes the smoke or other test much more efficient by preventing the smoke, etc., from escaping into the sewer.

(5.) It also provides for a fresh air inlet.

(6.) It has a cascade action of three inches fall that thoroughly scours it out if not too large.

The trap should be placed outside of the house in a place easy of access, and its cleaning and inspection eye should be brought straight up to the surface, or within a few inches of the surface, and covered with a close-fitting iron plate, which can be easily removed when desired. This trap very seldom chokes.

The waste-pipes of baths and basins should always have separate traps close up to the fixture, and should never run into the trap of the water closet, which is yet often found. Sometimes the waste pipes are separately trapped and also run into the trap of the water closet. No pipe should be double trapped, without ventilation between and even then the second trap is only an impediment to the drain.

The seal in a wash-hand basin should be from three to four inches. A sink trap should have $1\frac{1}{2}$ inches, and a water closet trap $1\frac{1}{2}$ inches.

Bell traps should not be used inside of the house for many reasons :—

(1) They are nearly always choked.
(2) They become foul.
(3) When the top is lifted off the sewer gas comes up, and
(4) The top is often left off.

FLUSHING, ETC.

All water closets of wash-out or wash-down pattern should be flushed by means of $1\frac{1}{2}$ inch siphon service pipes from special cisterns regulated to discharge at least four gallons at each flush. This is economizing water for it is using it where it is needed.

A very grave mistake is to connect the overflow pipe of the cistern with the soil-pipe or some pipe connected with it. The overflow pipe so connected is often trapped in the cistern, but this only lessens a greater evil. This trap evaporates empty if the ball cock remains tight for some time.

Cisterns from 3 to 8 feet high should have a $1\frac{1}{2}$ inch service pipe; those higher than 8 feet a $1\frac{1}{4}$ inch pipe, and those lower than 3 feet a 2 inch service pipe.

No pipe should be allowed to sag sufficiently to retain water. This is still worse with hot water pipes. The least it can do is to make a disagreeable noise.

BATHS, SINKS, ETC.

It would be a great improvement if baths, sinks, water closets, etc., were put up without any, or very little, wood work. The baths and sinks would then stand on legs, and would not require any wood work; while the water closet would only require to have the lid composed of wood. If the water closet were also used as a slop sink, which is an excellent plan, it would require a double lid. both of which would be raised when the slops were being discharged. Under and around the baths and water closets thus put up should be laid tile of suitable patterns. A bath room of this kind looks inviting and the cost is moderate.

A very good material for sinks and wash-tubs is glazed earthenware

The common lead slop-sink is a filthy appliance. If made of glazed earthenware and of the hopper pattern it is passable, but in all slop sinks the space beneath the grating becomes foul and emits a disagreeable odor if it doesn't retain and spread germs of disease.

The common bath with a plug, and the water running in from above, is the most cleanly and best pattern of bath.

Baths, basins, sinks, etc., should be supplied directly from the pressure main. There should never be ground cocks on pipes under high pressure. Screw down cocks are safer, as they do not stop the flow so suddenly. Besides ground cocks wear away quickly.

HOT WATER CISTERN.

Hot water cisterns should—

(1) Be always close covered.
(2) Have a steam pipe.
(3) Have a check valve to prevent the hot water from running back into the cold.

The cold water cistern should not be used to supply the boiler and water closet both, nor should it be placed in the water closet apartment.

There are now hot-water tanks supplied direct from the pressure main which are excellent.

WATER CLOSETS.

The "Old Pan" water closet, so common, is now condemned by all sanitary authorities as a filthy and unsatisfactory appliance.

The best water closets are of the wash-down pattern. If flushed as described above they are as cleanly and healthful as can be desired. The valve leading to the service pipe should be half inch larger than the latter so as to (1) Fill the service pipe and start the siphon at once, and (2) So that sufficient water will press in to keep the air from mingling with it. If this is done the noise, so often attending the flush will not be, and the stream will be more compact and give a better flush.

The wash-down pattern of the water closets is completely above the floor and consequently works above board.

In examining the arrangements of houses there is generally much difficulty in seeing the pipes, as they are generally concealed inside the partition walls. This not only makes it difficult to examine the pipes but also makes it very troublesome and expensive to repair small leakages occurring in the concealed portion. All pipes should be exposed to full view, or only covered with a board that can be easily unscrewed off.

This short paper covers some of the most common mistakes made in the drainage of houses.

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THE LAKE OF THE WOODS AS A MINING CAMP.

By HENRY DeQ. SEWELL,
O L.S., A.M.I.C.E., Eng., D.L.S., Port Arthur and Rat Portage.

At the last Annual Meeting of this Association I attempted to give you an account of gold mining as it had occurred under my own observation in a comparatively limited and unknown area, viz., Taché, and I endeavored to show what could be done towards promoting our mining industries by a few energetic individuals, and how, if it were only properly followed up, many of the stations on our great national railway, the Canadian Pacific Railway, might be profitably turned into mining camps, or bases for mining camps, and thus contribute materially towards the exploration and development and consequent prosperity of the vast and material wealth of this country. It has thus naturally occurred to me, on being asked to contribute a paper at this meeting of the Association, to give you a description of an older, larger, and much better known mining camp in the same district, viz., "*The Lake of the Woods*;" and whilst it covers and is distributed over a much larger area than those near Taché, I trust itmay be deemed a fitting sequel to the former paper, and will, I hope, prove equally interesting and instructive, and thus help to draw attention and capital to the comparatively neglected science and industry of mining, that has hitherto been so overlooked and neglected in Canada, and which, if judiciously and properly followed out, is one of the richest and most profitable of the industries of this country.

For the purpose of this paper, I think it will be sufficient to describe the position of the "*Lake of the Woods*" by saying that Rat Portage, which lies at the entrance of the Winnipeg River (the principal outlet of the Lake on the north shore), is a station on the Canadian Pacific Railway in Lat. 49°, 27′ N., and Long. 94°, 44′, W., being 293 miles west of Lake Superior, and 133 miles from Winnipeg. The Lake extends from Rat Portage on the north to "Hungry Hall" at the entrance to Rainy River, for a distance of about seventy miles, whilst from the extreme east to the extreme west of the Lake, the distance is nearly 100 miles, having an area of about 1600 square miles. This extensive sheet of water is literally dotted over with thousands of islands of most varied forms and shapes and in endless variety of color, far surpassing in beauty and grandeur anything else of its kind on this continent, that the author has ever seen, whilst at the same time it affords a most easy and economical means of access

to the mines, that lie scattered along its shores. Such is the outline of the "*Lake of the Woods*," which, together with the adjoining mainland, forms the limits of the area that I propose to describe. As, however, the Laurentian formation predominates in the southern part of the "Lake of the Woods," our attention will necessarily be chiefly confined to the northern part of the Lake, the formations of which are mostly composed of the Huronian or Keewatin formation, intersected with considerable belts of Laurentian rocks. There are many minerals found within this area, but gold is the one principally sought for, and therefore is the one with whom we are mostly concerned. It is found chiefly in quartz veins that occur in the Keewatin formation, although the most promising veins are mostly found in near proximity to the Laurentian, whilst lying in the Keewatin, which is the true gold-producing rock. The Huronian, or more properly speaking the Keewatin formation, thus occupies a considerable tract of territory on the Lake of the Woods as well as on the south of Rainy Lake, where it meets the higher series of the Couchiching group. The typical Keewatin consists of greenish or greenish grey strata, with a dip nearly vertical; the principal portions having a slaty structure, consisting of chloritic, argillacious talcose, silicious dioritic and fine grained micacious slates, with interstratified beds of diorite, frequently much tilted. It is from these slates at or near the line of contact with the Laurentian granites and gneisses, we look for, and frequently obtain, our best results of gold-bearing ore.

THE SULTANA.

The Sultana is a most interesting property. It is situated about eight or nine miles east of Rat Portage, on the north shore of the Lake of the Woods. During the past two years considerable exploring work has been done on it. Latterly, however, a shaft has been sunk to the depth of 105 feet. At 68 feet, (the first adit level), drifting east and west along the vein is being carried on, whilst sinking goes on at the bottom. They have at present a force of thirty men employed. The dimensions of the shaft are 14 × 8, and that of the drifts 7 × 5. The strike of the main lode is north-east and south-west, with so far but little perceptible dip. Average width of the vein is 4′ 6″, composed of fine sugar quartz. Average value of the ore is $15.50 per ton of 2000lbs. The mill consists of ten stamps, with amalgamating plates, and two improved Frue vanners. They have also a cyanide of potassium plant of the MacArthur-Forest type for the special treatment of more refractory ore: so far, however, they have not required to put this plant into active service. They want steam pumps and hoists badly, and were these provided, the mine would assuredly make a much better return than the solitary gold brick, which is brought into Rat Portage every week. In fact it is needless to say that under proper management, this property, which has abundance of ore averaging $15.50 per ton of 2000lbs., would undoubtedly yield handsome dividends.

(Since writing the above they have purchased three air drills and compressor plant.)

THE GOLD HILL.

The Gold Hill or Northern Gold Co. is in the same formation as the Sultana. The main or Ada G. shaft is down to a depth of 66ft., while the Pearl shaft on the Pearl lode is 61 feet deep, with a drift commenced in a 4 foot vein at this depth. These veins run parallel with each other, their strike being north-east and south-west. Average width of veins 4 feet, dip 10° S. The shafts are 8′ × 5′. Average assay value of ore from both shafts, $17.50 per ton of 2000lbs. A ten stamp mill has lately been erected. This and the Sultana are the only mines in the district that are really getting into fair working order. They have 25 men employed systematically in sinking and drifting on both veins, with an additional 5 men employed in attending to their mill and reduction works. The results in the way of gold products are, I am assured, most encouraging. This property is situated on the east shore of the Lake, and about four or five miles from the Sultana.

THE BULL DOG.

The Bull Dog adjoins the Gold Hill mine; it has a shaft sunk 80 feet with some drifting east and west along the vein, which is 3′ 6″ wide and the ore assays from $10 to $70 per ton of 2000lbs. This mine owns and operates a steam drill, hoist and pump. Hitherto they have had a Crawford mill, but as this machine has proved a complete failure, it has been removed to make way for the old-fashioned but reliable stamps. The shaft is 5′ × 8′. This is a promising property, and one that has every likelihood of turning out a paying concern. Near the Bull Dog is

THE WINNIPEG CONSOLIDATED.

This is a property that has been shut down for years, owing to work having been commenced before a title to the land had been secured; they sunk a shaft to a depth of 104 feet and put up a five stamp mill on the property; the vein measured only eight inches at the surface; but at the bottom of the shaft it was nearly eight feet wide. The ore averaged over $22 per ton of 2000lbs. Of course no company could possibly last without some prospect, no matter how remote, of one day obtaining possession of the land on which they were operating. Consequently the Company collapsed, and the property has fallen into the hands of parties who want a good price, and who are likely to continue to want it.

PINE PORTAGE.

Pine Portage is about one mile east of the Sultana, on the mainland; it is one of the strongest and best defined veins on the Lake. The vein is about 6′ to 7′ wide. The shaft is sunk at the junction of an east and west vein with a north and south fissure vein, the drifting being done on the fissure vein. The ore is black in color, and is extremely refractory. It averages $12 per ton, although some assays have gone as high as 22 oz, or $4.40. The shaft is 120ft. deep and the drifts and cross cuts amount to 150 feet. They have erected a

ten stamp mill and Frue vanners. The work was done at the same time as the Winnipeg Consolidated, and had the ore been as suitable as the others that I have already mentioned for economical working, it would probably have been a working mine to-day. Unfortunately, as a result of this mine closing down, chiefly owing to the presence of tellurium in its ore, the public generally seem to have come to the conclusion that the Lake of the Woods ores are generally full of tellurium and are consequently very refractory. This conclusion is, however, not borne out by assays and subsequent developments. Generally speaking, the Lake of the Woods ores are comparatively free milling for some distance down from the surface, after which they are mostly affected with iron, sulphur and copper only, thus necessitating the use of some concentrating process, but not by any means such an expensive process as the presence of tellurium has hitherto demanded, and which in the case of Pine Portage resulted in the closing down of the mine.

THE TREASURER.

This has been sunk 53′ 6″, with a cross cut of 10ft. Average width of vein, 3′ 3″. Average value of ore, $16.25 per ton of 2000lbs. It is a promising prospect.

THE L' DI VERE.

This is owned by the same party as the Treasurer and has been sunk 100 feet, the average assay being from $10 to $20 per ton of 2000 lbs. There is a steam hoist on this property. The width of the vein is about three feet.

THE WILD ROSE.

This is situated near L' Di Vere and the Treasurer. It contains a very promising vein 3 feet wide of good looking quartz, yielding from $10 to $27 per ton of 2000lbs. It is a property of considerable promise, situated as it is in the very heart of the auriferous mining belt.

THE BAD MINE.

This is another favorable prospect on which active development is now going on with a view to purchasing it, should the present developments warrant it. One interesting feature of this property is that the vein occurs in the Laurentian formation instead of in the Keewatin or at the junction of these formations. Consequently the developments are extremely interesting from a geological standpoint. These last four prospects are situated near Rossland Station, on the Canadian Pacific Railway, about 8½ miles east of Rat Portage, and I have selected them as fair samples of many prospects which exist on the Lake of the Woods, such as Britannia Island, Cariboo, Woodchuck, Argyle, Regina, etc.

In conclusion I may say that I regret that I was only a comparatively short time at Rat Portage last year, and that

during that time I was extremely busy, or I have no doubt that I should have been able to have gathered together more data of this very interesting gold field, whch is still very much in its infancy. Enough development has, however, been already done to prove the existence of gold in paying quantities, and also to prove that there are many really good claims that are still undeveloped, and that in order to secure a good paying mine, it is not necessary to invest in and develop one of the most ancient mining locations, which appears to have been the general practice so far, but that it is equally safe to invest in and develop recent mining claims, which, if carefully selected, are just as likely to turn out well. It will thus be seen that the Lake of the Woods is a very promising locality for anyone who may desire to experience the pleasures and profits of gold mining. The ores are generally easily milled, the veins are of fair width, and although so far none of them have proved very rich, good paying veins can be secured, that will carry on an average from $10 to $17 per ton of 2000lbs. The known gold area is constantly increasing, promising free gold finds having been found on Manitou Lake, La Seine River and the south part of Rainy Lake. In fact, owing to the rich discoveries of gold, and also coal on Rainy Lake, our American cousins have not only laid out a townsite on the American side in the State of Minnesota, about fourteen miles east of Fort Francis, but they intend building a railroad from Tower and Ely to Rainy Lake. In fact, the country may be considered as almost entirely unexplored, the few properties now under development having been found more by accident than as a result of systematic and careful search. So that there is ample scope left for the explorer and miner to win for themselves the profits, which properly belong to the careful and assiduous searcher in Nature's laboratory.

DISCUSSION.

Mr. Gaviller—Were the results as to the percentage of gold obtained from an assay, or from crushing the ore on the ground?

Mr. Sewell—Mostly from actual practice, from mill tests. A good many of my averages are much lower than you could get from an assay.

Mr. Gaviller—I gathered from your paper that the mill had not been used to a great extent, and, of course, while your plates are being amalgamated there is a good deal of gold lost, and the results are not fair unless they had been working for some time. Of course an assay is a totally different thing from putting the ore through the mill.

Mr. Kirkpatrick—Did I understand you to say there was coal found on the American side?

Mr. Sewell—Yes. They claim you can follow any of these little streams on the south side of the Rainy River, and you will find little lumps of coal on the bars. They also claim that at the Rapids there is a seam of coal going through, but I did not see it. I see by the papers since that they they claim to have discovered it on the American side. It is lignite coal.

Mr. Kirkpatrick—I would suggest that instead of giving the local names of the mines, such as "Bull Dog" mine, "Bad" mine, etc., you give the mining location, number or name. It would be much more intelligible to outsiders, when it comes to be read.

Mr. McAree—Where the Crawford Mills failed, is that free milling ore?

Mr. Sewell—Mostly free milling. They ceased to be free milling when they got down. I don't think there is any really refractory ore except this Pine Portage.

Mr. Tyrrell—None of the mines worked there are mispickel, are they? I know it occurs there in large quantities.

Mr. Sewell—No, I don't think so. It is chiefly in quartz.

Mr. McAree—Do you know if the mispickel carries much gold?

Mr. Sewell—Well, some of it does.

Mr. Whitson—Any specimens of coal I ever heard of up there were in the hands of Indians, but whether they came from the tugs on the lake, or not, I would not like to say. The general impression up there is that they came from that source.

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

"ANNUITIES."

By M. J. BUTLER,

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

In anticipation of possible criticism that this subject has nothing to do with "Surveying," it may be answered that now-a-days surveyors are assumed to be men of high technical acquirements, that they are frequently consulted by school trustees, municipal officers, and others with reference to "sinking funds," "realized prices" for debentures, etc., a class of problems that really belong to the profession of an actuary. It is therefore thought that an easily applied solution to this class of problems will be of sufficient interest and value to merit a place in the Proceedings of the Association.

Frequently the expediency of temporary construction is condemned. The expression is common "It would have been cheaper in the end to have had it done right in the beginning." Now, when called upon to carry out any works, we should be able to show clearly where the "temporary"—*vs.* the "permanent"—is warranted; and, in so doing, we should bear in mind that the rate of interest is steadily declining, that new methods of construction cheapen cost, and that in this progressive age new inventions are constantly superseding the old methods and materials, abstract mathematical formula being more difficult to follow, only concrete examples embodying the rule will be used in what follows:

We are anxious to provide for our old age, and the experience of those who have grown rich teaches us that there is but one safe way, viz., the accumulation of small sums yearly, invested at compound interest. Hence we will find how much a saving of $200.00 a year for 20 years at 5% per annum compound interest will amount to?

The formula is $A = \frac{P(R^t - 1)}{r}$ where A = amount sought.

P = periodic payment, in this case $200 per year.

R = $1.00 improved at the rate r for 1 year, in this case = $1.05.

t = time, in this case, 20 years.

r = rate per cent. in this case, .05.

Log 1.05 = 0.0211893 × 20 years = 0.4237860, and this is the logarithm of $2.6533 - 1 = 1.6533$. $\frac{1.6533}{.05} = 33.066 \times \$200 = \$6613.20$. Quite a comfortable little sum.

A new high school is to be built to cost $30,000.00. It is proposed to raise the money by debentures, to run 20 years, drawing interest at the rate of 5% per annum. What should be the annual sum raised?

The formula is $A = \frac{PR^t r}{R^t - 1}$

Where A = periodic payment required.

P = present value of the periodic payments, in this case = $30,000.

R = $1 improved at rate, r, = 1.05 in this case.

r = rate per cent .05.

t = time = 20 years.

$30,000 \times \text{Log } 1.05 = 0.0211893 \times 20 \text{ years} = 0.4237860 = 2.6533 \times 05 = .132665$

$2.65533 - 1 = 1.6533$

$= .0802 \times \$30,000 =$,$2406, *Q.E.D.*

A corporation issues debentures at the par value of $50,000 bearing 5% interest, running 10 years, and receives therefor $46,000. What rate of interest does the loan actually cost? For the $46,000 received they pay $2,500 a year = .0543, at the end of 10 years they must return $4,000 more than they received. The amount of $1 per year at 5% for 10 years is 12.5786, hence we have the proportion $1 : 12.5786 : : x : $4,000 = $318, which paid at the end of each year produces $4,000 at the end of 10 years. And $318 is .0066 per cent. of $46,000, which added to .0543 = .0609% *Q.E.D.*

A proposed new pavement with an estimated life of 30 years will cost $3 a square yard, whereas the town being poor finds that a wooden one will cost $1 per square yard with an estimated life of ten years. Interest being 5% per annum. Which is the better investment?

The solution of this problem is as follows:

1st. $\$3 \times (1.05)^{30} = \$12,9658\phi$.

2nd. $\$1 \times (1.05)^{10} + 2 \times (105)^{10} + \$3(1.05)^{10} = \$9.77\frac{1}{8}$.

Or by an annuity table we find at once the annual cost, viz.:

The Permanent, $\$3 \times .0651 = 19\frac{1}{2}$c.

The Wooden, $1 \times .1295 = 12\frac{95}{100}$c.

In conclusion the writer desires to express the opinion that life is too short to spend the necessary time to work out the formulæ by Logarithms. Books, such as Millener's "Useful Tables for Business Men," published by Rand, McNally & Co., of Chicago, can be had for $1 25, and by their aid this class of problems becomes merely simple multiplication.

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THE GENESIS AND DEVELOPMENT OF MINING IN THE SUDBURY DISTRICT.

By JOHN D. EVANS,

O.L.S., C.E., Trenton.

THERE have been heretofore many reports and papers presented from time to time on nickel mining of this (Sudbury) district, all bearing more or less of a professional or technical character, fully describing the rock formations, but very few touching upon its early history. The writer having been connected more or less with the industry, almost from its inception, purposes to give, in the following paper, a brief account drawn chiefly from his personal recollections and observations.

Previous to the advent of the Canadian Pacific Railway in this district (in the year 1883), this section of the country was in a state of nature, untrodden by the foot of white men, except perhaps in the case of the officers of the Hudson Bay Company and the staff of the Geological Survey of Canada, whose travels were confined more to the vicinity of the lakes and streams, and little if anything was known of the numerous and immense deposits of mineral throughout this region.

The face of the country generally is more or less undulating, broken at intervals with rocky ridges and hills, with swamps and marshes interspersed, and was covered chiefly with a heavy growth of green timber, white pine prevailing over large areas, mixed with hemlock, birch, etc.

At various times, and many years previous to the year above mentioned (1883), large areas of this section had been devastated by forest fires, thereby destroying the moss and other vegetation on the rocky ridges and hills, which in after years presented a desolate appearance, with numberless tall, nude trunks of the pine forest trees, interspersed amongst a thick growth of young trees, consisting chiefly of poplar, white birch, etc, and with areas of bare rock cropping out in many places, thus exposing small or large patches or tracts of a reddish brown decomposing rock or gossan, and in some places a reddish earthy soil, almost a sure indication of mineral underlying Such was the appearance of the country when the line of the Canada Pacific Railway was projected through this district. The first indications of the presence of mineral were had during the construction of the railway, first in a cutting through the extreme easterly end of

a small ridge on the line of the main line, about four miles north westerly from Sudbury, since known as the "Murray Mine," and second, a very small show of mineral in a very insignificant cutting (and appearing only in the centre of the track) on the line of the "Soo" branch of the railway, about twenty-five miles south-westerly from Sudbury. This property was first known as the "Crane Mine," and subsequently the "Worthington Mine," under which name it is now being operated. Surface indications of the presence of mineral, although much broken by wide intervals, could be traced from this point for several hundred feet in a north-easterly direction across a small stream and up on to a ridge. This property was bonded by some New York people, who prospected the place under the charge of a mining expert from New York during the summer of 1885, had a number of men employed and put down a shaft on the top of the ridge, about sixty feet deep. Small quantities of copper ore (chalcopyrite) were obtained, but not sufficient to promise a paying mine, and finally was given up.

During this year (1885) prospecting was carried on in this section by a few pioneers, among them being Thomas Frood, R. McConnell and James Stobie. The first mentioned (Frood) had discovered several promising properties and had associated with himself Messrs. McAllister and Medcalf, of Pembroke, and commenced to develop a promising find on lot one, concession three, township of Snider, and known as the "McAllister Mine." A shaft about ten feet deep was sunk and the prospects were promising for a paying copper mine. The surface indications at this point were very extensive, extending continuously for several hundred feet in a south-westerly direction up the slope of a high hill, and at places upward of 200 feet wide. Subsequently, in September 1886, this property was visited by Lady Macdonald in company with a party of influential gentlemen from Montreal and other places, among whom might be mentioned W. C. Van Horne, Esq., Sir Geo. Stephen and Sir Charles Tupper. Saddle horses were provided for the trip of two miles from Copper Cliff for some of the gentlemen, but there being no side-saddle obtainable, her ladyship undertook the walk, which under the circumstances was a trying one, the road being little more than a bridle trail. The weather was exceedingly close and sultry after a heavy thunder-storm in the early morning, which had filled every small depression in the trail with water. The heat over head and the mud and water under foot rendered pedestrian exercise anything but exhilarating, but her ladyship showed great pluck and took everything in good part, and in honor of the event the name of the mine was changed to that of "Lady Macdonald Mine." In addition to the above mentioned discoveries prospecting had been done at other points, the most notable being by Thos. Frood and associates on lot six, in concession six, township of McKim, and by R. McConnell, on lot one, concession four, township of Snider. Up to this time (the end of the season of 1885) nothing had been done, excepting some prospecting in the most primitive manner at various points, and copper was the only mineral of commercial value at that time known to be contained in the rock formations.

At this stage Mr. S. J. Ritchie, of Akron, Ohio, visited this section, and after careful inspection negotiated for several properties, and during the winter of 1885-6 the Canadian Copper Co. was formed to take over and operate said properties, among which were the McAllister (now Lady Macdonald) mine, McConnell mine, lot 12, concession 2, township of McKim (now Copper Cliff Mine), lot 6, concession 6, township of McKim, and lot 1, concession 1, township of Creighton.

Late in the season of 1885 the deposit of mineral on S. half lot 1, concession 1, township of Snider, was also discovered by one F. J. Eyre and his associates, and a few shots put in. Some samples were procured from this place by the writer in November of that year and submitted to Mr. Ritchie. This property was eventually purchased the following year by the Canadian Copper Company, and the mine is now known as the "Evans mine." It was also during this season that the Stobie mine, on lot 5, concession 1, township of Blezard, was discovered by James Stobie, some superficial prospecting done by cutting a trench up the easterly face of the hill from the bottom to the top for upwards of 100 feet in length, to a depth of from eighteen inches to three feet, through a reddish sandy soil, overlying the gossan and piercing the gossan in places to the underlying mineral. This mine was also secured by the company in the summer of 1886, and a railroad projected to it from Sudbury, which was put under construction before winter set in, the distance being four miles.

With the opening of the spring of 1886 active measures were taken by the Canadian Copper Co. for prosecuting the development of the several properties on an extensive scale. Work was first commenced at the twin hills, on lot 12, concession 2, township of McKim, and known as "The Buttes," since named "Copper Cliff Mine," by making a side hill open cut through a sand and gravel formation, the decomposed rock or gossan cropping out at the apex of the hill. Ore was struck so soon as this gravel and sand had been passed through, which proved to be largely composed of magnetic iron pyrites (pyrrhotite) with small masses and particles of chalcopyrite scattered throughout it. At this time the presence of nickel in the pyrrhotite was not suspected, and since this mineral was known to possess no other value, large quantities were consequently thrown over the dump and now form in part the dock between the mine shaft and the railroad tracks. A railroad track was constructed to the mine from the "Soo" branch of the Canadian Pacific Railway in the month of September, the distance being exactly one mile; and in the month of October a shipment of several hundred tons of selected copper ore was made to New York, upon the treating of which the discovery was made of the presence of nickel.

During this summer (1886), prospecting work was continued at the McAllister mine to a limited extent, also at the McConnell mine, and the Eyre (now Evans) mine was purchased by the Canadian Copper Company and the sinking of a shaft commenced. It was also during this summer (1886) that R. McConnell discovered the deposits of mineral upon the S. half of lots 2, 3, 4, 6, 8 and 9, concession 5, and N. halves lots 8, 11 and 12, concession 4, township of Denison,

some of which also came by purchase into the possession of the Canadian Copper Company in 1888. In October of this year (1886) was also purchased by the same company, the S. half of lot 7, concession 6, township of McKim (lying adjacent to a lot (No. 6) formerly purchased by them), from Thos. Frood and associates P. C. Campbell and Robert Tough, for the sum of $30,000; this being by far the largest figure paid up to this time for mineral lands in this section. During the year 1887 mining was carried on in a very desultory manner, owing largely to the want of a practical method of treating the ores containing nickel, and during this term very few further discoveries of mineral deposits of any appreciable extent were made. In the winter of 1887-8 the services of Dr. E. D. Peters, jr., were called in by the Canadian Copper Company to devise some method of successfully treating the ores, which culminated in the plant which was installed during the following season of 1888 at Copper Cliff, consisting of an extensive roasting yard furnished with two railroad tracks, an elevated and a low-level one, a 100 ton Herreshoff smelting furnace, with blowing engine, pumps, steam boilers and other accessories. This furnace was blown in about the latter part of December of that year and proved very successful in treating the ores. This plant was augmented by a second furnace, of a like description and capacity, early the following summer (1889).

It was during this year (1888) that a railway track was constructed from the "Soo" branch of the Canadian Pacific Railway to the Evans mine, a distance of about 3,000 feet, and active operations were undertaken in bringing the ores by rail from the three mines operated by this company, viz: Copper Cliff, Evans and Stobie to the roasting yards, constructed in the vicinity of Copper Cliff mine. The characters of these ores were somewhat different, and each had a distinctive feature of its own. That of Copper Cliff, while carrying a higher percentage of copper and nickel than either of the other two, was yet more disseminated through the matrix or vein rock (diorite), and the chalcopyrite and pyrrholite more intimately and regularly mixed and carrying about an equal percentage of each metal, varying from five to six per cent., while individual samples of pyrrhotite would assay as high as ten or twelve per cent. of nickel. With the Stobie ore the mineral occurred in large solid masses of pyrrhotite, very free from barren rock and with a much smaller proportion of chalcopyrite, but assaying on an average very little over two per cent. of each metal (Cu. and Ni.); while the ore from the Evans mine bore a character between these two, in that the bunches or masses of Cu. and Ni. ores were more clearly defined and separated as a rule, and the ore carrying from three to four per cent. of each metal. The ores from either the Copper Cliff or Evans mines, or from both combined, used as a charge for the furnace, was too silicious, but with a proper proportion of the Stobie ore, carrying an excess of iron, added, made a suitable combination and giving self-fluxing ores. These mining and smelting operations have been continued with short interruptions up to the present date, with the exception of the Stobie mine, which has been closed down owing to the ores from the other two mines being recently

of a higher grade, and closer sorting gives a grade of ore which can be smelted successfully without calling in the aid of the Stobie ore.

It was not until the season of 1889 that other mining and smelting companies entered the field, the first one being the Dominion Mineral Company, which developed the Blezard mine, which had been discovered late in the summer of the previous year (1888) ; this mine being distant about one and one-fourth miles northerly from the Stobie mine. It is now, however, closed down, as the ore is said to be entirely worked out. This company (Dominion Mineral Company) also, about the same time, secured the Crane mine (now known as the Worthington mine), and have prosecuted mining operations intermittingly and with varying results, smelting the ore therefrom at their smelting furnace at the Blezard mine.

The same year (1889) the Murray mine was secured by the Messrs. H. H. Vivian Company of Swansea, Wales, and in due course, after a certain amount of prospecting had been done, a mining and smelting plant was installed, at which operations have been continued with short interruptions to this date.

In the year 1887 gold was discovered upon lot No. 6, concession 4, township of Denison. A company was formed to prosecute mining upon this property and other lots in the vicinity, and was designated the Vermillion Mining Company. The vein carrying gold did not extend, however, to any great depth and operations were soon afterward suspended, but at another point upon the same lot Cu. Ni. ore has been found of a very high grade, assaying seventeen per cent. of Ni., on an average for several car loads. With this ore was also associated sperrylite, an arsenide of platinum (this being the first instance where platinum has ever been found as an ore), which occurred in the sand contained in the crevices of the rock in the vicinity of a shaft that had been sunk. In the year 1890 this mining company passed under the control of the Canadian Copper Company, since which time mining operations have been entirely suspended.

Since the spring of 1890 many deposits of nickel ore have been discovered throughout the district, of greater or less extent, some presumably of great value, but the great majority probably of little or no value. Many companies have been formed to develop mineral lands, but very little has been done in the way of prosecuting mining operations vigorously. There are two, possibly three, exceptions, viz.: The Creighton Gold Mining Company, operating a claim in the 4th and 5th concessions of Creighton, but with the details of which the writer is not personally conversant ; the Inez mine in the township of Drury, which has been worked a couple of years, has a mining and smelting plant, but has not to this date been very productive ; the Davis mine in the township of Blezard, after some prospecting work done in 1891 and '92, installed a good mining plant in 1892, but has since doing so closed down.

For a full description of this district in all its scientific bearings, geologically, mineralogically and metallurgically, I would refer you to a report by Dr. Robert Bell, of the Geological Survey Department of 1891, and a paper by Alfred E. Barlow, M.A., of the same department, read before the Logan Club of Ottawa, on 6th March, 1891.

DISCUSSION.

Mr. Gaviller—This is a most interesting paper. It is the clearest description I have ever heard of that part of the country. I saw a very extraordinary description in the *Globe* the other day of how the nickel was discovered in those ores. It seems to have been found by accident as it were, having been sent to New York for smelting. Some six or seven careful assays had been made of the ore and the presence of nickel had not been detected. It seems to me very strange how it was that they did not find it out.

Mr. Evans—The nickel present in the ores is a very small percentage, comparatively speaking, and unless a search is made for it, (and it is a very intricate assay to make,) it is apt to remain unnoticed. In those days very few assayers knew how to make an assay for nickel. Even the assayer of the Canadian Copper Company had been there for some time before he noticed it. Take an ordinary piece of ore and it would not run above two or three or four per cent., which is a very small percentage, and unless some one made a special examination for it they would not find it. Where a sample of copper ore would probably be thirty-five per cent., a sample of nickel ore would be only about three or four.

Mr. McAree—Have they ever made use of the magnetic needle in exploring?

Mr. Evans—The needle is always affected by it, but we never use it particularly. There are many deposits of pyrrhotite which would only carry one-quarter to one-half per cent., and it would be just as much magnetic as what would carry fifteen per cent. It runs all the way from a mere trace of nickel up to thirty per cent., and in every case it would be still magnetic.

Mr. Kirkpatrick—Is there much ore being shipped now?

Mr. Evans—They are shipping the matte all the time. The Canadian Copper Company ship to New York.

Mr. Chipman—In correspondence with the members of the committee respecting Topographical Surveying I received a letter from a member in Algoma, in which he says "The Mining Act has knocked the surveyors up this way completely out." Now, I had the privilege of visiting the Copper Cliff and other mines in the vicinity of Sudbury last year, and discussed the question with several parties there, but I have not been sufficiently enlightened yet to know in what respect the present Mining Act has knocked the surveyors' business out.

Mr. Niven—There is not so much speculation. I had a conversation with a surveyor last fall at Port Arthur, and he said that during the old Mining Act, before the present Act was passed, a great many prospectors took up land whether there was anything on it or not, so long as there was rock there of Huronian formation. They would take up tracts of land, have them surveyed, and buy them at $1 an acre. This was going on all through the district, and the result was that the Government was receiving a great amount of

money for lands, but since the Mining Act has been passed there is very little of that done. The consequence is there is no surveying being done, and it does not seem that the Government is realizing much money from the sale of land. I suppose that is what the surveyor meant by saying that the Mining Act has knocked the surveyors out.

Mr. Chipman—The Mining Act as it stands now will not permit any individual to buy land at $1 an acre.

Mr. Kirkpatrick—No, it is $3 within 12 miles of the railway and $2.50 outside.

Mr. Evans—I think the royalty claim is one of the great bugbears.

The President—There was at one time a report that gold had been found at Copper Cliff.

Mr. Evans—There is just a very slight trace. There are also platinum and other minerals and a slight trace of cobalt.

The President—There was a report circulated that the reason there has not been more work done in nickel was on account of there not being a demand for the nickel. Is that the case?

Mr. Evans—I cannot of course answer that, but what the company gave out is, that they have not got a market for the nickel. The proportion of nickel used in nickel steel is only about three per cent. The great difficulty is that the processes at present known are expensive.

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PELEE ISLAND DRAINAGE WORKS.

By WILLIAM NEWMAN,

O.L.S., C.E., Windsor.

THE writer will, in his humble way, try to convey to his fellow-surveyors some of what he considers the most important points in a drainage system, together with the description of some of the works on which the writer has been employed.

Drainage works have been carried out to a larger extent in Western Ontario than in any other part of the Province. This can be accounted for by the fact that in few parts of Ontario is the soil so productive as in the Western part, and in no part is the general surface of the soil so nearly uniform and level.

The streams in the West are generally small, with very low banks and slow currents.

Under the Counties of Essex and Kent the rock formation is what is known as the Corniferous formation, cropping out in the Township of Malden, near Amherstburg, and on Pelee Island. But in the remaining part of Essex and Kent it is covered with a deposit of blue clay, sand, and gravel, to an average of more than 100 feet in depth. Wherever the rock crops out, it shows unmistakable signs of having been planed off and groved by the glaciers. This glacial action is very plainly marked on the east side of Pelee Island.

Lake St. Clair lies to the north of the County of Essex and west of the County of Kent. Lake St. Clair, as is well known, is very shallow and bounded on all sides by great wide marshes. Into, and through these marshes, nearly all waters from the Counties of Essex and Kent flow. This low lying marsh land is generally composed of clay mixed with a certain amount of vegetable matter, and also covered with vegetable matter varying from about six inches to three or four feet in depth.

In many places, when the water is high in the lakes, this marsh land is inundated for miles in extent, and as this water is spread over the marsh the greater portion of the year, it keeps the land, where the vegetable matter is deep, almost afloat, and by this means makes the marsh very soft and boggy.

Thousands of acres of this marsh land have been bought for two dollars per acre and upwards, and to a casual observer it would appear as a wild speculation.

Vast tracts of these marsh lands have been reclaimed and are to-day under cultivation, and make the best farming land that can be

found, when the water is kept off, after the muck has had a chance to rot for two or three years.

Some six or seven years ago an attempt was made to drain, what is known as the " Big Marsh " on Pelee Island, and expel the water by steam power into Lake Erie.

The Big Marsh is situated, as can be seen from the accompanying plan, in the northern part of the Island. The total area of the Island is about 13,000 acres, and the area of the " Big Marsh " basin about 7,000 acres, and of this 7,000 acres more than 5,000 acres is a treeless marsh. The remaining 2,000 acres being what is known as wet wood-land, and high land, the waters of which drain into the Big Marsh. The whole of this marsh land was bought up some years ago by two gentlemen—L. S. Brown, who lives on the Island, and Dr. J. M. Scudder, of Cincinnati, Ohio. An attempt was made some years ago to have the whole marsh reclaimed and divided up into farms. To carry out this scheme the owners, Messrs. Brown and Scudder, let the contract to the Chatham Dredging Company to construct about thirteen miles of drainage canals and to form dykes along the lake where there was any danger of the lake surf coming over the natural bank during the heavy blows.

The dredging was proceeded with, but during the greater portion of the time that the dredge was at work there was from one to two feet of water on the marsh, which was sufficient to keep the vegetable matter afloat, or at least very soft and boggy, so that when the dredge went through it left a lot of this muck behind, which settled to the the bottom. When the dredging was completed, a steam boiler and engine and one of those great fan-like water-wheels were put in position at the north end of the Island, at the point marked " Old Pump House. These big wheels are built principally of wood. This particular one is about twenty-eight feet in diameter, and about six feet wide on the face, and built into a closely fitting trench or sluice. The wheel is made to revolve in this sluice by means of a pinion working into segments on the centre of the outer surface of the wheel, and by this means causes the water to be shoved out in front of the great fanlike spokes.

This kind of wheel seems to work fairly well where the maximum lift is only a few feet, and even then it is a great waste of power caused by the wheel never fitting closely to the sides of the sluice, and by this means allowing a good share of the water to be continually falling back around the fans. There being only one of these wheels to pump the water off 7,000 acres of land, was, in the writer's opinion, assuming the capacity of the pump to be far too great, then by placing it at an end of the system of shallow canals, and supposing it to drain the whole thireen miles, was out of the question. One of the greatest advantages gained by the partial drainage of this marsh land was that as the water was lowered in the canals the land settled and became solid, and the muck commenced to rot. But what muck was left by the dredge in the canals settled to the bottom, this giving rise to a rank growth of aquatic plants which, in places, was almost sufficient to stop the flow of water in the canals, and during

wet weather the marsh land was altogether too wet for farming purposes. Such was the condition of affairs when the Council took over the drainage of the marsh and undertook to improve it under the Municipal Drainage Act, in the summer of 1892, and engaged the writer to come over and advise a scheme to improve their drainage works.

The writer made a close survey of the whole marsh, taking levels every 100 hundred feet along the entire length of the canal system, also noting the distance between the stakes, and the surface of the water in the canals. Then soundings were taken opposite every stake. By this means the depth of the old canals was determined, together with the surface of the marsh.

The writer's plan included the cleaning out of about eleven miles of the old canals, to a depth of about eight feet from the surface of the marsh, and at the time making the top of the canal at least thirty feet wide, with the bottom as narrow as it was possible for the dredge to pass through. Also the cutting of a channel six feet wide and about four feet deep through the rock at the place called the "Neck," shown on the accompanying map, so as to give an outlet to the waters of the round marsh. Together with the erection of two new pumping stations, one on the east, and the other on the west, side of the island. In each pump house was placed a steel boiler fourteen feet long and sixty inches in diameter, connected to an engine with cylinder fourteen inches in diameter, and giving an eighteen inch stroke, making one hundred and fifty revolutions per minute, with a boiler pressure of eighty pounds per square inch. To each engine is coupled by means of a rubber belt sixteen inches in width a centrifugal pump. The pump is of the horizontal type with a *suction* pipe *twenty inches* in diameter, and the *discharge* pipe *eighteen inches* in diameter. The maximum lift is ten feet. Each pump is connected to the canal by means of a flume six feet wide and nine feet deep, built of white oak timber and planked both inside and outside with white oak planks. The discharge pipe is connected with the lake by means of another flume.

The contract for the whole of this was let in November, 1892, to Alister McKay, Esq., of Chatham. Work on the canals was commenced at once, and carried on till about the 1st of January, 1893, when the dredge was compelled to shut down owing to the heavy ice forming in the old canals. Work was not started again until some time in March, 1893, and was again pushed forward as fast as the nature of the work would permit, without any serious delays, excepting once or twice, when the machinery of the dredge gave out. When the spring opened the machinery and materials were brought upon the grounds, and the work of erecting the pumping stations and the placing of the machinery was proceeded with. On about the first day of November last, the dredge made its way out into the lake, and the pumping machinery was started, and ran very smoothly, to the great satisfaction of the writer, and all the ratepayers present. Now all the work that remains undone is the blasting of the rock at the "Neck," which could not be proceeded with until the pumping machinery was started, and the water lowered in the canals.

The estimated cost of the whole of the above work was $22,500, but up to date only about $21,000 has been paid, leaving a balance of $1,500 to finish the rock blasting.

The pumps, since they have been in operation, have given the utmost satisfaction, and are keeping the water down in the marsh with the greatest possible ease.

The writer's reason for placing a pump at each side of the Island and leaving the old one still in use at the north end was to give the water a chance to get to the pumps without having to travel so many miles of canals, for it must be borne in mind that the surface of the marsh is almost a horizontal plane, and whatever fall the water has in the canals it is caused by the lowering of the water at the "pump" end of the canal. But when it comes to dividing this fall over five or six miles of canals, partly choked with vegetation, you can easily see the writer's reasons for having the pumping machinery distributed as much as possible.

There are a number of marshes, in this section of the country, where reclamation may be carried on to a large extent and be very successful There are marshes again where it would be a total failure.

The most essential points to be considered in determining whether it would be advisable or not to try to reclaim a certain marsh can only be determined by a careful survey and examination of the whole surroundings, as to the nature of the muck on the top, as to the depth to which water lies on the marsh, of what the sub-soil is composed, and if there is any quicksand in the same. Also look up the size of the marsh, and the nature of the body of water around it, whether it is a river or a lake, or whether or not it is subjected to floods. Still another consideration which is of great importance is, the price of farm land in the adjacent locality, both present and prospective. If there is much muck on the surface of the marsh, and the subsoil is composed of quicksand or gravel, it is doubtful whether it would pay to try to embank, or reclaim the marsh. But where the muck is not too deep, and where the subsoil is of a clayey nature, and not subjected to floods, the marsh can be easily reclaimed and converted into the best of farming land. The only question then arises, will the nature of the land in the neighborhood warrant the expense of the undertaking?

A large tract of good marsh should be reclaimed for from six to eight dollars per acre. This first cost will include the dredging and the placing in position of the necessary pumping machinery.

The yearly cost of keeping the machinery in order, and the hire of a man to run the same during the wet weather, together with the cost of fuel, should not amount to more than twenty cents per acre per year. The contract for running the machinery of Pelee Island, together with supplying all the fuel necessary to pump the water off the whole 5,000 acres of marsh, has been let for the year 1894 to a reliable man for $900.

Windmills have been tried as a power to pump the water out of our smaller marshes, but in no case that has come under the writer's notice, has wind, as a power for pumping water for drainage purposes, proved successful.

There are a great many swamps and marshy places far inland from our large lakes and rivers that can be drained by merely cutting a channel through a ledge of rock, or through a bar of earth, and by this means give the water a chance to flow out by gravity ; thus converting, what would appear as a barren waste, into first-class farming lands, at a very low first cost, and then there would be no further costs for pumping, etc.

The writer was employed on one of these drainage systems, some time ago, where there was a treeless marsh, and covered with water the greater portion of the year. The plan adopted to drain this marsh was to commence back at a creek about three miles from the nearest edge of the marsh and to bring up a ditch, on a grade of about three feet per mile, and carry this ditch clear through the marsh. This ditch was at places over twelve feet deep, and the bottom width the whole way up was twelve feet. Since this work has been completed what used to be a watery waste is now the most productive section of the township.

So much for the financial side of the question ; but, perhaps, what engineers should consider more than the financial side is the effect of good drainage, and the removal of all stagnant water and decaying vegetable matter from the community, as is now well-known the health of a community is known by their surroundings, and the health of a man, to a great extent, depends on whether or not he is supplied with the following :—Pure water, pure air, and pure food. Now there is nothing that will give a community pure water and pure air so effectively as good drainage, and if a man has pure water and pure air his food will be much purer than it is possible for it to be without these elements. As a proof of this I would direct your attention to the amount of ague, chill fever, etc., there used to be in the Counties of Essex and Kent before municipal drainage was commenced, and to-day you never hear of a case of any of these low forms of fever.

Thus by assisting nature and giving her law a chance to act, the engineer has brought health, wealth and prosperity to his fellow-citizens in this as well as in many branches of science.

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THE GRAND BEND CUT.

By R. COAD,
O.L.S., C.E., Glencoe.

Grand Bend, as referred to in the subject of this paper, is the name given to a small country corner near the extreme northerly angle of the County of Lambton, and is no doubt applied to it on account of the sharp bend which takes place in the Aux Sables River at this place.

The Grand Bend Cut, the subject of this paper, is a work which has recently been carried out (but not yet completed) of making a cut or channel from the river at the Bend, direct to Lake Huron, and of deepening the river up stream above the Bend for a distance of about three and a half miles.

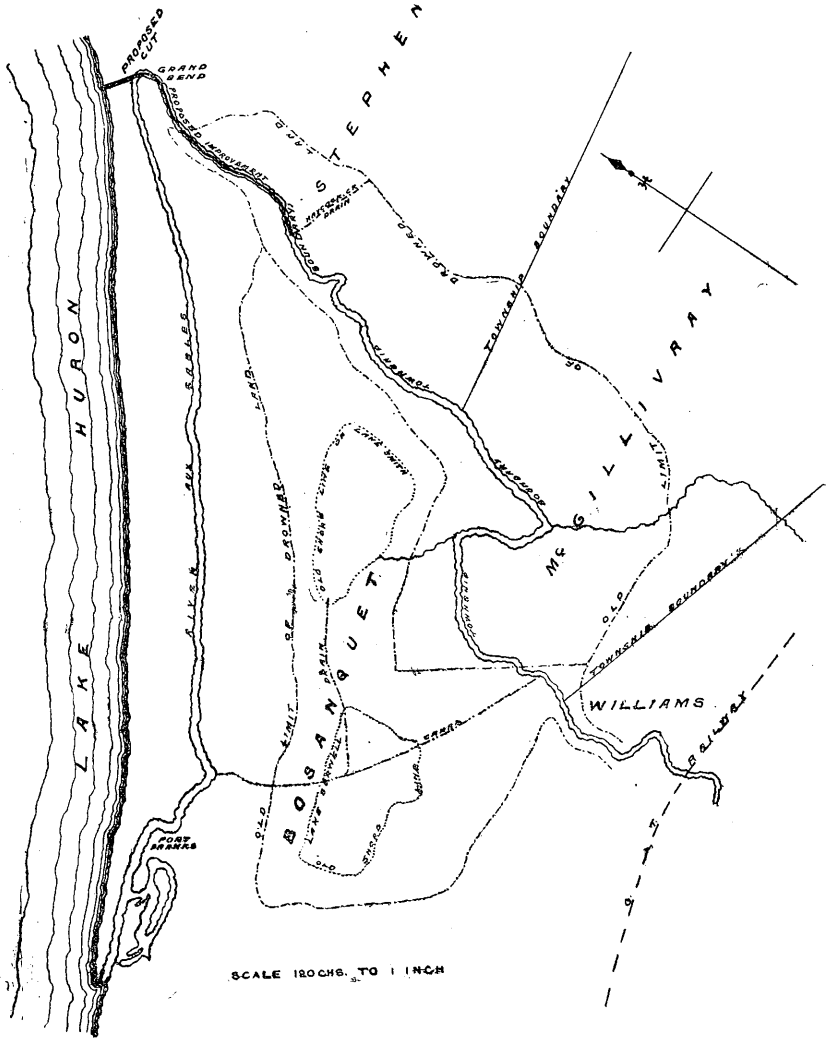
Taking its rise in the Township of Hibbert, in the County of Perth, the River Aux Sables finds its way by a crooked course some seventy miles long, through parts of the Counties of Huron, Middlesex and Lambton to its outlet into Lake Huron at a point some thirty-five miles in a staight line from its source and about an equal distance north east of Sarnia. There is little doubt but that at a comparatively recent geological period the mouth of the river was some twenty-four miles above its present location, near where the course of the stream crosses the boundary between the Townships of Williams and McGillivray in the County of Middlesex; and that at a still more recent period the outlet into the lake was at Grand Bend, from which latter point, by a process still going on, the winds and waves are shifting the outlet farther south-westerly each year.

The prevailing winds in this locality are from the north-west across Lake Huron, and acting on the lake-shore sand are continuously shifting it into the outlet of the river and throwing it up to form the sand dunes of the peninsula extending from Grand Bend to the present outlet of the river, a distance of about twelve miles.

This peninsula varies in width from one-half to one-quarter of a mile.

Previous to, and during the time that the outlet of the river was at Grand Bend, all that part of the Township of Bosanquet, lying northerly of the north boundary of the Township of Williams, and westerly portions of the Townships of McGillivray and Stephen, were flooded by the waters of the river, the lake shore being at that time the sand banks east of the present channel of the river from Grand Bend to the existing outlet.

On the area thus flooded the silt brought down by the river was deposited, forming a soil from which a luxuriant vegetation sprang up, converting the whole tract into more or less solid land, with the exception of about 2,200 acres, occupied by Lakes Burwell, Smith and George.



The Canada Company originally owned all the land in the Townships adjoining this tract, and from time to time sold the lands in the neighborhood until all that not flooded had been disposed of.

This brought up the question of how best to drain the drowned land, and land which was subject to flooding.

To accomplish the first of these objects and to aid in preventing the second, the Canada Company, acting on the advice of their then engineer (now commissioner) Mr. Willson, let a contract in the winter of 1872, to construct a new channel for the river, commencing at a point on the river about one-half mile below the north boundary of Williams, and running thence north-westerly, nearly in a straight line, passing through Lake Burwell to join the river again about two miles above the present outlet.

This channel is about one and a half miles in length east of Lake Burwell, about one mile through Lake Burwell and one and one-fourth miles west of Lake Burwell; in all, a total length of about three and three-fourth miles.

The bottom width of the new channel was twenty feet throughout and the side slopes one and one-half to one. The section west of Lake Burwell averaged about thirty feet in depth (the maximum depth being sixty feet) through pure lake shore sand and gravel; through the lake the excavation was vegetable matter, while the section east of Lake Burwell averaged about six feet through clay and vegetable matter. This contract was completed in the fall of 1875, and subsequently about ten miles of tap drains were constructed.

The cost of the work done by the Canada Company was about $80,000, benefiting about 16,000 acres of land.

The original scheme contemplated the construction of the cut at Grand Bend, but it was not considered advisable to proceed with this part of the work until the resident ratepayers who would be benefited should apply to have their lands drained under the provisions of the Municipal Act, and so this part of the scheme lay untouched until the year 1887, when a petition having been sufficiently signed and presented to the Municipal Council of the Township of Stephen, that body instructed the writer to make the necessary examination, survey, plans, and report for the drainage required.

The report states that the locality described could be most effectually drained by constructing a drain in Haycock creek, and carrying the water into the Aux Sables River. and thence along that course easterly to the Grand Bend, and thence across the bar into Lake Huron.

It was found that the surface of the water in Lake Huron was five feet seven inches lower than the surface of the water in the river at the Grand Bend, at the time of low water, and that in one and one-fourth miles up stream from this point was a rise of two and one-half inches in the surface, above this it was practically level for the next three miles or more.

The distance from the lake to the river on the course of the cut is twenty-one and one-half chains, which was staked off and levelled in the usual way. Soundings or measurements were also taken in the bed of the river along the course of the proposed work, and numbered stakes planted on the shore as was deemed necessary. As the height

of water in Lake Huron is somewhat variable, it was thought advisable to make the bottom of the cut one foot lower than the surface of the lake at the time of survey.

The greatest depth of cutting in doing this was thirty-one feet nine inches, and the shallowest, twelve feet eight inches, or an average of about twenty feet for eighty rods.

The bed of the river from the head of the cut is very irregular, as shown on the profile, for a distance up stream of about one and three-eighths miles, the water varying in depth from one foot to eight feet; above this the bed is more regular and the water from three to six feet deep to where the work leaves the river, and above this again for four miles or more the water in the river is seven or more feet deep. The bottom of the cut and work in the river was to have a level grade throughout, and was to be thirty feet wide and the side slopes one and one-half feet horizontal to one vertical.

By such a scheme as this it was thought that the water in the river would be discharged so quickly at times of freshet that the adjoining lands would not be flooded to any considerable extent, and that at ordinary times the water in the river would stand about five feet lower than it had previously done, and thus an additional five feet or so of drainage would also be obtained and the lands on either side, much of which was, before the performance of the work, from two to eight feet above low water in the river, would be largely benefited as far up stream as where the original cut was made by the Canada Company.

It was also thought that from the nature of the bank or bar to be cut through to the lake that the channel would widen to a considerable extent by the action of the water from the river, and also that the mouth of the new channel might become obstructed to some extent by the lake casting up sand bars across it, but this would be scoured out some at times of freshet in the river and that the channel would thus keep tolerably well open.

The estimated cost of the work was as follows :—

Excavating in the cut, 61,500 cubic yards at 15c.....	$ 9,225 00
Excavating in the river, 47,574 cubic yards at 23c.....	10,942 02
Excavating in Haycock Creek, 3,721 cubic yards at 10¾c... ..	400 00
Total cost of excavation.....	$20,567 02
Other expenses in connection with the work.....	900 00
Total.....	$21,467 02

This sum was assessed over 8,114 acres of land, not including road allowances, also on the road allowances to the extent of $1.010.

The assessment on the lands varied from 80 cents per acre to $4.15 per acre, or an average of about $2.52 per acre, involving lands in four townships and three counties. Some little difficulty was experienced in getting the necessary By-laws passed and money raised, and some of the weak points in the Ontario Drainage Act were made conspicuous, as shown in the suit, Stephens vs. McGillivray. Notwithstanding this, the preliminary part of the

work was satisfactorily settled and the contract let, and actual work commenced in the cut in the summer of 1892. It was found that the water in Lake Huron at this time was about three feet lower than at the time of survey in 1887. This facilitated, to some extent, the work of the cut. The top of the cut was taken out by means of teams and scrapers, and the lower part by means of a tram road and dump cars, filled by hand and operated by horses, carrying the excavated material and dumping it into the lake. In this way probably about one half of the work next the lake was almost completed. In that part next the river a narrower channel was cut through to a depth below the surface of the river and the water of the river turned through it. The action of the water of itself now nearly completed the work so far as this cut was concerned, carrying the material out into the lake; so that by the following spring, the narrowest part of the channel would not be less than 300 feet and varying to 600 feet.

As was also supposed, a bar is already cast up at the mouth by the action of the waves, and a formation started on the north and west sides, similar to the one cut through. The bar on excavation was found to be pure lake shore sand and gravel, coarser towards the bottom where were many stones from two to four inches in diameter, except for some two or three chains next the river where the bottom was made up of a marly clay in which trees, logs, stumps and the like were found.

The work in the river was not commenced till the following spring (1893), when a dredge was put in, working its way from the lake up through the cut. The bottom of the river through the the heavier parts of the work towards the Grand Bend and also towards upper end was a very hard white clay, containing stones and boulders, and somewhat difficult to operate a dredge in. Farther up the river and in the lighter parts of the work, the bed is softer and of a mucky nature. This part contained the remains of many trees, stumps, etc., in a good state of preservation, which had, no doubt, floated down from farther up stream and become lodged and buried in the channel at the earlier period previously referred to.

Before getting through the upper part of the work the dredge became disabled, and as it was on in the autumn, operations were stopped for the time being. We understand, however, that it is the intention of the contractor to complete the work by hand labor and teams.

As there has been no freshet since the carrying out of so much of the work, we cannot say definitely what the effect will be, but there is every reason to believe that it will be as anticipated; as last spring, when only the cut through the bar was made, the water got away much more quickly than usual, and it is now expected that there will be no danger from flooding and that good drainage will also be afforded these lands, which are of excellent quality and only waiting to get the water off to make the best of farms, and we feel that this will be accomplished when this work is completed.

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LITTLE BEAR CREEK DRAIN.

LETTER FROM W. G. McGEORGE, O.L.S.

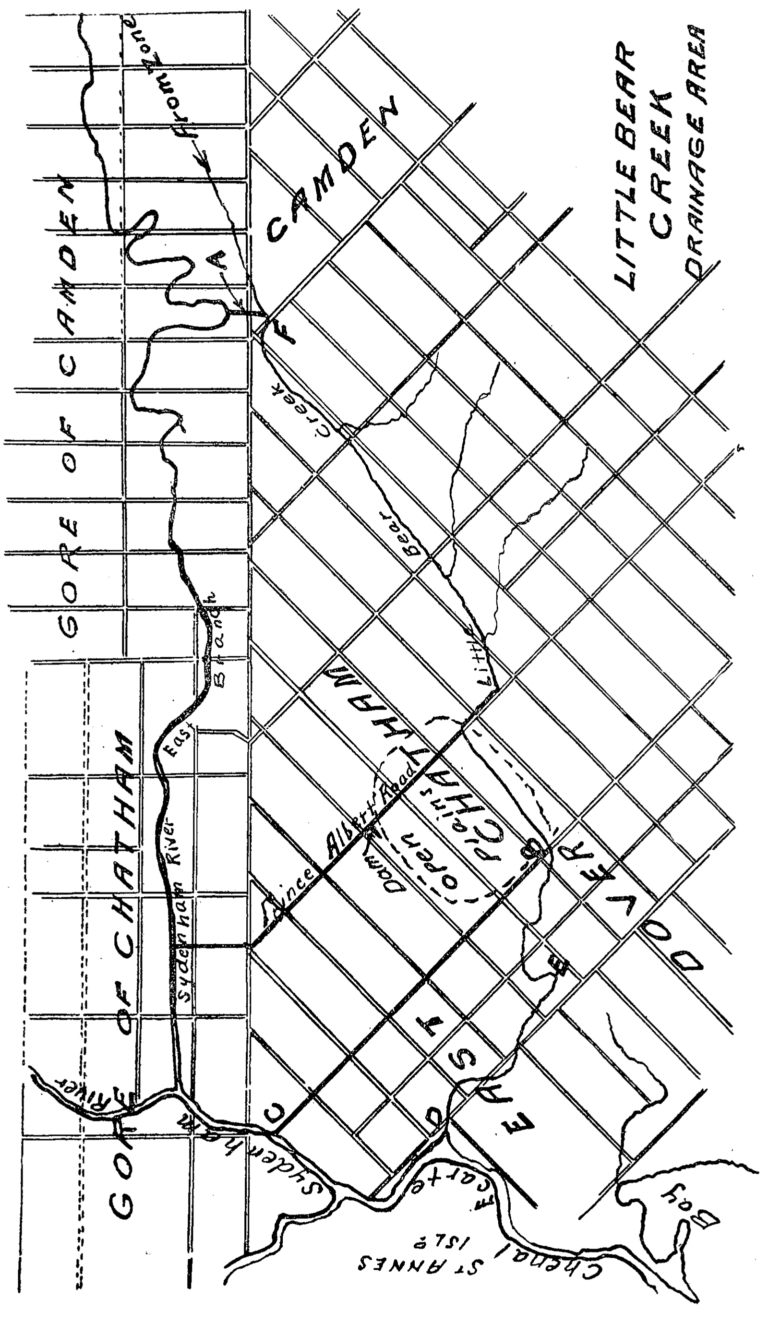
LITTLE BEAR CREEK takes its rise in the township of Zone, in the county of Kent, and running nearly parallel to the River Thames and River Sydenham, makes its outlet in the Chenal Ecarte, an outlet of the River St. Clair. After leaving Zone it passes through the townships of Camden, Chatham and Dover East. At the westerly side of the Township of Chatham it spreads its waters over a large area of land, some five miles long and four miles wide, and there it has no well defined course. At the Chatham and Dover Townline the channel is resumed and is continued through Dover to the outlet.

A very large area of land in Chatham was formerly flooded nearly the whole summer of each year. This land was partly open marsh and partly timbered. This land, at about nine miles from the mouth of the creek, is only at an elevation of about eight feet above the surface of the water in the Chenal Ecarte, and at about seven miles it is only four feet above the same surface.

The first improvement made was by tapping the Creek at a high elevation at the Townline of Camden and Chatham (at A on plan,) diverting the waters of the upper stretch in Zone and Camden, by a short cut, into the river Sydenham, at a cost of some six thousand or seven thousand dollars. This cut has, through time, become greatly enlarged and has done a great deal of good. The next improvement was in the Creek in the township of Chatham and a short distance in Dover. The expenditure was about $30,000, but this work was quite inadequate. It was done with plough and scraper and was costly for the size of the drain.

About twenty years ago the drain was tapped at the Chatham and Dover Townline by a drain along this Townline to the River Sydenham (from B to C on plan). This tap drain, probably six miles long, and costing about $30,000, passes for half its length through low, marshy lands very little higher than the River, and was chiefly beneficial in making a good road and in cutting off water from passing into Dover between the Creek and River. The County of Kent contributed about $10,000 as an assessment on the Townline.

Another tap drain was made on the Prince Albert Road in the Township of Chatham, the next side east of the Chatham and Dover Townline, and about two miles and a quarter east of the townline. It was made to extend from the Creek to the River Sydenham and is about five miles long. Its cost was about $12,000. This has done good in making the road and relieving the Creek, but complaint is



GORE OF CAMDEN
CAMDEN
From Zone
LITTLE BEAR CREEK
DRAINAGE AREA
GORE OF CHATHAM
CHATHAM
EAST DOVER
Sydenham River
East Branch
Little Bear Creek
Prince Albert Road
Dam
Sydenham
Chenal Ecarte
ST ANNES Isle
Bay

made that lands are flooded that were before its construction beyond the influence of the Creek, and that the water should not have been diverted in this direction. I may say that much of the land along this road is only some seven or eight feet higher than the River, and on occasions the River rises seven or eight feet.

It is not now considered with us advisable to make tap drains in such low land. River floods are becoming higher from year to year in these rivers. The Prince Albert Road Tap was made about ten years ago.

Some eight or nine years back the Dominion Government through the influence of the member for Kent, dredged out Little Bear Creek from its mouth some three or four miles up (from D to E on plan) into Dover, and made it navigable that far for small vessels and useful for rafting logs, etc., and the township of Chatham about the same time on my report improved the Drain and Creek from the Camden and Chatham Townline through Chatham and in Dover to the termination of the Government work (E to F on plan), at the road between Concessions 13th and 14th of Dover East at Lot 20. The work in Dover, and for about seven miles in Chatham was done by a powerful steam dredge, and the drain in Dover was made forty feet wide, and with four feet of back water to the Chatham and Dover Townline, and from this point the dredge was floated by placing dams behind it at intervals, and supplying water by portable engines and chain pumps, until the dredge was carried to an elevation some twelve feet above the water at the entrance to the Creek. In Chatham the cut was about thirty feet wide and six feet deep. This is much the cheapest and most effective way to do such work.

A fair paying estimate for such work in ordinary cases is from ten to twelve cents per cubic yard of excavation. Of course in an inland situation, where a dredge would have to be built on the ground, and where it would have to be broken up upon the completion of the work, an estimate would require to be made to accord. Say dredge first cost $10,000, value of deteriorated machinery at removal, $2,000 to $3000.

Beyond the dredge work the drain was continued to the Camden Townline of smaller dimensions, and work was done with plough and scraper.

After the drain was completed use was made of it in floating logs to its injury, and many new drains were made leading into it and others were enlarged, and now it is found that the Little Bear Creek drain requires to be enlarged and improved over about the lower half of its length, and it is purposed to carry out the improvement in accordance with the report and by-law which I enclose, and which will give you the information you desire. In fact, the work is now under way, two powerful steam dredges being at work, and it is expected that the whole will be completed next summer. This work deals only with the western part of Little Bear Creek Drain. The rest of Little Bear Creek in Chatham is in a fine state of repair, and as you will see, part of the Prince Albert Road Tap is changed into a branch of the Drain.

Dover and Camden acquiesced in the assessment to pay for the work, and there has been very little change made at the Court of Revision The assessment was chiefly for outlet, under Section 590 of the Act, and each parcel of land in the drainage area pays in proportion to the cost of the part of the drain used for its waters, no lands paying any of the cost of the work above where the waters of these lands enter the drain, and all lands using the drain pay alike for their portion, whether they are near the Creek or remote from it.

Where lands pay for a benefit, it is where water is cut off by the embankment of the Prince Albert Road, and by the proposed dam in the Prince Albert Road Drain, where the dredge stops.

The work, owing to keen competition, was let at about two-thirds of my estimate.

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

NIPISSING & JAMES' BAY RAILWAY SURVEY.

By J. A. PATERSON,
O.L.S., C.E., Toronto.

On the evening of the 4th July last summer (1893) a party of travellers at the Union Station, Toronto, might have been seen boarding the G. T. R. train for North Bay. By the appearance of their outfit, consisting of transits, levels, rods, etc., it would be surmised that they were on a surveying expedition, and when it was said that they had a box car loaded with provisions, canoes, tents, blankets, etc., it was evident that the expedition was of no small importance. This was the survey and location of what might be called the first division of the Nipissing & James' Bay Railway. An enterprise that might well interest every citizen of this Province, as it concerns the development of the northern part of Ontario, an immense region hitherto comparatively unknown.

It was in April, 1884, that the charter was granted by the Dominion Government, since which time the enterprise has languished from want of encouragement from capital. But at last to set the enterprise on its feet, by a proper survey and estimate of the cost, a couple of public-spirited, enterprising gentlemen put their hands in their pockets and raised the necessary funds.

At the time when the charter was granted the attention of most enterprising men was directed to the possibilities of the North-West, and this Province was drained of men and money. Latterly the rest of the Province has occupied public attention, railways and other public works being built, public money being thus far well utilized. But now the time has come for the development of this northern district, and to do this the railway is the great agent and pioneer, opening up a highway for traffic through the heart of the country and connecting the existing lines of railway, that permeate the rest of the Province on the south, with James' Bay, the southern prolongation of Hudson Bay, on the north.

The total length of the line will be about 360 miles. Commencing at the Town of North Bay, a thriving municipality on the north bay of Lake Nipissing, distant from Toronto 225 miles, connecting therewith the Grand Trunk Railway—connection may also be there had with the Canadian Pacific Railway—the line takes a north-westerly direction, rising gradually with some interruptions till at 21 miles distance the elevation is 577 feet above Lake Nipissing, which is 642 feet above the sea, so that the total elevation at this point is 1,219 feet above the sea, this will be the highest point on the line. From there

the line descends 270 feet gradually to the level of what might be called the Lake country at about the 30th mile, a country dotted with innumerable lakes and lakelets, with short connecting rivers. The method of travelling in this northern district is by water, which consists of stretches of deep, still lakes or ponds, connected by streams interrupted by rapids and falls, around which the light canoes are portaged by hand. Traversing this country for forty miles, the line touches the north-east arm of Lake Tamagaming—the Indian word Tamagaming is of the Cree language, meaning "deep water"—the water being in some places 300 feet deep and same color as that of Lake Superior, is full of trout and white fish and has been one of the chief fishing grounds of the Hudson Bay Company for over one hundred years, supplying many of their posts with fish. This is a very extensive lake, having many extensive deep bays with many islands, and looks as if nature not having room to scatter all her lakes, threw the balance in a heap at this place. The Hudson Bay Company have a trading post on Bear Island, in the middle of the lake. It has two outlets—one flowing southerly into the Sturgeon River, thence to Lake Nipissing; the other northerly into the Montreal River, thence into Lake Temiscaming. The line continues from Lake Tamagaming 22 miles further to reach Lake Temiscaming, a total of 90 miles from North Bay, descending over 300 feet from the general level of the lake country to this lake, which is about thirty feet lower than Lake Nipissing, its elevation being 612 feet above the level of the sea. In approaching Lake Temiscaming the line passes through a large district of fine agricultural lands, reported by actual surveys to contain about 95 per cent. arable land. Lake Temiscaming is a magnificent stretch of navigable water, the largest and deepest of the whole course of the Ottawa, extending 75 miles without any obstruction to vessels of the largest tonnage. The name Temiscaming is from the Ojibway language and means "deep water" also, it consists of three lakes—the lower, middle and upper—connected by narrow straits, with its tributary the River Blanche, which enters at its northern end, navigation is continued many miles further into the interior. It is the great basin of the Ottawa and drains 19,000,000 acres. The land in this district is good, similar to the best in Canada, with a climate equal to any on the north shore of the St. Lawrence. To this lake would be the first division of the railway.

Leaving this lake, the line again rises to the upper level of what might be called the table land, which may be described as a level clay plain, with a number of rocky hills and ridges protruding. At about ninety miles distance Lake Abittibi is reached, which is about thirty feet below the ordinary level of the plain described. This is also a very extensive lake. The outlet is by the Abittibi River, which flows northerly to the Moose River and thence to James' Bay. This would form what might be called the second division of the railway. From Lake Abittibi to Moose Factory, situated on an island in the mouth of Moose River—where it enters James' Bay—the distance is about 180 miles. After leaving the locality of Lake Abittibi the line begins to descend rapidly till it comes to the level of an immense plain,

covered with belts of timber, intersected with stretches of peat beds; the soil is clay, so that there are large stretches of good strong alluvial soil.

James' Bay, named after Capt. James, who wintered there in 1632, begins at Cape Jones on the east side of Cape Henrietta Maria on the west, and runs south about 360 miles, with an average breadth of 150 miles. It is merely a prolongation of Hudson Bay. With many people Hudson Bay is apt to be associated with the Polar regions, yet no part of it comes within the Arctic circle. The latitude of its southern extremity James' Bay begins about 51 degs. north, is south of London, England. It never freezes over, and is connected with the Atlantic by a wide passage. This great Canadian sea, including James' Bay, abounding with whale, porpoise, salmon and white fish, and to the further north with seal, is about 1,000 miles long north and south, and more than 600 miles wide at its north part; total area about 500,000 square miles. At Moose Factory, farming and gardening are carried on by the officers of the Hudson Bay Company. Oats, barley, beans, peas, potatoes, turnips, beets, carrots, cabbage, onions, tomatoes, etc., are grown without any more care than is required in other parts of Canada. Horses and cattle are kept and plenty of fodder is found for them.

Professor Bell says:—"Around James' Bay and up the eastern "sides of Hudson Bay lie great deposits of iron and coal so close "together that this district about James' Bay may yet become another "Pennsylvania."

Another explorer says of the district about James' Bay:—"This "district is the richest mineral region in the Dominion, perhaps on "the continent. Coal and iron are also to be found in abundance "along the rivers south of James' Bay."

Another explorer in his report to the Ontario Government says:—"There are also in the neighborhood of James' Bay, north of the "height of land, enormous peat beds, perhaps the largest in the "world, from eight to twenty feet thick, besides lignite or Brown coal, "Kaolin and Iron."

Other resources of James' Bay are: Furs, oils, whalebone, feathers, quills, fish, castoreum, lead ore, lumber, ivory, tallow, gypsum. The iron ore is particularly valuable, as it contains a great amount of carbonate of magnesia, making it available for the manufacture of Bessemer steel.

The district from around Lake Abittibi to James' Bay, with its clay formation, has endless resources for the production of aluminium, which by newly discovered processes, can now be produced at less than 25 cents per pound, and when produced in the quantities that this district warrants the supply of, it will take the place largely of silver, copper and tin. The Kaolin deposits are extensive, and the very best qualities of china and porcelain may be also manufactured; there are also beds of the finest sand for the manufacture of glass. Large quantities of gypsum, fire-clay, brown and yellow ochre are to be found; there are also many signs of petroleum and natural gas.

All these valuable resources lie waiting development. Now is the

time to revive and stimulate the business of the country by the building of this railway; but such an undertaking needs the backing and co-operation of both the Provincial and Dominion Governments to a much greater extent than at present proposed.

The location of a good railway line through this country is no small undertaking. After leaving the settlement in the vicinity of North Bay there are no roads of any kind, and the dense, pathless forest, with its heavy undergrowth, is entered. The instructions given were to secure the most direct possible line, the maximum grade to be 1.33 feet per 100 feet going northerly, and 1 foot per 100 feet going southerly; the sharpest curve to be not less than that of 1,146 feet radius. As an early report and estimate were desired two parties were sent out. The number in each party varied from ten to eighteen men, as circumstances required. On the first thirty miles, there being no lake or river convenient, the provisions and camp outfit had to be carried on men's shoulders, and the days that camp was moved were the great and eventful days of the survey. A trail or path through the bush having been opened out, three or four miles ahead in the direction the line was likely to go, all the surplus provisions, etc., having been carried forward by the packmen, and the survey and location having been completed in the district of the existing camp, an earlier start than usual was made, and at daybreak blankets, tents, etc., were rolled up, each man making up his pack into as convenient a shape as possible for the mounting on his shoulders. Each pack being made up to include as much as each man could struggle with through the woods and was often a curious conglomeration of camp outfit. Blankets, pots and pans, pork and stationery, flour and grindstone, canned goods and personal clothing. The pack mounted on the shoulders at the back of the neck, the tump line or strap passing round the forehead by a loop, made the portager or packer sometimes top heavy, when he began to get weary, and if he passed too close to one tree, trying to dodge another, the recoil might send him stumbling headlong over the lying timber on the trail. One incident that might have been serious happened simply; the pack of one of the party was surmounted with the large tin bake pan, to rest and adjust his pack he backed up to a large lying pine, intending to deposit his pack on tree; he laid it down and just as he was about to take his head from the loop, the tin pan being bright and smooth, slid on the round tree and the whole pack of about one hundred pounds shot off over the tree like a catapult, took the stalwart portager at a disadvantage, carrying him with it head over heels.

A trial or preliminary line was always ran ahead first, and if not satisfactory, another and another, till the best line possible in that locality was got. Going to the camp or to the end of the survey line by short cuts through the bush was also an interesting part of the service; every moment of time possible was utilized in running in the line, and then in getting to camp across country as one best could, it sometimes happened that some adventurous spirit would overshoot the mark, pass beyond and thus be late in getting there, and, of course, would then be the recipient of much chaffing, as well as

chaffing enquiries as to the country he had seen ; had he explored a a new route ? It would, of course, be decidedly awkward to be benighted in the woods, as it darkens quickly and it is useless then attempting to travel, so one had better hang himself up on a limb till morning.

A number of fine pine trees had to be felled on the line, some over three feet through, regular monarchs of the forest. It was always a source of regret to the engineers to cut down such magnificent timber, also to the axemen on a hot day with the cry " Hurry up now, boys ! Push her down !" ringing in their ears, as it is no easy job to throw down such giants hurriedly, but four good men would gather around and a merry chime would be rung, as the four axes swung, with clip ! ! clip !—clip ! ! clip ! and then hurrah ! cries of look out ! and

" Beware the pine tree's withered branch,"

or dead limbs sometimes fly where least expected, and fall so close with sickening thud as to make one shiver.

This country is the home of the moose, of which there are a great many. Their paths were plentiful and sometimes well worn with great foot prints. One of the axemen said that " The woods were crawling with them !" It is difficult to understand how these immense beasts, with immense branching horns, get so fast through the dense bush ; of course they have their runways, but when taken unawares they break off anywhere. They are protected by a prohibitary law till October, 1895. But of course a person may kill one in self-defense ; it is said that the meat is very fine, particularly as a change from salt pork. As the party had started out with a certain quantity of provisions, calculated to last a certain time, and it was necessary to connect the two surveys at all hazards, as the provisions got lower, the axes seemed to ring quicker, till all the party got worked up to a state of enthusiasm to push ahead, and latterly the cry of " Line ahead." by the axemen to the transitman were frequent, and occasionally if there was any delay in the transit, the cry was heard ringing down the line, " Come ahead with your lorry " till finally the wonder ceased at the moose running in the woods so. The party all seemed as active as moose. Some one was heard to say that the spirits of murdered moose had entered into the party. Anyway the surveys were connected and a good line located. The first thirty and odd miles ready for construction, the rest of the distance has yet to be run over again. As soon as the line reached the Lake country, birch bark canoes were used to travel in and move camp with. They were light and portable, as it was necessary to carry them across from one lake to another when the rivers did not connect. It might be noted here that similarly as the axemen said of the woods with moose, he also said of the lakes with fish, " They were fairly crawling wid them "—black bass, pike, trout and white fish.

Regarding the timber, which is so plentiful through this country, it has been estimated that there is enough pine alone to supply traffic for the railway when built for seventy years. Experts were sent out specially who after careful and exhaustive explorations made their

reports and estimates. Then there are lots of fine cedar, black spruce, black birch, tamarac, etc., the whole country is densely covered with all sorts of timber, and what is not required for lumber is suitable for making pulp. The quantity of pulp wood is illimitable and there are so many convenient water falls that mills for the manufacture of pulp can be put up as required. And when it is noted that the new processes for manufacturing the pulp when produced are so much improved now, that a texture equal to the finest silk can be produced, it is evident that this district may yet become a richer producing country than the cotton fields of the South. For it is certain that many kinds of cloth and paper will be superceded by this material, and when clothing can be manufactured better and cheaper of pulp, why should not Ontario yet become the great *Manchester* of the world?

Again the question might well be asked: Why do the enterprising Americans value so highly their bit of northern country called Alaska, while Canadians are apparently satisfied to sleep peacefully with a larger, more valuable expanse of territory, lying north of James' Bay, through Hudson Bay to Baffin Bay, with its whale, porpoise, seal, feathered game and minerals, and all that fur-producing country that has made the English shareholders of the Hudson Bay Company so wealthy? Why is this? Echo answers why?

It surely must be because they are asleep, and yet people prate about hard times, the dulness of trade, with all these avenues of trade lying dormant at their back door, and no other country to interfere with it.

Many rich Toronto men, lacking enterprise, would rather sit down on a few corner lots in the city and wait till they rise in value. Aldermen would rather squabble over putting on or taking off half a mill taxation, than stir outside and bring in trade.

If the construction of this railway could be commenced at once, immediate employment would be given to thousands of men. While the development of the various avenues of trade that would result therefrom would give continued employment to all classes of skilled and unskilled labor for generations. This is the only practical solution of the difficulties of the labor question that present themselves to us now in all our cities.

The Ottawa and Ontario Governments might well turn themselves loose on these matters, and metaphorically kill the "*Giant Hard Times*" in Canada.

DISCUSSION.

Mr. Tyrrell—I am extremely pleased to hear this paper. Perhaps I take more interest than some others in that part of the country, having been up there several times, and I often wondered what was the principal object in building this railway to James' Bay, but I have been enlightened by this paper. It appears it is not so much to reach a seaport at Moose Factory as to develop the resources themselves. From what I know of the shores of the bay they are not suitable, in that part at least, for seaports, vessels not being able to get

within ten miles of the shore. It is very unfortunate, but it is a fact nevertheless. But, as the paper states, the resources of the bay are large, and I have no doubt the wealth of the country would be very great if developed. As I have said in some papers and letters published in newspapers and other places, we have been allowing the Americans to scoop out for years the wealth of Hudson's Bay in the form of whales. They have been, and are still, catching whales in the northern portion of the bay every year, and we do not seem to be making any effort at all in that direction. As far as I know, no Canadian vessel has ever thought it worth while going into the bay.

Mr. Niven—I may say that I know something of that country. In 1885 I connected the southern portion of the system of survey there with the Temiscamingue country by running a meridian line 30 miles north to the township of Lorrain which was surveyed. We always heard that there was a fine tract of land at Temiscamingue, and I expected to have reached it when we got to this township, but we surveyed a township there that was simply in the rocky tract like a great many others. However, in the following year the system of survey was produced farther north, and we certainly struck the promised land then. As far as the eye could reach, from a hill a a short distance north of Temiscamingue, the country was just spread out before you, and it certainly was one of the finest sights I ever saw. I was describing this hill and the locality to a gentleman in Toronto after I came back and he at once thought it would be a capital place to erect a summer resort, but I hardly thought that it would do for that. Twenty-six townships have been outlined there and twenty of them, I think, have been subdivided. There are townships there that you can scarcely find a stone in, and perfectly level. I have surveyed a township there and the only hill on it was at the extreme north-east corner, a little elevation of about 40 feet. So far as the James' Bay Railway is concerned, I think it is very much in the interest of Toronto that it should be built. The Ottawa lumbermen at that time were very anxious to have it there, and Mr. Gillis, whom I met there, told me that he would put his mills on the Canadian side and cut his lumber there, and he expected to cut, I think, twenty million feet for a great many years. However, the C. P. R., I think, has some designs on that country on the east side of the river, and it may be that Toronto will be too late if they do not act quickly. So far as the road is concerned, I have no doubt that a practicable route can be found, and by adopting the chain of waters that goes from the Tamagaming, (I don't know whether the line has been located there, but I have always thought that they would adopt that), navigation from the Tamagaming Lake would bring all sorts of products down. I do not speak of the farther end of the railway; I never was beyond the Temiscamingue country, but I know whereof I speak regarding that when I say that there is not a tract of land in Ontario to-day open for settlement that is the equal of the Temiscamingue country.

Mr. Butler—I was up there on the first exploration for this line towards Hudson's Bay. We stopped at Tamagaming and I can

re-echo what Mr. Paterson has so well said as to the resources of timber and minerals between the Montreal River and North Bay.

The President—I certainly think with Mr. Niven that if the City of Toronto expects to keep ahead in a commercial way, she can only do so by continuing in the line that has brought her prosperity in the past. There is no question about it that the City of Toronto owes her present commercial prominence in this province to the fact of her pushing out railways years ago, the Nipissing and others, and I think if she wishes to retain that position she will have to do it in some such line as we have been speaking of.

Mr. Paterson—In writing the paper I had some little hesitation, because I felt that possibly the subject was not technical enough for the society, and in beginning to write with the intention of only writing a short paper I hardly knew where to stop, the subject was so extensive; and my mind was so full of what I had seen there in the way of scenery and other things, that I felt possibly it would be difficult for you to entertain some of the ideas regarding the subject that I do myself. Regarding the possibility of having an outlet from Moose Factory to England, I think that idea is more connected with the scheme which the Winnipeg people had, their idea was to have an opening from Winnipeg through to England. This scheme would not entertain that idea just now. We want to build up Toronto and Ontario, and we have already an outlet to England. As to the shallows of the James' Bay, of course the bay is shallow and very large vessels taking deep water may not be able to get there, but we have ships that go from there to England belonging to the Hudson's Bay Company, and the idea is that larger seaports for larger vessels could be established from some other points and lighters used to go down to the terminus of the railway. These are matters of detail, but I should be very much pleased if at another meeting I could give an extension of this subject with perhaps a few more practical results.

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DESCRIPTIONS OF CITY PROPERTIES.

By T. B. SPEIGHT,
O.L.S., Toronto.

Two papers on Descriptions have already been read before this Association since its formation, and the subject has been so ably presented to you by the authors, Messrs. Klotz and Gaviller, that it may seem to some of our members an unnecessary task to re-open the topic.

It is, nevertheless, a fact that defective descriptions of recent dates are frequently to be met with, and the writer is of opinion that an interchange of ideas during discussion may be of benefit to all; and the purpose of this paper is to promote such discussion.

The object of a description would seem to be twofold, firstly: that the parcel in question may be located and its position defined on the ground by a surveyor, for the benefit of the owner in the enjoyment of his property; and secondly: that the position of the property so described and located may be easily determined with relation to surrounding properties by the person who is searching the title.

Surveyors in and about Toronto who have been called upon to describe properties held, or to be placed under the "Land Titles," have had a special incentive given them to devote more time and thought to what is necessary in a description to fulfil the above conditions from the fact that the Master of Titles insists upon these conditions being fulfilled. Having from the responsible nature of his position, made a special study of this subject, the Master of Titles has long been recognized as a high authority, and his necessary criticism of descriptions which have come before him has resulted in much improvement in this important branch of a surveyor's practice.

The subject of bearings deserves more attention than it has hitherto received. The use of bearings without any statement of the line with regard to which the courses are run is a great source of trouble. As a *matter of law* every bearing is astronomic unless it can be gathered from the description, or possibly from all the surrounding facts, that something else is intended. See Thibaudeau *vs.* Skead, 39 Upper Canada Reports, page 387. This being the case, it is obviously the duty of every surveyor drawing out a description with bearings to state whether astronomical courses are intended, or whether, as is usually the case, the bearings are calculated from some line or street which is taken at a generally recognized course. Every description which contains a bearing should therefore include a state-

ment that such a line is taken as the governing line, on such and such a course, or that the bearings are astronomical.

The same description applies to plans. It is obviously convenient in practice, and is a great saving of expense, that in most cases an astronomical bearing should not be taken, but that a street or some other known line should be accepted as the governing line on its recognized course, and the various bearings marked on the plan calculated from this street or line, but it certainly should not be left to be surmised from what the bearings are computed. The fact should be distinctly stated on the face of the plan.

The placing of courses in inverted commas, to show that they are taken from some former plan, survey or deed, is entirely illusive. It is not likely that once in twenty times are inverted commas in a description carried into the deed for which the description is prepared, and even in the exceptional cases these quotation marks are valueless, as they do not indicate the source from which the quoted bearings are taken. Indeed, all that they in fact indicate is that the person who drew the description does not pretend to say whether the course is correctly or incorrectly given, but that it is taken from some unstated source, that he does not guarantee. It is only necessary to put this in words to see how absurd such marks really are when inserted in a surveyor's description.

Where descriptions are prepared for the office of Land Titles for subdivisions, it is obviously necessary that the surveyor should be furnished with a copy of the description of the whole parcel as registered in that office, as the description of the subdivision must be drawn with reference to that in the register which governs the title.

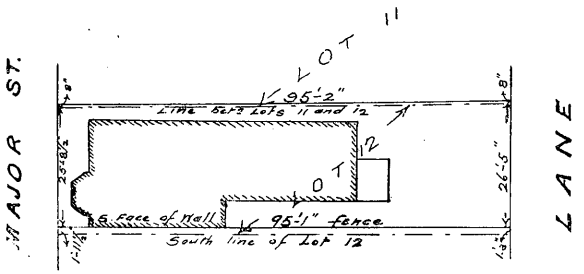
It is of course granted that astronomical bearings are much to be preferred to any other, but, unfortunately, this fact is not recognized by the public, and therefore a surveyor who may be so desirous of obtaining perfection in his plan and descriptions as to take an astronomical observation may with certainty calculate on that observation being taken at his own expense. The only hope we have of astronomical bearings being introduced into practice for this kind of work is in the possible event of an *Act* to make astronomical bearings on registered plans compulsory; then the public would not question the expense, and the sooner that the public know that surveying is something more than merely measuring a block of land with a chain or steel tape the better both for the public and the profession.

As the methods employed in making surveys in cities and towns differ materially from those required in running lines in rural districts, so also the description of a parcel of land occupied by a building and surrounded by other buildings has features unlike those contained in a description of vacant or farm land.

A surveyor in the constant practice of his profession is liable to fall into a fixed groove, and errors of phraseology in his descriptions may pass unnoticed by himself while patent to others. With the request that you will bear this fact in mind, I beg leave to submit the following examples of descriptions taken from our description books as exemplifying three cases frequently met with in a city practice:

EXAMPLE I.

"All and singular that certain parcel or tract of land and premises situate, lying and being in the City of Toronto, in the County of York and Province of Ontario, being composed of the southerly 8 inches of lot number 11 and of part of lot number 12, as shown on a plan filed in the western division of the Registry Office for the said City of Toronto as number "D 195"; and which said parcel is more particularly described as follows:



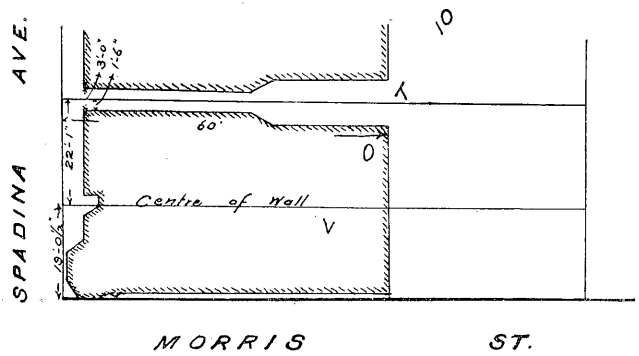
Commencing at a point in the easterly limit of Major street, distant 1 foot 11½ inches, measured northerly along the same from the southerly limit of the said lot 12, said point being in the westerly production of the southerly face of the southerly wall of the dwelling now known as No. 3 Major street; thence, easterly, in a straight line to and along the said face of wall and along the existing fence forming the southerly boundary of the rear premises of the said dwelling, No. 3 Major street, in all a distance of 95 feet 1 inch, to a point in the westerly limit of a lane shewn on said plan, and which point is distant 1 foot 3 inches northerly from the south easterly angle of said lot 12; thence, northerly, along said limit of lane 26 feet 5 inches, more or less, to a point 8 inches northerly of the north easterly angle of said lot 12; thence, westerly, parallel to the line between said lots 11 and 12 and distant 8 inches northerly therefrom, 95 feet 2 inches to the easterly limit of Major street aforesaid; thence, southerly, along the last mentioned limit, 25 feet 8½ inches, more or less, to the place of beginning."

It will be observed that no bearings are given. The reason for their omission is that they are not necessary to the proper identification of the parcel, and if calculated bearings had been given they would probably have differed from the patent bearing, N. 16° W. or N. 74° E., as shewn on the original plan, and thus have confused the future searcher.

EXAMPLE II.

"All and singular that certain parcel or tract of land and premises situate, lying and being in the City of Toronto, in the County of York, and Province of Ontario, being composed of parts of lots numbers 10 and 11, as shewn on a plan filed in the western division of the

Registry Office for the said City of Toronto, as number "D 254," and which said parcel is more particularly described as follows:



Commencing at a point in the easterly limit of Spadina avenue (formerly called Brock street), distant 19 feet and one-half inch, measured northerly along said limit from the southwesterly angle of said lot 10, the said point being opposite the centre line of partition wall between the two brick dwellings now standing on said lot 10 and the southerly portion of said lot 11; thence, north 73° 56′ east, to and along the said centre line of wall and along the easterly production thereof, in all a distance of 110 feet; thence northerly, parallel to the said limit of Spadina avenue 21 feet 7½ inches, to intersect the easterly production of a line drawn through the centre of the passage between the most northerly one of the hereinbefore mentioned dwellings and the next dwelling to the north thereof; thence, south 74° 10′ west, to and along the said centre line of passage and along the westerly production thereof, in all a distance of 110 feet, to the said easterly limit of Spadina avenue; thence, southerly, along the last mentioned limit, 22 feet 1 inch, more or less, to the place of beginning.

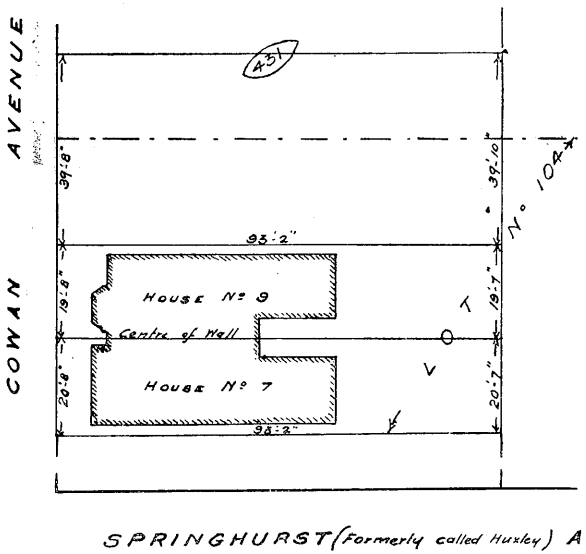
Together with a right of way at all times, in common with others entitled thereto, over a strip of land 1 foot 6 inches in width, immediately adjoining the northerly limit of the hereinbefore described parcel and extending easterly from Spadina avenue to a depth of 60 feet, and *reserving* a right of way at all times over and along the northerly 1 foot 6 inches of the westerly 60 feet of the said hereinbefore described parcel.

Note.—The bearings herein are calculated with reference to the line between lots 10 and 11, it being assumed N. 74° E."

Example III.

"All and singular that certain parcel or tract of land and premises situate, lying and being in the City of Toronto, in the County of York and Province of Ontario, being composed of part of the westerly portion of lot number 104, as shewn on a plan filed in the Registry Office

for the said county as number 431, but now in the western division of the Registry Office for the said City of Toronto, and which said parcel is more particularly described as follows :



Commencing at a point in the easterly limit of Cowan avenue, as widened by By-law, distant 20 feet 8 inches, measured northerly along the same from the southerly limit of said lot 104, said point being in the westerly production of the centre line of partition wall between the two semi-detached brick dwellings now standing on the southerly portion of the westerly part of said lot 104 ; thence, north 74° 3′ east, to and along said centre line and the easterly production of the same, in all a distance of 93 feet 2 inches ; thence northerly parallel to said limit of Cowan avenue, 19 feet 7 inches, more or less, to a point in the easterly production of a line drawn parallel to the northerly face of the most northerly wall of said dwellings and distant 1 foot and 6 inches northerly therefrom ; thence, south 74° 6′ west, along the line drawn as aforesaid, 93 feet 2 inches, to the easterly limit of Cowan avenue aforesaid ; thence southerly along the last mentioned limit 19 feet 7 inches, more or less, to the place of beginning.

Note.—The bearings herein are calculated with reference to the north limit of said lot 104, it being assumed N. 74° E."

The party wall is an important feature in each of Examples II. and III. and is probably one of the most delicate boundaries met with in a city practice. It may, therefore, not be out of place to devote some space to this subject, giving some Court decisions in regard to it, although not coming entirely within the title of this paper.

Watson vs. Gray, 14 Ch. D. 192 (1880).

The following clause appeared in the conveyance :—

" It is hereby agreed and declared by and between the said parties hereto that the north and south gables and walls of the said messuage or dwelling house and hereditaments hereby conveyed shall be and remain party walls, and that the eastern and western walls and the pallisades in front of the said messuage or dwelling house shall belong exclusively to the said Jane Lyons, her heirs and assigns."

Mr. Justice Fry, after stating this proviso, said : " What is the meaning of the term ' party wall ' as there used ? The words appear to me to express a meaning rather popular than legal, and they may I think be used in four different senses.

" I. They may mean, first, a wall of which the two adjoining owners are tenants in common, as in Wiltshire *vs.* Sidford and Cubitt *vs.* Porter. I think that the judgments in those cases shew that that is the most common and primary meaning of the term.

" II. In the next place the term may be used to signify a wall divided longitudinally into two strips, one belonging to each of the neighboring owners, as in Matts *vs.* Hawkins.

" III. Then thirdly the term may mean a wall which belongs entirely to one of the adjoining owners, but is subject to an easement or right in the other to have it maintained as a dividing wall between the two tenements.

" IV. Lastly the term may designate a wall divided longitudinally into two moieties, each moiety being subject to a cross easement in favor of the owner of the other moiety."

As it is not the business of a surveyor to say what constitutes a party wall, or what sort of a party wall it is, he may write after the words " party wall " in his sketch or plan, a reference to the instrument creating it. A surveyor should be careful before he writes the words " party wall " on a line in his sketch or plan to ascertain whether it is a party wall all the way up from the ground or only for a portion of the distance ; and if it is only a party wall for a certain distance, write " party wall for thirty feet from ground " (or as the case may be). This is suggested from the following passage : Lloyd's Law of Building and Buildings, at page 342—" Buildings upon a party wall : Either of the owners of a party wall has the right to increase its height, provided such increase can be made without detriment to the strength of the said wall, or to the property of the adjoining owner, but he makes such addition at his peril. The exercise of the privilege brings about the peculiar circumstance that a wall may be a party wall to a certain height and subject to the sole ownership of one of the adjacent proprietors above said height. In such a case the court will hold that so far as the wall between the buildings is concerned it is a party wall, while it may grant an injunction prohibiting the removal of the other portion." " We have known in this court," says James L. J. in Weston *vs.* Arnold, " cases in which property in London is intermixed in such a way that one man's basement and cellar extend under another man's shop ; and again the first floor of one house is over the shop of the next house. In such a case there would

be a party wall between the two buildings below, while above would be only a private partition between two rooms in the same house. There is nothing in fact or in law to make it impossible or improbable that a wall should be a party wall up to a certain height, and above that height be separate property of one of the owners. But the owner of one half of a party wall has no right to extend it to the line of the street, thereby occupying a portion of his neighbor's land not built upon."

Must be no window in party wall.

Sproule *vs.* Stratford, 1 O. R. 325 (1882).

The defendant raised the party wall beyond the building of the plaintiff (the adjoining owners). This he did with the plaintiff's consent. But when he opened a window through the raised part of the wall, the plaintiff applied for an injunction. Chancellor Boyd decided: "My conclusion is, that the making of the window in the wall was an unauthorized user of it by the defendant, and that the plaintiff has the right to enjoin him against its further continuance, and to a declaration that the extension in height of the wall in question, is a continuation of the party wall between the adjoining properties of the plaintiff and defendant."

Brooke *vs.* McLean, 5 O. R. 209 (1884).

Case of one owner building a high building and using a wall (on adjoining property) as a party wall, thereby weakening same. Damages given.

The suggestions thrown out here are by way of warning surveyors against making plans and sketches that might mislead. While surveyors are not responsible for their advice in the same way as solicitors, yet they have a certain status as advisers. Thus in Haberdashers Co. *vs.* Isaac, 3 Jur. N. S., 611 (1857), Wood V. C. said: "The Defendant says that Mr. C., the agent whom he employed in 1853-4, was not a sufficient protection to him. It is true he was not a solicitor, but he was a surveyor, and surveyors and builders have generally very good notions of the legal effect and consequences of the stipulations in leases, and are perfectly competent advisers."

DISCUSSION.

The President—There is one suggestion Mr. Speight has made which would be a capital thing if it be carried out—that is, that a Registrar should not be allowed to receive any deeds in which the descriptions are not by astronomical bearings; but it would be pretty hard to get such an Act passed through the Legislature.

Mr. Sankey—I am personally very much interested in descriptions of city property, as my principal practice has been in city work. Papers of this kind I think are papers we all ought to read and study. I know there is a good deal in it that is well worthy of our consideration.

Mr. Wilkie—Although I have not had any practice in descriptions of city property, I have had a little in small towns, and I might just mention one case that was brought to my notice a short time ago

by the Registrar of the town in which we are practising. It was a mill property that changed hands quite recently, and the Registrar pointed it out to me as a curiosity. One bearing ran to a cedar stump blazed on two sides—remember this description was re-written within the last six months—and this cedar stump has been gone probably thirty years. Another description referred to a barn which has also been gone, I think, about twenty years, and it was written by a lawyer. But I think that description came from the Courts and was of course just copied as being from that source.

Mr. Gibson—Taking everything into consideration, if you want a really good description of city property where there is a party wall, it requires a good deal of skill.

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

THE REGULATION MILE TRACK OF THE WINDSOR DRIVING PARK ASSOCIATION.

By OWEN McKAY,
O.L.S., C.E., Windsor.

THE ground enclosed by the Windsor Driving Park Association, covering an area of $57\frac{1}{2}$ acres, which contains the new race course, the necessary buildings, exercise grounds, etc., is situated just south of the Windsor city limits, and is bounded on the south side by the Canadian Pacific Railway lands, and on the remaining three sides by streets leading to the city, as shown in the annexed plan.

Towards the close of the year 1891, Mr. Joseph De Gurse, O.L. Surveyor and Civil Engineer, Windsor, was requested by the Windsor Driving Park Association to prepare plans, profiles, etc., for a new race track, which they had decided on building. Before proceeding to comply with their request, Mr. De Gurse visited several of the racecourses throughout the country, and also corresponded with many of the leading trackmen with the view of obtaining the fullest information on the subject.

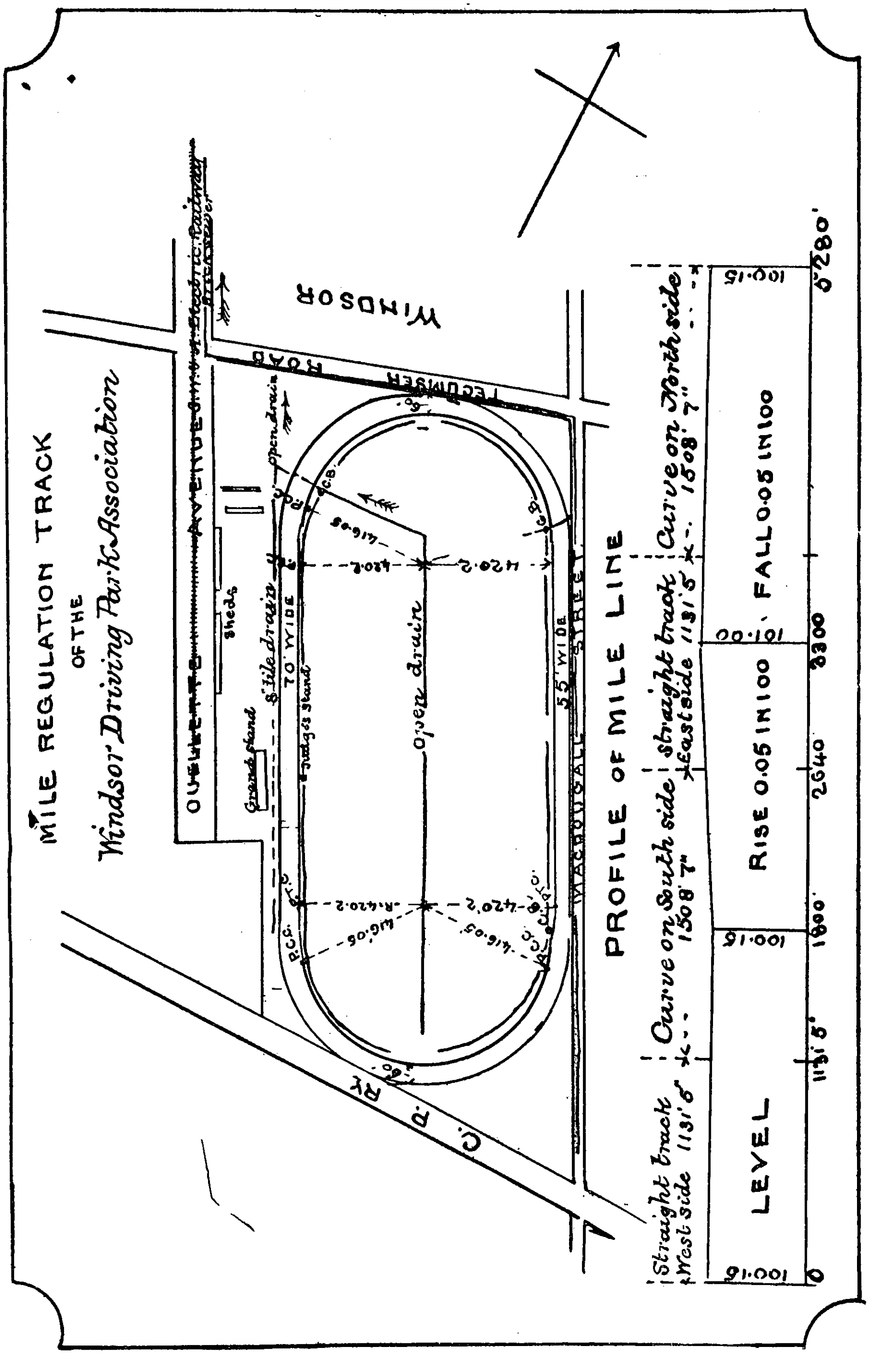
The result of his investigations and enquiries led him to recommend a regulation mile track, with easement or transition curves at the beginning and end of each of the turns, and with grades, widths of track, etc., as set forth in this paper, as the best form of track to build, which recommendations were adopted by the Association.

A regulation mile track when measured on a line three feet from the inside of the track, called the mile line, consists of two parallel tangents, each 1320 feet or $\frac{1}{4}$ of a mile in length, and two semicircular arcs, each of which is also 1320 feet in length, or in other words, one half-mile in length is on tangents and one half-mile on curves.

The radius of a semicircular arc of 1320 feet is $\frac{1320}{3.1416} = 420'.17$ nearly, and the width of track between the two parallel tangents on the mile line is equal to the diameter of the semicircle $= 420\ 17 \times 2 = 834.34$.

The rule that a race track shall be measured for its true length on a line three feet from the inside fence of the course has been adopted by both the National and American Trotting Associations.

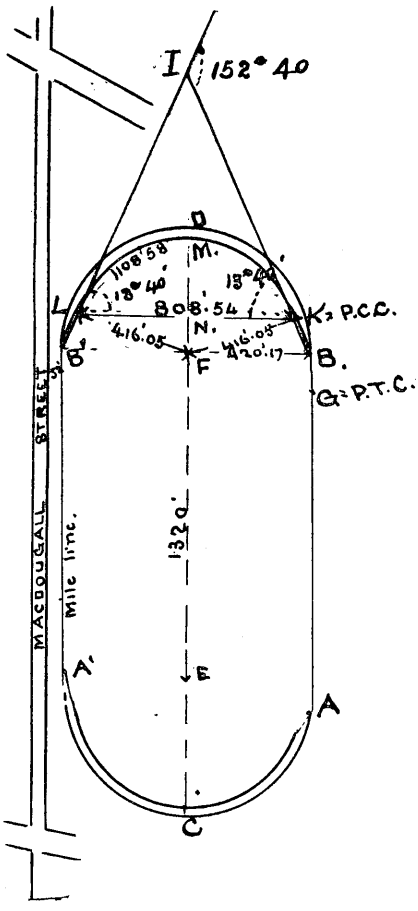
In staking out the track on the ground the mile line was first located, stakes being planted 100 feet apart on the tangents and 25 feet apart on curves, and the inside and outside lines of the course


MILE REGULATION TRACK
OF THE
Windsor Driving Park Association
WINDSOR
TECUMSEH ROAD
OUELLETTE AVENUE
Sheds
Grand stand
Judges stand
8" tile drain
70' WIDE
55' WIDE
open drain
420.2
416.05
C. P. RY
PROFILE OF MILE LINE
Straight track West side 1131'6"
Curve on South side 1508' 7"
Straight track East side 1131'5"
Curve on North side 1508' 7"
LEVEL
RISE 0.05 IN 100
FALL 0.05 IN 100
100.16
101.00
100.15
0
1131'6"
1800
2640
3300
5280'

were next located by making the necessary right-angled measurements from the stakes planted on the mile line, the widths of the track being 70 feet on the home stretch, 55 feet on the back stretch, and 60 feet at the middle of each of the turns.

As the radius of each of the turns is 420.17 feet, and the width of the back stretch is 52 feet from the outside of track to the mile line, if a line C, D (shewn on figure 1, below), be run parallel with Macdougall Street, and distant 472.17 from its westerly limit, it will pass through the centres of each of the semi-circular arcs, and be equally distant from the parallel tangents. The centres E and F of the arcs were found by trial measurements, so as to place the track suitably with reference to the northerly and southerly boundaries of the field.

Next, the points A A', B B', where the tangents join the arcs, and which would be the P.C. and E.C. of the two curves respectively if there were no easement curves, were located by measuring the length of the radius = 420.17 from the points F and E at right angles to the centre line C, D.



A, B and A', B' are the tangents of the mile line = in length to E, F = 1320 feet, and A, D, A and B, C, B are the arcs of the semi-circles respectively = 1320.

Now, if the track had been laid out without easement curves, after staking out the tangent lines A, B and A', B' we would have located the curves by the method of deflection angles, as follows :

The deflection angle for a chord of 100 feet (see fig. 2) sin ;

$$\tfrac{1}{2}\,D = \frac{50}{420.17} = .1189.$$

$\tfrac{1}{2}$ D = 6°50' = deflection angle for a chord of 100'.

D = 13°40' = central angle for a chord of 100' feet.

As the number of minutes in 180° = 10800, and in 13°40 = 820', the length of the curve measuring on 100' chords

$$= \frac{10800 \times 100}{820} = 1317.03'.$$

The length of the curve measuring on arc = 1320.00'.

If chords of 25ft. in length be used with the proper deflection

angle the measurement of the curve on 25′ chords = 1319.9 + or very nearly equal to 1320′, and since the rule in the measurement of race tracks is to reckon the measurement on the arc, we used chords of 25 feet in length in the preliminary location of the mile line, and 16 feet in length on the final location.

Owing, however, to the introduction of transition or easement curves at the beginning and end of each of the turns, the tangents are each shorter than 1320 feet and the curves correspondingly longer.

When a curve of a short radius joins a tangent it is customary in railroad work to introduce a curve of a larger radius between the tangent and the central curve, so as to make the change from the tangent to the curve less abrupt. Such a curve is called a transition or easement curve.

There are many methods given in the text books and in engineering magazines for setting out such curves, but we followed the method adopted by Mr. E. T. Muenscher, Manistee, Michigan, as explained in a paper read by him before the Michigan Engineering Society in 1891, and in a second paper in 1892, and published in their manual for those years, as they appeared to us to be best adapted for the purpose, and the most simple to use.

He deduced his formula for the easements from the equation of the cubic parabola, assuming the length of the easement to be 200 feet, or 100 feet approximately on each side of the P.C. of the central curve.

As his method has been very fully explained in the above papers, which are within reach of any of the members of this Association who may happen to be interested in the matter, I shall not repeat his deductions, as it would make the paper too long, but shall only give the values of the deflection angle for each 25′ when D = 13°40, as previously explained. Let the origin or P.T.C. of the easement curve be at G (Fig. 1), then the deflection angle from the origin or the point G to the terminus at K (fig. 1) = $\frac{1}{3}$ D° = $\frac{1}{3}$ of 13°40 = 4°33′, and the deflection for any intermediate chord varies as the square of the distance from the origin nearly, thus, the deflection angle for 50

$$= \left(\frac{50}{200}\right)^2 \times \tfrac{1}{3}\ D^\circ = \tfrac{1}{48}\ D^\circ = 17.$$

The deflections therefore for each successive chords of 25′ beginning at the origin and ending at K will be 4′, 17′, 38′, 1°08′, 1°47′, 2°34′, 3°47 and 4°33 respectively. After planting the stakes at each 25′ up to the terminus of easement at K, the angle $\frac{2}{3}$D = 9°07′ is deflected from the direction of G K to get the tangent K I to the central or circular curve, the total deflection being 13°40 at K.

In railway curves up to 8° or 10°, and when the total deflection seldom exceeds 90°00, it would be sufficiently correct to measure back 100 feet from the P.C. of the curve along the tangent to obtain the P.T.C. or origin of the easement curve, but in race tracks the error involved in doing so would be considerable, and should not be neglected.

The distance of P.T.C. from P.C. of the curve can be simply found as follows:

Referring again to (fig. 1),

The $< I K L = 90° - 13°40 = 76°20$ = also to $< I L K$.

The $< K I L = 27°20$.

The offset from the tangent at K = 200 × sin 4°33 = 15′.9 approx.

K L = 840.34 − 2 × 15.9 = 808.54.

R′ = the new radius of the central curve with easements = $\frac{K.N.}{\sin 76°20} = 416.05$, the central angle L E K − 152°40.

Length of the central curve = $\frac{2\ \Pi R' \times 152°40}{360} = 1108.58$.

Add 200 for each side for easements = 1108.58 + 400 = 1508.58, 2640 − 1508.58 = 1131.42 = length of each tangent with easements.

The length of the tangent without easements = 1320.

$\frac{1320 - 1131.42}{2} = 94.29$ = G B = distance of the origin P.T.C. of the easement curve from the P.C. of the circular curve if there were no easements.

If we measure back 94′29 along the tangent from the point B to the point G or P.T.C., then set up the transit at G, and plant the stakes 25′ apart up to the terminus at K, using the deflection angle 4′, 17′, etc., up to 4° 33° as explained above, and, having set the last stake at K, the transit is set up over the point K, and the angle $\frac{2}{3}$ D° = 9°07 is deflected from the direction of G K to obtain the direction of the tangent K I.

The deflection for each 25 feet on the central curve from K = $\sin \frac{1}{2}d = \frac{12.5}{416.05}$. ∴ $\frac{1}{2}d = 1°43'$, 17′ nearly.

We then deflect 1° 43′, 17′ in succession from the direction of the tangent K I for each 25′, omitting seconds and reading to the nearest minute.

We ran in one-half the curve from each end, so as to minimise errors of readings or measurements.

Having in this manner located the curve at the south end, the curve at the other end being similar, was located in the same way.

After the grading was completed we again located the mile line, having previously referenced the principal points, this time planting the stakes 16′ apart, and calculating the necessary deflection angles for 16′ similarly to the above.

GRADES.

As the natural surface of the ground is almost level, the longitudinal grades are very light, as shown on the annexed profile. Commencing at the northwest turn, and going southwards, the track on the inside is level for about $\frac{1}{3}$ of a mile, it then rises .05 per 100, or about 10 inches for $\frac{1}{3}$ mile, and falls 10 inches for the remaining distance.

The transverse grades are $\frac{1}{10}$ of a foot per 10 feet on the stretches, and 1 inch per foot on the turns.

Around the easement curves, the grade of the outside of the track rises uniformly from the end of the straight course to the point where it joins the circular curve.

Thus, on the home stretch, the outside of the track = $\frac{7}{120}$ or $8\frac{1}{2}$ inches higher than the inside, and at the middle of the turns when the track is 60′ wide, the outside is 5′ higher than the inside.

GRADING.

The number of cubic yards of embankment on the stretches and turns was about 23,700, the material for embankments being obtained from the land adjacent to the inside of the track.

The surface soil, which consisted principally of clay loam, was first removed back, and afterwards used as a top dressing; the subsoil, which was of a stiff clay formation, was then used for embankment on the turns, and on the stretches where required.

The embankment on the outside of the turns was put on in layers of from 6 to 9 inches, each layer being thoroughly harrowed and rolled until unyielding and compact before the next layer was put on.

When the grading was made to within 6 inches of grade, the top dressing of surface soil was spread over the track, and thoroughly harrowed and rolled until the entire track was completed to the intended grade.

DRAINS.

Owing to the location of the ground, the drainage of the track and grounds was comparatively inexpensive, the outlet for the drains being the main sewer on Ouellette Avenue, the terminus of which is on the north side of Tecumseh Road.

The open ditches on the north side of Tecumseh Road and on the west side of Macdougall Street were enlarged and deepened to the required capacity, and an open ditch was constructed southwards along the west side of the track for about 600 feet, the remainder of the distance, down to a point near the C.P.R. lands being drained by an 8-inch tile drain. The interior of the track was drained as follows: An open drain was made through the middle of the enclosed land, and emptied into a catch basin near the northwest turn, which was connected with the open drain on the outside of the track by 10-inch sewer pipes, also an open drain was made all around the interior of the track about three feet from the inside fence, part of which had its outlet into the catch water basin already mentioned, and the remainder into two catch water basins on the east side which were connected with Macdougall Street ditch by 10-inch sewer pipe passing under the track.

FENCES.

Fences were built around the outside and inside of the course, and in addition a fence ten feet in height was built to enclose the necessary grounds, as shewn on the annexed plan and profile.

BUILDINGS.

The grand stand, which is 200 ft. × 36 ft., is placed so that its south-east corner is 30 feet from the outside of the track, and its north-east corner 40 feet. The wire, which is opposite the centre of the grand stand, is 405 feet from the commencement of the south-west turn.

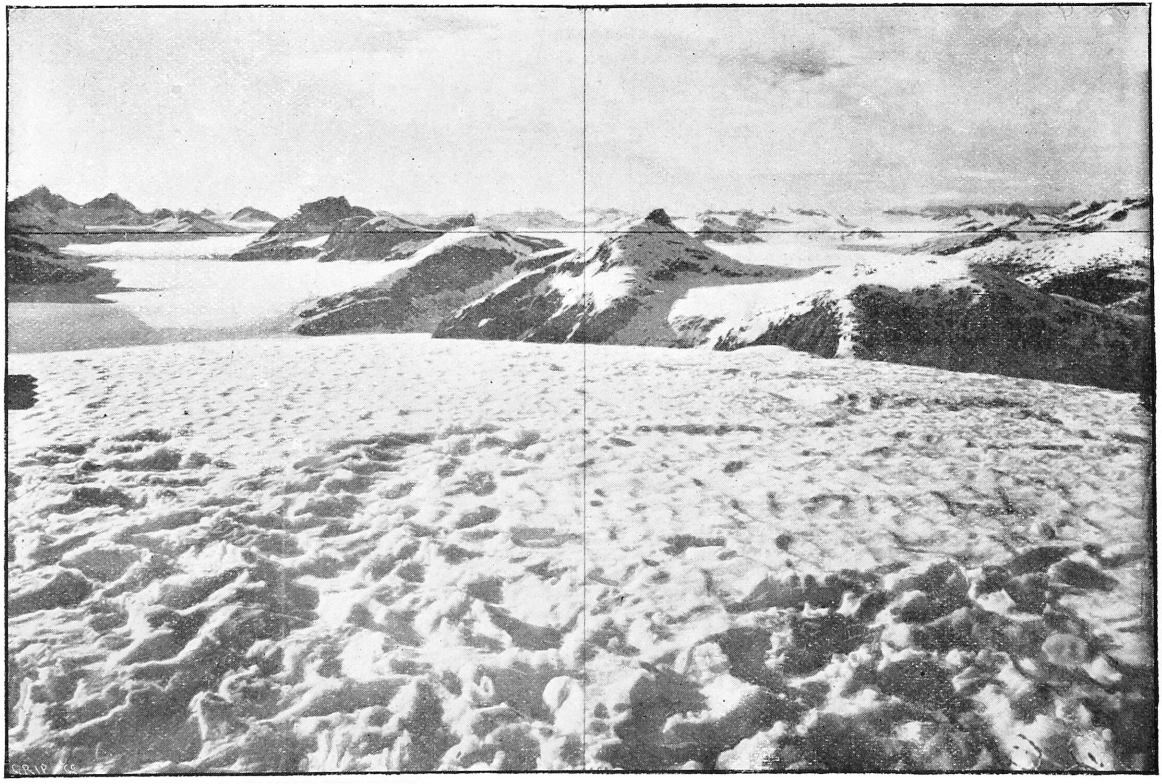
The stables, which are not yet all completed, will accommodate about 150 horses.

The judge's stand is placed about 10 feet from the inside of the track.

The cost of the improvements is as follows:

57½ acres of land @ $300.00	$17,250 00
Grading, Ditching	6,370 00
Grand Stand	7,500 00
Fencing	2,800 00
Stabling and other buildings	5,000 00
Total	$38,920 00

The improvements and additions to buildings will bring up the cost to about $40,000.



View taken at an elevation of 4,200 feet on the west side at the head of Taku Inlet, Alaska, and looking westerly, showing Windom Glacier to the left and Foster to the right. Both glaciers reach the sea. The mountains on the sea shore show glaciation 4,000 feet high.

The photograph is by W. OGILVIE as the writer's are too large for insertion.

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

PHOTO-TOPOGRAPHY.

By OTTO J. KLOTZ,

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

The subject that I have chosen covers too much ground for a paper before an association; however, as it is comparatively new, the rudiments may not be uninteresting to some of the members.

The application of photography to surveying has passed the experimental stage and has obtained a firm footing. To Canada belongs the honor of having made the most extended photo-topographic survey of any country in the world, and its development is due to Mr. E. Deville, Surveyor-General, Department of the Interior, Ottawa, who has also written an exhaustive treatise on the subject, but, unfortunately, it is not in the market. About 2,000 square miles of our Rocky Mountains have been mapped by this method by Mr. J. J. McArthur.

The camera used is especially designed for the purpose. It consists of a strongly-made, brass-bound box, and, as the views are always distant, there is no adjustment for focus. The lens is of superior quality, and gives a flat image, is free from distortion, and includes an angle of about 60 degrees. Its focal length is about $5\frac{1}{2}$ inches.

The glass plates are $4\frac{3}{4}''$ by $6\frac{1}{2}''$, and are isochromatic. In the camera and close to the plate are fixed four small brass combs, one in the middle on each side; as images of these are photographed onto the plate, they serve the purpose of providing traces of planes of reference—the horizon and principal lines—for orienting the views. Six shields, carrying a dozen plates, accompany the camera. The difficulty of photographing distant views arises in a great measure from the haze. This difficulty is to a certain extent overcome by inserting an orange glass screen behind the objective. Views 35 miles distant have been obtained with sufficient clearness to use for checking. At such a distance of course no detail can be obtained.

In order to obtain sharpness of detail a small stop or diaphragm is used, whereby the time of exposure is increased. It is placed between the two lenses of the objective.

The camera is provided with a level on top, for it is essential to have it well levelled; furthermore, to it can be attached a foot, fitting onto the tripod of the transit, which, it is scarcely necessary to say, is indispensable in photo-topographic work.

The transit used should be light and compact, and be provided with three-inch horizontal and vertical circles.

This comprises the necessary instrumental outfit; an aneroid is however generally carried also. The country especially adapted for photo-topographic surveying is a mountainous one, and the more mountainous and rugged it is, the more are the merits of the camera over other methods for such regions shown. For this reason was the photo-topographic method chosen by the Canadian Commission for the work to be done in connection with the Alaskan Boundary.

The principles underlying the method are simple, and may briefly be stated.

For the present the focal length, the horizon line (the intersection of the horizontal plane with the picture plane), and the principal line (the intersection of the vertical plane, containing the optical axis, with the picture plane to which it is perpendicular) which are the constants of the camera, are supposed to be known; the method of their determination will be shown hereafter.

Let the accompaning diagram represent a view, and on which are drawn the horizon line H H', and the principal line P P', O is the principle point. The principle point gives the "pointing" of the camera. Produce P P' to F making O F = the focal length.

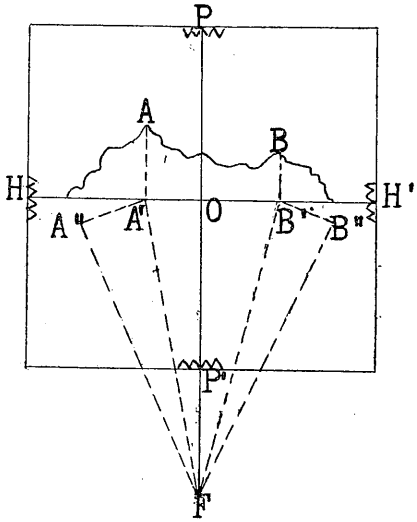


Figure 1

From the principles of optics and similar triangles we know that the horizontal distance of the image of the object from the principal point is proportional to the distance of the object from the optical axis in the ratio of the focal length to the projection of the distance of the object on to the optical axis; and similarly the vertical distance of the image above or below the hoizon line is proportional to the vertical height of the object in the same ratio.

Hence in the diagram if A and B are two mountain peaks and we

draw A A′ and B B′ perpendicular to H H′, and A′ A″ equal to A A′ and perpendicular to F A′; similiarly with B′ B″; F A′, F B′ will be the pointing of A and B and the angles A′ F O and B′ F O the azimuths from the line of sight, hence too A′ F B′ represents the horizontal angle between A and B as seen from the station, and corresponds to the angle, if read with the transit. Similarly the angle A″ F A′ and B″ F B′ are the vertical angles of the points A and B as seen from the station.

This is in short the essential principle of photo-topographic work, and by which the position of any point on a photograph is resolved into its horizontal and vertical components.

What concerns us next is, how to get linear measurements from the photograph. We will first determine the focal length of the objective. Set up the transit, and take horizontal angle reading on four or more points comprised within the angle of the camera, say on A, B, C, D, E (here in Toronto the University would be a very suitable object for the purpose), then photograph from the same station the points. The prints made from the $4\frac{3}{4}'' \times 6\frac{1}{2}''$ plates are enlarged to double that size. On a sheet of drawing paper describe an arc of say 70° with any radius, preferably a little greater than the focal length or rather, double the focal length, as the print is enlarged in that proportion. By means of chords lay off on the arc the successive horizontal angles and join the ends of the chords with the centre of the arc, as shown in the diagram (2), F A, F B, F C, F D, F E. Now lay a strip of paper on to the print and mark thereon consecutively the horizontal distances between the points. Next transfer the strip to the drawing paper and fit so over the radial lines that the points fall on their respective radii. After having found the desired position draw a line A′, B′, C′, D′, E′ for that position. A′ E′ is the trace of the picture plane on the horizon plane. Then the line F O drawn at right angles to A′ E′ is the required focal length. The graphical determination as above indicated, is simpler than the trigonometrical one. To find the horizon line we observe some verticle angles (say on the University) from the same station. These angles may be read at the same time that

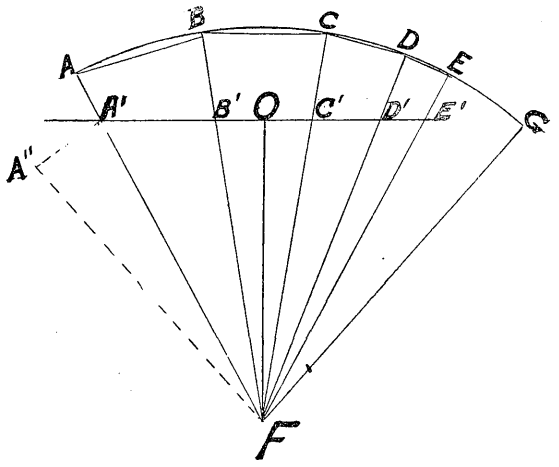


Fig. 2.

the horizontal angles are taken. Lay off at F (Fig 2) the angle A′ F A″ equal to the elevation (or depression) of A and at A erect the perpendicular A′ A″ to A′ F, then A′ A″ represents the linear measure of A above the horizon line. Similarly with the other points B, C, D. Hence if we lay off vertically on the print these measures from their respective points, the line passing through their extremities is the horizon line, H H′ (Fig. 1). Evidently two angles of elevation or depression are sufficient for establishing the horizon line, but it is well to take one or two more for checking.

The principal line is established by drawing from F (fig. 1) a line at right angles to H H′. The position of the distance point O, may be computed too trigometrically from the known focal length, the observed horizontal angle between two points and their linear horizontal distance apart on the print, and then, a line drawn through it perpendicular to H H′ for the principal line.

The horizon and principal lines once well established, we note their position on the comb-marks for future reference.

The skeleton or triangulation upon which the photo-topographic work is based is made with the transit. On a mountain summit horizontal and vertical angles are read onto prominent peaks, so as to have at least one horizontal angle for every view taken, of which there are generally seven at each station, so as to cover the whole horizon and allow a small lap of one view on to the adjoining one. It is well to take occasional solar or stellar azimuths during the season. The horizon and principal lines are supposedly constant, but each photograph has generally sufficient data to check, if necessary, their position.

From each triangulation station as plotted we lay off on the map the focal length in the direction of the pointing of each view and at the extremity draw a line at right angles to it, then on this latter line from the principal point lay off the horizontal distances of any point on the print (which we wish to locate) from the principal point; we thereby get the direction of the point from the station. Now selecting the same point on another photograph and from a different station, we proceed likewise. Evidently the position of the point lies at the intersection of the two lines giving its direction from the two stations. Thus as many points as can be identified on two photographs from different stations can be located. It is seen therefore that the location of points on the map is simply a graphical solution of triangles.

The focal length of a camera is expressed by a certain number of inches and bears a direct relation to the linear measures on the print, it follows that for the given scale of the map the vertical measure of a point above or below the horizon line (station from which the photograph is taken) on the print can be directly expressed in feet.

Having located as many points as possible for a certain area and having assigned to each its absolute height the drawing of the contour lines begins.

It may be stated that besides the stations on the summits, others called camera stations are taken in valleys or on mountain slopes for detail. The position of these latter stations is determined either by direct angular measurements or by photographs on known points from them.

On the Alaskan Boundary work the scale is 1 : 80,000 and the contour lines are drawn 250 feet vertical apart.

The work of a photo-topographer in a country like Alaska, midst jungles, precipices, rocks, snow and glaciers, is very arduous and dangerous. Fortunately no serious accident occurred. Ascents are made at the rate of about a thousand feet an hour. Every climber carries the indispensable alpenstock. Every party had a Mackinac boat for shifting camp and also a Peterboro' canoe. The tides were new to some of the men and by experience thay learned that camp pitched on dry land in the evening may be found in Venice by midnight. The parties consisted of six, all told. The most covered by any party was about a thousand square miles: however, if much detail is required 500 square miles represents a good season's work.

In south-eastern Alaska, where it rains five or six days every week, and where fogs are prevalent in an almost constantly saturated atmosphere, great care must be exercised in keeping the plates dry, for which purpose air and water tight tin boxes holding two dozen plates each are carried. There were about 700 photo-topographic views taken, covering an area of nearly five thousand square miles.

The accompanying view gives a faint idea of the rugged and arctic nature of the country as seen from a mountain peak.

At the sea level the temperature during the year is not subject to as great fluctuations as on the Atlantic sea-board, and besides the average is higher. The mean winter temperture of Sitka is nine degrees higher than that of Halifax, although the latter place is nearly 900 miles farther south. During the past summer I found the mean temperature to be about 54° F. One of the arms of the sea into which glaciers discharge was found to have a temperature of 36° F. Pretty cold for sea-bathing!

In closing I will just state that topographers are not born but made, and by years of training and experience.

It would astonish many of you to see an expert identify some points on one photograph with those on another print from a different station; not mountain summits, which are comparatively easy to recognize, but patches of snow, dark spots of rock and the like.

I believe you have a man here in Toronto who is just on the eve of finishing a practicable flying machine. I would respectfully request our secretary to send his address to the Alaska Boundary Commission, Ottawa, as soon as the machine is completed, for thereby sole-leather and ejaculations would be saved.

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CEDAR, MACADAM AND GRAVEL ROADWAYS.

By P. S. GIBSON,
O L.S., C.E., Willowdale.

Of the many important public questions of the day that of "Good Roads" is becoming of Provincial interest, as lately shown by the meeting in this building of representatives of most of the counties of the Province.

I need hardly state that drainage is the most important requisite of a good road, and yet there is no statutory provision by which a corporation may make suitable ditches at proper distances from the centre line of the roads, but on the contrary, if such ditches be made and a careless driver, or a good driver with a vicious horse, or a drunken driver with any kind of a horse, should meet with what is called an accident by driving into such ditch, the corporation soon learn that a plea by the corporation of contributory negligence on the part of such person is not a suitable defence, and travellers have a legal right to travel on any part of the public road, and that a ditch is in a legal sense an obstruction, I have thought that by an appeal by the corporation to the Ditch and Watercourses Act, or the Drainage Act, by which all persons owning lands adjoining public roads would be compelled to aid in the draining of the same, would be advisable, but such Acts would not, I am of the opinion, relieve the corporation from damages in the case of a so called accident; but they should, and all doubt should be removed by an amendment to those Acts to that effect, or to the general Municipal Act.

As good roads cannot be made without good drainage, and as there is no statutory provision for securing good drainage free from actions for damages by the travelling public, and again as under English practice or law, water cannot be taken from an extraneous source and discharged upon land where it would not naturally flow if the lay of the land was the same as in a state of nature, it is readily seen that we have a very difficult problem to solve in attempting to secure good drainage for public roads. I think the law and the cases decided on the same are clear that while water falling upon land from above may have its natural flow, assuming the lay of the land to be as in a state of nature, yet neither an individual or corporation can collect the water so falling or springing and discharge it in a body upon public or private lands, except in cases provided for under the Ditches and Watercourses Act or Drainage Act.

I am engaged now in a case where water has been for a long time flowing into and down a ravine from the public road, and the only artificial drainage from the public road to the ravine is a ditch dug by the owner at one time when pathmaster, about 33 feet in length, to let the water across a corner of his lane into the ravine. The present owner, son of said owner, now, under instructions of an eminent legal firm in Toronto, has filled up said artificial short drain and demands damages for past years' flooding and security against future damage, amounting to the modest sum of over two thousand dollars, in case the water continues to flow. Now as the discharge into and down said ravine is the really only practicable route for the water according to the usual practice of country road making, the corporation will require to invent some new method of road-making, should the plaintiff succeed in his claim, as this is not the only one, but there are many others of a similar kind now pending. So may it not be conceded that while the township and county councils are being continually urged to make good roads, and are anxious to do so,, they are practically precluded from doing so. Since a good road must be drained by open ditches, which should be, if possible, three feet in depth below the crown of roadway, and ditches of this depth must and do draw water from extraneous sources, and do discharge water on lands where it would not naturally flow, as we have actually artificial and not natural drainage, and ditches of such dimensions must to some extent be dangerous to careless, reckless and drunken drivers and at times to the most sober and careful.

If correct as to the legal difficulties in the way of securing good drainage, some simple and quick procedure should be obtained by statute to secure when required such drainage, even if in some cases individuals may in their opinion suffer for the general good. This should not, in the present age, be difficult to obtain, when in the supposed public interest quick transit is considered a necessity. Electric cars and with double tracks are permitted to pass along the crowded streets of our cities and towns at a speed frightful to witness, and often causing death to both man and beast, and telegraph, telephone, electric light, and trolley poles are crowding each other in our public roads, and even encroaching on the turnpiked portion, all as pretended in the public interest.

Assuming that we have the right to drainage, we have still grave difficulties to overcome. In a climate where the frost often penetrates to over four feet in depth and the subsoil cannot even with the best of drainage be kept free of water, either by absorption from below, or by penetration from above, on account of deep ruts often in the road covering or on account of the shallow metal covering; in the spring particularly when the frost is, as we say, coming out of the ground, the road bed beneath the macadam or gravel covering becomes like a bog, and, as I have often seen on Yonge street, the macadam crust on top breaking through, letting the wheels pass to the hubs into the roadway.

A roadway in such a state, which is not uncommon for our best macadam roads, soon under the pressure of heavy travel, shows the

mud gradually pressing upwards through the stones or gravel and the stone or gravel rapidly passing down into the mud, and thus leaving a roadway a mixture of mud and stone, or mud and gravel, as the case may be, and often, so far as the casual observer can see, in the end only a fair earth road It is evident, therefore, that a good road, the same as any other good structure, must have a good foundation, and that the foundation must, so far as practicable, be properly drained.

To secure this object various methods have been employed. The good old Roman method of filling in a trench to some feet in depth in some cases with boulders for a foundation, or the Telford system, where a pavement of stone set on end and fixed permanently by wedging with smaller stone, or by laying a bed of large flat stone carefully fitted together, and solidly rammed and spaces between filled in with smaller stone, or the good old frontier method of letting down the corduroy roads of cedar or other logs into the swamp soil below, and then ditching the sides and covering the logs with clay to a suitable depth before putting on the macadam gravel.

In my practice in constructing roads under the Local Improvement system, where the petitioners were applying or about to do so for the cedar block pavement, I have recommended them to adopt a kind of roadway which may be called a cedar, macadam and gravel roadway, which may be considered the subject of this paper.

In constructing this roadway I first make a profile and sections of of the road, and having fixed the grade lines both longitudinally and transversely, I receive tenders, if there is much excavation, at a rate per cubic yard for excavation, and at a rate per lineal rod for the cedar, macadam and gravel, all laid complete in the roadway. I find the cost about the same as for cedar block roadway.

The specifications for the cedar, macadam and gravel provides that for cedar, that it shall be of round cedar posts, at least 6 inches diameter at the smaller end inside the bark, that they shall be laid at right angles to the centre line of the road in straight or curved lines as the case may be, that they shall fit tight together and be bedded solidly in the earth bed of road and earth rammed tight under and between them, and to a height of about one inch over the tops of logs and consolidated so a buggy or wagon may be driven rapidly over them with ease and comfort, the tops of the logs to have a uniform surface, and so laid that no movement among the logs will take place when driven over before the macadam is put on. In some cases the cedar logs are laid only to the width of one post 9 feet long, which is quite wide enough for an ordinary roadway. In other cases I have two courses of posts 8 feet in length each, thus giving a sixteen foot roadway, the posts butting at the centre of road. The advantage of using round posts is that they bed better and are less liable to move, but provision is made, in case round posts cannot be got, the contractor may use split posts, which as well as the round posts must be straight, but in case split posts are used, they must be at least 7 inches in diameter at any place at the smaller end, and when laid must be lapped by alternately putting flat side down and then the round,

and as in case of the round posts, must be laid to make a solid road before the macadam is laid on.

My idea of using cedar posts for the foundation of the macadam was that I could get any amount of second-class cedar, as so much first-class was required for cedar blocking, and that a second-class would answer my purpose about as well. This second-class cedar I provided should have an extra diameter in case of large " pin holes," or partially decayed parts, but in no case were rotten posts allowed, but generally those were used that would not do for cedar blocks or fence posts, and on that account were got very cheap by the corporation. Burnt posts were also allowed.

Upon the cedar foundation thus prepared I had placed macadam 6 inches in depth to be rolled and consolidated. I usually have the contractors haul the boulders (good, hard field stone, no limestone allowed where heavy traffic is to be expected), and have them hand-broken on the cedar, as I found it was generally cheaper for the contractor and resulted in having the cedar and clay covering completely consolidated. I required the stone in all cases to be hand-broken, as I consider the machine-broken stone to be inferior on account of being, to some extent at least, generally damaged throughout by the crushing power used to break them, and therefore more likely to disintegrate under influence of travel, and the effect of frost and water, and from other causes. The stone I required to be broken as nearly as possible to a cubical form and to pass in any direction through a $2\frac{1}{2}$ inch ring. I preferred them to be rather on the large size for a new road.

Upon the macadam thus laid and rolled and consolidated, all work done under the superintendence of a skilful inspector, I had a cover of 3 inches in depth above the tops of the stone, put of good, select gravel, not over 2 inches in diameter, which was to be evenly spread and rolled with a heavy iron roller to the satisfaction of the engineer.

By the terms of agreement the contractor has to keep the road in repair for three months after completion, to insure which from 10 to 15 per cent. of contract price is retained. During the three months the ruts are to be kept filled in and any large stone coming to the top to be broken or re-imbedded, and road to be kept smooth and even. These roads have generally a turnpiked width of about 30 feet, *i. e.*, 15 feet from centre to bottom of water-tables, which ought to be about 15 to 18 inches below crown of road. I prefer the cross-section to be of an elliptical form. Where the cedar is laid only 9 feet wide, there is a good earth drive on each side.

In all cases I would prefer to have land tile drains put in these roads, not only under centre of road, but beneath each water table, but it is difficult to get a proper discharge to these tiles in a flat district, and where the land is rolling they are not required so much, and I then put in a good sharp ditch at about 16 feet from centre on each side and taking care to get good, clean discharges and putting in good 6′ × 6′ or 8′ × 8′ squared cedar culverts at every natural run or old ditch or watercourse I find on the roadway,so as to make sure of good drainage in the future.

The cost of these roadways is about 80 cents per square yard, where no excavation beside the necessary trench for cedar and ordinary water tables is required. If deep cuts are to be made, the contract price for excavation laid in embankment for ordinary hauls, if soil is of clay, about 15 to 18 cents per cubic yard. For cedar culverts cedar being sawn and say 6′ × 6′ or 8′ × 8′, about $20 per M, board measure, laid in the work all complete, including iron drift bolts. Should bridging be required I generally pay at a rate of $22 per M, board measure, for pine lumber, including stringers, if short spans; and if piles required, at the rate of 25 to 30 cents per lineal foot driven, all complete in the work, and for iron say from 5 to 6 cents per lb.

The said roadway as completed by rolling during wet weather and having the ruts carefully raked in, soon becomes a smooth, hard road without having the macadam exposed for months to the action of vehicles to consolidate them, as is done in some roads where no gravel or covering is put on and rolled down upon and into the openings of the macadam, and thus leaving the macadam to be either ground into powder or round pebbles, which form a bond with difficulty.

I need hardly say that the cedar post foundation of this roadway will last for a long time, and is a good protection for the macadam from the earth or mud if it forms beneath, and that the smooth surface on top caused by the gravel covering, makes the water flow readily off the road surface, and also that the roadway thus completed forms an excellent drive for not only heavy waggons but for carriages, and is easy on the horses feet, which cannot be said of an ordinary macadam road or asphalt, brick or granite sets, and also suits the bicycle well.

On one occasion an application was made to the corporation for a Local Improvement of a roadway, and I found on examination that the soil was a hot dry sand of such character as to in a short time cause the destruction of any wood with which it came in contact, so that instead of recommending the cedar blocking the petitioners were desirous of proposing, I suggested that the road should have a flagstone foundation of large Humber stone firmly bedded in the roadway and wedged in with smaller stone. Upon this foundation I had from 6 to 8 inches of good screened gravel laid and rolled and consolidated and all large gravel stone broken. This roadway cost at the rate of about 35 cents per square yard for stone and gravel laid complete, and excavation, of which there was a considerable quantity, cost at the rate of 12 cents per cubic yard. The roadway was a very cheap one and has given great satisfaction, and, I believe, will last for a great many years, whereas a cedar block would have become dilapidated in a short time and a nuisance and a cause of danger to the public and would have cost much more. Of course a cedar post foundation would not have answered in such a locality.

In this paper I have tried to state:

1st. The necessity of good drainage.
2nd. The legal difficulties.
3rd. That a good foundation is necessary.
4th. The kind I have adopted in some cases.
5th. The class of roads known as cedar, macadam and gravel.
6th. The flagstone and gravel road.

I would have been pleased to continue the paper to consider other kinds of roadways with the advantages to each, and localities where applicable and cost of same, but it would make the paper too long.

DISCUSSION.

The Chairman—This is a very interesting paper and certainly provides a novel way for making the foundation for macadam. It seems to me it is also a very ingenious and a very efficient way. We all know that timber buried in the ground and excluded from the air where it can be kept saturated will last almost forever. On the one hand, timber, if it is kept perfectly dry will last forever, and on the other, if it is kept perfectly wet it will last forever ; it is between the two conditions that it rots so quickly. And I fancy that if it were as spoken of by Mr. Gibson it would be kept permanently damp and excluded from the air and would last a very long time.

Mr. Tyrrell—How long has this road been down ?

Mr. Gibson—There are roadways of the same kind in Yorkville put down 15 or 20 years ago and the cedar is still there.

Mr. Tyrrell—Do you find that there is no movement of the stone upon the cedar, that it forms a solid bed on the cedar ?

Mr. Gibson—The spaces between the logs behind them form a grip, as it were, and the stones are never worn. It does not do to use gravel of any size, use selected gravel with clay, if possible, among it ; that forms a bed and a very tight cover.

The Chairman—There is another point that Mr. Gibson draws attention to, that is that in his wooden bridges he uses very small scantling so that they dry out thoroughly. I know about 10 or 12 years ago I was asked to report on a bridge built in 1840 and to prepare plans for an iron bridge to take its place, and after a careful examination I found the timber was perfectly sound. I told them to reshingle the roof—it was one of these bridges with a roof on it—and they did so and it is as good to-day as it was in 1840, when it was put up, and it is good for 40 years more I have no doubt. In another instance of a somewhat similar kind in London, 150 years ago, a bridge was built of oak and it was taken down last year to provide for increased width, and every stick of oak in it was perfectly sound. I saw a cane made of it and it looked as if it were cut a few days before. It was protected from the water, and that is the secret of the whole thing. I have no doubt if you protect it from the water it will outlast iron, because municipalities as a rule do not paint their iron bridges at all, and if they do they paint them with the rust on between the iron and the paint, so the paint peels off and the bridge is rusted out in 25 or 30 years. I think Mr. Gibson ought to give us a paper on wooden bridges for next year.

Mr. Gibson—In some bridges I was rebuilding that had been built of 12 x 12 or 12 x 14—stuff that will last only 12 or 14 years—I arranged to cut up all the timber fine and put galvanized iron between the joints ; that was in 1878, and this year I found the joints where I

had the galvanized iron just as white as the day I left them. There was not the least sign of decay.

The Chairman—How would Portland cement do ?

Mr. Gibson—Well, if you keep the water out. Then I built two or three large bridges and covered the upper portion of each truss with galvanized iron in such a way that the water cannot get into them. On the sides they don't require it. All the joints were covered in the same way, and my impression is those bridges will last 25 or 30 years, and they have been built since 1878.

Mr. Traynor—Do you find any difficulty with the frost raising the cedar in the road bed ?

Mr. Gibson—Oh no ; if it does it just goes down again. With these macadam roads in some places it becomes a perfect bog in the spring ; it is soft below and the stone goes down and the mud comes up and there you have your road.

Capt. Gamble—Do you have the ditches you speak of on the road side of the fence ?

Mr. Gibson—I put them about 15 or 16 or 18 feet from the centre of the road and let people run the risk of it.

Capt. Gamble—In the old country they generally put the ditches on the field sides ; in some countries they would not be allowed to put them on the roadside.

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PROTECTION OF THE SOURCE OF THE OWEN SOUND WATERWORKS SYSTEM.

By R. McDOWALL,
O.L.S., C.E., Owen Sound.

THE Town of Owen Sound, lying as it does in a narrow valley surrounded by ranges of hills from two hundred to three hundred feet in height, from which issue numerous large clear springs of water, is particularly well situated as regards a system of water supply by gravitation. There are three springs of sufficient elevation and volume, in close proximity, to supply a city with a population of twenty thousand—one in the east on Lot 16, concession 10, in the Township of Sydenham; another in the south on Lot 11, concession 2, in the Township of Derby; and another, the present source of the waterworks system, in the south on the road allowance between Lots 12 and 13, concession 2, in the Township of Derby.

In the year 1878 a private company received the franchise from the Corporation for the laying and operating of a system of waterworks for the town, the Corporation retaining the right after ten years of buying out the system from the company at an arbitrated valuation.

The spring chosen for the source of supply of the system was the one before mentioned on the road allowance between Lots 12 and 13, concesion 2, in the Township of Derby, some two miles from the centre of the town. One of the reasons for the choice of this spring was that the water was a mixture of hard and soft, making a water fit and useful for both drinking and washing. The temperature of the water reads 38 degs. Far. in winter and 43 degs. in summer. At the site of the source the rock is very abrupt, about twenty feet in height, and from several crevices in the rock near its foot the water gushed out, and, previously to its being confined, ran down the hill in a natural ravine, finding its way to the River Sydenham. In order to gather the several streams which flowed from the numerous crevices in the rock, an excavation was formed in the face of the rock to the depth of three feet and of sufficient length to enclose all the streams. Along the mouth of this excavation a stone wall was built enclosing a sluice-way some two feet square, which led to a perpendicular penstock at the bottom of which the water-pipe was laid.

The water main laid by the Company was six inches in diameter, and led from the penstock at the source at an elevation of one

hundred and seventy five feet above the town datum to a reservoir on the east hill, the elevation of overflow being one hundred and sixty-feet above datum.

In the early part of the year 1890, the town after considerable dealing bought out the entire system from the private waterworks company for the sum of fifty-five thousand dollars, and since that time the town has controlled the system. The same year the town laid a ten-inch main from the spring to the town and along the principal streets.

While under the control of the Company the water from the taps had occasionally been roily, but in June, 1890, after a very heavy rain storm it was muddy, the sediment resembling yellow clay. On investigation it was discovered that the field at the south-east part of Lot 13, concession 3, had been recently ploughed, that its subsoil was a yellow clay, the water in the ditch along the side road into which this field drained was of a yellow color. This ditch ran east along the road side and turned into Lot 13, concession 2, and emptied into a sink hole, a large crevice in the limestone rock. In all probability this sinkhole had underground connection with the source of the waterworks, as the water at the spring was of the same color. In order to test if there was a connection between them, a quantity of oats, sawdust and corkdust was put in the sink hole at several separate times. A fine wire screen was placed over the waste weir at the penstock, but out of all the quantity placed in the sinkhole only a few grains of oats found their way to the screen.

In the summer of 1891 a suit was instituted against the Corporation of the Township of Derby by the Corporation of the Town of Owen Sound for an injunction restraining them from draining their road allowance into the sinkhole before mentioned, under Clause 18, chap. 28, 31 Vic., of their private waterworks Act—"If any person, etc. * * * * * * cause, permit or suffer the water of any sink, sewer or drain, to run or be conveyed into the same (that is, source of waterworks) or cause anything to be done whereby the water therein may be in any way tainted or fouled, etc."

The corporation of the Township of Derby, after some preliminary attempts at a peaceful settlement, decided to defend their case, and it came up for trial in the full Chancery Sittings before Justice Robertson.

The writer was employed on the side of the defence, whose object was to prove :

(1) That the sinkhole, together with numbers of others, formed the natural outlet of a large district of country from time immemorial.

(2) That they had prior rights of drainage, the ditch leading to sinkhole having been constructed some twenty-three years previously, or ten years before the penstock was constructed.

(3) That the plaintiffs were trespassers on the property of the defendants, having constructed their penstock and utilized a spring of water on their road allowance without obtaining permission of any kind or paying one cent of compensation.

While making a survey of the surrounding lands the writer dis-

covered no less than thirteen sinkholes, one of which had as large a stream of water entering it as the one concerned in the suit. These sinkholes are just crevices in the limestone rock. Across Lots 12 and 13, concession 2, about 20 chains from concession 2 and 3 road allowance, the limestone rock is abrupt and rises to the surface of the ground, thence westward. The surface of both the rock and soil surface dip downward and at ten chains from the abrupt rock is from three to four feet below the surface of the soil, and here the sinkholes occur ; from thence westward the ground surface rises.

In order to have a case the plaintiffs had to prove positively a connection between sinkhole and source of waterworks system. In order to make a test a gallon of phenyle was obtained. Phenyle when mixed with water assumes a milky white color, and its smell and taste are very objectionable. As there was very little water running in the ditch at the time a dam was placed across it in order to collect a sufficient quantity of water to cause a good flush. In this reservoir the phenyle was mixed ; the dam was taken away and the milky disinfecting fluid was sent on its errand of subterranean discovery. The town engineer and his two witnesses walked leisurely down to the spring some 1,500 feet distant from the sinkhole and patiently waited for the appearance of the phenyle. Fifteen minutes passed, then thirty minutes ; they grew impatient ; at forty-five minutes a perceptible smell of phenyle was noticed and in a short time the milky water bubbled from the spring and ran into the penstock. Unfortunately the valve between the source and the town main was not turned off and the phenyle ran onwards to the town. This was about 1 o'clock p.m., and at 6 o'clock p.m. all water takers in the town were extremely live witnesses to the fact that there was a connection of sinkhole and spring. Many amusing anecdotes are told of the scenes at the supper tables when tea was served, and 'tis said that the whiskey at one of the hotels tasted of phenyle three months after ; of this the writer knows naught, but he remembers his tea. The color, smell and taste disappeared from the water during the following day after having disinfected both water and sewerage systems of the town.

The tenor of Justice Robertson's judgment against plaintiffs in the case was as follows :—That the plaintiffs were trespassers on defendants' lands and had no rights to the spring ; that the defendants in digging the ditch leading to sinkhole were only improving their roads as they had a perfect right to do. The Corporation of the Town of Owen Sound then appealed to the Divisional Court against this judgment and it came up in that court before Justices Galt and McMahon, who upheld the former judgment.

The evidence brought out by the trial showed the great danger the town was in from contamination of its water supply. An infectious disease such as typhoid fever or diphtheria might at any time become prevalent in the area drained into the sinkholes and germs of disease find their way into the town. As an example of such danger, see *Engineering News*, April 2, 1892 : " The epidemic at Plymouth, " Pa., is doubtless more or less familiar to our readers, as it is cited in " connection with nearly every discussion of typhoid epidemics in

"this country. It occurred in 1885 in the six months, April to "September inclusive, there having been one person taken sick in "September, 15 in August, 81 in July, 83 in June, 261 in May and "713 in April. In all there were 1,104 cases in an estimated popula- "tion of between 8,000 and 9,000. Of the 1,104 cases, 114 or over 10 "per cent. were fatal.

"This epidemic has been traced to the dejecta of a single typhoid "patient, which began to accumulate early in January, and remained "upon the frozen ground and snow until March 26th, when the first "thaw began, lasting until April 4. The dejecta, or some of it, was "carried down a stream to the reservoir supplying the town with "water, which had not been drawn upon during the winter, but was "begun to be used the first day of the thaw. The general sanitary "condition of Plymouth was very bad and doubtless accelerated the "epidemic greatly."

But in order to obtain some relief from the danger of pollution (it must not be misunderstood that the water was at any time undrinkable; at its very worst it was slightly roily, but well tasting, as the surface water which found its way to the spring was free from pollution) the Waterworks Board purchased some five acres about the sinkhole and one half acre about the spring. In the summer of 1893 the Waterworks Board employed the writer to report upon some remedial scheme. Two schemes presented themselves—one to filter the drainage water, and the other to construct a ditch to carry off the drainage water to a point below the spring. The variable quantities of water and the cost were the main objections to the first scheme, and rock cutting and caulking of crevices in the limestone rock the difficulties in the second. The Board of Waterworks decided to construct a ditch some twenty-two hundred feet in length. The greatest depth of rock cutting was four and one half feet, and its amount some two hundred and forty cubic yards; the amount of clay being seven hundred and sixty-six cubic yards. Wherever crevices occured in the rock they were to be filled and packed with broken stone, then a six-inch layer of blue clay, upon the top of the clay a layer of cement mortar in proportion of one to one. Tenders were called for and the work was let late last fall at 95 cents per cubic yard for rock and 26 cents for clay, amounting to the sum of four hundred and twenty-seven dollars. The excavation was completed in November, but as the frost had set in it was not deemed advisable to fill the crevices in the rock until next spring. In the meantime, after every thaw the water finds its way in the "new sinkholes" to the spring, but it is hoped that by next May, Owen Sound can depend upon the source for perfectly pure water.

DISCUSSION.

THE CHAIRMAN—It has always struck me that a filter is an uncertain instrument; you cannot be quite sure what it will intercept. It may clarify water but it does not purify it.

Mr. Gibson—I had a case in filtration. I was requested to prepare a sewerage system for part of the township of York. They

were determined they would have a system put in. It was very difficult to get rid of the sewage, so I proposed to filter it. Instead of filtering it as is usually done, that is, allowing the stuff to pass downwards, I have a settling-basin formed, passing through screens, and then the sewage has to come upward, and what is called the upward system works a great deal better and purifies the water more perfectly than downward filtration, because the downward is apt to carry matter with it but the upward leaves it behind. You have often noticed in a swamp that the water is beautifully clear and you can drink it with perfect safety, because the water is coming up, but if it were going down it would be apt to carry the impurities with it. So I would do the same with sewage. All the sewage is poured into this reservoir and it passes downward. When it pours into the first chamber it works up a lot of quicklime in a box—quicklime is kept there all the time—and then it passes down through a screen that catches any paper, etc., that may be in it ; then it has to rise and the filter in the second chamber is formed of slats of wood one inch apart ; upon that is an inch of gravel and then the whole is covered with quicklime. The sewage has to come upwards, and it works remarkably well. There is very little smell, and the water when it reaches the creek below is practically pure so far as the eye can see, but of course the germs may be there.

APPENDIX.

BIOGRAPHICAL SKETCH OF DAVID WILLIAM SMITH (BARONET), SURVEYOR-GENERAL OF UPPER CANADA, FROM 28TH SEPTEMBER, 1792, TO 10TH MAY, 1804.

DAVID WILLIAM SMITH was born on the 4th of September, 1764, and was the only child of John Smith, Esquire, sometime of Salisbury, Lieutenant-Colonel of the Fifth Regiment of Foot, who died commandant of the fortress of Niagara, Canada West, in 1795, by Anne, daughter of William Waylen, Esquire, of Rowde Hill and Devises, County of Wiltshire.

At an early age he was appointed by Earl Percy as Ensign in his father's regiment, and subsequenly obtained the rank of Captain, when his aptitude for business in the civil department so manifested itself that he was induced to leave the regular army and enter upon a course which afforded scope for his unusual talents. Although he relinquished his position in His Majesty's regulars, Mr. Smith did not abandon a military career, and held at various times the following offices in the militia, viz. :—Colonel of Lincoln Militia, Colonel of 2nd Battalion York Militia, Canada, and Lieut.-Col. of the Percy Tenantry Riflemen, of Northumberland, England.

On the 27th of August, 1792, Mr. Smith was elected a member of the first Canadian Parliament, and was re-elected to the two succeeding Parliaments.

As a member of Parliament, in which capacity he served his country for twelve years, his abilities made him one of the most distinguished men of his time, and he was chosen Speaker to that body in 1797, and re-chosen in 1801.

Called to the bar on 7th July, 1794, he bore, at various times, the titles of Deputy Judge Advocate, Justice of the Peace, Judge of the Court of Requests, Master in-Chancery and Privy Councillor.

Upon the passing of "The Constitutional Act," 31 George III., Cap. 31, by which the original Province of Quebec was divided into Upper and Lower Canada, Mr. Smith was appointed the first Surveyor-General of the Province of Upper Canada (28th September,

1792), and continued to serve in that capacity until ill-health compelled him to resign, which occurred on the 10th of May, 1804.

Having been from his boyhood known and honored by the notice of the Duke of Northumberland, Mr. Smith, upon his return to England, was appointed by His Grace as commissioner, auditor and general receiver for the Northumberland estates, which position he successfully filled for the remaining thirty-two years of his life.

During this time he also held many prominent public offices, and on August 30th, 1821, as a recognition of his many services in the new world as well as the old, he was created a baronet.

Sir David was twice married, first, on November 3rd, 1788, to Anne, daughter of John O'Reilly, Esquire, of Ballykilchrist, County of Longford, Ireland, and by that lady, who died in 1798, he had issue seven children, three of whom died young, one son, David William, of H. M. ship "Spartan," was killed at Quiber, and three daughters who survived him.

In 1803 Sir David married Mary, youngest daughter of John Tylee, Esquire, of Devises, banker, by whom he had one son and one daughter.

He died near Alnwick, in the County of Northumberland, England, on May 9th, 1837, in the 73rd year of his age.

His personal property and books after his death drifted into the hands of strangers, but by a fortunate accident, which the watchfulness and energy of Mr. Bain, the librarian of Toronto's Public Library, turned to good account, about twenty-five volumes of manuscript recently fell into the hands of that institution, and these contain records and information of much value to surveyors as well as antiquaries. Among the more interesting of these may be mentioned, a book of plans and descriptions of various properties in this province acquired by Sir David during his residence here, also the first lithograph map of the province, published in London, England, in 1800, from data furnished by the Surveyor-General for that purpose. This map is accompanied by a volume descriptive of the topographical features and settlements of the province. There are also maps of Toronto, Niagara, Duffin's Creek, and others of the more prominent hamlets of one hundred years ago.

Already the plans and maps referred to have been found of great service in boundary disputes, and, with a view of giving to those interested in such matters an idea of the localities touched upon, a schedule of the properties is copied and appended hereto.

Another interesting volume is entitled "Duplicates of Original Papers, showing the manner in which the land granting department was conducted on the first settlement of Upper Canada, with the forms of proceeding, and several subsequent minutes." A volume of miscellaneous matter includes instructions to deputy surveyors, a statement of the contents of the Surveyor-General's office on 1st July, 1802, numerous autograph letters from Chief Joseph Brant, relative to the surrender of territory by the Six Nations Indians; also papers relative to the militia and the lieutenancy of the County of York.

The numerous appointments received by Sir David during his public career were arranged by himself, in order of their dates, and are given below :—

A MEMORANDUM OF THE DATES OF THE HON. D. W. SMITH'S APPOINTMENTS.

Ensign in the 5th Regiment of Foot..... 8th Sept., 1779
Acting paymaster to same..... ..... 8th Sept., 1780
Secretary of the Land Board, Detroit..... 4th June, 1790
" to the Commandant, " ..... " "
Fort Adjutant, " ..... " "
Assistant Engineer " 1791
Deputy Quarter Master General, Niagara.....12th April, 1792
Secretary to the Commandant, " .....12th June, 1792
Member of first Canadian Parliament.....27th Aug., 1792
Justice of Peace..... ..... " " "
Surveyor General of Lands.....28th Sept., "
Deputy Judge Advocate..... 8th Oct , "
Member of all the Land Boards.....27th " "
Vice-President of Agricultural Society..... " " "
Articled to the Attorney-General..... 2nd June, 1793
Called to the Bar..... 7th July, 1794
Major to Provincial Horse Artillery.....18th August, 1794
Captain in the Fifth Regiment of Foot..... 2nd Sept., 1795
Privy Councillor..... 2nd March, 1796
Deputy Lieutenant for County of Lincoln..... 1st August, "
Member of 2nd Parliament.....18th " "
Colonel of Lincoln Militia..... 7th Jan'y, 1797
Judge of the Court of Requests..... " " "
Speaker of the House of Commons..... 7th June, "
Commissioner for Examining Public Offices....12th August "
Trustee for the Six Nations Indians.....10th Oct., "
Colonel of York Militia, 2nd Battalion..... 1st June, 1798
Lieutenant of the County of York..... 3rd Dec., "
Master-in-Chancery.....17th July, 1799
Member of 3rd Parliament..... Aug., 1800
Re-chosen Speaker..... June, 1801
Commissioner of Growth of Hemp.....28th July, "
Commissioner for Administering the Government... 1st Sep., "
Resigned my appointments, and a pension settled for my services.....10th May, 1804
Commissioner, Auditor, and General-Receiver to His Grace the Duke of Northumberland.....10th May, 1805
Lieut.-Col. of the Percy Tenantry Riflemen.....28th June, "
Deputy-Lieutenant for the City of Northumberland.23rd June, 1807
Commissioner for the Land Tax..... " "
Qualified for Magistrate, Co'y of Northumberland.. 8th Oct., "
One of the 24, Parish of Alnwick..... .. 2nd Feb., 1808
Commissioner of the Breamish Turnpike Road....31st Jan'y, 1809

Qualified as Commissioner for the Land Tax.....	23rd March, 1809
Chosen a subscribing member of the Society for Promoting Christian Knowledge.....	9th Nov., 1808
Elected an honorary member of the Literary and Philosophical Society of Newcastle-upon-Tyne..	1st Nov., 1809
Appointed a Trustee by Act of Parliament for the Turnpike Road from Newcastle to North Shields.....	18th April, 1810
Sworn in a Trustee for the Great North Road from Newcastle to Oxford.....	26th Jan'y, 1811
A Trustee for the Turnpike Road from Alnmouth to Hexham.....	29th April, 1809
A Vice-President of the Diocesan Branch of the Society for Promoting Christian Knowledge..	" 1815
One of the gentlemen nominated for Sheriff of Northumberland.....	"
A Vice-President of the Alnwick Dispensary.....	"
Chairman of the Committee of Alnwick Dispensary	"
One of the Northumberland Committee for the Waterloo Subscription.....	"
Occasional Chairman for the District Committee of the Society for Promoting Christian Knowledge	"
Chairman of the Quarter Sessions in Northumberland.....19th, 20th and	21st Oct., 1820
Created a Baronet. (*Gazette*).....	27th July, 1821
Foreman of the Grand Jury at the Assizes for the County of Northumberland.....	March 1822
Ditto ditto.....	" 1823
First on the list to be Sheriff of Northumberland....	Sept., 1823
Presented Address to the Duke of Wellington, and dined with His Grace at Alnwick Castle.....	Oct., 1827
Vice-President to Mechanics' Institute, Alnwick " " to Nat. His. Soc'y of North'd.....	2nd Aug., 1830
Vice-President to Alnwick Library.....	16th May, 1834
" " (one of them) to Northumberland Agricultural Society.....	28th Sept., 1836
Proposed as Chairman of the Guardians of the Poor, but declined on account of age.....	Nov., 1836

SCHEDULE.

How Acquired / Township.	Park Lots, to whom gr'nted	By Purchase. To D. W. Smith		To Whom Granted.												Total number of Acres.
				Town Lots.			Heads of Families.				Children of Hon. D. W. Smith.					
	D. W. Smith.	Town Lots.	Farm Lots.	Hon. D. W. Smith.	Mrs. Anne Smith.	Widow A. Smith.	Lt.-Col. John Smith.	Mrs. Anne Smith.	Hon'ble D. W. Smith.	Mrs. Anne Smith.	Mary Elizabeth.	David William.	Sarah.	Anne.	John O'Reilley.	
Ameliasburgh	....	....	....	....	....	....	.....	600	.....	.....	.....	.....	.....	.....	1200	1800
Ancaster	....	....	....	....	....	....	.....	.....	.....	....	1184	1200	1200	.....	.....	3584
Charlotteville	....	....	....	....	....	....	.....	200	.....	.....	.....	.....	.....	.....	.....	200
Crowland	....	....	....	....	....	....	200	.....	.....	.....	.....	.....	.....	.....	.....	200
Dorchester	....	....	....	....	....	....	.....	.....	120 6/20	.....	.....	.....	.....	.....	.....	120 6/20
Dunwick	....	....	....	....	....	....	.....	.....	150	.....	.....	.....	.....	.....	.....	150
Harwich	....	..	....	....	....	....	.....	.....	199 12/20	.....	.....	.....	.....	.....	.....	199 12/20
Howard	....	....	....	....	....	....	.....	.....	600	.....	.....	.....	.....	.....	.....	600
Louth	....	....	....	....	....	....	.....	.....	50	.....	.....	.....	.....	.....	.....	50
Niagara	....	....	....	4	....	....	.....	.....	202	.....	.....	.....	.....	.....	.....	206
Oxford-on Thames	....	....	....	....	....	....	.....	.....	500	.....	.....	.....	.....	.....	.....	500
Pickering	....	....	....	....	....	....	4800	.....	1800	.....	.....	.....	.....	1200	.....	7800
Rainham	....	....	....	....	....	....	.....	200	295	.....	.....	.....	.....	.....	.....	495
Raleigh	....	....	....	....	....	....	.....	.....	280	.....	.....	.....	.....	.....	.....	280
Southwold	....	....	....	....	....	....	.....	.....	441	.....	.....	.....	.....	.....	.....	441
Stamford	....	....	....	....	....	....	.....	.....	.....	5	16	.....	.....	.....	.....	21
Wainfleet	....	....	....	....	....	....	.....	.....	255	.....	.....	.....	.....	.....	.....	255
Walpole	....	....	....	....	....	....	.....	.....	.....	1195	.....	.....	.....	.....	.....	1195
Woodhouse	....	....	....	....	....	....	.....	200	290	.....	.....	.....	.....	.....	.....	490
Yarmouth	....	....	....	....	....	....	.....	.....	410	.....	.....	.....	.....	.....	.....	410
York	200	6 8/20	400	1	1	1	.....	.....	407 2/20	.....	.....	.....	.....	.....	.....	1016 5/20
Total number of acres	200	6 8/20	400	5	1	1	5000	1200	6000	1200	1200	1200	1200	1200	1200	2001 3/20

PAPERS USED AT THE NOVEMBER, 1893, SESSION OF THE BOARD OF EXAMINERS.

PRELIMINARY.

Subject No. 3—Arithmetic.

Max. Marks 100, *Min. Marks 40.*

No. 1. Give an example of a proper and an improper fraction, and state by what other names they are called.

No. 2. Reduce the following to an improper fraction: $969\frac{1}{2}\frac{9}{3}$.

No. 3. Express the following improper fractions as whole numbers, $\frac{768}{24}$, $\frac{10101}{101}$.

No. 4. Multiply $\frac{17}{19}$ by 9, 3, 23, 47.

No. 5. Reduce the following compound fraction to a simple one, $\frac{6}{7}$ of $\frac{8}{11}$ of $\frac{15}{16}$.

No. 6. Express the following numbers in words, 762.762, .2436.

No. 7. Find the product of 2.236 and 2.4495.

No. 8. Divide 4.096 by 10.24 by 102.4 by 25.6 by .32 by .064.

No. 9. Extract the square roots of 625, 631, 961, 970, and give the remainder in each case.

Group No. 4—Logarithms and Algebra.

Max. Marks 100, Min. Marks 30.

1. Give the definition of a logarithm of a number. How many systems of logarithms have been constructed, and tables calculated, and by whom invented? What numbers may be taken as the bases of systems?

2. How are large numbers, say of 10 figures each, multiplied together when one number is a whole number and the other a decimal? How divided? Give full procedure as to each necessary step.

3. What is the logarithm of .001? Give the reason. Add the following logarithms, 5.3468541, $\bar{3}.2685427$. Add 6.3874654 and $\bar{2}.9245636$. Multiply $\bar{3}.7856473$ by 6; 35.86 by 2.1046; 0.8372 by 0.00294. Find the 365 power of 1.0045. Find the fourth root of 0.0076542.

4. Give explanations of the following expressions: "Tables of logarithmic sines, tangents, etc."; "Tables of natural sines, tangents, etc.," and show by examples how each are used.

5. Give the rules for adding, multiplying, subtracting and dividing algebraic fractional expressions, with an example of each and the proof of the rules.

6. What are equations of the first degree? Give the rules for working them and explain the same. Give an example.

7. What are simultaneous equations of the first degree with two or more unknown quantities? Give the various rules for working such equations and examples of the same.

8. Two casks contain equal quantities of water, from the first 34 quarts are drawn and from the second 80. The quantity remaining in one cask is now double that in the other. How much did each cask contain?

9. $7x - 2z + 3u = 17.$
$4y - 2z + v = 11.$
$5y - 3x - 2u = 8.$
$4y - 3u + 2v = 9.$
$3z + 8u = 33.$
Find values of x, v, y, u and z.

Subject No. 5—Euclid.

Max. Marks 100, Min. Marks 40.

1. Give the definitions of the following: Superficies, term or boundary, similar segments of circles, a right line placed in a circle, theorem, deduction.

2. Write out the following propositions: To bisect a given finite, straight line. Prop. 10, Bk. I.

3. To describe a square on a given right line. Prop. 46, Bk. I.

4. Parallelograms upon equal bases and between the same parallels are equal to each other. Prop. 36, Bk. I.

5. If a right line be divided into any two parts, the rectangles contained by the whole and each of the parts are together equal to the square of the whole line. Prop. 2, Bk. II.

6. To describe a square that shall be equal to a given rectilineal figure. Prop. 14, Bk. II.

7. The opposite angles of any quadrilateral figure inscribed in a circle are together equal to two right angles. Prop. 22, Bk. III.

8. In equal circles, equal arcs are subtended by equal right lines. Prop. 29, Bk. III.

9. To describe a circle about a given square. Prop. 9, Bk. IV.

10. To describe a circle about a given equiangular and equilateral pentagon. Prop. 14, Bk. IV.

Group No. 6—Plane Trigonometry and Rules for Spherical.

Max. Marks 100, Min. Marks 40.

1. Define the three modes of measuring angles, called the sexagesimal, the centesimal and the circular, and give examples of each.

2. Show that the unit of circular measure is equal to 57°.2958 nearly, and that an angle whose circular measure is 180° and an angle whose circular measure is $\frac{\pi}{2}$ equals 90° and 2π equals 360°. Express in circular measure 60°. Express in circular measure 22°, 30′, 0″.

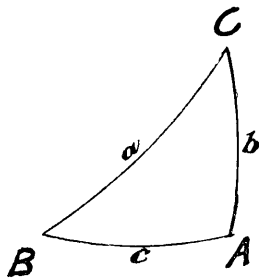
3. Give the rules for solving plane triangles. (*a*) Given two sides and an angle opposite one side. (*b*) Given two sides and the included angle. (*c*) Given three sides. Give proofs of rules.

4. Give rules for solving plane, right-angled triangles. (*a*) Given hypotenuse and angle at base. (*b*) Base and angle at the base. Give proofs of rules.

5. Given two sides of a plane triangle, viz. : 1686 and 960 and their included angle 128°, 4′, 0″—Required the other two angles.

6. Give Napier's rules for solving right-angled spherical triangles.

7. In this triangle :
Given *a* and *c* to find *b*.
" *C* " *c* " *a*.
" *B* " *b* " *C*. Assume $A = 90°$.



8. Give the rules for solving any spherical triangle when (*a*) Given two sides and an angle opposite one side. (*b*) Given two sides and their included angle. (*c*) Given three sides, to find the angles.

9. (*a*) Of what arcs are the sides of spherical triangles constructed ? (*b*) How many right angles may there be in the sum of the three angles of any spherical triangle ?

Subject No. 7—Mensuration of Superficies.

Max. Marks 50, Min. Marks 25.

1. The area of an equilateral triangle is 10 acres. Required, the length of a side in chains and links.

2. The base of a triangle is 56 chains, the height is 15 chains and one side is 25 chains. Required the other side.

3. Find the circumference of a circle equal in area to a square whose side is 300.

4. What is the area of a trapezoid whose parallel sides are 4 feet 6 inches, and 8 feet 3 inches, and the perpendicular height 5 feet 8 inches ?

5. What is the area of a field whose south side is 27 chains 40 links ; east side, 35 chains 75 links ; north side, 37 chains 55 links ; west side, 41 chains 5 links ; and the diagonal from south-west to north-east, 48 chains 35 links.

SUBJECT NO. 8—LINEAR DRAWING.

Max. Marks 50, Min. Marks 25.

1. Draw five parallel lines one-half inch apart, the top line thin and dotted, the bottom line thick and dotted, the centre line thick, and the intermediate lines thin.

2. Draw three concentric circles with radii 1 inch, $1\frac{1}{8}$ inch, and $1\frac{1}{4}$ inch, respectively. Ink in the outer one with heavy dots, the middle one with chain dots, and the inner one with simple dots.

3. Draw three circles with radii of one inch, each circle touching the other two. Show the construction in pencil, and ink the circles as in question 2.

4. Draw a scale for a plan on which 80 feet is represented by one inch. Make it long enough, and so divided, that 495 feet may be taken off it directly. Give its representative fraction.

5. Draw a line four inches long and divide it by construction into seven equal parts.

6. Construct, as accurately as you can, a triangle, the sides being respectively, $2\frac{1}{4}$, $2\frac{1}{2}$, and $2\frac{3}{4}$ inches long. Ink the figure in the finest lines you can.

7. Construct angles of 15°, 30°, 45°, 60°, and 120° (without protractor). (Instruments to be used are, pencil, straight-edge, pen, dividers with pen and pencil points, and scale or rule divided into inches and eighths).

FINAL.

SUBJECT NO. 1—GEOMETRY.

Max. Marks 100, Min. Marks 50.

1. If the square described on one of the sides of a triangle be equal to the squares described on the other two sides of it, the angle contained by these two sides is a right angle. Prop. 48, Bk. I.

2. If two circles touch each other, internally, the straight line which joins their centres being produced, shall pass through the point of contact. Prop. 11, Bk. III.

3. In a circle the angle in a semi-circle is a right angle ; but the angle in a segment greater than a semi-circle, is less than a right angle, and the angle in a segment less than a semi-circle, is greater than a right angle. Prop. 31, Bk. III.

4. To describe a circle about a given square. Prop. 9, Bk. IV.

5. 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.

6. Similar triangles are to one another in the duplicate ratio of their homologous sides. Prop. 19, Bk. VI.

7. If a straight line touch a circle and from the point of contact a straight line be drawn cutting the circle, the angle which this line makes with the line touching the circle shall be equal to the angles which are in the alternate segments of the circle. Prop. 32, Bk. III.

8. The opposite angles of any quadrilateral figure inscribed in a circle are together equal to two right angles. Prop. 22, Bk. III.

9. To divide a given straight line into two parts so that the rectangle contained by the whole and one of the parts may be equal to the square on the other part. Prop. 11, Bk. II.

10. If a straight line be divided into two equal parts and also into two unequal parts, the rectangle contained by the unequal parts, together with the square on the line between the points of section, is equal to the square on half the line. Prop. 5, Bk. II.

SUBJECT NO. 2—ALGEBRA.

Max. Marks 100, Min. Marks 40.

1. Define, (*a*) Greatest Common Measure ; (*b*) Least Common Multiple. Find the G C. M. of $6x^4+x^3-x$ and $4x^3-6x^2-4x+3$. Find the L. C. M. of $x^2-(a+b)x+ab$, $x^2-(b+c)x+bc$ and $x^2-(c+a)x+ca$.

2. Define the following : (*a*) Equation; (*b*) Identity. Prove, (*a*) That if every term on each side of an equation be multiplied or divided by the same quantity the results are equal ; (*b*) That any quantity may be transposed from one side of an equation to the other by changing its sign. Give the rule for the solution of any equation of the 1° with one unknown quantity. Solve the following : $\frac{1}{6}(8-x)+x-1\frac{2}{3}=\frac{x+6}{2}-\frac{x}{3}$

3. A crew which can pull at the rate of 9 miles an hour finds that it takes twice as long to come up a river as to go down. At what rate does the river flow ?

The length of a field is twice its breadth, another field which is 50 yards longer and 10 yards broader contains 6,800 square yards more than the first. Find size of each.

4. Define, (*a*) Involution ; (*b*) Evolution ; (*c*) Find $(1+2x+3x^2)^2$; (*d*) Find $(1+2x+3x^2)^3$; (*e*) Extract the square root of $4x^4-4x^3+5x^2-2x+1$.

5. What is the meaning of $a^{\frac{1}{2}}$, $a^{\frac{1}{3}}$, $a^{\frac{m}{n}}$. Simplify $(x^{\frac{2}{3}}\times x^{\frac{4}{7}})^{\frac{1}{1}\frac{4}{8}}$. Find the product of $\left(\frac{ay}{x}\right)^{\frac{1}{2}}$, $\left(\frac{bx}{y^2}\right)^{\frac{1}{3}}$ and $\left(\frac{y^2}{a^2b^2}\right)^{\frac{1}{4}}$.

6. What is the rule for solving a quadratic equation ? What are the roots of the equation $ax^2+bx+c=0$. When are they real and when impossible? Solve the following: (*a*) $3x^2-7x=20$; (*b*) $(2x+1)(x+2)=3x^2-4$. The length of a rectangular field exceeds

the breadth by one yard and the area is three acres. Find the lengths of the sides in yards.

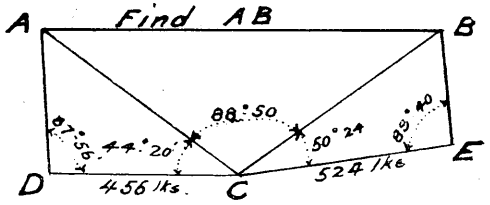
7. When are quantities said to be in (*a*) arithmetical progression; (*b*) geometrical progression? What is the rule for finding the sum of any number of terms in an arithmetical progression when "*a*" equals first term, "*l*" equals last term, "*s*" equals sum, and "*n*" equals number of terms. Sum to 21 terms $\frac{5}{7}$, $\frac{8}{3}$, $\frac{13}{11}$. How many terms of $1+3+5+7+$ &c. amount to 1234321? What is the rule for finding the sum of any number of terms in a geometrical progression when "*a*" equals first term, "*r*" equals common ratio, "*n*" equals number of terms, "*s*" equals the sum of the terms, and "*l*" equals last term?

Group No. 3—Plane and Spherical Trigonometry.

Max. Marks 100, Mim. Marks 50.

1. Give the rules and prove the same, for solving plane triangles, when (*a*) Two sides and an angle opposite one side are given; (*b*) Two sides and the included angle given, to find the other parts; and (*c*) When the three sides are given to find the angles.

2. Given data shown on figure to find *AB*.



3. Explain the difference between a table of logarithmic sines, tangents, &c., and a table of natural sines, tangents, &c., and how each is used.

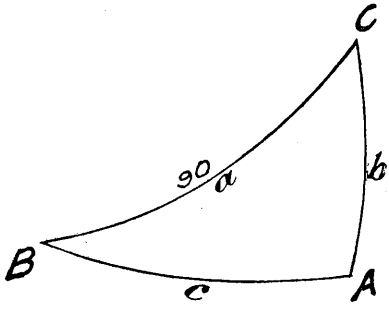
4. By the centesimal mode of measuring angles, find the number of grades, minutes and seconds in the following angle: 300° 15′ 58″.

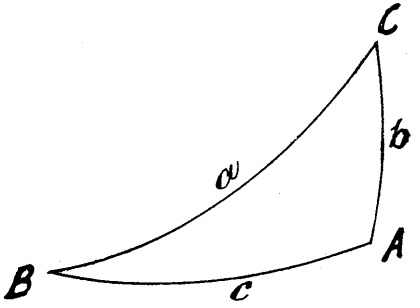
5. Give Napier's rules of circular parts for solving spherical triangles, and prove the same.

6. In this triangle:

Given *B* and *C* find *c*.
" *b* " *c* " *a*.
" *a* " *C* " *c*.

Show how each is found.





7. In this quadrantal triangle, given *CB* equal 90°, *C* equal 42°, 12′, *A* equal 115°, 20′. Find *B*, *c*, and *b*.

8. In a spherical triangle, given three sides, a equal 40° 18′ 29″, b equal °67 14′ 28″, and c equal 89° 47′ 06″. Required the angle A.

9. In a spherical triangle ABC there are given: A equal 34° 15′ 03″, B equal 42° 15′ 13″, and side c equal 76° 35′ 36″. Required the angle C.

Group No. 14—Geology and Mineralogy.

Max. Marks 75, Min. Marks 25.

1. Give the meaning of the term "geology," and the theory upon which it is based as a science.

2. How are rocks classified as to their origin? Give the names of three or more groups and the distinctive features of each.

3. Define the term "fossil," and state the theory as to their formation. In what kind of rocks are they found? State the name of the lowest formation in which fossils are found, and the kind.

4. Explain the meaning of the following terms: "stratified," "dip," "strike," "anticlinal," "synclinal," "conformable," "unconformable," and "fault."

5. State the theory of the "glacial deposits."

6. State the geological formations of Western Canada, say of Ontario, particularly.

7. State the theory of the formation of coal beds.

8. State the theory of the origin of petroleum as found in Canada.

9. What is lime, and in how many different forms does it appear as a rock? Are fossils found in all kinds of limestone? State the different purposes for which lime is used, and how prepared for use.

10. State the difference between "Azoic" and "Paleozoic" rocks.

11. What is the meaning of the term "mineralogy"?

12. How are minerals distinguished from one another? State the different characters.

13. Under what condition does color become a useful character in the discrimination of minerals?

14. Why is streak, in general, a more important character than color?

15. State the difference between metallic and sub-metallic lustre, with examples.

16. Name the different kinds of structure presented by mineral bodies.

17. State "Chapman's convenient scale of hardness."

18. What is the meaning of the expression "specific gravity," and how is it found—of a mineral body? If a piece of spar weighs 66 grs. in air and 46 grs. in water (distilled), what is its specific gravity?

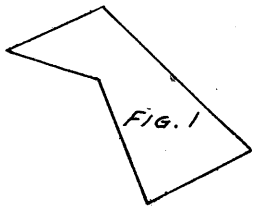
19. Explain the use of the blow-pipe and the structure of the parts of the flame.

20 Give the meanings of the terms "electro-positive," and "electro-negative," and state how developed.

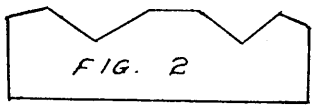
21. Explain the following terms, illustrating each by one or two examples: "Native substances," "oxide," "sulphide," "silicate," "carbonate."

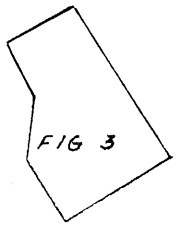
Group No. 4—Mensuration of Superficies and Laying Out and Dividing Land.

Max. Marks 150, Min. Marks 75.

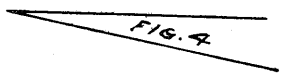


1. Give the method and formula required for finding area of figures given by use of chain alone for measurement.



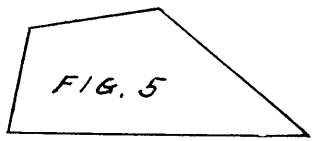


2. Explain the method of finding the area of the figure given by latitude and departure.



3. Find the method and formula for parting off a given area from the above figure. (1) By a line perpendicular to one side. (2) By a line running in any direction.

4. The bearings and distances of the sides of the above figure being given, give the method of dividing it into two parts, having a given ratio by a line running parallel to one of the sides.

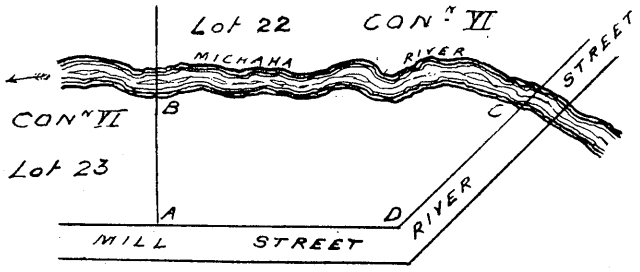


Subject No. 5—Descriptions by Metes and Bounds.

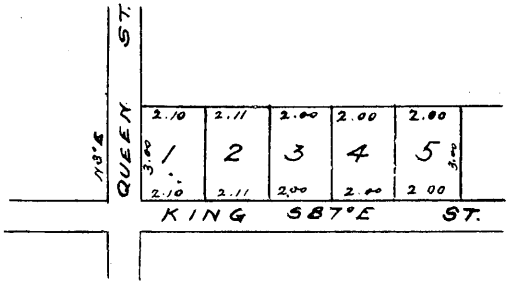
Max. Marks 100, Min. Marks 75.

1. Give some instances in which the term "more or less" may be used in a description.

2. Give definition of the terms "bank" and "shore."



3. Write description of the property *A*, *B*, *C*, *D*, in the diagram, giving imaginary bearings and distances.



4. Write out description of the east half of Lot No. 3, in above figure, supposing there to be no registered plan of the subdivision.

Subject No. 7—The Laying out of Curves.

Max. Marks, 50, Min. Marks. 20.

1. Given a curve of radius, 955,366 feet; intersection angle, 62 24; required the tangent.

2. A curve of 985,451 feet radius is "What degree of curve"?

3. Show how any offset—from the tangent—to any curve may be approximately calculated in terms of the degree of curve and the number of 100 feet chords.

4. The radius of a curve is 890 feet; it is required to find the ordinate to a chord of 100 feet at a point 46 feet from one end.

5. It is found, on stretching a chord of 100 feet, that the ordinate at the centre is 4,374 feet. Required the radius of the curve.

6. It is frequently necessary to lay out a curve by the chain only. Give the detail work necessary, and describe fully how would lay out a 12 curve 750 feet long, using a chain and box-sextant or optical square.

Subject No. 8—Practical Astronomy.

Max. Marks, 150; Min. Marks.

1. Define fully the following terms. Right ascension, azimuth, declination, zenith, terrestrial latitude and longitude?

2. Explain fully what is meant by standard time?

3. Define refraction, dip, parallax.

4. Explain fully and clearly the precaution necessary to determine by direct observation of (*a*) the sun, (*b*) a star, for azimuth and latitude.

5. March 11th, 1891. At a point in the County of Hastings, Ont., obs., mer., alt., suns lower limit, 41° 37′. Find latitude.

6. At a point on Ottawa river on April 3rd, 1874, the obs. transit of Procyon was found to be 47° 31′ 40″. Find latitude.

7. On January 25th, 1873, at a point on Ottawa river in latitude 46° 35′ 33″ the following observations were taken of the sun's lower limb west of the Meridian. Find error of watch.

TIMES.	ALTITUDES.
2h. 5m. 41s.	19° 15′ 20″
2h. 6m. 10½s.	19° 13′ 0″
2h. 6m. 34s.	19° 11′ 0″
2h. 7m. 0s.	19° 8′ 20″
2h. 7m. 29½s.	19° 6′ 0″
2h. 7m. 54s.	19° 3′ 40″.
2h. 8m. 17½s.	19° 1′ 20″
2h. 8m. 58s.	18° 58′ 50″

8. The latitude of Violet, Ont., is 44° 10′ north. Required number of miles in degree of longitude there, with diagram.

9. At a point in the district of Algoma on October 18th, 1887, at 9 a.m., in latitude 46° 31′ 16″ north, the obs., alt. sun's lower limb was 24° 47′. Find azimuth of sun.

SUBJECT NO. 9—SURVEY ACT.

Max. Marks 150, Min. Mark.

1. Give a form of oath to be administered to a chain-bearer.

2. Give proceedings to be followed if a person refuses to attend to be examined, as to a boundary, by a surveyor.

3. In what manner, on the ground, should you proceed to establish a partly obliterated concession line which was intended, in the original survey, to be straight?

4. In a township where no proof-lines have been run, which is the governing line?

5. Which is the governing line in townships divided into sections of 1,000 acres, or thereabouts?

6. How would you proceed to establish a point where the original post cannot be found. (*a*) In a single front concession? (*b*) In a double front concession?

7. Give method of running side-lines of lots. (*a*) In single front concessions. (*b*) In double front concessions.

GROUP NO. 10—MINING AND OTHER ACTS.

1. What are the requirements of a plan or map of a sub-division of a parcel of land to make it comply with the Registry Act? Answer fully, giving form of Surveyor's certificate.

2. (*a*) Define "Mining Location." (*b*) In the unsurveyed territory, within the District of Algoma, what shall be the shape, size, and bearings of outlines of mining locations. (*c*) Who shall survey them, and how?

3. Give briefly the chief differences between the "Municipal Drainage Act" and the "Ditches and Watercourses Act." (*b*) Why, in your opinion, are the two Acts necessary?

4. An engineer receives a requisition for a drain under the Ditches and Watercourses Act, on the 6th Nov., 1893. State his duties until the "Award" is filed with the clerk of the township, giving dates to which he is limited for the performance of the various parts ot his work.

5. Give the course to be pursued when a drain, constructed under the Ditches and Watercourses Act, requires to be cleaned out.

6. In case of the non-completion of any part of a drain award under the Ditches and Watercourses Act, state the course to be pursued to have it completed, setting forth clearly the engineer's duties.

7. How would you proceed to obtain the drainage of a tract of land under the Municipal Drainage Act. State the duties of the municipal council in the matter.

8. In case a drain commencing in one township is required to be continued into another township for an outlet, what course is required to be pursued?

9. How are drains which are in more than one township, kept in repair?

10. What is meant by "A work of preservation, maintenance, and keeping in repair" of a drain as applied to this Act?

Subject No. 11—Levelling.

Max. Marks 50, Min. Marks 35.

1. (*a*) What is a level surface? (*b*) Give the difference between true and apparent levels.

2. Show that the difference between true and apparent levels vary as the square of the distance.

3. What is a "bench mark" and a "turning-point"? What is a "datum line"?

4. Show a form of book for entering levels taken in a field; enter thereon an imaginary course of levels, of at least fifteen stations, including benches, fore-sights, back-sights, intermediates, turning-points, and reduction of levels to a datum line.

5. Give a detailed statement of the procedure in taking levels in the field.

Subject No. 12—Principles of Evidence and Drawing Up of Affidavits.

Max. Marks 80, Min. Marks 30.

1. For what purposes are Ontario Land Surveyors empowered to take affidavits?

2. Give a case in which more than one witness is required to an affidavit taken by an Ontario Land Surveyor.

3. What should be done with an affidavit taken by an O. L. S. for the purpose of keeping it on record?

4. How would you first proceed to obtain evidence for a survey under instructions from the Commissioner of Crown Lands ?

5. In the case of a person refusing to give evidence, or produce documents, as to a boundary, how would you proceed to obtain the same ?

6. Give a form for drawing up an affidavit to establish the original position of an original post or monument.

NEW BY-LAWS.

By-Law No. 34. "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, Ontario Statutes, 1892. Chapter 34, viz., Henry Strange, Milton C. Schofield, William Robinson, Joseph Kirk, Charles Fraser, Joseph M. O'Cromwell, H. O. Wood, F. H. Lynch-Staunton, and E. C. Caddy." Passed by Council of Management 11th Nov., 1893. Ratified by Association at annual meeting, 1st March, 1894.

By-Law No. 35. "The annual fees to this Association, paid by candidates who are admitted at the November examination in each year shall cover all annual dues for the remainder of such current Association year and for the Association year following the same." Passed by Council of Management, 11th November, 1893. Ratified by Association at annual meeting, 1st March, 1894.

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 qualied 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 number 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.

LIST OF MEMBERS.

Names marked * have been granted exemption under ratified By-laws; and those marked †, under By-laws passed by Council since the annual meeting of the Association.

Abrey, George Brockitt ..... Toronto Junction.
Aylsworth, Charles Fraser, Sr. ... Madoc.
Aylsworth, Charles Fraser, Jr ..... Madoc.
Aylsworth, John Sidney ..... Selby, P. O. Box 23.
Aylsworth, William Robert ..... Belleville, P.O. Box 2.

Baird, Alexander ..... Leamington.
Barrow, Ernest George ..... Hamilton, City Hall.
Bazett, Edward ..... Burk's Falls.
Beatty, David ..... Parry Sound.
Beatty, Herbert John ..... Pembroke.
Beatty, Walter ..... Delta.
Bell, Andrew ..... Almonte.
Bell, James Anthony ..... St. Thomas.
Bigger, Charles Albert ..... Ottawa, 68 Daly ave.
Bolger, Francis ..... Penetanguishene.
Bolger, Thomas Oliver ..... Kingston, City Engineer's Office.
Bolton, Jesse Nunn ..... Toronto, 264 Major st.
Bolton, Lewis ..... Listowel.
Booth, Charles Edward Stuart .... Kingston, 196 Colborne st.
Bowman, Clemens Dersteine ..... West Montrose.
Bowman, Herbert Joseph ..... Berlin.
Bray, Edgar ..... Oakville.
Bray, Harry Freeman ..... Oakville.
Bray Samuel ..... Ottawa, Dept of Ind'n Affairs.
Brown, David Rose ..... Cornwall.
Brown, John Smith ..... Kemptville.
Browne, Harry John ..... Toronto, 17 Toronto st.
Browne, William Albert ..... Toronto, 17 Toronto st.
Burke, William Robert ..... Ingersoll.
Butler, Matthew Joseph ..... Napanee, P.O Box 359

Caddy, Cyprian Francis ..... Campbellford.
*Caddy, Edward C ..... Cobourg.
Caddy, John St. Vincent ..... Ottawa, 559 King st.
Cameron, Alfred John ..... Peterborough.
Campbell, Archibald William ..... St. Thomas.
Carre, Henry ..... Belleville, P.O. Box 203.
Carroll, Cyrus ..... Hamilton, 6½ James st. s.
Casgrain, Joseph Philippe Baby ... Morrisburg.

Cavana, Allan George.....Orillia.
†Cheesman, Thomas.....Mitchell.
Chipman, Willis .....Toronto, 103 Bay st.
Coad, Richard.....Glencoe.
Cozens, Joseph .....Sault Ste. Marie.
Creswicke, Henry.....Barrie.
*Cromwell, Joseph M. O.....Perth.

Davidson, Alexander.....Arkona.
Davidson, Walter Stanley .....Arkona.
Davis, Allan Ross.....Napanee.
Davis, John.....Alton.
Davis, William Mahlon .....Woodstock.
Deacon, Thomas Russ.....Rat Portage.
Deane, Michael .....Lindsay.
Deans, William James .....Oshawa.
DeGurse, Joseph.....Windsor, P.O. Box 167.
DeMorest, Richard Watson.....Sudbury.
Dickson, James.....Fenelon Falls.
Dobbie, Thomas William.....Tilsonburg.
Doupe, Joseph.....Winnipeg, Man., 411 Main st.

Ellis, Henry Disney.....Toronto, City Hall.
Esten, Henry Lionel .....Toronto, 157 Bay st.
Evans, John Dunlop.....Trenton.

Fair, John.....Brantford.
Fairbairn, Richard Purdum .....Toronto, 127 Major st.
Fairchild, Charles Court.....Brantford.
Farncomb, Frederick William....London, 213 Dundas st.
Fawcett, Thomas.....Ottawa, Dept. of Interior.
Fitton, Charles Edward.....Orillia, Drawer 31.
Fitzgerald, James William.....Peterborough, Box 333.
Flater, Frederick William.....Chatham.
Foster, Frederick Lucas.....Toronto, 157 Bay st.
Francis, John James.....Sarnia, Box 304.
*Fraser, Charles.....Wallaceburg.

Galbraith William .....Bracebridge.
Gamble, Killaly.....Toronto, 193 Bloor st. e.
Gardiner, Edward .....St. Catharines.
Gaviller, Maurice.....Collingwood, Box 773.
Gibbons, James .....Renfrew.
Gibson, George .....St. Catharines.
Gibson, Harold Holmes.....Willowdale.
Gibson, Peter Silas.....Willowdale.
Graydon, Aquila Ormsby .....London.
Griffin, Albert Dyke.....Woodstock, Box 612.

Hanning, Clement George.....Preston.

Hart, Milner.....Toronto, 103 Bay st.
Harvey, Thomas Alexander.....London, 1 Oxford st
Henderson, Eder Eli.....Henderson P.O., Maine.
Henry Frederick.....London, Albion Building.
†Hermon, Royal Wilkinson.....Rednersville.
Hewson, Thomas Ringwood.....Peterborough.
Hobson, Joseph.....Hamilton, G. T. Ry. Office.
Hopkins, Marshall Willard.....Hamilton, 28 James st. s.
Howitt, Alfred.....Gourock,
Hutcheon, James.....Guelph.

Innes, William Livingstone.....Peterborough.

James, Darrell Denman.....Toronto, 19 Richmond st. e.
James, Silas.....Toronto, 19 Richmond st. e.
Johnson, Robert Thornton.....Toronto, 131 Wellington st. w.
Jones, Charles Albert.....London, 213 Dundas st.
Jones, John Henry.....Sarnia.
Jones, Thomas Harry.....Brantford.

†Keefer, Thomas Coltrin.....Ottawa.
Kennedy, James Henry.....St. Thomas, P.O. Box 434.
Kippax, Hargreaves.....Huron, South Dakota.
*Kirk, Joseph.....Stratford.
Kirkpatrick, George Brownly....Toronto, Dept. of Crown Lands.
Klotz, Otto Julius.....Ottawa, Dept. of Interior.

Laird, James Steward.....Essex Centre.
Laird, Robert.....Toronto, City Hall.
Lendrum, Robert Watt.....Vankleek Hill.
Lewis, John Bower.....Ottawa, Brunswick House.
Lougheed, Aaron.....Port Arthur.
†Low, Nathaniel E.....Wiarton.
Lumsden, Hugh David.....Toronto, 63 Homewood ave.
*Lynch-Staunton, Francis H.....Hamilton.

Macdougall, Allan Hay.....Port Arthur.
MacKenzie, William Lyon.....Mattawa.
MacNabb, John Chisholm.....Chatham.
McAree, John.....Toronto, 86 King st. e.
†McCallum, James.....Rat Portage.
McCulloch, Andrew Lake.....Galt.
McDonell, Augustine.....Chatham, 4 & 5 Ebert's Block.
McDowall, Robert.....Owen Sound.
McEvoy, Henry Robinson.....St. Marys.
McFadden, Moses.....Neepawa, Man.
McFarlen, George Walter.....Toronto, Court House.
McGeorge, William Graham.....Chatham.
McGrandle, Hugh.....Huntsville.
McKay, Owen.....Windsor.

McKenna, John Joseph.....Dublin.
McLatchie, John.....Ottawa, 28 Stanley ave.
McLean, James Keachie.....Elora.
McLennan, Murdoch John .....Williamstown.
McLennan, Roderick.....Toronto, 115 Avenue rd.
McMullen, William Ernest.....Toronto, 7 Murray st.
McNab, John Duncan .....Owen Sound.
McPhillips, George.....Windsor, P.O. Box 556.
Malcolm, Sherman ....Blenheim.
Manigault, William Mazyck.....Strathroy, P.O. Box 300.
Marshall, James .....Holyrood.
Miles, Charles Falconer.....Toronto, 320 Spadina ave.
Moore, John Mackenzie.....London cor. Rich'd & Carling sts.
Moore, John Harrison .....Smith's Falls.
Moore, Thomas Alexander .... .London South.
Morris, James Lewis .....Pembroke.
Mountain, George Alphonse.....Ottawa.
Murdoch, William .....Port Arthur.
Murphy, Charles Joseph .....Toronto, 157 Bay st.

Newman, William .....Windsor, 57 Sandwich st.
Niven, Alexander .....Haliburton.

Ogilvie, John Henry .....W. Sup'r, Wis , 1810½ Tower ave.
Ogilvie, William.....Ottawa, Dept. of Interior.
O'Hara, Walter Francis .....Chatham.

Paterson, James Allison ... .Toronto, 23 Adelaide st. e.
Patten, Thaddeus James .....Little Current.
Pinhey, Charles Herbert .....Coteau Landing, Que.
Pope, Robert T.....Baysville.
Proudfoot, Hume Blake.....Toronto, 78 Con. Life Bdg.
Purvis, Frank .....Eganville.

Reid, James Hales .....Bowmanville.
Reilly, William Robinson..... Regina, Assa.
Ritchie, Nelson Thomas ....Kincardine.
Roberts, Vaughan Maurice .....New York, 137 Broadway.
Robertson, James .....Glencoe.
*Robinson, William.....London, 322 York st.
Roger, John.....Mitchell.
Rorke, Louis Valentine.....Sudbury.
Ross, George .....Welland.
Rubidge, Tom S.....Cornwall.
Russell, Alexander Lord .....Port Arthur.

Sanderson, Daniel Leavens .....Wilton.
Sankey, Villiers .....Toronto, City Hall.
Saunders, Bryce Johnston.....Brockville, P.O. Box 114.
Scane, Thomas .....Ridgetown.

*Schofield, Milton C.....Guelph.
Seager, Edmund.....Rat Portage.
Selby, Henry Walter.....Toronto, 408 Huron st.
Sewell, Henry DeQuincey.....Port Arthur.
Silvester, George Ernest .....Ringwood.
Sing, Josiah Gershom.....Meaford.
Smith, George.....Woodville.
Smith, Henry .....Toronto, Crown Lands Dept.
Speight, Thomas Bailey .....Toronto, Yonge St. Arcade.
Steele, Charles Edward.....Goderich.
Stewart, Elihu.....Collingwood.
Stewart, John .....Ottawa.
Stewart, Walter Edgar.....Aylmer.
*Strange, Henry .....Rockwood.

Tiernan, Joseph Martin.....Tilbury Centre.
Traynor, Isaac.....Dundalk.
Turnbull, Thomas.....Winnipeg, Man., C.P.R. Office.
Tyrrell, James Williams.....Hamilton, 42 St. James st. n.

Unwin, Charles .....Toronto, 157 Bay st.
Ure, Frederick John .....Woodstock.

VanBuskirk, William Fraser ....Stratford.
VanNostrand, Arthur J.....Toronto, Yonge St Arcade.

Wadsworth, Vernon Bayley.....Toronto, 103 Bay st
Walker, Alfred Paverley .....Toronto, C.P.Ry Eng. Office.
Wallace, Charles Hugh.....Hamilton.
†Walsh, Thomas W.....Simcoe.
Warren, James .....Walkerton, Box 190.
Watson, John McCormack .....Orillia, P.O Box 224.
Weatherald, Thomas .....Goderich, P.O. Box 273.
Wheelock, Charles Richard.....Orangeville.
Whitson, James Francis .....Toronto, Crown Lands Dept.
Wicksteed, Henry King .....Cobourg.
Wiggins, Thomas Henry .....Napanee.
Wilde, John Absalom.....Sault Ste. Marie
Wilkie, Edward Thomson.....Carleton Place.
Wilkins, Frederick William.....Peterborough, 372½ Water st.
Williams, David .....Kingston, 220 King st.
Winter, Henry.....Thornyhurst.
*Wood, Henry O.....Billings' Bridge.

Yarnold, William Edward.....Port Perry, P.O. Box 44.

REGISTERED AND WITHDRAWN,

Apsey, John Fletcher.....Baltimore, Md., 2125 N. Chas. st.

Bowman, Arthur Meyer .....Berlin.

Bowman, Leander Meyer.....Toronto, Medical Health Office.
Bowman, Franklin Meyer.....Berlin.
Burnet, Hugh .....Victoria, B.C.

Cambie, Henry John.....Vancouver, 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.

Edwards, George .....Thurso, Que

Fowlie, Albert.....Orillia.

Green, Thomas Daniel.....Ottawa, Dept. of Indian Affairs.
Galbraith, John .....Toronto, Sch. of Prac. Science.

Haskins, William .....Hamilton, 45 Wellington st. s.
Harris, John Walter.....Winnipeg, Assm't. Com. Dept.
Hermon, Ernest Bolton .....Vancouver, B.C.

Irwin, James M.....Peterborough.

Jephson, Richard Jermy .....Calgary, Alta.

Kains, Tom.....Victoria, B.C.

Livingstone, Thomas Chisholm ..Winnipeg, Man.

MacLeod, Henry Augustus F....Ottawa, 340 Cooper st.
MacPherson, Duncan.....Montreal, Que.
Magrath, Charles Alexander.....Lethbridge, Alta.

Pearce, William .....Calgary, Alta.
Pedder, James Robert .....Doon.
Ponton, Archibald William.....Regina, Assa

Reiffenstein, James H.....Peterborough.
Rogers, Richard Birdsall .....Ottawa, Dept. of Interior.
Ross, Joseph Edmund.....New Westminster, B.C.

Strathern, John .....Vancouver, B.C.
Sherman, Ruyter S.....Vancouver, B.C.
Simpson, George Albert.....Winnipeg, Man., N. P. & M. R'y.
Spry, William .....Toronto.
Stewart, Louis Beaufort.....Toronto, Sch. of Prac. Science.

Thomson, Augustus Clifford .....Kansas City., Mo.
Tracey, Thomas H .....Vancouver, B.C.

Vicars, John Richard Odlum ....Kamloops, B.C

Weekes, Abel Seneca .....Wetaskiwin, Alta.
Wheeler, Arthur Oliver .....New Westminster, B.C.
Willson, Alfred .....Toronto, 204 King st e.

SUMMARY.

Active members subject to dues	198
Active members exempted from dues	15
Withdrawn from practice	40
Dead	1
Total number enrolled since incorporation	254

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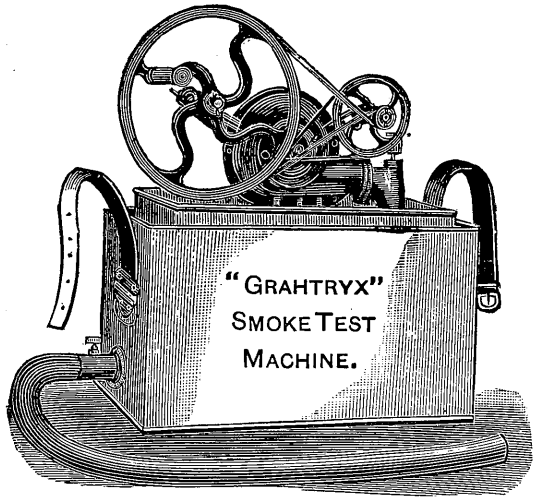

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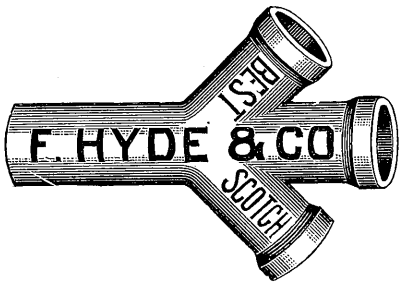

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CIRCULAR NO. 16

Association of Ontario Land Surveyors

Incorporated by Act of Parliament (Vic. 55, Chap. 34).

Office of Secretary-Treasurer
Room C, Yonge Street Arcade.

TORONTO, 15th September, 1894.

SIR,—At the Annual Meeting of the Association, in February last, upon the recommendation of the Land Surveying Committee, it was decided that a Circular asking for information on the following points should be sent to each member of the Association. You are requested to write your answers in the blank spaces for that purpose, and return the same to the office of the Secretary, by November 1st, as the Council will meet about that date.

(*1*) Give the names of all practising Land Surveyors, in the county in which you reside.

(*2*) Give the names of all persons whom you know to be practising land surveying without license under the O. L. S. Act.

(*3*) Name any Municipal Surveys in your county that have been confirmed by the Commissioner of Crown Lands during the present year.

(*4*) Give any decisions in cases of importance that have been given at sittings of the High Court, relating to the Survey or Drainage acts.

Your obedient servant,

A. J. VANNOSTRAND,
Secretary-Treasurer

(*1*)

(*2*)

(*3*)

(*4*)

"SURVEYORS' REGISTER," JANUARY 1, 1894

NAME	RESIDENCE, P.O. ADDRESS	Qualifications and Additions
Abrey, George Brockitt	Toronto Junction	Town Engineer
Aylsworth, Charles Fraser, Sr.	Madoc	
Aylsworth, Charles Fraser, Jr.	Madoc	
Aylsworth, John Sidney	Selby	
Aylsworth, William Robert	Belleville	
Baird, Alexander	Leamington	
Barrow, Ernest George	Hamilton	
Bazett, Edward	Burk's Falls	
Beatty, David	Parry Sound	
Beatty, Herbert John	Pembroke	
Beatty, Walter	Delta	
Bell, Andrew	Almonte	
Bell, James Anthony	St. Thomas	
Bigger, Charles Albert	Ottawa, 68 Daly ave.	
Bolger, Francis	Penetanguishene	
Bolger, Thomas Oliver	Kingston	City Engineer
Bolton, Jesse Nunn	Toronto, 264 Major st.	
Bolton, Lewis	Listowel	
Booth, Charles Edward Stuart	Kingston, 196 Colborne st.	
Bowman, Clemens Dersteine	West Montrose	
Bowman, Herbert Joseph	Berlin	Town Engineer
Bray, Edgar	Oakville	
Bray, Harry Freeman	Oakville	
Bray, Samuel	Ottawa, Dept. of Ind'n Affairs	
Brown, David R.	Cornwall	
Brown, John Smith	Kemptville	
Browne, Harry John	Toronto, 17 Toronto st.	
Browne, William Albert	Toronto, 17 Toronto st.	
Burke, William Robert	Ingersoll	
Butler, Matthew, Joseph	Napanee, P.O. Box 359	
Caddy, Cyprian Francis	Campbellford	
Caddy, Edward C.	Cobourg	
Caddy, John St. Vincent	Ottawa, 559 King st.	
Cameron, Alfred John	Peterborough	
Campbe l, Archibald William	St. Thomas	
Carre, Henry	Belleville	
Carroll, Cyrus	Hamilton, 6½ James st. s.	
Casgrain, Joseph Philipe Bâby	Morrisburg	
Cavana, Allan George	Orillia	
Cheesman, Thomas	Mitchell	
Chipman, Willis	Toronto, 103 Bay st.	
Coad, Richard	Glencoe	
Cozens, Joseph	Sault Ste. Marie	
Creswicke, Henry	Barrie	
Cromwell, Joseph M. O.	Perth	
Davidson, Alexander	Arkona	
Davidson, Walter Stanley	Arkona	
Davis, Allan Ross	Napanee	
Davis, John	Alton	
Davis, William Mahlon	Woodstock	
Deacon, Thomas Russ	Rat Portage	
Deane, Michael	Lindsay	
Deans, William James	Oshawa	
DeGurse, Joseph	Windsor, P.O. Box 167	
DeMorest, Richard Watson	Sudbury	

NAME	RESIDENCE, P.O. ADDRESS	Qualifications and Additions
Dickson, James	Fenelon Falls	Inspector of Crown Land Surveys
Dobbie, Thomas William	Tilsonburg	
Doupe, Joseph	Winnipeg, Man., 411 Main st.	
Ducker, William A.	Winnipeg, Man., 314 McWilliam st.	
Ellis, Henry Disney	Toronto, City Hall	
Esten, Henry Lionel	Toronto, 157 Bay st.	
Evans, John Dunlop	Trenton	Chief Engineer Central Ont. Ry.
Farncomb, Frederick William	London, 213 Dundas st.	
Fairbairn, Richard Purdom	Toronto, 127 Major st.	Surveyor for Dept. of Pub. Works
Fawcett, Thomas	Ottawa, Dept. of Interior	Dom. Topographical Surveyor
Fitton, Charles Edward	Orillia	
Fitzgerald, James William	Peterborough, Box 333	
Flater, Frederick William	Chatham	
Foster, Frederick Lucas	Toronto, 157 Bay st.	
Fowlie, Albert	Orillia	
Francis, John James	Sarnia	
Fraser, Charles	Wallaceburg	
Galbraith, William	Bracebridge	
Gamble, Killaly	Toronto, 193 Bloor St. e.	
Gardiner, Edward	St. Catharines	
Gaviller, Maurice	Collingwood, Box 773	
Gibbons, James	Renfrew	
Gibson, George	St. Catharines	
Gibson, Harold Holmes	Willowdale	
Gibson, Peter Silas	Willowdale	Engineer for Township of York
Graydon, Aquila Ormsby	London	
Griffin, Albert Dyke	Woodstock	
Hanning. Clement George	Preston	
Hart, Milner	Toronto, 103 Bay st.	
Harvey, Thomas Alexander	London	
Haskins, William	Hamilton, 45 Wellington st. s.	
Henderson, Eder Eli	Henderson P.O., Maine	
Henry, Frederick	London, Albion Building	
Hermon, Royal Wilkinson	Rednersville	
Hewson, Thomas Ringwood	Peterborough	
Hobson, Joseph	Hamilton. G. T. Ry. Office	Chief Eng. Southern Div. G.T.R.
Hopkins, Marshall Willard	Hamilton, 28 James st. s.	
Howitt, Alfred	Gourock	
Hutcheon, James	Guelph	
Innes, William Livingstone	Peterboro', Can. Gen. El'c Co.	
James, Darrell Denman	Toronto, 19 Richmond st. e.	
James, Silas	Toronto, 19 Richmond st. e.	
Johnson, Robert Thornton	Toronto, 310 College st.	
Jones, Charles Albert	London, 213 Dundas st.	
Jones, John Henry	Sarnia	
Jones, Thomas	Brantford	City Engineer
Keefer, Thomas Coltrin	Ottawa	
Kennedy, James Henry	St. Thomas, P.O. Box 434	
Kippax, Hargreaves	Huron, South Dakota	Assistant Surveyor General
Kirk, Joseph	Stratford	
Kirkpatrick, George Brownly	Toronto, Dept. of Crown Lands	Director of Surveys
Klotz, Otto Julius	Ottawa, Dept. of Interior	Dom. Topographical Surveyor

NAME	RESIDENCE, P.O. ADDRESS	Qualifications and Additions
Laird, James Steward	Essex Centre	
Laird, Robert	Toronto, City Hall	
Lendrum, Robert Watt	Vankleek Hill	
Lewis, John Bower	Ottawa, Brunswick House	
Lougheed, Aaron	Port Arthur	
Low, Nathaniel E.	Wiarton	
Lumsden, Hugh David	Toronto, 63 Homewood ave.	
Lynch-Staunton, Francis H.	Hamilton	
Macdougall, Allan Hay	Port Arthur	
MacKenzie, William Lyon	Mattawa	
MacNabb, John Chisholm	Chatham	
McAree, John	Toronto, 86 King st. e.	Dom. Topographical Surveyor
McCallum, James	Rat Portage	
McCulloch, Andrew Lake	Galt	
McDonell, Augustine	Chatham	
McDowall, Robert	Owen Sound	Town Engineer
McEvoy, Henry Robinson	St. Marys	
McFadden, Moses	Neepawa, Man.	
McFarlen, George Walter	Toronto, Court House	
McGeorge, William Graham	Chatham	
McGrandle, Hugh	Huntsville	
McKay, Owen	Windsor	
McKenna, John Joseph	Dublin	
McLatchie, John	Ottawa, 28 Stanley ave.	
McLean, James Keachie	Elora	
McLennan, Murdoch John	Williamstown	
McMullen, William Ernest	Toronto, 7 Murray st.	
McNab, John Duncan	Owen Sound	
McPhillips, George	Windsor, P.O. Box 556	
Malcolm, Sherman	Blenheim	
Manigault, William Mazyck	Strathroy, P.O. Box 300	
Marshall, James	Holyrood	
Miles, Charles, Falconer	Toronto, 320 Spadina ave.	
Moore, John Mackenzie	London, Richmond & Carling	
Moore, John Harrison	Smith's Falls	
Moore, Thomas Alexander	London South	
Morris, James Lewis	Pembroke	
Mountain, George Alphonse	Ottawa	
Murdoch, William	Port Arthur	
Murphy, Charles Joseph	Toronto, 157 Bay st.	
Newman, William	Windsor, 57 Sandwich st.	City Engineer
Niven, Alexander	Haliburton	
Ogilvie, William	Ottawa, Dept. of Interior	
O'Hara, Walter Francis	Chatham	
Paterson, James Allison	Toronto, 23 Adelaide st. e.	
Patten, Thaddeus James	Little Current	
Pinhey, Charles Herbert	Coteau Landing, P.Q.	
Pope, Robert T.	Baysville	
Proudfoot, Hume Blake	Toronto, 78 Con. Life Bdg.	
Purvis, Frank	Eganville	
Reid, James Hales	Bowmanville	F. G. S.
Reilly, William Robinson	Regina, Assa.	
Ritchie, Nelson Thomas	Kincardine	
Roberts, Vaughan Maurice	Toronto, 11 Peter st.	
Robertson, James	Glencoe	
Robinson, William	London	

NAME	RESIDENCE, P.O. ADDRESS	Qualifications and Additions
Roger, John	Mitchell	
Rorke, Louis Valentine	Sudbury	
Ross, George	Welland	
Rubidge, Tom S.	Cornwall	Asst. Eng. Dept. Rys. & Canals
Russell, Alexander Lord	Port Arthur	
Sanderson, Daniel Leavens	Wilton	
Sankey, Villiers	Toronto, City Hall	City Surveyor
Saunders, Bryce Johnston	Brockville, P.O. Box 114	
Scane, Thomas	Ridgetown	
Schofield, Milton C.	Guelph	
Seager, Edmund	Rat Portage	
Sewell, Henry DeQuincey	Port Arthur	A. M. I. C. E.
Silvester, George Ernest	Ringwood	
Sing, Josiah Gershom	Meaford	
Smith, George	Woodville	
Smith, Henry	Toronto, Crown Lands Dept.	Supt. of Colonization Roads
Speight, Thomas Bailey	Toronto, Yonge St. Arcade	
Steele, Charles Edward	Goderich	
Stewart, Elihu	Collingwood	
Stewart, John	Ottawa	
Stewart, Walter Edgar	Aylmer	
Strange, Henry	Rockwood	
Thomson, Augustus Clifford	Kansas City, Mo.	
Tiernan, Joseph Martin	Tilbury Centre	
Traynor, Isaac	Dundalk	
Turnbull, Thomas	Winnipeg, Man., C.P.R. Office	
Tyrrell, James Williams	Hamilton, 42 James st. n.	
Unwin, Charles	Toronto, 157 Bay st.	
Ure, Frederick John	Woodstock	
VanBuskirk, William Fraser	Stratford	
VanNostrand, Arthur J.	Toronto, Yonge St. Arcade	
Wadsworth, Vernon Bayley	Toronto, 103 Bay st.	
Walker, Alfred Paverley	Toronto, C. P. Ry. Eng. Office	
Wallace, Charles Hugh	Hamilton	
Walsh, Thomas W.	Simcoe	
Warren, James	Walkerton	Depy. Registrar County of Bruce
Watson, John McCormack	Orillia, P.O. Box 224	
Weatherald, Thomas	Goderich, P.O. Box 273	
Weekes, Abel Seneca	Clinton	
Wheelock, Charles Richard	Orangeville	County Treasurer
Whitson, James Francis	Toronto, Crown Lands Dept.	
Wicksteed, Henry King	Cobourg	
Wiggins, Thomas Henry	Napanee	
Wilde, John Absalom	Sault Ste. Marie	
Wilkie, Edward Thomson	Carleton Place	
Wilkins, Frederick William	Peterborough, 372½ Water St.	Dom. Topographical Surveyor
Williams, David	Kingston	
Winter, Henry	Thornyhurst	
Wood, Henry O.	Billings' Bridge	
Yarnold, William Edward	Port Perry, P. O. Box 44	