D. W. Smith

Surgn.

Upper Canada

1792-1804.

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 Fifty-fourth 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

Lt. Governor
Upper Canada
1792-1804.

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ONTARIO LAND SURVEYORS

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PATRONIZE OUR ADVERTISERS.

NOTICES.

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

Members 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.

ASSOCIATION OF
ONTARIO LAND SURVEYORS

(Incorporated 1892).

ORGANIZED 23RD FEBRUARY, 1886.

Officers for 1894-95.

PRESIDENT.

M. J. Butler, O.L.S., Napanee.

VICE-PRESIDENT.

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

CHAIRMAN OF COUNCIL.

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

SECRETARY-TREASURER.

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

COUNCILLORS.

Hon. A. S. Hardy, Commissioner of Crown Lands.
Villiers Sankey, Toronto } For 3 years.
H. J. Bowman, Berlin }
G. B. Kirkpatrick, Toronto } For 2 years.
A. Niven, Haliburton }
P. S. Gibson, Willowdale } For 1 year.
Willis Chipman, Toronto }

AUDITORS.

F. L. Foster, O.L.S., Toronto.
H. B. Proudfoot, O.L.S., Toronto.

BANKERS.

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

BOARD OF EXAMINERS.

V. Sankey, Toronto (Chairman).
G. B. Kirkpatrick, Toronto } Appointed by Lieut-Gov.
M. J. Butler, Napanee } in Council.
M. Gaviller, Collingwood } For 3 years, appointed
R. Coad, Glencoe } by Council.
P. S. Gibson, Willowdale } For 1 year, appointed
A. Niven, Haliburton } by Council.

STANDING COMMITTEES FOR 1894-95.

LAND SURVEYING.—T. B. Speight (Chairman), C. E Fitton, Wm. Galbraith, J. L. Morris, L. V. Rorke, B. J. Saunders, J. M. Tiernan, I. Traynor, C. Unwin.

DRAINAGE.—Geo. Ross (Chairman), A. Baird, D. R. Brown, W. R. Burke, A. G. Cavana, R. Coad, C. A. Jones, C. F. Miles, H. Winter.

ENGINEERING.—T. H. Jones (Chairman), G. B. Abrey, A. W. Campbell, W. M. Davis, J. McAree, R. McDowall, O. McKay, J. Robertson, H. K. Wicksteed.

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

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

TOPOGRAPHICAL SURVEYING —Willis Chipman (Chairman), J. P. B. Casgrain, J. Cozens, J. Dickson, T. Fawcett, O. J. Klotz, W. Ogilvie, A. L. Russell, E. Stewart, J. W. Tyrrell.

SPECIAL COMMITTEES.

POLAR RESEARCH.—Willis Chipman (Chairman), W. Ogilvie, O. J. Klotz, J. W. Tyrrell, L. B. Stewart, M. J. Butler, J. McAree.

STANDARD MEASURES OF LENGTH —G. B. Abrey (Chairman), A. Niven, W. R. Burke, M. W. Hopkins, J. McAree, M. Gaviller.

BIOGRAPHY.—G. B. Kirkpatrick (Chairman), W. Chipman, H. L. Esten, W. R. Aylsworth.

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. McArce, 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 Baiances 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.

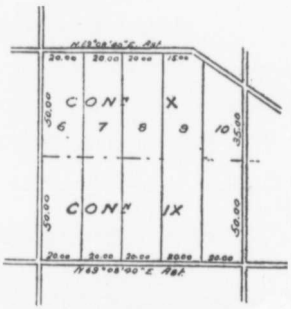
A number of questions, as to field work, have been submitted; said questions, with decisions by your Committee, are annexed. We recommend all to aid heartily this important department.

All of which is respectfully submitted.

M. GAVILLER,
Chairman.

QUESTION DRAWER.

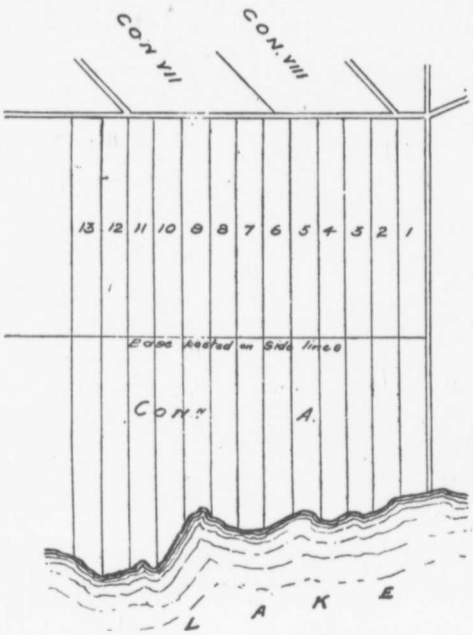
FIG. I



Question 1.—How would you establish the blind line across lots 9 and 10, between concessions IX. and X.?

Answer.—Divide proportionally.

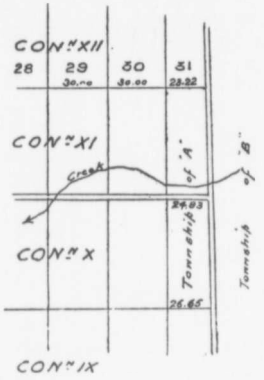
FIG. 2



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.?

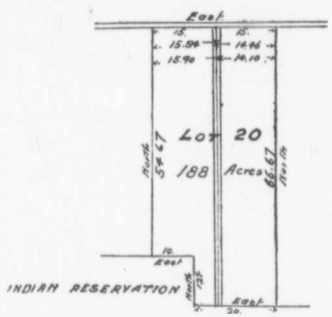
In the original survey, post was planted in Line Cons. X and XI. at Lots 28 and 29; and the surveyor continued:—"1.70 links to a creek trend south-west, and large open marsh with deep water: so much so, that it is impossible to run this line any further through."

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.

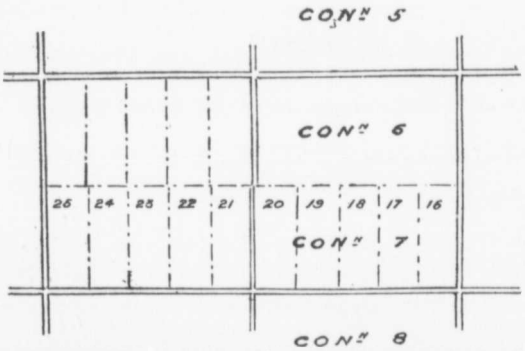
No. 2—That the dividing line should divide the 188 acres in proportion to the quantity mentioned in the respective deeds of conveyance to B and C which would give B 96-41 acres, and C 91-59 acres.

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 re port 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 itselt, 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; would 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,

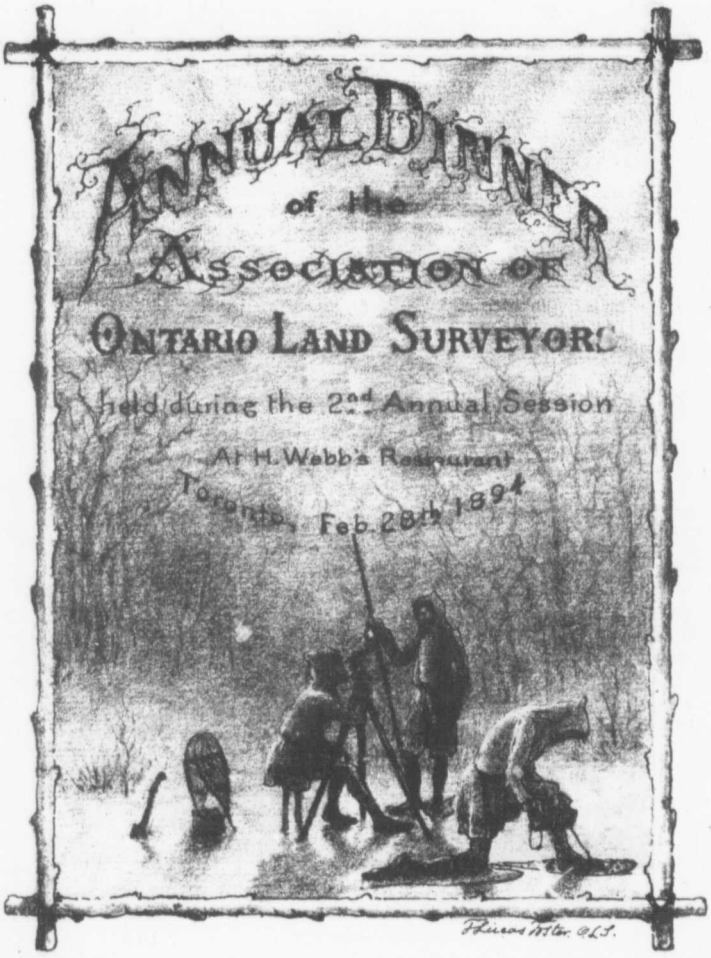
H. L. ESTEN,
Chairman.

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

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 plaçe 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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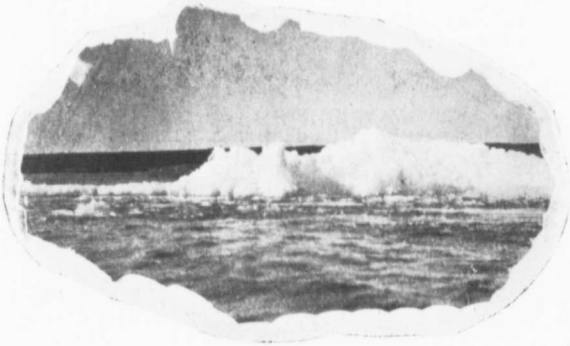
MR. J. W. TYRRELL IN ESKIMO GARB.



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 1½ 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.

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

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.

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"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. $\$1 \times (1.05)^{10} + 2 \times (105)^{10} + \$3(1.05)^{10} = \$9.77\frac{1}{2}$.

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.

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

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.

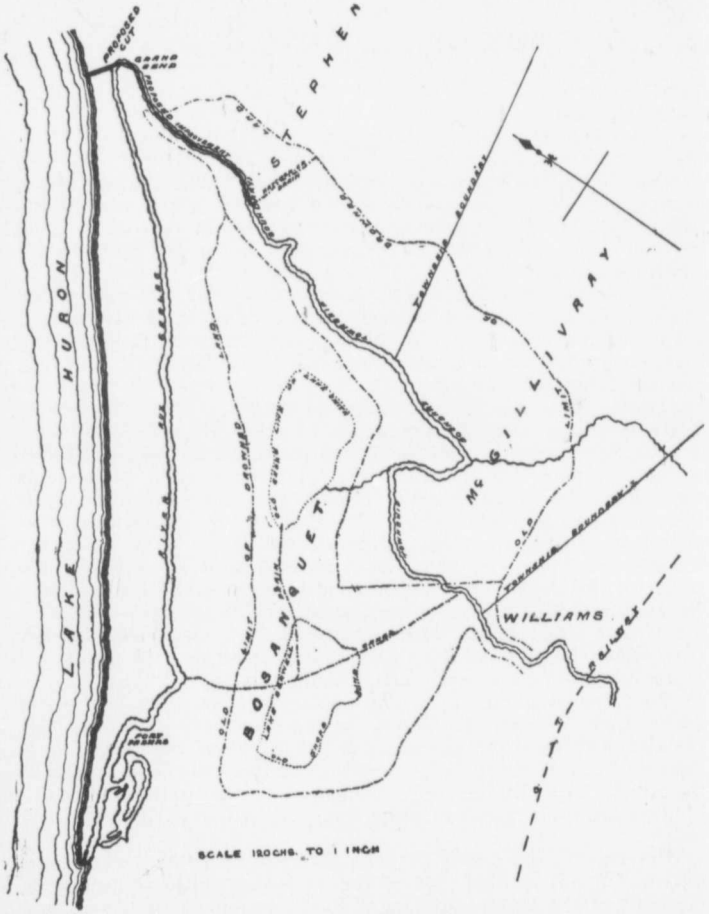
Taking its rise in the Township of Hibbert, in the County of Perth, the River Aux Sables finds its way by a crooked course some seventy miles long, through parts of the Counties of Huron, Middlesex and Lambton to its outlet into Lake Huron at a point some thirty-five miles in a staight line from its 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 10⅔c... ..	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.

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

LITTLE BEAR CREEK DRAIN.

LETTER FROM W. G. McGEORGE, O.L.S.

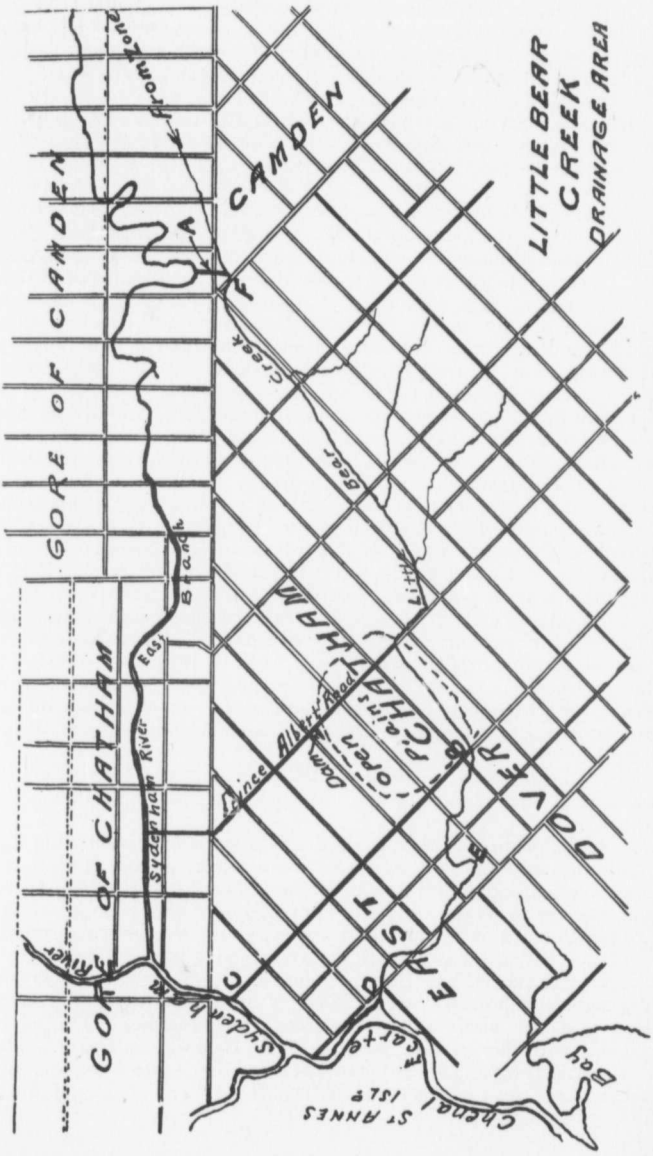
LITTLE BEAR CREEK takes its rise in the township of Zone, in the county of Kent, and running nearly parallel to the River Thames and River Sydenham, makes its outlet in the Chenal Ecarte, an outlet of the River St. Clair. After leaving Zone it passes through the townships of Camden, Chatham and Dover 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


LITTLE BEAR CREEK DRAINAGE AREA
GORE OF CHATHAM
GORE OF CAMDEN
CAMDEN
CHATHAM
DOVER
EAST
POINT
Sydenham River
Bear Creek
Little Bear
Dam
Prince Albert Road
Chenal Ecarté
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.

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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.

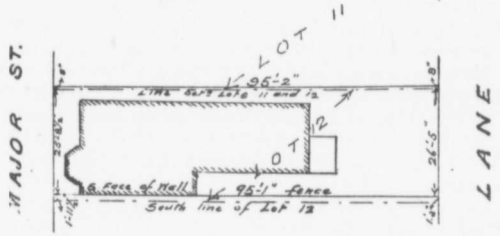
It is of course granted that astronomical bearings are much to be preferred to any other, but, unfortunately, this fact is not recognized by the public, and therefore a surveyor who may be so desirous of obtaining perfection in his plan and descriptions as to take an astronomical observation may with 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:



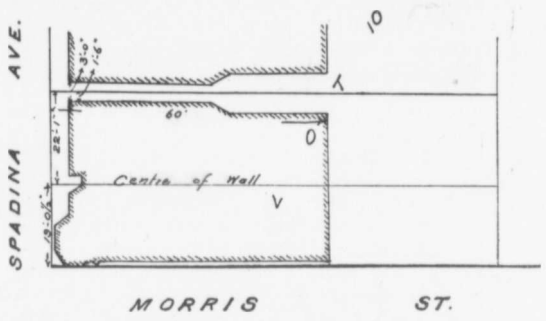
Commencing at a point in the easterly limit of Major street, distant 1 foot 11½ inches, measured northerly along the same from the southerly limit of the said lot 12, said point being in the westerly production of the southerly face of the southerly wall of the dwelling now known as No. 3 Major street; 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.

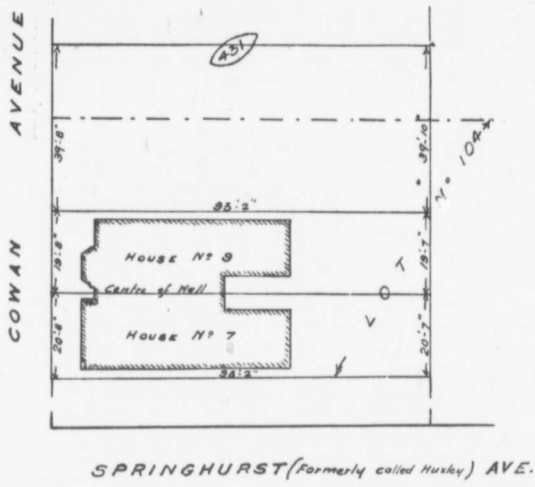
Together with a right of way at all times, in common with others entitled thereto, over a strip of land 1 foot 6 inches in width, immediately adjoining the northerly limit of the hereinbefore described parcel and extending easterly from Spadina avenue to a depth of 60 feet, and *reserving* a right of 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 any 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 57½ 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.

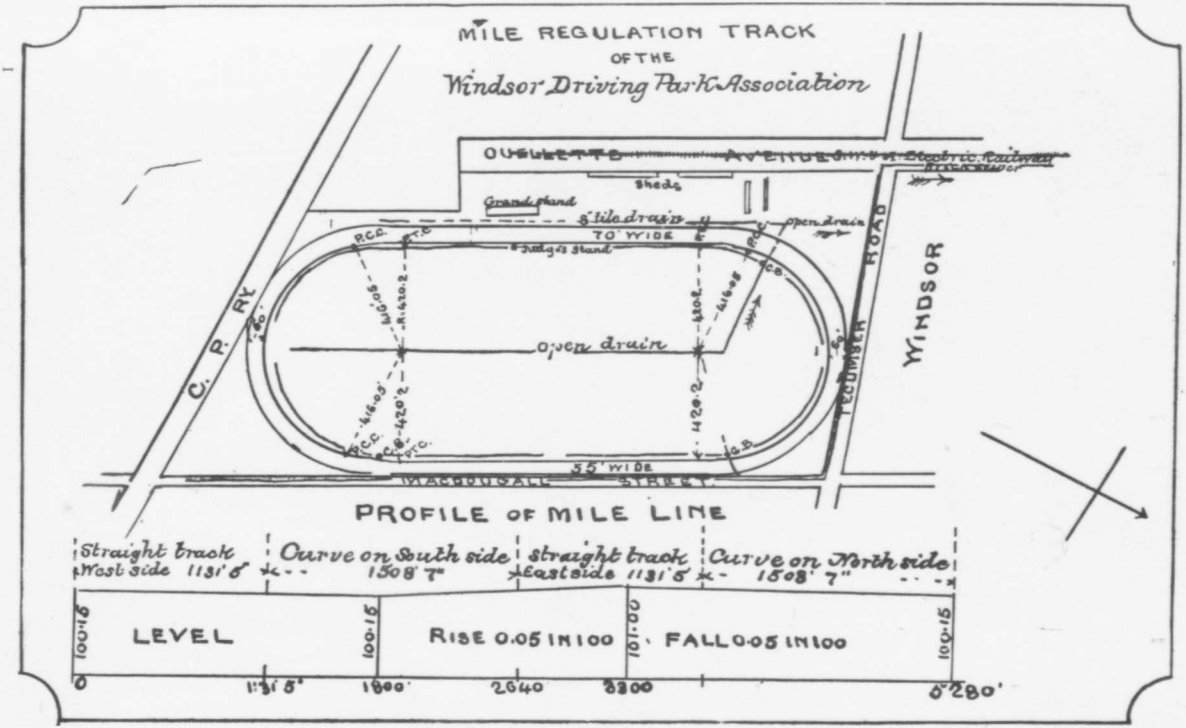
The result of his investigations and enquiries led him to recommend a regulation mile track, with easement or transition curves at the beginning and end of each of the turns, and with grades, widths of track, etc., as set forth in this paper, as the best form of track to build, which recommendations 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 ¼ 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 × 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.

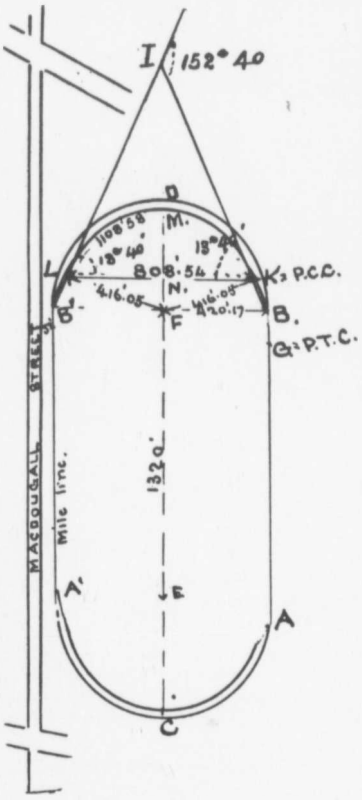
In staking out the track on the ground the mile line was first located, stakes being planted 100 feet apart on the tangents and 25 feet apart on curves, and the inside and outside lines of the course


MILE REGULATION TRACK
OF THE
Windsor Driving Park Association
OUELLETTE AVENUE
Sheds
Grand stand
8" tile drain
open drain
70' WIDE
Judge's Stand
C. P. RY.
WINDSOR
TECUMSEH ROAD
open drain
55' WIDE
MACDOUGALL STREET
PROFILE OF MILE LINE
Straight track West side 1131' 6"
Curve on South side 1508' 7"
Straight track East side 1131' 6"
Curve on North side 1508' 7"
LEVEL
RISE 0.05 IN 100
FALL 0.05 IN 100
100.15
101.00
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 ;

$$\tfrac{1}{2}\,D = \frac{50}{420.17} = .1189.$$

$\tfrac{1}{2}\,D = 6^\circ 50' =$ deflection angle for a chord of 100′.

$D = 13^\circ 40' =$ central angle for a chord of 100′ feet.

As the number of minutes in $180^\circ = 10800$, and in $13^\circ 40' = 820'$, 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 = $\frac{2\ \text{II}\ R' \times 152°40}{360} = 1108.58$.

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 $= \frac{7}{12}$ 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.

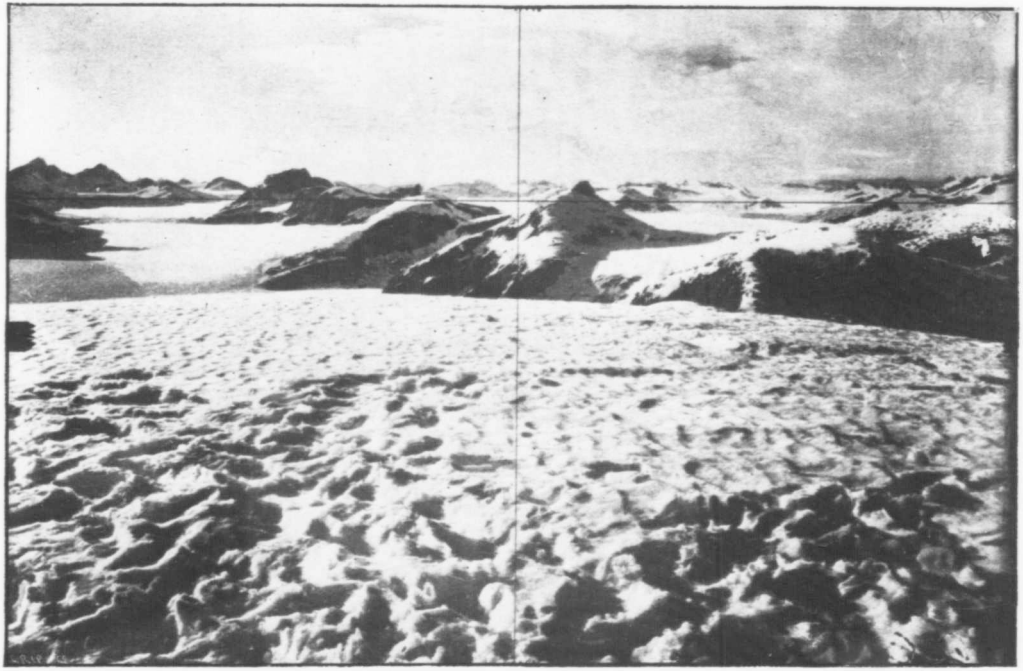
The stables, which are not yet all completed, will accommodate about 150 horses.

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.

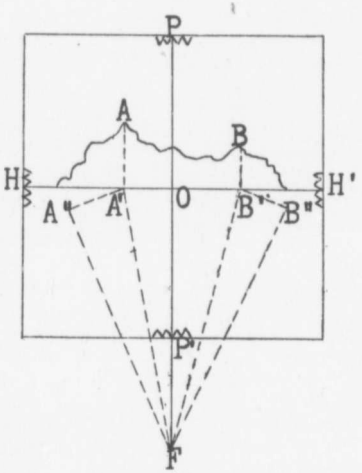


Figure 1

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

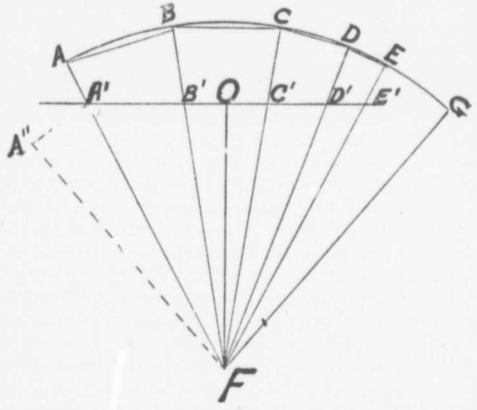


Fig. 2.

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.	By Purchase.			To Whom Granted.												
	Park Lots, to whom gr'nted	To D. W. Smith		Town Lots.			Heads of Families.				Children of Hon. D. W Smith.					
Township.	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.	Total number of Acres.
Ameliasburgh	....	....	....	....	....	....	.....	600	.....	.....	.....	.....	.....	.....	1200	1800
Ancaster	....	....	....	....	....	....	.....	.....	.....	....	1184	1200	1200	.....	.....	3584
Charlotteville	....	....	....	....	....	....	.....	200	.....	.....	.....	.....	.....	.....	.....	200
Crowland	....	....	....	....	....	....	200	.....	.....	.....	.....	.....	.....	.....	.....	200
Dorchester	....	....	....	....	....	....	.....	.....	$120\frac{6}{20}$	.....	.....	.....	.....	.....	.....	$120\frac{6}{20}$
Dunwick	....	....	....	....	....	....	.....	.....	150	.....	.....	.....	.....	.....	.....	150
Harwich	....	..	....	....	....	....	.....	.....	$199\frac{18}{20}$	.....	.....	.....	.....	.....	.....	$199\frac{18}{20}$
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	$6\frac{8}{20}$	400	1	1	1	.....	.....	$407\frac{2}{20}$	.....	.....	.....	.....	.....	.....	$1016\frac{8}{20}$
Total number of acres	200	$6\frac{8}{20}$	400	5	1	1	5000	1200	6000	1200	1200	1200	1200	1200	1200	$2001\frac{8}{20}$

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: $969\frac{19}{23}$.

No. 3. Express the following improper fractions as whole numbers, $\frac{7}{14}\frac{6}{8}$, $\frac{1}{10}\frac{0}{0}\frac{0}{1}$.

No. 4. Multiply $\frac{1}{17}$ by 9, 3, 23, 47.

No. 5. Reduce the following compound fraction to a simple one, $\frac{9}{11}$ of $\frac{7}{11}$ of $\frac{1}{18}$.

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, $\bar{5}.3468541$, $\bar{3}.2685427$. 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″.

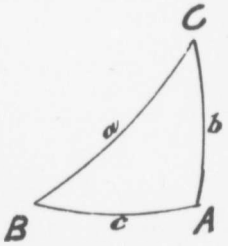
3. Give the rules for solving plane triangles. (*a*) Given two sides and an angle opposite one side. (*b*) Given two sides and the included angle. (*c*) Given three sides. Give proofs of rules.

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 $(x^{\frac{3}{4}}\times x^{\frac{1}{4}})^{1\frac{1}{2}}$. Find the product of $\left(\frac{ay}{x}\right)^{\frac{1}{2}}$, $\left(\frac{bx}{y^2}\right)^{\frac{1}{3}}$ and $\left(\frac{y^2}{a^2b^2}\right)^{\frac{1}{2}}$.

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.

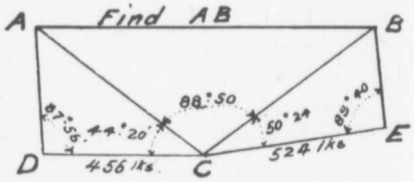
7. When are quantities said to be in (*a*) arithmetical progression; (*b*) geometrical progression? What is the rule for finding the sum of any number of terms in an arithmetical progression when "*a*" equals first term, "*l*" equals last term, "*s*" equals sum, and "*n*" equals number of terms. Sum to 21 terms $\frac{1}{9}, \frac{2}{9}, \frac{4}{9}$. 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 "*z*" 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.

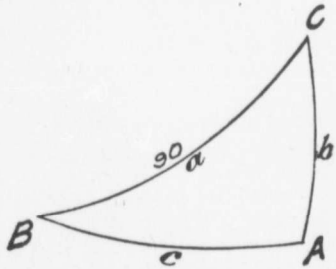
4. By the centesimal mode of measuring angles, find the number of grades, minutes and seconds in the following angle: 300° 15′ 58″.

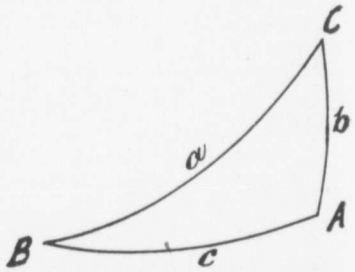
5. Give Napier's rules of circular parts for solving spherical triangles, and prove the same.

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?

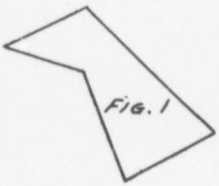
19. Explain the use of the blow-pipe and the structure of the parts of the flame.

20 Give the meanings of the terms "electro-positive," and "electro-negative," and state how developed.

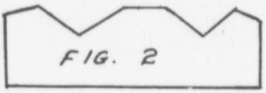
21. Explain the following terms, illustrating each by one or two examples: "Native substances," "oxide," "sulphide," "silicate," "carbonate."

Group No. 4—Mensuration of Superficies and Laying Out and Dividing Land.

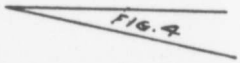
Max. Marks 150, Min. Marks 75.



1. Give the method and formula required for finding area of figures given by use of chain alone for measurement.

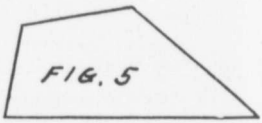


2. Explain the method of finding the area of the figure given by latitude and departure.



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.

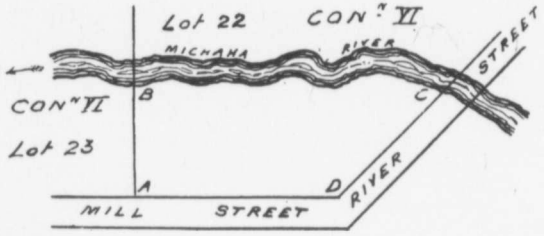


Subject No. 5—Descriptions by Metes and Bounds.

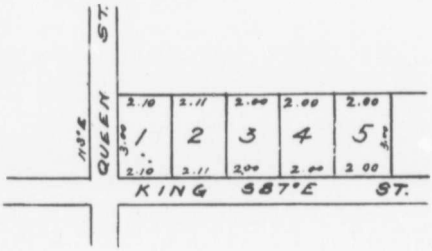
Max. Marks 100, Min. Marks 75.

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 qualified Land Surveyors for Ontario for a period of not less than 35 years prior to July 1st, 1892, are hereby placed on the list of registered Surveyors for Ontario, and are exempt from the payment of further dues under the authority of sub-section 4 of section 10, Chapter 34, Ontario Statutes 1892, viz., Thomas Coltrin Keefer, Nathaniel Edward Low, Thomas Cheesman, James McCallum and Thomas W. Walsh." Passed by Council of Management, 4th April, 1894.

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

By-Law No. 38. "Whereas it has been recommended by the Board of Examiners that the minimum marks in the subject of levelling

be reduced from 40 to 35, it is therefore hereby enacted that the minimum number of marks required to be taken by each successful candidate in the subject of levelling shall be 35 instead of 40 as set forth in By-law 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 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.
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