THE HON. SAMUEL PROUDFOOT HURD,
Surveyor-General for Upper Canada, 1830.

No. 12

PROCEEDINGS

OF THE

ASSOCIATION

OF

Ontario Land Surveyors

At its Fifth Meeting since Incorporation

HELD AT

TORONTO

23rd, 24th and 25th February

1897

Being the Twelfth Annual Meeting of the Association of Land Surveyors for Ontario.

The Sixth Annual Meeting of the Incorporated Association will be held in Toronto, commencing on Tuesday, 22nd February, 1898.

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

NOTICES.

Members and others can be supplied with copies of the Proceedings for 1886, 1887, 1888, 1889, 1891, 1892, 1893, 1894 or 1895, by remitting fifty cents to the Secretary for each copy required.

Extra copies of Mr. Esten's "Head Notes of Reported Land Cases" have been printed for the Association, and may be obtained from the Secretary at a cost of fitfy cents.

Members are invited to inspect the many valuable contributions which have been received in the Repository during the past year.

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PATRONIZE OUR ADVERTISERS.

PREFACE.

To the Members of the Association of Ontario Land Surveyors :

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

We are happy to say that much zeal and earnestness has been exhibited by the members of the various committees, and we look for still more during the current year.

Respectfully submitted on behalf of the Council,

A. J. VANNOSTRAND,
Secretary.

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ASSOCIATION OF

ONTARIO LAND SURVEYORS

(Incorporated 1892).

Organized 23rd February, 1886

Officers for 1897-98

PRESIDENT.

T. Harry Jones, O.L.S., Brantford.

VICE-PRESIDENT.

P. S. Gibson, O.L.S., Willowdale.

CHAIRMAN OF COUNCIL.

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

SECRETARY-TREASURER.

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

MEMBERS OF COUNCIL.

Hon. J. M. Gibson, Toronto.	
Villiers Sankey, Toronto,	For 3 years.
J. W. Tyrrell, Hamilton,	
Geo. B. Kirkpatrick, Toronto,	For 2 years.
Alex. Niven, Haliburton,	
F. L. Foster, Toronto,	For 1 year.
J. L. Morris, Pembroke,	

AUDITORS.

H. L. Esten, Toronto.
A. R. Davis, Wabigoon.

BANKERS.

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

BOARD OF EXAMINERS.

Villiers Sankey, Toronto, Chairman.

M. J. Butler, Napanee,
Geo. B. Kirkpatrick, Toronto, } Appointed by Lieut.-Gov. in Council.

P. S. Gibson, Willowdale,
Alex. Niven, Haliburton, } For 2 years, appointed by Council of Management.

M. Gaviller, Collingwood,
A. J. VanNostrand, Toronto, } For 1 year, appointed by Council of Management.

STANDING COMMITTEES, 1897-98.

LAND SURVEYING.—M. Gaviller (Chairman), C. F. Aylsworth, Jr., C. A. Bigger, A. R. Davis, John Fair, C. E. Fitton, Wm. Galbraith, H. H. Gibson.

DRAINAGE.—W. G. McGeorge (Chairman), Jos. DeGurse, C. C. Fairchild, J. S. Laird, O. McKay, Jas. Robertson, George Smith

ENGINEERING.—A. W. Campbell (Chairman), T. O. Bolger, Jas. Hutcheon, V. M. Roberts, B. J. Saunders, W. F. VanBuskirk, A. P. Walker, T. H. Wiggins.

ENTERTAINMENT.—A. P. Walker (Chairman), R. P. Fairbairn, P. S. Gibson, C. J. Murphy, J. F. Whitson.

PUBLICATION.—Killaly Gamble (Chairman), H. J. Browne, H. L. Esten, H. H. Gibson, C. J. Murphy.

TOPOGRAPHICAL SURVEY.—Otto J. Klotz (Chairman), G. B. Abrey, M. J. Butler, Thos Fawcett, John McAree, L. B. Stewart, F. W. Wilkins.

SPECIAL COMMITTEES.

POLAR RESEARCH.—J. W. Tyrrell (Chairman), Willis Chipman, William Ogilvie, J. A Paterson, L. B. Stewart, J. F. Whitson.

REPOSITORY AND BIOGRAPHY.—H. L. Esten (Chairman), Willis Chipman, P. S Gibson, G. B. Kirkpatrick, F. H. Lynch-Staunton, Charles Unwin, V. B. Wadsworth.

EXPLORATION.—E. Stewart (Chairman), R. W. DeMorest, James Dickson, C. F. Miles, A. Niven, A. L. Russell, J. W. Tyrrell.

PROGRAMME OF THE

Association of Ontario Land Surveyors

(INCORPORATED),

AT ITS FIFTH ANNUAL MEETING HELD IN TORONTO,
FEBRUARY 23RD, 24TH, AND 25TH, 1897.

PROGRAMME.

Tuesday, 23rd February—Morning at 10 o'clock,

AT THE REPOSITORY, PARLIAMENT BUILDINGS.

Meeting of Council.
Meeting of Standing and Special Committees.

Afternoon at 2 o'clock.

Reading of Minutes of previous meeting
Reading of Correspondence.
Report of Council of Management (including Reports of Board of Examiners, and Secretary-Treasurer). Villiers Sankey, Chairman, Toronto.
President's Address
Report of Committee on Publication. Killaly Gamble, Chairman, Toronto.
Report of Committee on Repository and Biography H. L. Esten, Chairman, Toronto.
Report of Committee on Polar Research. J. W. Tyrrell, Chairman, Hamilton.
Paper—"Reminiscences of an Old Surveyor." Charles Unwin, Toronto.
Report of Committee on Standard Measures of Length. M. J. Butler, Chairman, Napanee.
Report of Committee on Legislation. Willis Chipman, Chairman, Toronto.
Paper—"Irrigation." A. W. Ponton, Regina, Assa.
Paper—"Irrigation in the Canadian N. W. Territories." Wm. Pearce, Calgary, Alta.

Evening at 8 o'clock.

Paper—"Electric Street Railway." T. O. Bolger, City Engineer, Kingston.
Paper—"Mines of Ontario." J. F. Whitson, Toronto.
Paper—"Hints to Prospectors." H. DeQ. Sewell, Port Arthur.
Paper—"The Proposed Sault Ste. Marie and Hudson's Bay Railway." Jos. Cozens, Sault Ste. Marie.
Report of Committee on Exploration in Ontario. E. Stewart, Chairman, Collingwood.
Report of Committee *re* Civil Engineers' Bill. Willis Chipman, Chairman, Toronto.

Wednesday, 24th February—Morning at 10 o'clock.

Report of Committee on Drainage, with Question Drawer. B. J. Saunders, Chairman, Brockville.

Report of Committee on Topographical Survey. Otto J. Klotz, Chairman, Ottawa.

Paper—"Water Works." T. H. Wiggins, Cornwall.

Paper—C. A. Jones, Petrolea.

Afternoon at 2 o'clock.

Report of Committee on Land Surveying, with Question Drawer. J. L. Morris, Chairman Pembroke.

Paper—"Hints on Surveying and Instruments." Sherman Malcolm, Blenheim.

Paper—"Island Surveying." C. E Fitton, Orillia.

Paper—"Land Surveying" Jas. Dickson, Fenelon Falls.

Paper—"Evidence." J. L. Morris, Pembroke.

Evening at 8 o'clock.

ANNUAL DINNER.

A. P. Walker, Acting Chairman of Committee on Entertainment.

Thursday, 25th February—Morning at 10 o'clock.

Report of Auditors.

Report of Committee on Engineering. Jos DeGurse, Chairman, Windsor.

Paper—"Sewage Disposal." Capt. W. F. VanBuskirk, Stratford.

Paper—"Macadam Streets in Towns." A. W. Campbell, Toronto.

Afternoon at 2 o'clock.

Report of Committee on Entertainment A. P. Walker, Acting Chairman, Toronto.

Ratification of New By-Laws.

Unfinished Business.

New Business.

Nomination of Officers (President, Vice-President, Two members of Council, Secretary-Treasurer and Auditors).

Appointment of Scrutineers.

Adjournment.

ASSOCIATION OF

ONTARIO LAND SURVEYORS

(INCORPORATED 1892).

MINUTES OF THE FIFTH ANNUAL MEETING

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

FEBRUARY 23rd, 24th and 25th, 1897.

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10 O'CLOCK A.M., 23RD.

Meeting of Council.

Meeting of Standing and Special Committees.

At 2 o'clock p.m. the meeting resumed, the President, Mr. Willis Chipman, in the chair.

The minutes of the previous meeting were read by the Secretary and adopted by the meeting.

Reading of Correspondence.

The President then read his address.

The Report of the Committee on Publication was presented by Captain Killaly Gamble, who moved its adoption; seconded by Mr. Foster and carried.

Mr. Esten then read the Report of the Committee on Repository and Biography, and moved its adoption; seconded by Mr. Browne. Carried.

Captain Gamble suggested that an album be obtained to contain the photographs of the members.

A paper on "The Reminiscences of an Old Surveyor," by Mr. Unwin, was then read by Mr. Ager.

Mr. Butler not being able to be present, Mr. VanNostrand read a letter from him containing the Report of the Committee on Standard Measures of Length.

On motion of Mr. Niven, seconded by Mr. Foster, the report was adopted.

The President then read the Report of the Committee on Legislation, and suggested that the discussion on it be left over till tomorrow, when there would be a larger number of members present.

Mr. VanNostrand moved, seconded by Mr. Niven, that the report be held over for further consideration. Carried.

The President then called on Mr. T. Harry Jones to take the chair.

A paper on "Irrigation in the North-West Territories," by Mr. William Pearce, was then read by Mr. Foster.

At 5 o'clock p.m. the meeting adjourned.

At 8.30 o'clock p.m. the meeting resumed, the President in the chair.

There were present: Messrs. John Davis, P. S. Gibson, H. DeQ. Sewell, C. J. Murphy, H. J. Browne, G. B. Abrey, J. W. Tyrrell, E. Stewart, H. L. Esten, A. P. Walker, A. Niven, A. J. VanNostrand, K. Gamble, J. F. Whitson, G. B. Kirkpatrick, T. Harry Jones, and others.

A paper entitled "Electric Street Railways," by Mr. T. O. Bolger, City Engineer, Kingston, was read.

"The Mines of Ontario" was the title of a paper presented by Mr. J. F. Whitson, O.L.S., Toronto.

"Hints to Prospectors," by Mr. H. DeQ. Sewell, of Port Arthur, was read. He illustrated his very interesting paper with a prospector's outfit.

Mr. G. B. Abrey presented to the Association Mr. Fletcher's book on " Blow Pipe Outfit " and Mr. Chapman's Assay Book.

The Report of the Committee on Exploration in Ontario was presented by Mr. E. Stewart of Collingwood, who moved its adoption ; seconded by Mr. Kirkpatrick. Carried.

The Report of the Committee on Polar Research was read by Mr. J. W. Tyrrell, Chairman, who moved that it be received and adopted ; seconded by Mr. H. DeQ. Sewell. Carried.

Report of Committee *re* Civil Engineers' Bill. Mr. Willis Chipman, Chairman, Toronto. He presented a verbal report, and referred to page 180 of last year's Proceedings. He stated a report had been drafted in which it was recommended that no action be taken at present.

At 11 o'clock p.m. the meeting adjourned.

24th February, A.D. 1897, the meeting resumed at 10 o'clock a.m., the President, Mr. Willis Chipman, in the chair.

Among those present were : Messrs. H. J. Browne, P. L. Gibson, A. Niven, T. H. Jones, E. Stewart, H. L. Esten, A. R. Davis, G. W. Ross, H. H. Gibson, R. T. Johnson, T. H. Wiggins, Killaly Gamble and others.

Report of Committee on Drainage, with Question Drawer. B. J. Saunders, Chairman, Brockville.

The President read the report which had been presented by the committee, dated November, 1896.

It was moved by Mr. T. H. Jones, seconded by Mr. A. Niven, That the report be received and adopted as read. Carried.

" The Ditches and Watercourses Act as Applied " was the subject of a volunteer paper presented by Mr. G. Smith, O. L. S., Woodville, and read by Mr. T. H. Jones.

The President then presented to the Association Mr. Kivas Tully, Chief Engineer of the Public Works Department, who donated to the Association a chart or plan of a proposed tunnel under the western channel, between the Queen's Wharf and the Toronto Island.

Mr. Tully said—Mr. President and gentlemen : I came down to see if you were comfortable here. I think in the future we can assist you to be more so. The Commissioner of Public Works furnished these rooms, and I think at any time if you desired an extension it would be arranged.

It gives me a great deal of pleasure to meet the Board of Surveyors, for I am a land surveyor myself. I have seen a good deal of it in the Old Country but not in Canada.

What I wish to bring before you to-day is this question: you may have seen the agitation in the papers about an island railway, and it is proposed to erect a bridge with a pier in the centre of the Western Channel. The Harbour Commissioners are objecting to it because it would interfere with navigation, and I see the matter is now before the Board of Trade, and I understand they very likely will object to it also, and in all probability they will recommend a tunnel which I have recommended to the Harbour Commissioners, and I made a rough plan; the lengths are accurate but the heights I cannot quite guarantee. I made some measurements with regard to the heights, but the City Council would have to take regular levels to ascertain it accurately. A tunnel can be built for about $10,000 more than the bridge would be built for, and then the advantage would be they would have no expense of opening and shutting the bridge during the season of navigation.

It is proposed the tunnel should be simply for the street railway, not for ordinary traffic. If they find it succeeds they could have another tunnel for ordinary traffic and pedestrians to the island, but I would not advise them to use it for pedestrians at present. The size of the tunnel would be 20 feet wide by 15 feet in height, and it would be deep enough so that the Western Channel could be deepened at any future time for vessels drawing 20 feet of water. The grade is only 5 feet in 100, and it would be less objectionable a great deal than a bridge because according to the plans prepared by the City Council for a bridge there would be embankments on either side and the embankments would rather interfere with the property of the Commissioners and the elevator that is near the Queen's Wharf which is rented to the Canadian Pacific Ry. Co.

I have made this plan, as I have mentioned, and submit it to you, and make a present of it to the Board of Surveyors, and I would be very glad if you had any discussion on it when you can spare a little time to look into it, and kindly give your opinion. There are a great many Engineers on your Board who would be able to guide the Board in the matter.

Mr. Stewart—What is the estimated cost of the tunnel, if you are at liberty to give it?

Mr. Tully—The bridge would cost about $70,000 and the tunnel would cost $80,000.

Mr. Jones—What length would it be?

Mr. Tully—It would not be more than a quarter of a mile, and it does not interfere with anything.

Mr. Jones—And the width?

Mr. Tully—It would be wide enough for a double track.

The President—Those are structural costs, not land damages.

Mr. Tully—Oh no, nothing to do with the right of way, or the construction of the rails or a bridge over the track at Front Street. The Street Railway Company would do half of that. It is simply the tunnel itself. It is soft rock, all Hudson River group; you can cut it out with a pickaxe; there would be very little blasting. There are some remains of hard limestone I know of, but nothing beyond that would have to be blasted. In Chicago they have two tunnels across the channel. They found out it interfered with traffic, but that is half a mile more from the entrance. In Chicago they would not allow a bridge to be put across the entrance going into the harbour, but they were forced to put in tunnels there under the river.

Mr. Campbell—What is your objection to have foot passenger traffic?

Mr. Tully—It would be rather dangerous. I went through the Chicago tunnel; it is open for traffic there, for persons who want to take the risk; but I think it should not be allowed, for the street railway runs across every five minutes.

Mr. Campbell—They would want a sidewalk?

Mr. Tully—Yes. It is quite wide enough for the two tracks of the street railway. You could not drive through a tunnel like that; a horse would be frightened out of his wits. They would have another tunnel alongside of it usually, and they could have a sidewalk for foot passengers, but that is in the future.

The Report of the Committee on Topographical Surveying, by Mr. Otto J. Klotz, Chairman, Ottawa, was read by Mr. H. H. Gibson.

It was moved by Mr. A. Niven, seconded by Mr. H. H. Gibson, and carried, That the report be received and adopted. Carried.

A paper on "Waterworks," by Mr. T. H. Wiggins, of Cornwall, was then read.

A paper on the proposed Sault Ste. Marie and Hudson's Bay Railway, by Mr. Joseph Cozens, of Sault Ste. Marie, was read by Mr. Davis.

The President suggested that Mr. Cozens should be written to and asked to prepare a sketch showing the proposed route.

At 12.50 p.m. the meeting adjourned.

At 2 o'clock p.m. the meeting resumed, the President in the chair.

The proposed amendments to the Survey Act and the Act Respecting Land Surveyors was then taken up and very fully discussed.

It was moved by Mr. John Davis, seconded by Mr. P. S. Gibson, and resolved, That the draft bill respecting Land Surveyors and the Survey of Lands, as presented by the Committee on Legislation, and amended by resolutions passed by the Association, be and is hereby approved and adopted, and that the Committee on Legislation be instructed to present the draft bill to the Commissioner of Crown Lands, and that they request that the proposed amendments be brought before the House at its present session.

A paper on "Evidence," by Mr. J. L. Morris of Pembroke, was read.

The Report of the Committee on Land Surveying, with Question Drawer, by Mr. J. L. Morris, Chairman, Pembroke, was read by Mr. A. Niven.

It was moved by Mr. Niven, and seconded by Mr. Gibson, That the report be received and filed. Carried.

A paper on "Undisputed Posts, Limits or Monuments," by Mr. Henry Carre, C. E., Belleville, was read by the Secretary.

A paper on "Hints on Surveying and Instruments," by Mr. Sherman Malcolm, of Blenheim, was read.

It was moved by Mr. Sewell, seconded by Mr. Johnson, and resolved, That the section of the Act prescribing the method of subdividing sections in townships surveyed on the Manitoba system be referred to Mr. P. S. Gibson, he to report to the secretary at his earliest convenience

At 5 45 o'clock p.m. the meeting adjourned.

At 8.30 o'clock p.m. a most enjoyable dinner was partaken of by the members at McConkey's, when toasts and speeches were the order of the hour.

25th February, 1867, at 10 o'clock a.m., the meeting resumed, the Vice-President, Mr. T. H. Jones, in the chair.

There were present: Messrs. K. Gamble, T. H. Wiggins, G. W. Ross, H. L. Esten, V. Sankey, A. J. VanNostrand, A. W. Campbell, H. DeQ. Sewell, J. W. Tyrrell. W. F. VanBuskirk, A. Niven, E. Stewart, O. McKay, J. F. Whitson, G. B. Kirkpatrick, P. S. Gibson, H. H. Gibson and others.

The Report of the Committee on Engineering, Joseph DeGurse, Chairman, Windsor, was read by Mr. A. W. Campbell, who moved its adoption ; seconded by Capt. VanBuskirk. Carried.

A paper on " Sewage Disposal " was then presented by Capt. W. F. VanBuskirk, of Stratford.

It was moved by Mr. A. W. Campbell, and seconded by Mr. T. H. Wiggins, That the paper be received and embodied in the report of the meeting. Carried.

It was moved by Mr. A. W. Campbell, seconded by Mr. T. H. Wiggins, and resolved, That the Association of Ontario Land Surveyors heartily endorse the action of the Committee on Polar Research in its endeavor to promote the exploration of our " Northern Heritage," and that a copy of this resolution together with a copy of the report of the Committee be sent to Ottawa in the hands of a deputation from this Association, who shall present the matter as forcibly as possible to the Honorable Clifford Sifton, Minister of the Interior.

A paper was then read on " Macadam Streets in Towns " by Mr. A. W. Campbell, of Toronto.

It was moved by Mr. A. Niven, seconded by M. A R. Davis, and resolved, That the following clause be added as a sub-section to section 52 of the Survey Act :

Provided that in the following townships, viz., all townships in the Muskoka and Parry Sound Districts, all townships in the District of Nipissing south of the Mattawa River and Trout Lake, and the township of Mattawa north of the Mattawa River, all townships in the Provisional County of Haliburton, the townships of Dalton, Digby and Longford in the County of Victoria, the townships of Galway, Cavendish, Anstruther and Chandos in the County of Peterborough, the townships of Tudor, Grimsthorpe, Wollaston, Limerick, Cashel, Farriday, Dungannon, Mayo, Herschell, Monteagle, Carlow, McClure, Wicklow and Bangor in the County of Hastings, the townships of Anglesea, Effingham, Abinger, Ashby and Denbigh in the County of Addington, the townships of Barrie, South Canonto and North Canonto in the County of Frontenac, and the townships of Brougham, Grattan, Wilberforce, Alice, Mattawatchan, Griffith, Sebastopol, South Algoma, North Algoma, Fraser, Richards, Hagarty, Brudenell, Lynedoch, Raglan, Radcliffe, Sherwood, Burns and Jones in the County of Renfrew, the lines between all lots shall from and after the first day of July, 1897, be run on the astronomical course given on the original plan and field notes of said townships of record in the Department of Crown Lands.

Provided that all lines in the aforesaid townships run prior to 1st July, 1897, shall not come under the operation of the foregoing amendment.

Every Land Surveyor shall on the 31st day of December, 1897, make a return, in the form of schedule hereto annexed, to the Township Clerk, of all lines run by him in any of the aforesaid townships during the last six months, and henceforward annually on the 31st December in each year.

At 12.50 o'clock p.m. the meeting adjourned.

At 2 o'clock p.m. the meeting resumed, the President in the chair.

The Secretary read the Annual Report of the Secretary-Treasurer.

The Report of the Auditors was presented and read by Mr. A. P. Walker.

The Report of the Council of Management with Report of the Board of Examiners was read by Mr. V. Sankey, who moved the adoption of the report of the Council of Management and of the Board of Examiners and that of the Secretary-Treasurer ; seconded by Mr. J. W. Tyrrell. Carried.

Mr. V. Sankey moved that the Report of the Committee on Entertainment be printed in our Proceedings as usual ; seconded by Mr. A. P. Walker. Carried.

RATIFICATION OF NEW BY-LAWS.

Mr. Sankey moved the adoption of the following by-laws, seconded by Mr. A. Niven : By-law No. 43 and 44. Carried.

It was moved by Mr. A. W. Campbell, seconded by Mr. P. S. Gibson, and resolved, That any omissions or clerical errors in the records of the proceedings of the meeting, now in the hands of the stenographer and the Secretary, be corrected by the Committee on Publication before publishing the same. Carried.

It was moved by Mr. A. J. VanNostrand, seconded by Mr. T. H. Jones, and resolved, That we have learned with regret of the death since our last meeting of Messrs. A. Howitt, William Haskins, A. C. Thompson and J. R. Pedder, and we desire to convey to their relatives this expression of sympathy with them in their bereavement. Carried.

NEW BUSINESS.

The President referred to the Tariff of Fees, and to the obtaining of an album for containing photographs of the members of the As-

sociation. He read Circular No. 24, issued in 1889, of Tariff of Fees.

It was moved by Mr. T. H. Jones, seconded by Mr. H. L. Esten, and resolved, That the Secretary-Treasurer be empowered to purchase a suitable photograph album for the use of the Association for the purpose of holding photographs donated to the Association, and that each member of the Association be requested to forward his photograph to the Secretary-Treasurer. Carried.

It was moved by Mr. A. P. Walker, seconded by Mr. Davis, and carried, That the Report of the Auditors be received and adopted. Carried.

It was moved by Mr. E. Stewart, seconded by Mr. A. R. Davis, and resolved, That the Secretaty be, and is hereby instructed to have a number of copies of the Tariff of Fees printed, and also that copies of the same be forwarded to each member of the Association. Carried.

It was moved by Mr. A. Niven, seconded by Mr. T. H. Jones, and resolved, That the sum of $175.00 be paid to the Secretary as a slight recognition of the very efficient manner in which he has discharged his duties during the past year. Carried.

Mr. Sankey moved that the meeting adjourn for five minutes; seconded by Mr. Stewart. Carried.

ELECTION OF OFFICERS.

Mr. P. S. Gibson nominated Mr. T. Harry Jones as President for the ensuing year.

There being no other nomination, the President declared Mr. Jones elected.

Mr. Sankey nominated Mr. Peter S. Gibson as Vice-President for the ensuing year.

No other nomination being received, the President declared Mr. Gibson elected,

The President stated there were now three vacancies on the Council.

Mr. Gibson	nominated	Mr. Sankey.
" Niven	"	" H. J. Bowman.
" Sankey	"	" A. P. Walker.

Mr. Stewart nominated Mr. T. H. Wiggins.
" T. H. Jones " " J. W. Tyrrell.
" V. Sankey " " A W. Campbell.
" H. H. Gibson " Capt. VanBuskirk.
" A.J.VanNostrand" Mr. J. L. Morris.

Mr. Davis nominated Mr. A. J. VanNostrand as Secretary-Treasurer for the ensuing year ; seconded by Mr. T. H. Jones.

No other nominations being received, the President declared Mr. VanNostrand elected.

AUDITORS.

Mr. Foster nominated Mr. H. L. Esten.
" Niven " " A. R. Davis.

They were then declared elected.

SCRUTINEERS.

The President appointed Messrs. H. J. Browne and J. F. Whitson.

Mr. Stewart moved that the President leave the chair, and that Mr. Sankey take the same; seconded by Mr. Foster. Carried.

Mr. Stewart then moved that a vote of thanks be tendered to the retiring President for his very able services to the Association and the courteous manner in which he filled the chair as President ; seconded by Mr. A. R. Davis, and unanimously carried.

Mr. Chipman replied to the vote in a few well-chosen words.

At 5 o'clock p.m. the meeting was concluded.

Mr. Niven—I would say that our Secretary has faithfully discharged his duties. It is not every one that is suited for that position, and I am aware that it takes a great deal of Mr. VanNostrand's time, and my opinion is when we have a good officer we should give him all we can afford ; $175 is but a trifle compared to his services.

Mr. Jones—I heartily endorse all Mr. Niven has said. Anyone that has heard the report of the Secretary-Treasurer for the year, and knows the amount of his correspondence, and the other details of his

work, must think that his remuneration is a very slight recognition of his services.

The President—I may be permitted to add I know something of the work the Secretary has to do. Reading that report is a very simple matter, but if you visited his office sometimes and saw him up to his ears in work you could sympathize with him. I think the time has about arrived when we should have a fixed salary attached to the office. As it is now there is no salary mentioned in our by-laws, and I think it would be as well, at the next meeting, to take up the question of settling the salary at a fixed amount.

Mr. VanNostrand—Mr. President and gentlemen, I am very much obliged to you for this mark of esteem which you have given me. With regard to the work, it has always been a pleasure to me to do it. I would like very much to be able to do it in a more efficient manner than I have done, but so far as I have been able I have done it cheerfully, because I enjoyed doing it, and the question of remuneration is not one for a secretary to consider too much in matters of this kind. It takes a good deal of time, but unfortunately Toronto's surveyors can testify there has been some spare time in the past few years, and it has been a very pleasant way of filling it up for me.

Mr. Jones—Mr. Chairman and gentlemen, I can only say I thank you extremely for the honor you have done me in electing me unanimously to the highest office in the gift of the Association, and I can only say I will use my best endeavors to forward the interests of the Association in any way I can. (Applause.)

Mr. Gibson said—I have much pleasure in occupying the position of Vice-President, knowing the high standing of our Association at the present time. I am very much obliged to you, gentlemen, for the honor you have done me.

Mr. Stewart moved that the President leave the chair, and that Mr. Sankey take the same.

Mr. Foster seconded.

Mr. Stewart—I have much pleasure in moving a vote of thanks to the retiring President. I think if there is any one in this Association that deserves the thanks of the Association, not only for his services during past year but for the services from the very start of the Association, it is the retiring President; and without saying anything further, I move this hearty vote of thanks of the Association to him for his services.

Mr. Davis, in seconding the motion, said—I have known Mr. Chipman to be a zealous member of this Association, and I knew him

before he was a member of this Association. It may strike you as somewhat peculiar, but years ago before the gray hairs of our worthy President appeared at all, Mr. Chipman was my school teacher, and I sat at his feet for a number of years (applause), and during the succeeding years I have watched his progress with a great deal of delight; and you all know, or a great many of you know, better than I do, those of you who have been regular attendants at the Association, that Mr. Chipman has been one of the principal helpers in promoting the interests of this Association through all these years, and we are arriving at a certain status that enables us to obtain legislation that otherwise we could not get, and as the years advance there is no doubt that our Surveyors' Association in this Province will be a more important factor than it has been in the past. There is no doubt in the world that our present status is due to a large extent to the exertions of our now ex-President, Mr. Chipman.

The motion on being put to the meeting was unanimously carried.

Mr. Chipman, in reply to the vote of thanks, said:

Gentlemen, I must thank you for the very cordial way in which you have passed this resolution. It has always been a pleasure to me to endeavor to advance the interests of the surveying profession. There was a time in the early history of this Province, when the Surveyor-General was "something considerable," to use an Americanism, in the land. The Surveyor-General's office in Ontario has been abolished but the surveyors remain. In the olden times when the country was first being developed the Surveyor-General appointed the deputies. They were called D.P.S. for many years until the forties, when the term was changed to that of P.L.S., and, later since the organizing of our Association, to that of O.L.S. The work I have done in the interests of the profession has been a pleasurable one, perhaps the pleasantest one in my life. For the last eight or ten years I have not been practising surveying to any extent, but the profession of engineering is the next door neighbor to it. I hope to see a future when this Association will become also a Provincial Geological Society. We have now the nucleus of a library, and we have what I believe to be the best collection of charts on this side of Ottawa. With a very little effort on the part of a few, the number of charts will be increased yearly. I would like to urge upon the city members, especially that as they have greater advantages, and derive greater benefits from this Repository than the outside members, they should therefore exert themselves to acquire whatever plans, documents, reports and so on they can get to add to the Repository. The exploration of our northern territory has always been another fad of mine, and I hope that my dreams may be partially realized in the near future. I believe the surveyors of this country have a great future, and

a large field for exploring and developing the country to the north of the C.P.R. in our Province, to say nothing of the territory beyond I do not believe in making Hudson's Bay the out port for Ontario, but propose to convey from Hudson's Bay and the surrounding territory the products into Ontario and to make Ontario the out-port of the products of all that territory. The outlet to Hudson's Bay is closed for several months in the year, while the outiet this way will be open all the year round.

I thank you for your kindly feeling.

MINUTES OF SPECIAL MEETING

WHICH WAS CALLED BY THE PRESIDENT BY CIRCULAR.

HELD 30th AND 31st DECEMBER, 1896.

WEDNESDAY, DECEMBER 30TH, 1896.

The meeting opened at the Repository of the Association in the Parliament Buildings at 2 p.m. on Wednesday, 30th December; the President, Mr. Willis Chipman, in the chair.

The President stated the reasons for which he had, with the advice of the Council, convened the Association before the date for the annual meeting, as provided for in the By-laws.

The meeting was formed into a Committee of the Whole, and Chapter 34, Ontario Statutes, 55 Victoria, was discussed, also Chapter 152, Revised Statutes of Ontario (1887), as far as Section 25.

At 6 p.m. the session was adjourned until 8 p.m., when the President again took the chair.

Letters from Messrs. John Davis and Sherman, relative to obscure and imperfect sections, Chap. 152, R.S.O. (1887), were read and discussed.

The proposed changes in the dates of meetings of the Board of Examiners was discussed, and it was decided that one session in each year would meet all requirements, and that such session should begin on the second Monday in February.

The standard measure of length to be provided by the Board of Examiners was next discussed, and it was agreed that a steel band properly tested and stamped would best serve the purpose, the arrangement of the details being left to the Council.

It was also recommended that each candidate for admission to practice should be required to be the possessor of a Theodolite or Transit-theodolite.

The question of fees charged by Registrars having been found too indefinite in some particulars, it was decided to lay the facts before a representative of the Commission for the Revision of the Statutes and ask for legislation which would prevent further difficulties arising.

The survey of lines in townships laid out in sections similar to the Dominion Lands System, was brought up, and after discussion, referred to the Committee on Legislation, which was instructed to draft clauses that would cover such cases and be similar to those now in the Dominion Lands Act.

The session adjourned at 10.30 p.m.

THURSDAY, 31ST DECEMBER, 1896.

MORNING SESSION.

The President in the chair, read his address and reviewed the work already done at the session.

Moved by Mr. Foster, seconded by Mr. H. Smith, "That each clause of the Act where changes are proposed be discussed and the proposed changes voted upon." Carried.

Sec. 6, Chap. 152 (Date of Meetings of Board of Examiners). One annual meeting, commencing the second Tuesday in February, was agreed upon.

Sec. 7, Chap. 152 (*Re* Preliminary Examinations). It was decided to add the subjects of History and Geography—of Canada in particular—and English Grammar.

Sec. 10, Chap. 152 (Articled Pupils). Recommended that candidates for admission to practice be required to submit a detailed statement of the work in which they were engaged during their apprenticeship. Pupils should be allowed to break the term of apprenticeship for the purpose of taking courses in certain subjects, but with the consent of the Board.

Sec. 11, Chap. 152. Insert a new clause granting certain privileges.

Sec. 27, Chap. 152. A steel tape-measure to be furnished and certified by the Board.

Municipal Surveys. To be made unalterable after due notice served upon the interested parties by the Department of Crown Lands.

Fees of Registrars. The matter to be submitted to the Commission for Revision of Statutes, with particulars.

Compiled plans of cities, towns and villages discussed, but action deferred until the afternoon session.

Session adjourned at 12.30 p.m.

AFTERNOON SESSION, 2 P.M.

The President in the chair.

The discussion upon Compiled Plans was resumed, and it was moved by Mr. Campbell, seconded by Mr. H. Smith, that the following committee be authorized to frame such clause or clauses for the proposed legislation dealing with the question of compiled plans of municipal surveys, as they may deem advisable, viz.: T. H. Jones, Brantford; Villiers Sankey, Toronto; F. L. Foster, Toronto; H. J. Bowman, Berlin; J. W. Tyrrell, Hamilton; F. W. Farncomb, London; A. Niven, Haliburton; the President and the Secretary—five of whom shall form a quorum. Carried.

The arrangement of the proposed changes in the various Acts was then left in the hands of the Committee on Legislation, with instructions to prepare drafts and ask for legislation in the name of the Association.

The meeting adjourned at 6 p.m.

PRESIDENT'S ADDRESS.

This being a strictly business meeting, I will not take up your time with a lengthy address, but will confine myself to the problem we have in hand, the revision of the Survey Act.

Chapter 152 of the Revised Statutes of Ontario should be incorporated with Chapter 34 of the Statutes of 1892, and some important amendments are necessary. The Ontario Land Surveyors, and they only, know the defects, the incongruities, the contradictions and fossilized absurdities to be found in these Acts, and we are, therefore, the best fitted to revise them.

The Committee on Legislation will present for your consideration a draft bill, which contains little that is not to be found in the present Acts. The important amendments recommended are as follows:

1. The preliminary examination, which has not been materially changed for 40 years, has been made to conform more closely with Provincial Educational System. (Sec. 7, Cap. 152.)

2. Owing to the indefiniteness of the present Act, the apprenticeship of students has in some cases been nominal, this being specially the case with those who are required to serve but one year. The Committee recommends that the apprentice give a written report on the work done by him during his time of service. (Sec. 10, Cap. 152.)

3. The standard measure to be supplied surveyors should be a steel band, 66 feet long, the same as that prescribed by the Dominion Government for Dominion Land Surveyors. The wooden yard sticks now supplied surveyors may have been useful when link chains were used, but they now are only objects of ridicule. (Sec 27 and 28, Cap. 152.)

4. The sections referring to Municipal Surveys are now cumbersome and should be re-cast. It would not be unreasonable to add clauses confirming such surveys after sufficient time had elapsed for appeals, etc., to Commissioner of Crown Lands. (Secs. 34-40, Cap. 152.)

5. Compiled Plans are now frequently made by surveyors from data to be found in the Registry Office, without making any surveys or measurements on the ground. It is proposed to remedy this by introducing two new sections. (Sec. 69, Cap. 152.)

There is nothing in the proposed amendments to arouse hostility either in Parliament or out of Parliament. The question of fees has been left alone, and no changes of importance have been recommended in the present methods of survey. The draft Act will now be presented. The coming year promises well, and I hope it may prove a prosperous one for the members of our profession.

WILLIS CHIPMAN,

President.

December 30th, 1896.

MEMBERS IN ATTENDANCE AT THE SPECIAL MEETING OF 30TH AND 31ST DEC., 1896.

Abrey, G. B.	Farncomb, F. W.	Niven, A.
Bowman, H. J.	Foster, F. L.	Pinhey, C. H.
Browne, H. J.	Galbraith, J.	Sankey, V.
Browne, W. A.	Gamble, K.	Smith, H
Campbell, A. W.	Hutcheon, J.	Speight, T. B.
Chalmers, J.	Jones, T. H.	Stewart, L. B.
Chipman, W.	Kirkpatrick, G. B.	Tyrrell, J. W.
Esten, H. L	McKay, O.	VanNostrand, A. J.
Evans, J. D.	McLean, J. K.	Walker, A. P.
Fairbairn, R. P.	Miles, C. F.	Whitson, J. F.

MEMBERS IN ATTENDANCE AT THE FIFTH ANNUAL MEETING.

Abrey, G. B.
Beatty, W.
Boswell, E. J.
Browne, H J.
Browne, W. A.
Campbell, A. W.
Charlesworth, L. C.
Chipman, Willis
Davis, A R.
Davis, John
Esten, H. L.
Fairbairn, R. P.
Fitton, C. E.
Foster, F. L.
Galbraith, J.
Gamble, K.
Gibson, H. H.
Gibson, P. S.
Johnson, R. T.
Jones, T. H.
Kirkpatrick, G. B.
McKay, O.
McLean, J. K.
Murphy, C. J.
Niven, A.
Ross, G.
Sankey, Villiers
Sewell, H. DeQ.
Smith, H.
Spry, W.
Squire, R. H.
Stewart, E.
Stewart, L. B.
Tyrrell, J. W.
Unwin, C.
Van Buskirk, W. F.
Van Nostrand, A. J.
Walker, A. P.
Whitson, J F
Wiggins, T. H.

RESULT OF ELECTIONS.

President.....T. Harry Jones.....(by acclamation).
Vice-President.....P. S. Gibson.....(by acclamation).
Secretary Treasurer.....A. J. Van Nostrand.....(by acclamation).

Members of the Council of Management elected for the ensuing three years:

Villiers Sankey, J. W. Tyrrell.

Auditors for the ensuing year:

H. L. Esten, A. R. Davis.

I hereby declare the above-named members of the Council of Management elected.

A. J. Van Nostrand,
Secretary-Treasurer.

Certified correct.

J. F. Whitson,
H. J. Browne,
Scrutineers of Ballots.

REPORT OF THE COUNCIL OF MANAGEMENT.

The Council held its regular meetings in April and November.

At the April meeting Mr. Villiers Sankey was re-elected Chairman of the Council for the ensuing year, and the several Standing and Special Committees appearing on Page 6 of the Association Report for 1896 were struck.

The question of reducing the number of examinations in each year was referred to the Board of Examiners to report to the Council in November.

It was also decided that each President should be required to present an inaugural address for publication in the annual reports of the Association. By-laws Nos 43 and 44 were passed and are now submitted to the Association for ratification or otherwise.

At the November meeting of the Council some cases of irregular practice were reported, and action is now pending in one of these.

A proposed bill to incorporate the Canadian Society of Civil Engineers by an Act of the Ontario Legislature was transmitted by that Society, but it was not considered to be in the interests of our Association to support the bill in its present form.

The reports of the Board of Examiners and the Secretary-Treasurer are presented herewith, they having been received and adopted by the Council.

Respectfully submitted,

VILLIERS SANKEY,
Chairman of Council.

REPORT OF THE BOARD OF EXAMINERS.

The Board of Examiners met in April and November of 1896, and the following candidates were successful in passing the Preliminary Examination, each receiving a certificate entitling him to be admitted to apprenticeship, viz. :—

APRIL.

MACKAY, JAMES JOHN, London.
MACLAREN, GEORGE PETER, London.

NOVEMBER.

WALLACE, JAMES NEVIN, B.A., B.E. (Dub.), Hamilton.

The successful candidates for admission to practice were as follows:—

APRIL.

CHARLESWORTH, LIONEL CLARE, Grad. S.P.S., Collingwood.
CODE, ABRAHAM SILAS, Alvinston.
SQUIRE, RICHARD HERBERT, Grad. S P.S., Brantford.
CHALMERS, JOHN, Grad. S.P.S., Owen Sound.
SMITH, ANGUS, Grad. S.P.S., Ridgetown.
MACKENZIE, WILLIAM, Grad. R. M. Coll., Sarnia.

NOVEMBER.

HEAMAN, JOHN ANDREW, London.
SCHWITZER, JOHN EDWARD, B.A Sc. (McGill), Ottawa.
TAYLOR, WILLIAM VERNER, Grad. S.P.S., Gananoque.
BOSWELL, ELIAS JOHN, Grad. S.P.S., Peterborough.

These were duly admitted and sworn.

Articles were filed by apprentices as follows:

LIST OF ARTICLED PUPILS.

Name of Pupil.	Name of Surveyor.	Residence.	Date of Articles.	Term.
McPherson, A. J., Grad. S.P.S...	H. J. Bowman, O.L.S.....	Berlin	31st March, 1896.....	One year.
MacKay, James John	Wm. Mahlon Davis, O.L.S.....	Woodstock	11th April, 1896	Three years.
MacLaren, George Peter	F. W. Farncomb, O.L.S..	London	20th April, 1896	Three years.
Fielding, J. S.....	M. W. Hopkins, O.L.S.	Hamilton	1st July, 1896.....	Three years.
Armstrong, John, Grad. S.P.S....	T. R. Deacon, O.L.S.....	Rat Portage	26th October, 1896....	One year.
Wallace, J. N., B.A., B.E. (Dub.).	C. H. Wallace, O.L.S..	Hamilton	7th November, 1896...	One year.
Dobie, James S., Grad. S.P.S.....	A. H Macdougall, O.L.S.	Port Arthur.....	1st December, 1896....	One year.
Meadows, Wm. W., Grad. S.P.S.	T. R. Deacon, O.L.S...	Rat Portage	1st January, 1897	One year.
Robinson, Frank J., Grad. S.P.S..	T. R. Deacon, O.L.S.....	Rat Portage	11th January, 1897....	One year.
Dunbar, Marcus, Grad. S.P.S....	T. R. Deacon, O.L.S.....	Rat Portage	5th February, 1897 ...	One year.

The articles of William Innes Margach were transferred from H. B. Proudfoot, O.L.S., to M. W. Hopkins, O.L.S., for the remainder of the three year period.

It is recommended by the Board that the Council apply for legislation which will reduce the number of examinations to one in each year, and that the date of the beginning of such examination be the second Monday in February in each year.

VILLIERS SANKEY,
Chairman of Board of Examiners.

REPORT OF THE SECRETARY-TREASURER.

MR. CHAIRMAN,—I beg leave to submit the following report of the official business of the Association transacted in my department between February 24th, 1896, and February 23rd, 1897.

The following circulars were issued :—

No. 30	Ballot for 1896-7	225	copies.
" 31	Explanation of ballot, with names of candidates	225	"
" 32	*Re* British Association for the Advancement of Science	250	"
" 33	Respecting arrears of fees	80	"
" 34	Announcing special meeting of Association	200	"
" 35	Announcing annual meeting	250	"
" 36	Programme for annual meeting	350	"

Letters and accounts sent from the Secretary's office	949
Postal cards	94
Letters and postal cards received	606
Copies of 1896 Report sent to exchanges	640
Copies of 1896 Report sent to members	154
Exchanges sent to members	750

The exchange of reports for members was continued with the Engineering Society of the School of Practical Science and with Michigan, Illinois, Iowa and Ohio ; reports from all those societies having been sent to all our members not in arrears of dues, leaving a sufficient number on hand to be sent out as soon as arrears of dues are paid.

Our mailing list continues to increase and the receipt of valuable additions to the library shows a corresponding improvement.

We are indebted to the Provincial Executive for our more commodious and better equipped quarters. As will be seen by the report of the Committee on Biography and Repository much has been done by members of the Association in the way of adding to the Association's collection of biographical sketches, maps, charts, books, etc.

The work of the Committee on Publication was unusually great during the past year, but it was cheerfully accepted, and the results are satisfactorily shown by the '96 Report. The cost of publishing this Report was nearly $100 greater than that of any previous year.

All of which is respectfully submitted.

A. J. VAN NOSTRAND,
Secretary-Treasurer.

STATEMENT OF RECEIPTS AND EXPENDITURES BETWEEN 24TH FEBRUARY, 1896, AND 23RD FEBRUARY, 1897.

RECEIPTS

To balance on hand, 24th February, 1896		$1,190 94
" Amount collected from advertisements in 1896 Report ...	$ 90 00	
" Amount donated by Peary Lecture Committee	24 00	
" Proceedings, sold, 11 copies at 50 cents	5 50	
		119 50
" Registration fees, 16 at $1.00 each	16 00	
" Commuted back dues, 1 at $14.00	14 00	
" Annual fees for 1894-5, 2 at $4.00 each	8 00	
" " 1895-6, 13 "	52 00	
" " 1896-7, 154 "	616 00	
" " 1897-8, 8 "	32 00	
		738 00
" Accrued interest on deposit in Savings Bank		26 56
" Receipts in Board of Examiners' account, including Government grant of $200.00		714 00
		$2,789 00

EXPENDITURES.

By Postage	$ 88 40	
" Bank Collections	1 80	
" Printing Circulars, wrappers, stationery, etc	37 10	
" Publishing Proceedings of 1896 meeting, with extra copies of parts	366 35	
" Freight and express charges	6 27	
" Customs brokerage on exchanges	3 00	
" Amount paid to Secretary-Treasurer for 1895 6	150 00	
" " " Stenographer for 1896 meeting	35 00	
" " paid for Rent of rooms	8 00	
" " " Map mounting	16 24	
" " " Extra copies '95 exchanges	38 50	
" " " " '96 "	43 50	
" " " Expenses for Council meetings	22 50	
" " " Lithographing Polar map	45 00	
" " " Office sundries	6 95	
" " " Typewriting	8 40	
" " " Cartage	3 15	
" " " Packing and shipping to exchanges	1 00	
		881 16
" " " Disbursements in Board of Examiners' account		585 75
" Balance on hand in Savings account 23rd February	779 04	
" Balance on hand in Current account 23rd February	543 05	
		1,322 09
Total		$2,789 00

A. P. WALKER, GEO. ROSS, *Auditors.*

A. J. VAN NOSTRAND, *Secretary-Treasurer.*

REPORT OF AUDITORS.

To the Association of Ontario Land Surveyors:

We hereby certify that we have examined the accounts of the Secretary-Treasurer and vouchers therefor for the year ending 23rd February, 1897, as well as the financial statement, and have found them correct.

The cash in the Savings account amounts to $779.04 and in current account to $543.05, and we recommend that the Savings account be increased to one thousand dollars.

A. P. WALKER,
GEO ROSS, } *Auditors.*

Toronto, 24th February, 1897.

DISCUSSION.

The President—I think the Association is to be congratulated on its good financial standing at the present time.

Mr. Sankey—I may say by way of explanation the Council of Management came to the conclusion it was unnecessary to include in their report, or refer in any way to the reports of the special committees that the Council appoints. These reports all come before the Association, they are printed in our reports, and there is no use cumbering our report with repetitions. They are all presented and discussed on their own merits, and the Council of Management have thought it wise not to encumber their report by repetition or remarks on the other reports.

REPORT OF PUBLICATION COMMITTEE.

MR. PRESIDENT,—This Committee has nothing of particular interest to draw your attention to. The usual business brought before them has, I trust, been carried out to your satisfaction.

Eleven hundred and fifty copies of the Report of the Proceedings were printed by the Presbyterian Printing & Publishing Co., at a cost of $366.35, being rather more than last year. As an Appendix to the Report we have printed "Head Notes of Reported Land Cases," for

the compilation of which we are entirely indebted to Mr. H. L. Esten, O.L.S.

We also issued with the Report a plan of the Polar Regions, which was prepared with great care by Mr. Louis B. Stewart, D.T.S.

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

We trust the members of the Association will do all in their power to forward the interests of our advertisers.

We continue to exchange our Reports with other societies.

EXCHANGES SENT TO

Iowa Civil Engineers' and Surveyors' Society	50 copies.
Illinois Society of Engineers and Surveyors	130 "
Michigan Engineers' Society	130 "
Ohio Society of Surveyors and Civil Engineers	130 "
School of Practical Science Engineering Society	200 "

KILLALY GAMBLE,
Chairman of Committee.

REPORT OF COMMITTEE ON REPOSITORY AND BIOGRAPHY.

MR. PRESIDENT,—Your Committee have to report that biographical sketches of the following surveyors have been received:

Hon. Alexander Vidal, of Sarnia, with a photograph and also a cutting from an American newspaper, containing a portrait and a short history of his life, which he has corrected.

J. O. Browne, P.L.S., written by H. J. Browne, O.L.S.

J. G. Howard, P.L.S., also written by Mr. H. J. Browne.

Chas. Unwin, O.L.S., D.L.S., written by himself. A photograph has also been sent by him.

H. J. Browne, O.L.S., written by himself.

F. L. Foster, O.L.S., D.L.S., written by himself.

V. B Wadsworth, O.L S., a member of your Committee, has signified his intention of writing an account of the life and work of J. S. Dennis, O.L.S., late Surveyor-General of the Dominion, but has not yet been able to complete it.

Members of the profession and others, in various parts of the Province, have been communicated with in the hope of procuring more biographical sketches; but no answers have been received to such appeals, except from John H. Jones, O.L.S., of Sarnia, who writes that he will do what he can as soon as possible.

Your Committee has made some progress in the work of arranging and preparing a catalogue, etc., of the books, maps and charts now in the Repository, and has also prepared a list of the Reports of our own Society and of those of the Societies exchanging with us.

We would recommend that either the Government be requested to furnish, or the Secretary be instructed to procure, a step-ladder for use in the Repository, as opening the windows, which is absolutely necessary frequently on account of the heat, is a work of considerable difficulty.

The catalogue and lists before referred to are attached to this report.

All of which is respectfully submitted,

H. L. ESTEN,

Chairman.

LIST OF EXCHANGES AND O.L.S. REPORTS.

Arkansas	1887— 3	copies	Michigan	1889—12	copies
"	1888—13	"	"	1890— 9	"
"	1889—10	"	"	1891— 5	"
Indiana	1888— 4	copies	"	1892— 4	"
"	1889-90— 4	"	"	1893— 2	"
"	1891— 5	"	"	1894— 4	"
"	1892— 6	"	"	1895— 4	"
"	1893— 4	"	"	1896—22	"
"	1894-95—12	"			
Illinois	1887—1	copies	Ohio	1889—12	copies
"	1888—3	"	"	1890—19	"
"	1889—2	"	"	1891— 7	"
"	1890—3	"	"	1892— 3	"
"	1891—7	"	"	1893— 2	"
"	1892—8	"	"	1894—11	"
"	1893—2	"	"	1895—12	"
"	1894—5	"	"	1896—	"
"	1895—4	"			

Iowa.....1887— 7 copies
" .....1888— "
" .....1889—18 "
" 2nd meeting 1889— 8 "
" .....1890— 7 "
" .....1891— 4 "
" .....1892— "
" .....1893— 4 "
" .....1894— 9 "
" .....1895—14 "
" .....1896— . "

O. L. S. Reports—
" 1886 -25 copies
" 1887—74 "
" 1888—78 "
" 1889—99 "
" 1890— 5 "

School of Science—
" 1885-86— 2 copies
" 1887 88— 3 "
" 1889-90— 8 "
" 1890-91— 5 "
" 1891-92— 5 "
" 1892-93— 6 "
" 1893-94— 9 "
" 1894-95— 7 "
" 1895-96—22 "

O. L. S. Reports—
" 1891—81 "
" 1892—46 "
" 1893—10 "
" 1894—73 "
" 1895—65 "

1896—179 copies

LIST OF CHARTS AND MAPS IN DRAWERS.

Geological Survey of Michigan, containing 13 Plates.
British Columbia, 10 Sheets and Wall Map.
Carte Réduite de l'Ocean Oriental, 1753.
Essai d'une Carte Polaire Artique, 1774.
Charts of St. Lawrence River, 15 Plates (Hydrographic).
" " " " " 2nd Set.
Plan of Northern Polar Regions (Chipman & Stewart), 1896.

Hydrographic Charts of—

Toronto Harbour.
Lake Huron and Georgian Bay.
Lakes Erie and Ontario.
Kingsville Harbour, Lake Erie.
Lake Superior.
Polar Regions, Baffin's Bay to Lincoln Sea.
Lake Michigan.
N. and E. coasts of Newfoundland.
Detroit River—Bar Point to Mamajuda Lights.
Pelee Passage, Lake Erie
Chicago Harbour and City.
S. Chicago.
Erie Harbour.
Cleveland Harbour and Cuyahoga River.

LIST OF WALL MAPS.

Room (1), Pennsylvania, Quebec, Small Dominion, Arctic Regions, Hydrographic Map, Ry. Map of Canada, Ontario.

Room (2), Nova Scotia, Manitoba, British Columbia, Quebec (maps), Wisconsin, Ohio.

Room (3), N. W. Territories and Manitoba, New Brunswick.

A.

Agriculture, 22nd Annual Report New Jersey Board.
Almanac, Nautical, for 1872, 1882, 1886.
Almanac, American Nautical, 1881, 1883, 1884, 1885, 1886, 1887.
Almanac, Canadian, 1893
Archives, Canadian, 1883 to 1895.
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REPORT OF COMMITTEE ON POLAR RESEARCH.

MR. PRESIDENT,—Although the results of the work done by your Committee on Polar Research during the past year may be inappreciable, it has not been altogether inactive. Taking advantage of the fact that an expedition is to be sent to Hudson Straits and vicinity by the Domininion Government during the approaching spring, the Hon. Mr. Davies, Minister of Marine and Fisheries, under whose control the expedition is being despatched, was interviewed with the object of having a small exploring party accompany the expedition to a point on the north shore of Hudson Straits near the west end, and thence work northerly during the summer and return with the ship in the autumn. With regard to such a proposition, however, I was informed that I would have to deal with the Minister of the Interior. This I at once did through a written communication,—a copy of which, together with the Minister's reply, is hereto attached.

I only regret that it does not contain more encouragement.

" 42 James St. North, Hamilton, Ont.

" HON. CLIFFORD SIFTON, " December 29th, 1896.

" Minister of the Interior,

" Ottawa.

" SIR,—On behalf of the Association of Ontario Land Surveyors, I desire to call your attention to what appears to us a very worthy object, viz., the exploration and examination of some of the hitherto entirely unknown shores of northern Canada. The accompanying North Polar map, recently prepared by two of our members, Messrs. Chipman and Stewart, will show you at a glance the extent of unexplored territory situated within the bounds of our Dominion.

" Since we believe an expedition is to be sent out to Hudson Strait in the spring by the Department of Marine and Fisheries, it appears to us that a small exploring party could be sent out with the Expedition at a minimum expenditure of money, and from the west end of the Strait might do much excellent work along the coast to the north, as indicated by the red line on map. This northern region is not the worthless waste that some suppose it to be, but is undoubtedly rich in its fisheries, furs and minerals. From personal observation, I have seen enough to convince me of this fact.

" We therefore beg to urge upon you the advisability of seizing the opportunity for sending out an exploring party with the Marine Expedition next spring to carry on work along the east shore of Fox Channel, and thence if possible during a second season, to the west coast of Grinnell Land. There is no more interesting field in the world for exploratory work than that above outlined.

" A party could be conveyed to or from the shores of North Devon any year by one of the whalers frequenting the waters of Baffin Bay; but without going further into details, we leave the matter in your most able hands.

" Together with the North Polar Map, permit me to send you two articles relating to Hudson Bay and Northern Exploration. As our Association meets in February, may I ask the favor of receiving your reply in such time that I may be able to present it to the meeting.

" I have the honor to be, Sir,

" Your obedient servant,

" J. W. TYRRELL,

"(Chairman Com. on Polar Research.) "

"(PERSONAL.)

"Ottawa, January 12th, 1897.

"J. W. TYRRELL, ESQ.,

"42 James Street North,

"Hamilton, Ont.

"DEAR SIR,—I have pleasure in acknowledging receipt of yours of the 29th ult., and have noted what you say in regard to the advisability of exploring Northern Canada. I am afraid the demands upon my Department will not permit of any expenditure in that direction during the coming year, but am pleased to be apprised of your views and may be able to do something in the direction suggested in the future.

"Yours faithfully,

"CLIFFORD SIFTON."

Notwithstanding the indifferent success of your Committee, the year 1896 has been a notable one in the annals of Polar Research.

Since the last annual meeting of our Association, by far the most successful Polar expedition ever inaugurated has returned from its three years' battle with the ice packs.

The dauntless leader of this expedition, as you all know, is a Norwegian—Dr. Frithjof Nansen—upon whom honor and tribute is now being poured by all nations. Though Nansen failed in the attainment of his highest ambition, he was singularly successful in many respects. He and his solitary companion—Lieut. Johansen—performed a wonderful five months' journey, which has no equal in the history of arctic exploration, over the frozen sea, reaching a point 170 geographical miles nearer the pole than had ever been attained by any human being. He penetrated a hitherto undiscovered area of 50,000 square miles and collected much valuable scientific information.

His expedition has practically demonstrated the truth of the theory with regard to the drift of the polar pack, whether from ocean current or prevailing winds, and it has thus determined the route for future exploration.

Nansen has also with the model of the "Fram" to a great extent solved the problem of dangerous ice navigation, and has proved most conclusively by his three years' experience, which was entirely free from disaster, that it is possible to spend a healthy and cheerful, if not a pleasant existence, even amidst the solitary darkness of a polar night.

His expedition sailed from the coast of Norway during the summer of 1893, and on the 22nd of September of the same year, north of the New Siberian Islands, entered the polar pack, with which

for nearly three years it was to drift in a westerly direction. On the 14th of March, 1895, after spending a year and a half in the pack, Nansen and Johansen stepped over the side of the "Fram," and, accompanied by a number of dogs, and one hundred days' provisions for themselves, set out over the frozen sea for the Pole. They did not reach it, but they reached latitude 86° 14′ north, on April 7th, and after five months' travel over the ice, and experiencing many hardships and escaping many dangers, they returned to the shores of Frans Josef Land, where they arrived on August the 6th, 1895, and where for the ten succeeding months they lived in a hut ten feet long by six feet wide, built of stones and covered with walrus hide.

During their occupation of these winter quarters, they subsisted entirely upon polar bears and other animals which they killed. In the month of June, 1896, whilst attempting to reach Spitzbergen over the drifting pack, they happily fell in with the Jackson-Harmsworth expedition near Cape Flora, and thence by the "Windward" were taken to Vardo on the coast of Norway.

At a reception given to Nansen by the members of the Royal Society and other distinguished men, in the city of London, only a few days ago, the guest of the banquet concluded his reply to the toast tendered to him, by expressing the hope that his friends would appreciate his "politeness" in leaving nearly three degrees between his farthest north and the pole still undiscovered.

The goal of polar expeditions remaining therefore unattained, let man with his inherent desire to fathom the mysteries of the unknown, persist in his noble endeavors, until both Arctic and Antarctic Poles shall be compelled to raise the flag of truce, and submit to their discovery.

In addition to sentimental reasons, there are many substantial objects to be gained through judicious arctic exploration. There is much to be looked for in the development of fisheries, the establishment of fur trade, and the discovery of minerals. It is well known that for many years the northern portions of Hudson Bay and the channels to the north of it have been favorite American and Dundee whaling districts. Several New England vessels have made Marble Island, in the northwest part of the Bay, their regular wintering quarters, for the purpose of getting at the whales with the breaking up of the ice in the spring. An American vessel for years wintered at Spicer's Harbour on the north shore of Hudson Straits, in order to attain the same object, and succeeded in accumulating much wealth.

When it is considered that a single Right Whale, in oil and bone, is valued at from ten to twenty thousand dollars, it is not difficult to conceive the possibilities of a successful whaling voyage.

Exclusive, however, of these more or less scanty prizes, Hudson Bay and the adjacent waters abound in other commercially valuable forms of life. I have observed the surface of the water, as far as the eye could reach from the deck of a vessel, appear an undulating sheet of white,—caused by great schools of white whales. This species of whale in the adult state is about fourteen feet in length, and is

valuable for both hide and oil. Great numbers of them are captured by the traders of the Hudson Bay Company, and their products are shipped to England.

Walruses are also found in great numbers in various parts of our north seas. I have met with many large herds of them, usually in shallow water and in the vicinity of sandy shores, where they feed upon clams which they dig from the sand.

A walrus hide—the weight of which averages three hundred pounds—is valued at about ten cents per pound, which together with the ivory tusks, places the value of one animal at from thirty to forty dollars. Hence it can be seen that a very few hundred walruses alone would form a cargo of no mean value.

In addition to the above list might be mentioned narwhales, porpoises, several varieties of seals, and many species of magnificent fish, all of which are of much commercial value. So much for the available products of our northern *seas*.

I think as much can be said with regard to the wealth of the *land*, but I shall merely endeavor to indicate in what direction its products may be looked for.

As to *furs*.—The fact that the traders of the Hudson Bay Company have for the past two hundred years been making untold wealth out of the furs obtained from these and adjoining districts to the south and west, seems to be almost sufficient proof of the existence of valuable furs. At one Hudson Bay station alone, I know that it is not an uncommon event for the Eskimos in one season to bring down from the north, three or four hundred skins of musk oxen, besides many others of polar bears, arctic wolves, wolverines, foxes, etc., etc.

I have myself seen the richest of furs, stacked by the Eskimos, like hay cocks upon the shore, to await an opportunity for transportation to the nearest Hudson Bay Coy.'s trading post.

At one locality which I had occasion to visit in 1885, the Eskimos during the one winter had trapped over a thousand white foxes, besides many wolves, wolverines and colored foxes. One black fox skin, which came into my possession from this place, was sold at the wharf in Halifax—where I landed—for sixty dollars; which I believe was considerably less than its full value.

As to *minerals*.—There is no reason why the limitless rocky plains of the north should not be found to contain as many and as rich mineral tracts as have ever been discovered in the temperate or torrid zones. In fact, mineral tracts have been discovered in some parts of our arctic territory, and beyond doubt many more rich ones await the arrival of the explorer and the prospector.

From a scientist's point of view, there is much to be gained through judicious exploration in the arctics. Of the many branches of science which may be pursued with fruitful results in this broad realm of mystery, the following are the most important,—Geology, Geography, Ethnology, Zoology, Botany, Meteorology, Oceanology,

and Terrestial Magnetism, and the extension of knowledge in any or all of these departments of learning would certainly be most desirable.

As to modern authorities upon questions of Arctic Exploration, few men should be better able to give expression to sound views than Admiral A. H. Markham, who, in 1876, distinguished himself in connection with the Nares Expedition. In a paper read by him before the Sixth International Geographical Congress, held in London in 1895, he expressed himself as strongly in favor of continued Arctic Research; and in speaking of the most promising fields for future exploration, he says: "No more important or interesting work associated with North Polar research, can be conceived than the exploration of that vast unknown region situated between Wrangle Island and Prince Patrick Island, and the connection of Prince Patrick Island with Aldriche's farthest in Grant Land." Now this unknown and most interesting region lies—we are glad to be able to claim—within the Dominion of Canada; but what are we as Canadians doing to establish our claim, or to lift from it the enveloping cloud of mystery?

Let us not be contented to stand still and see other nations win the laurels, but rather let us be inspired by the sentiments of the author who wrote the familiar lines—

"Up! up! Let us a voyage take,
Why sit we here at ease?
Find us a vessel tight and snug,
Bound for the Northern Seas."

All of which is respectfully submitted

J. W. TYRRELL,
Chairman of Committee.

DISCUSSION.

Mr. Niven—I think that is a very interesting document. Since we had Lieutenant Peary here, more interest seems to have been taken in the northern regions than before, and I thought we should have Dr. Nansen this year. It seems to be the proper thing for those men to be brought here by the land surveyors, and I think we should get him here next year.

The President—I hear he is going to be here next year, and we probably could.

Mr. Kirkpatrick—Would not it be possible to bring influence on the Dominion Government through some of the members as to this exploration? I think it would be possible to have a committee wait upon Mr. Sifton. It might be pressed upon him, and some of the

members spoken to, to bring it before him. We might get Mr. Lount, of this city; he ought to be approached in the matter.

Mr. Tyrrell—As to the advisability of trying to send a deputation down to Ottawa to bring this matter before the House, I would like very much personally if it could be accomplished, and if it is at all practicable I should have much pleasure in moving such a deputation be appointed, and I would be much pleased to be a member of it.

The President—How would it be to move that a special committee be appointed, or take your own committee on Polar Research, to draft a petition to the Dominion Government and have it submitted to-morrow or the next day to the Association, and when that is carried we will then be in a position to communicate with the Department. Leave the matter as it is now and bring in this resolution.

REPORT OF COMMITTEE ON STANDARD MEASURES OF LENGTH.

[NO REPORT.]

REPORT OF COMMITTEE ON LEGISLATION.

GENTLEMEN,—On June 15th, 1896, a circular letter was sent to each member of this important Committee by the Chairman, requesting each to take up a particular part of the work in revising the several Statutes affecting Surveyors and the Survey of Lands.

It was found impossible to call a meeting of the committee until Dec. 30th, when the matter of revision was taken up in earnest.

On Dec. 31st, the Draft Bill was presented to the Association at the special meeting, and discussed clause by clause.

The sections of the Act respecting Registered and Compiled Plans were referred to a special committee, with instructions to recast the same and report again to the Committee on Legislation. After receiving the replies from the sub-committee, the Draft Bill was submitted to the solicitors having in hand the revision of the Provincial Statutes. We were then informed that the two Acts, Cap. 152, R. S. O. and Cap. 34, 1892, had been recast into two Acts—one respecting *Land Surveyors*, and the other respecting the *Survey of Lands*.

These two new draft Acts do not, however, contain any of the changes desired by the committee, the chief of which were the following :—

(a)—Act respecting Surveyors.

1. Term of office of members of Board of Examiners changed from three years to two years.

2. Examinations to be held once per year only—February recommended.

3. Preliminary examination to include grammar, history, geography and linear drawing,

4. Final examination to include botany and forestry.

5. Candidates for final examination to present reports on Surveys made during apprenticeship.

6. Shortening term. Clauses to be recast.

7. Additional schedules.

(b)—Act respecting the Survey of Lands.

1. Standard measure to be a steel band, 66 ft. long, duly tested and stamped.

2. Municipal Surveys, when confirmed by the Department of Crown Lands, to be considered final after due notice to all parties interested.

3. Re-survey of city, town and village lots to conform more closely with original survey.

4. Plans for registration to be prepared as now prescribed in the *Land Titles Act.*

5. Completed plans to be two classes. *a.* Plans based on actual surveys and measurements. *b.* Plans based on paper titles only.

6. Rearrangement of sections prescribing methods of survey.

The amendments as recommended by the committee are herewith presented for your consideration.

WILLIS CHIPMAN,
Chairman.

DISCUSSION.

The President—It has been proposed we should take up the proposed Amendments in the Survey Act and the Act respecting Land Surveyors. The main points were pointed out by the Committee on Legislation.

Mr. Sankey—After the special meeting of the Association that was called together over this, the draft that was then prepared was handed to me. On making inquiries I was first told that they did not propose to make any re-arrangement of the Acts this session. On further enquiry I found this matter had already engaged the attention of the Ontario Government, and I was fortunate in making an appointment with Mr. Scott and Mr. Biggar, who are both engaged on the subject of re-arranging Acts—consolidation and re-arrangement. I attended at Mr. Scott's office for a very long time, and through his kindness I got a proof of the first portion of the Act that we are interested in. I may say it is the intention of the Government to pass or consolidate two Acts now with regard to Surveyors. One will be the first Act, whatever its chapter will be, an Act Respecting Land Surveyors That Act embraces all the parts of the old Act, chapter 152 and chapter 34 It is chapter 152 of the Revised Statutes of Ontario, and chapter 34 of 55 Victoriæ which was the Act that incorporated this Association. They had got this Act in the form commencing the various sections. We had got the whole thing in one with our proposed draft, and it seemed to me it made not a great deal of difference if we accepted their sectional numbers instead of our own. I went over the whole of the Act respecting Land Surveyors with him, and found that many of the proposals that we had suggested were put in the Act as they occurred to him. I do not know that it is necessary to go over all the points where we agreed. I should think at present it would be necessary merely to show that there are certain things we desire, which cannot go in under the head of consolidation ; but the people I have spoken to about it do not see any reason why the amending Act should not be got through this session to amend the various clauses.

Mr. Gibson—Did the Government take that up?

Mr. Sankey—The question whether the Government would take it up or somebody take it up for us is one that is open to question. I do not think that the amendments we are asking are such that the Government would object to take up. It is merely making things either clearer or adding a little to some of the existing legislation. I suppose we would be at the expense of some extra printing. I might say whatever is put in this year in the way of amending will go into the consolidated statutes. After the Act of Land Surveyors is gone through there will be the Act respecting the Survey of Lands, that will be the title of some other chapter, and anything that is already in the Surveyors' Act as part of the Registry Act is going to be taken out of the Surveyors' Act and put into the Registry Act, or whatever amendments we desire ; first of all in the Act respecting the Survey of Lands, will have to be amendments to the clauses of the existing Act. Now whatever amendments we propose with regard to registered plans or the compiled plans, will be amendments to the Registry Act, that being the way Mr. Scott outlined it to me. I have already com-

pleted the whole of the Act respecting Land Surveyors, and I suppose that will be the best thing for us to take up now and go through with.

What they are going to put into the Act respecting Land Surveyors will include our incorporation, also all the preliminary steps that are necessary to a man becoming a land surveyor and getting a certificate. The Board of Examiners and their appointment and the subjects they are entitled to examine upon, and everything up to the time a man gets a certificate.

The other Act will contain what it is a land surveyor shall be, after he becomes a land surveyor. This draft of ours, which we supposed was going to be all one Act, includes the whole thing, the Registry Act and all.

The President—The Act was printed exactly as the Acts are now, I understand, and there is very little change.

Mr. Sankey—A slight change in a clause here and there. Chapters 54 and 55 Victoria and a portion of R. S. O. Chapter 152 will be amalgamated in one. Clause No. 3, to give you an example, in chapter 152, says: "No person shall act as a land surveyor within this Province unless he has been duly authorized to practise as a land surveyor according to the provisions of this Act." [reads]. [Reads from Chapter 34.] That is the principle that is carried on all through.

Mr. Gibson—Prepare it the same as the old Act of Incorporation instead of what you have suggested there.

Mr. Sankey—"All persons prior to [reads] of the said Association." I was going to say what Mr. Scott drew my attention to was this, there were several proposals made here with regard to what information a candidate for examination shall supply the Board of Examiners with, as to the nature of his service and certificates and things of that kind, and Mr. Scott drew my attention to the fact that under the existing Act the Association has the power to pass By-laws for the proper management and for the good of the profession. He said if it goes in under that head it is far better for you to pass such by-laws as you desire yourselves. They have the authority of an Act of Parliament and do not bring them in under a special Act. As long as you do not overstep what is for the good of the Association, of the profession at large, no court in Canada would upset your action. And I thought that was good advice, and I think it worth our while following.

We will take up the other questions.

Sec. 19. It was found advisable by the Board of Examiners that the Secretary-Treasurer should be *ex officio* a member of the Board of Examiners. One reason was he is there all the time and he has the handling of the papers and giving of the papers to the candidates and

he is not sworn in as a member and it was considered advisable he should be sworn in. The simplest way to do it was to make him *ex officio* a member of the Board of Examiners So Clause 19 is to read this way [reads]. Then the one oath covers everything, because he is a member of the Board of Examiners, and you do not have to administer a special oath to him.

The next change is in Clause 20, where it was desired that we should have only one meeting of the Board of Examiners annually, and that it be held on the second Monday in February; so the words "First Monday in each of the months of April and November" are struck out and the words "Second Monday in February" inserted in lieu thereof.

In regard to the apprentices, we propose to strike out the existing Clause 22, and insert this clause in lieu thereof: "No person shall be admitted" [reads]. Mr. Biggar, Mr. Scott and some other gentleman in the room came to the conclusion "Orthography" was the proper word and the Board of Examiners had the power to divide that into whatever subjects they considered necessary. [Reads.]

Sec. 23 of this printed draft goes out and becomes one of the sections later on.

Sec. 24 [Reads.]

And this will be a new clause added in: "Any persons serving . . . Ontario Land Surveyor."

Mr. Gibson—That means the time he puts in at the School might be put into the 4th year.

Mr. Sankey—He must notify the Board he is going to do this before he starts, and he must get the permission of the Board if it is anywhere other than the School of Practical Science. It is the course they recognize.

As to the next amendment, Sec. 26. I will read the existing law and what was proposed to be changed. [Reads.] The difficulty was this: first of all the Board of Examiners had a considerable difficulty in knowing what the term "Land Surveyor duly admitted to practise in any of Her Majesty's Dominions other than this Province" meant. In England we have been led to understand there is no actual admission to practise as a land surveyor. Nor is there in Australia or any other of Her Majesty's dominions. This was what was proposed and as far as I know was finally decided on [reads].

The principal point is no one will be allowed to go through unless he serves the twelve months. The Board of Examiners have power to put on as many more as they think necessary.

Mr. Gibson—Quebec would not reciprocate in the matter before.

Mr. Jones—They could come in under six months' service before, and still if we want to practise in Quebec we have to serve a year.

Mr. Sankey—With regard to subsection 2 of section 27, which is the clause referring to those applicants for examination who may have to serve one, two or three years at the School of Practical Science, I may say I had a long discussion with Prof. Galbraith on this point, and my personal idea was it was a great mistake to have that in our Act at all. He said, "I wish you to strike the clause out altogether, I think it is unnecessary." I think most surveyors think the same way, so we propose to strike that clause out, unless someone wants it kept in. The result will be those attending the School of Science that do not graduate and get their diploma will have no more right to become land surveyors than any other person. They have got to pass their preliminary examination, serve their three years, and then pass their final.

The next amendments are simply clerical additions, so to speak. There is one in section 30. [Reads.]

In section 37 the addition is, "Each applicant." [Reads.]

In subsection 4 of section 38, "If the Council think fit" [Reads.]

Then the next clause of importance is Clause 30, which is the clause in which we have amalgamated all the fees, and Mr. VanNostrand has furnished me with a list here. It is simply picking them out from the Act from one section and another and putting them all in one. There is no addition to them and there is no change at all. They are as they are by law to-day.

Section 40 is the same. [Reads.]

Section 25, chapter 152, referred to.

I understand with regard to professional evidence in court, $4 a day is a standard fee paid to all professional men. I may say in this the Board of Revision have not thought fit to change that from $5 to $4, and I do not think we had better draw their attention to it.

That includes the whole of the Act in regard to the Land Surveyors; and there is one point I suppose the Revisors have omitted, that is about the standard of measure, as to whether the clause referring to that is to be in this or in the other. Personally, I think it ought to be in this, for it is one of the requirements that the surveyor has to do, to pay a $2 fee for his standard.

Mr. Sankey—There is one clause in particular we ought to discuss I think, and that is the proposed amendment to section 59 of chapter 152, that is with regard to the running of side lines. After a great deal of discussion, this is the form of the amended statement now: "For land surveyors employed to run," etc. [Reads section.]

I may say that it does not insist on taking an absolute astronomic observation if you do not want to, and it avoids the necessity of lay-out the governing line. If you have your point to start from already fixed, either by original monument or by the elements, you can run a line from that point and tie across to the front and rear ends of the governing line and then make your proper allowance for convergence in meridian and direct your line back again.

Mr. Niven—That is all right for that clause of the Act, but what I want is the sectional system.

Mr. John Davis—I was called in a suit in which I had made a survey, and Mr. Aylesworth, Q.C., was cross-examining me, and he took the ground very strongly because I had not taken this astronomic observation that the whole survey was irregular.

Mr. Sankey—I think that is possibly so, for the old Act says if it is not done before, and the course cannot be ascertained, it must be determined by astronomic observation. That is what the Act lays down, you must ascertain by astronomic observation.

Mr. J. Davis—Why not stike that "astronomic observation" out altogether?

Mr. Sankey—That is what we have done, we have struck it out. We say he shall run the line on the same astronomic course. It remains with the surveyor to decide which is the best. Were there not some monuments on the ground to determine your governing line?

Mr. J. Davis—Yes.

Mr. Sankey—It does not make any difference to the surveyor or the person for whom the survey is made what that particular bearing may be as long as the line to be run is run on the same astronomic course, and the fact of its being north 20° or 30° east by actual observation, as long as it is on the astronomic course of the governing line, there is the end of it, as the governing line is on the ground.

Those words, "astronomic course," were suggested after a lot of discussion. The words were originally "astronomically parallel." The words "astronomic course" seem to cover the whole question.

Mr. Niven—That is right.

Mr. Sankey—He shall run the line on the same astronomic course as the straight line joining the front and rear angles of the governing boundary line of said concession or section.

Mr. J. Davis—Why not leave the section just as it is, and add that these lines can be run by means of alternate angles after making due allowance for these meridians.

Mr. Sankey—You cannot do that. If it is not already done or cannot be ascertained, "He shall ascertain . . . . front and rear angles of the governing boundary line." The objection was, before you could do that, you have to cut out that boundary line, get a straight line between the front and rear ends, and then take your astronomic observations on that line; and that seemed to some sur-

veyors, who had more experience in that line of work than I had, an unnecessary expense to put their client to.

Mr. Niven—You can take the course of the trial line.

Mr. Sankey—Is it not better to leave out the "astronomic observation" altogether?

Mr. J. Davis.—If you can.

Mr. Sankey.—You can if you leave that out of the Act.

Mr. Gibson—As to the "astronomic course"?

Mr. Sankey—If the words "astronomic course" are not in the section, what is going to suggest to them the asking of the question you speak of in law suits?

Mr. Gibson—As you have it now?

Mr. Sankey—We have struck it out, the same astronomic course.

Mr. Gibson—If you are asked what is the astronomic course?

Mr. Sankey—If you do not put that in you will be faced with the magnetic course.

Mr. J. Davis—What was the original intention? What did they mean by that? If you wanted to run a line between lots 30 and 31 in one of those old townships. The idea was that you were to take that astronomic observation on the boundary line; then go up and take another at the division line. That is what the old section of the Act was supposed to cover.

Mr. Sankey—I quite agree with you, but this section does not compel you to do that. It allows you to do it.

Mr. J. Davis—It is simply all a quibble, and judges do not like it.

Mr. Gibson—Suppose it was only a mile, and you were going to take a very important case, and very heavy costs in taking astronomic observations in both cases?

Mr. J. Davis—The trouble is you may go twenty miles from the survey and stay for a week.

Mr. Sankey—Then you can angle up. Does this not allow that?

Mr. Foster—You can insert the words either by a series of angles or one or more astronomic observations.

Mr. Sankey—The way it is now it covers every way the surveyor knows, and in the interests of his client he uses the method he thinks most satisfactory. [Reads section again.]

Mr. Niven—That covers it all right provided that you know this astronomic course, but how are you going to take the course where you do not get it ?

Mr. Sankey—If you do not know it you have got to find it. You have got to find the front and rear ends of the governing boundary line. Then you imagine the line joining this without running it.

Mr. J. Davis—I have had some worry in court about this very thing, and that is the reason I am very particular about it.

Mr. Sankey—The question all turns on this word " astronomic."

Mr. J. Davis—Yes, that is it.

Mr. Sankey—If you say " on the same course " there is the difficulty. That is what occurred to me when the words were first written here, it was on the same course as it is in the Act before. Now that may be the magnetic or astronomic. That is a quibble lawyers could easily raise or surveyors. It would be the same course.

Mr. H. H. Gibson—" By astronomical observation or otherwise."

Mr. J. Davis—If you say I have run that line by alternate angles, which is the more accurate way of dealing with it.

Mr. Sankey—I will tell you why Mr. Aylesworth raised the point with you, and he was perfectly right. It says he shall determine it by astronomic observation. If you do not fulfil the law as laid down in those words, he would be justified in taking the objection he did; you did not fulfil the requirements of the law.

Mr. J. Davis—The fact is there is not one in a hundred lines drawn legally in the country.

Mr. Gibson—You run it by astronomic observation or otherwise to secure that result. That is what we actually do. There is not one line in fifty run astronomically.

Mr. J. Davis—If you leave that astronomic course in, it will conflict with section 53.

Mr. Sankey—" Shall run such division line as aforesaid on the same astronomic course."

Mr. Gibson—" By astronomic observation or otherwise."

Mr. Jones—I do not see the object of defining the method of doing the work where there are three methods left open.

Mr. J. Davis—You have it perfectly there, as to what the surveyor shall do; he is the best judge.

Mr. Sankey—"Shall run such division lines . . . by astronomic observation or otherwise as he may see fit."

Mr. Gibson—That is what we do anyway. That will be it.

Mr. Jones—If it is left the way Mr. Sankey had it the lawyers are not entitled to ask that. The Act, they will say, has left perhaps two or three courses open. You are working for one side, you have taken a certain course in which to do it. You have measured over, angled up. I have a surveyor here who has made surveys in accordance with the Survey Act, and he may say I have a surveyor on my side who has taken it the best way, that is by astronomic course, the first way mentioned in the Act. I think we are emphaisizng something to the lawyers that would be better left out altogether.

Mr. Sankey—Here is a point in which we will create difficulty. A surveyor is employed to run a line, and we will say he has a client in the district he lives in, and he does not want to put his client to any unnecessary expense, and he goes to work and angles up and measures across, does not even angle up to the governing line to the two points, and some five or seven years afterwards a dispute on the land comes up, and the surveyor does not hear anything about it, and a third surveyor makes an astronomic observation, and the next thing he hears it is overthrown. He says my method is correct; but he may not have been as careful in his chaining as he should have been. If he thought there would have been a law suit he would have taken the astronomic observation.

I have put in "shall run such division line or such line on the same astronomic course, determined by astronomic observation or otherwise."

Now we go on to the next part of the same section, "or, if the line" [reads]. The old Act does not say very clearly the two ends shall be joined. In does not make it very clear.

Mr. Davis—You say it is absolutely necessary to join them.

Mr. Sankey—Yes.

Mr. A. R. Davis—What do you infer from that; we must actually run that line out?

Mr. Sankey—I am taking the front of the concession where we have to run a line at an angle to the front of any concession or other line which is not straight. Then the ends of such line shall be drawn

as provided above. That is the two extreme ends of the line shall be joined, and you run your line in the requisite angle to that straight line, not to whatever variations of the line may exist within its course.

Mr. Niven—What did you do as to the proposed running the sectional system on the astronomic course? Take the sectional system altogether?

Mr. Sankey—That matter was left for further consideration. We have got some diagrams here.

With regard to the registered plans, the proposed amendment to the Registry Act: "Whenever any land is surveyed and subdivided," [reads]. In discussing the matter with Mr. Scott, he said: "It is very little more expense and very little more trouble to write the front width on each lot." He added that himself: "The width of each lot" [reads]. He has also suggested that we add a clause to insert on the plan what the governing line used for each block is or for the whole plan, if only one governing line is used. For instance, we say Yonge Street taken as north ten degrees west is the governing line of this plan, or block so-and-so.

Mr. Gibson—And between such points as defined by such monuments?

Mr. Sankey—That is the clause we want to add in.

Mr. Gibson—As defined by monuments. Then it is fixed.

Mr. Sankey—It says such information as shall show the course.

Regarding the compiled plans we have the next two important things. This would be an amendment to the Registry Act [reads]: "Unless the Inspector of Registry Offices orders a plan by the Registrar."

Mr. Scott said that would entail great expense. If he shows the deeds to the surveyor, he can make such extracts from them as he deems necessary. If he requires copies he should make them at his own expense, but the Registrar is to exhibit the deeds; it is not to rest with the surveyor to make a selection of such deeds as he deems necessary. It is the Registrar's duty to do that. The point is he is not responsible for what is put on, other than what is found on registered plans. If the surveyor is to be responsible he has got to hunt through hundreds of deeds to find the right one, whereas this has defined, the Registrar shall show him the deed he requires to put in the plan, and then the surveyor shall take from it such information as he may deem requisite. [Reads down to "from actual survey."]

Mr. Gibson—Do we understand from that we have to go down and survey it?

Mr. Sankey—Certainly.

Mr. Gibson—You would have double lots all over the town.

Mr. Sankey—You have got to go around the boundary of each registered plan.

Mr. Gibson—And the railway lots are all covered by deeds.

Mr. Sankey—This clause was provided to comply with the desires of a large number of surveyors that plans of this kind should be very accurate.

Mr. Jones—If you are making a plan of Toronto ordered by the inspector you will have to show on that plan not only every lot, but if 10 feet had been sold off a lot.

Mr. Sankey—Not unless the Registrar hands you the deed and says he wants you to show that covered by that deed. Where a plan is registered according to this section, first of all you show the outside boundaries under such registered plan as they appear on the ground by lines and measurements in black, then in case they differ from the boundary shown in the plans and deeds of record [reads down to "in some other color"]. It may be fixed by the walls of houses or streams or original boundaries.

Mr. Ross—It may be the fence is not right and the posts were put in roughly and not supposed to be the correct boundary.

Mr. Sankey—The surveyor has to use his own judgment as to that. But he goes on the ground and finds certain streets and certain blocks are bounded by fences and houses and occupied in that way; those are clearly the boundaries of that property as they appear on the ground. He is only bound to say he found them there.

Mr. Ross—I do not think that would work very well. As to the Registrar he is supposed to show all these deeds without any fee.

Mr. Sankey—Yes, but not to give copies of them.

Mr. Ross—At present it is undefined, the Registrar can charge what he likes.

Mr. Sankey—The surveyor has to search now and select the deed himself.

Mr. Jones—It rests with the Registrar as to the amount of details that shall be put in.

Mr. Sankey—Except as to registered plans.

Mr. Ross—That would work all right with some Registrars; some are particular, but with others it would be another thing. I think the surveyor ought to make a good plan whether the Registrar wants it or not.

Mr. Sankey—The compiling of those plans is compulsory, it is not in his option.

Mr. Gibson—Yes, but it is a little ambiguous as to the work you have to do. The question is whether you have only to put on the plans already registered.

Mr. Sankey—Then one other clause, "When the Registrar" [reads].

Mr. Jones—It may be a combination of the two plans. I suppose the title would simply have to be changed to a certain part of the plan.

Mr. Sankey—I do not think it would be a combination of the two; it is one or the other.

Mr. Jones—What I mean is, supposing that the inspector considered it necessary that for a certain section of a city or town that the simple compiled plan in accordance with that section would do, and for the other part of the town that the other section would apply.

The President—The sections respecting municipal surveys are not important, and I think the best thing we can do is to hand them to Mr. Kirkpatrick who is busy drafting some new clauses respecting municipal surveys.

There is one other section that has not been touched on, Mr. Sankey told me, respecting sectional surveys. The one under the present Act, clause 52, refers to sub-division into sections of townships surveyed according to the Order-in-Council of March, 1829. There are some few townships that have been surveyed or laid out in a different manner from the ordinary typical Algoma township. They are laid out in the same way as the townships in Manitoba and the North-West and numbered in the same way. Some surveyors have been in the habit when called upon to run sectional lines of running those lines as they are run in Manitoba and that is prescribed by the Dominion Lands Act, but that is not the method according to the present Act as it stands. It is now a question whether we would amend our Act to conform with the Dominion in that respect or leave it as it is.

Mr. Niven—What part of our Act speaks of this?

The President—Section 52. I do not know whether it applies to that kind of township or not.

Mr. Niven—We do not understand that to mean 36 sections in a township.

Mr. Jones—We could have a clause defining how they should be run then. It should be the same as in the Dominion Surveys.

Mr. Niven—Do you find anything there with reference to this Order-in-Council, section 52, in that Act? I drafted a clause, section 52, according to the Order-in-Council of 1829. I just happened to see the diagram there at the door. Take those upper two concessions. That refers to the sectional system that is referred to in this section 52. Now I am called upon to run a line between 9 and 10 in the second concession up there near the west corner. As the law stands now I have to go down to five and six side road and run that line through, across those two concessions, to get the bearing, and then angle up or take an observation at 9 and 10 and run the line. In a new country as it is in Muskoka and Parry Sound and Nipissing District and in Haliburton and also in Hastings, those back townships, the country is nearly all bush and there is more work connected with getting the bearing than there is in running the line. I have found it so in practice there for the last 25 years; and what I proposed here years ago, I have never been able to get everybody to see as I see it, but the longer I have looked at the matter the more convinced I am, what I want is the correct way of doing it, that is to go to 9 and 10 and take an observation and run the line on the astronomic course given on the plan of that township; and not to bother with 5 and 6 at all.

Mr. Gibson—You have to do that now.

Mr. Niven—I propose to run all the lines in the block on the astronomic course given on the plan. It is necessary to take an observation first, and it is not necessary to have an observation at every lot. You can take an observation at one point and carry your line from one point to another; it would be far less labor, less expensive and better, I contend, in every way. At the present time a poor man cannot afford to have his line run, and if it were my way it could be done for half the expense.

Mr. Gibson—And more correctly too.

Mr. Niven—Yes. Another matter, suppose you go to five and six and you have a difficulty in finding the bearing. Go down across that block and perhaps there is nothing there. Perhaps there is a section of country that has all been burned over and you cannot find blazed trees, posts or anything else. What are you going to do then? Then you have to go farther south and you have more work there, perhaps have a week's work before you can do anything. By this time you get discouraged and say, "I cannot do it at all." I will give you a practical instance. In the County of Hastings, five or six years ago, in the Township of Farraday, I commenced to get the bearing across a block; the lots are about 1½ miles across. The snow was very deep and we worked the whole day, and did not get the depth of one concession. The men said "This is intolerable, we cannot stand this." I said I know it, but the law compels me to do

this, or otherwise I cannot run your line properly. Well, they said, whether it is run properly or improperly we are not going back any more, and so everybody went off that night. The man was in a great state to have his line run, and I said, "Well, I will give you a line, I do not know whether it will be exactly on the same course as that or not, but if it is not it should be," and I set my instrument up that night and took an observation, and next morning ran his line, and I believe it will be a better line than the other one. There is not a surveyor in the room who does not know what I am saying occurs in his practice, and I think it would be much better to take an observation in those cases. I do not propose to go into the old settled parts of the country, up in the County of Perth and Huron where that system prevails, or some other place, but to go into the new districts, take Parry Sound and Muskoka, all that part of the District of Nipissing south of French river and the Mattawa river, the County of Haliburton and the north part of Hastings, Peterboro', Renfrew and Frontenac and down there, all those townships in which there have not been very many lines run, and I think it would be a great boon to the people there to have a survey performed in that way. In talking over this matter with Mr. C. F. Aylsworth, who is a land surveyor and road inspector, a short time ago, he approved of the system strongly, and suggested that it should be brought into force, say on the 1st of July next, so many months after the passing of the Act, when the lines should be run in that way; and he suggested that every surveyor should return to the township clerk the lines he had run during that year so as to know whether a certain line was run under the new system or under the old. But the principle is what I am contending for.

Mr. A. R. Davis—I think Mr. Niven is quite correct in his statement that it is impossible for poor farmers in those rear townships to have a survey made according to the present regulations. They simply do not make the survey, do not call upon the surveyor. A farmer will come into my office and say, "How would you run that line between Lots 9 and 10," in such a concession? Well, I explain to him what the law calls for, as Mr Niven has explained, and he says, "That will take you a week, and while I am quite willing to bear the expense of a day or two I cannot afford to have this survey made," and he drops out. And we all know that it takes more time to get the bearing, and get started at the actual survey than it does to make the survey. If we could change our law, modify it so as to make it possible to take the observation then, and perform the work, it would simplify matters materially, and be in the interests both of the surveyor and the public.

Mr. Foster—That would not interfere with the former section of the Act we have been discussing as to the astronomic course?

Mr. Niven—No, no; in certain townships you would run them on the astronomic course given on the plan of that township.

Mr. Gibson—Add to that, " It shall be applied in case of certain districts."

The President—The difficulty is in specifying or limiting or pointing out the districts where this is to apply.

Mr. Niven of course is acquainted with Haliburton and east and west of that, but how far shall that extend east or west? I think that is the difficultly and it would take some little time to settle.

Mr. Niven—I can tell you exactly. The idea is not to go into the old townships. Take for instance the counties of Perth and Huron, they were laid out on that system.

The President—Take the township of Oldham.

Mr. A. R. Davis—It would come under the system Mr. Niven recommends. There are no fences, fire has gone through and the monuments gone.

The President—What would you call Sherbrooke?

Mr. A. R. Davis—You cannot draw the line at a certain part of Sherbrooke. Take the township of Burgess, an old township, and it is as broken as these are.

Mr. Niven—Follow me for a minute. In the Muskoka and Parry Sound Districts, all that part of the District of Nipissing south of the Mattawa river and the County of Haliburton, three townships in the north part of Victoria, and three or four in the north part of Peterboro', and a number in the north part of Hastings and Addington and Renfrew, keeping away from the Ottawa river where there has been a great deal of surveying done, which would likely conflict with others, take all the new territory.

The President—I think I would keep within the county limits. I would not like one part of a county to be laid out in one way and another part in another.

Mr. Niven—There are counties where there are two systems of surveying. Take the County of Addington with double front concessions on the front and sectional system in the rear.

I propose to add a sub section to section 52: " Provided that in the following townships," then enumerated, "the lines between all lots shall be run on the astronomic course given on the original plans and field notes thereof, of said townships, of record in the Department of Crown Lands."

There will be the townships I have mentioned. As I said before, we do not propose to go into old districts, take Perth and Huron for instance where the old lines have been run, but restricted to the new country where there have only been a few lines run. You can take the whole district of Parry Sound and Muskoka, and the greater part

of the district of Nipissing south of the Mattawa river. It would not apply to the 640 acre system, leave that alone. It would take a part of the Provisional County of Haliburton and parts of Victoria, Peterboro', Renfrew, Hastings and Addington, and part of Frontenac, and keep away from the Ottawa river.

Mr. A. R. Davis—I consider Mr. Niven's proposition a good one, the clause he intends to add to 52. I think it is good in certain cases, but is it wise to make the thing obligatory? Suppose you take that side road between 5 and 6, there may be cases where the country is not all wilderness—sometimes it is open and the lines well defined on the ground—and you are called upon and go 40 or 50 miles in back, and run that line between 6 and 7, and it may be cloudy weather and it may not be convenient for a surveyor to wait to make an observation, would not it be well to let him run it in the method we have adopted in the other cases? Why make it obligatory to take this observation?

Mr. Niven—I have thought of that, but if you do that you will have the surveys conflicting, because it will not be perhaps in one case in ten where you find the side road exactly according to plan, and if you adopt that you will have to take one system. It is a little hard perhaps in such cases as Mr. Davis mentions, and I have known such cases too, but they are not many, and you will observe that a surveyor as soon as he gets a start in a neighborhood, it is not necessary to take an observation for every line, because he can keep his points and carry his bearings from line to line from one part of the country to the other. There is little difficulty there. That was an objection that Mr. Kirkpatrick urged eight years ago, but Mr. Kirkpatrick has come down to the time and he thinks it will work all right in the new country. [Reads draft amendment.]

Mr. Jones—There is nothing there about the astronomic observation. He can run the line, as we discussed in the other section, as long as he gets the astronomic bearings. It is not necessary always to take an astronomic observation.

Mr. A. R. Davis—I second the motion. I see Mr. Niven's explanation of the fact, having once taken an observation in one of those concessions, that the observation would apply for perhaps all the lines for a long distance throughout that concession and the adjoining concessions. It is necessary to have one observation; and then the difficulty pointed out here disappears largely; while it may be a serious grievance at one time, when it was cloudy for a few days just at the period he wanted his first observation, still afterwards having that first observation he carries it forward.

Mr. J. Davis—It seems to be open to avoid the matter by means of quibbles. If it says we are to do it this way, we are to run it by a

certain bearing, and it comes into court, and the question asked is, "What was the astronomic bearing, did you obtain it?" and we say we did not, we do not fulfill the conditions and requirements of the Act, and by leaving the thing open, by leaving it so we can run it by alternate angles or by this astronomic course it would do away with the difficulty. It is contended here there would be discrepancies between surveys. There would be that anyway. You would be making gore lots in every one of those side roads because they would not conform with the original bearing.

Mr. Niven—If you leave that optional you will never know how you are to run a certain line. It must be either one way or the other, it must be either parallel to the other line between 5 and 6 or on the astronomic course given on the line. You cannot have it both ways. You may as well understand that first as last, and you must have an observation to run your line on the astronomic course. If you go into the neighborhood and four or five lines run all around you, one observation will do them all. It is not necessary to take an observation every quarter of a mile. And you have to take your chances, you can take a star or the sun. It is the most scientific way of surveying, but there can be no option in the matter.

Mr. J. Davis—If this passes we can have no option in the clause we discussed here half an hour or so ago.

Mr. Niven—It is a different matter altogether.

Mr. J. Davis—I cannot see any difference. If you are called upon to do work in a certain way, you must do it in that way. In the clause we were discussing a while ago, the line runs on the same course, making allowance for divergence of meridians, and you add the astronomic observation and put in the word "otherwise." There is no difference here, it seems to me.

Mr. Gibson—There is a great difference. A governing line was used there, but here this is not the case, no governing line at all. That is the difference.

Mr. J. Davis—Will you please tell me how there is no governing line Say on that side road between 5 and 6, suppose you are called upon to find a stake between 5 and 6 that the meridian was taken from, and find one between 5 and 6 on the other concession and the country is cleared out, some man has patched it up, do you mean to say there is no governing line?

Mr. Gibson—The real fact is this, you do away with the governing line in the last case; you do away with it entirely, do not require it at all, do not care whether it is there or not. In fact it is better if there is not one there.

Mr. J. Davis—Why not admit this system all over?

Mr. Gibson—It is only intended for the new townships.

Mr. Jones—It would have been a good thing if it had been admitted originally, but we have to face the conditions as they are.

The President—It would be well to pass a resolution authorizing the incoming Council to press this legislation or appoint a small subcommittee, for it must be attended to at once. If the Association would authorize the committee that is already appointed to bring it before the Legislature at once, it would be a good thing.

The Secretary—The responsibility of it should be left with two or three, since we have the whole affair boiled down. A special committee of the whole Association could bring about no result, and what we have to do is, not to decide what is to be done, but how it is to be done. I think a motion would be in order to form a small committee, who would make it a personal matter and use the best ways and means in their power to bring about the desired legislation.

REPORT OF COMMITTEE ON EXPLORATORY SURVEYS.

Mr. President,—Your Committee beg to report that they have had under consideration the important matter referred to them, viz., the desirability of a thorough system of exploration of our unoccupied domain. We deem this work desirable for several reasons referred to later on. In the first place let us inquire what has been done. Many years ago certain exploration lines were run north of Lake Superior, and at the same time a line was started from the Upper Ottawa to meet one started east from Michipicoton. We believe for some reason these never connected. The late A. P. Salter, O.L.S., also ran a number of base and meridian lines north of Lake Huron on which the subsequent surveys in that region were based. During the past five years an outline survey has been made along the line of the Canadian Pacific Railway from the townships of what might be called Eastern Ontario, starting near Spanish River Station and extending to the east boundary of the township of Haycock, near the Lake-of-the-Woods, a distance of near eight hundred miles. This survey serves all the purposes of a base line through this district, from which future subdivision or other outline surveys can be started. In addition to this, by means of it, all the previous surveys of townships, mining locations, town sites, etc., along its course have been located and tied on so that their exact positions can be seen by reference to the maps and field notes ; also all railway stations, sidings, bridges and culverts and all mile boards are noted, so that in future any tie

line run to the railway and connected with any of these points will form a satisfactory connection.

For several years Alex. Niven, O.L.S., has been engaged on exploratory and outline surveys, first in the country adjacent to Lake Temiscamingue and later in running base and meridian lines in the Rainy River District, and during the past season on a line running due north between the Districts of Algoma and Nipissing, his objective point being the south shore of James' Bay. This line crosses the Canadian Pacific Railway about four miles west of Sudbury, and has been run to a point 132 miles north of said railway on to about latitude 48° 30' North. The termination of this line is some distance beyond the height of land between the St. Lawrence and Hudson Bay waters, in a level tract of excellent land, and it will probably be extended during the present year.

Numerous other exploratory or outline surveys have been made at various times and in different parts of the country, such as Herrick's exploration of the north shore of Lake Superior, but your committee desire more to give expression to their opinion of what is demanded in the future than to give a history of what has been done in the past. In the first place it is their opinion that in advance of surveys proper, and especially of sub-division work, there should be a thorough exploration made with a view of ascertaining and classifying the various sections. For instance, certain sections, where it would be more profitable for the Province to allow them to remain for their timber, should not be sub-divided or settlers allowed to locate, but be preserved for the produce of timber. Again a mineral section might be profitably surveyed on a different system from that of agricultural land. There is no question that our unexplored country to the north and west is rich in minerals.

The forests also may, if a proper system of cutting and preservation is adopted, continue for all time a great source of wealth to the Province. There is no more reason why the soil adapted to the growth of timber should not continue to bear its successive crops if good forestry methods prevail, than that the soil adapted to the growth of the cereals should be confined to one crop.

But it order that the work which we as surveyors are called upon to perform in this new region may be in the public interest, it is necessary that the Government be possessed of sufficient knowledge regarding the various sections of that vast region to enable them to know what sections should be opened up for agriculture; what parts should be sub-divided for mining purposes; and also what districts should be preserved for the growth of timber.

Again, with such knowledge they would be in a better position to know where it would be wise to project highways and assist in the construction of railroads, and this information can only be obtained by a thorough exploration of the whole country.

It is but a comparatively short time since this Province became the undisputed owner of the vast territory between Lake Superior and Manitoba, and extending as far north as, probably, it would be

profitable for her to go; and our legislators are only now beginning to realize that this heritage may be worth looking after. Of course if it were of no value they would be justified in their past inactivity, but now in order that they may start right in opening it up, in order that the development may be undertaken in a systematic manner, and in a way where every dollar spent may produce the best results, it is as necessary that they should be acquainted with the character of all sections as it is that a farmer commencing on a new lot should know the character of all parts of that lot in order to proceed intelligently and profitably from the beginning. Heretofore we have been working in the dark, and in a manner resembling a farmer who, owning a two-hundred acre lot, had never considered it worth his while to examine the character of his possessions beyond the limits of his small clearing on the front of the lot. At the present time we hear of three or four projected railways to James' Bay, but with our present limited knowledge regarding the character of the country, is it possible for our rulers to say which, if any, of these will pass through a country which it would be profitable for the Province to expend money to open up.

For these and other reasons that might be given, your committee feel that they are more than justified in asking the Association to use its influence in the manner that we have indicated.

E. STEWART,
Chairman.

DISCUSSION.

Mr. Stewart—Although those recommendations may not bear fruit immediately, I think from our experience in the past there are several suggestions that have in time been adopted by the Government, and I remember several years ago making a motion in this Association regarding exploratory surveys, and a committee was appointed and waited on the Commissioner of Crown Lands, and I think Mr. Niven's instructions this year were just on the lines we proposed. We proposed that in making these exploratory surveys the surveyor be accompanied by men capable of judging what was good mineral land and recording timber and also agricultural land, and though it is several years since, I think that our labors then have borne fruit.

Mr. Kirkpatrick—A geologist accompanied Mr. Niven this year, and I believe he brought back a number of specimens, quite a large variety, and they have been handed over to the School of Practical Science to Professor Coleman, and probably his report will be published in the next Report of the Bureau of Mines. I have not myself seen the report, but it will no doubt be published and will bear fruit in that way. The object was to see what was the extent

of the Huronian formation in that northern region, because I believe it is a well knowr. fact it is in the Huronian formation the principal gold-bearing rocks are found.

Mr. Niven—I think some of the suggestions I heard in the last part of the report are all right. Some exploration has been done in times past that has not been productive of much good. For instance, a line was run from the Montreal River, away west towards Lake Superior, and also one from Lake Superior easterly to meet that one, and they never met. They ran simply a line and it is pretty hard to find now, but I found it this year where I crossed it. I found several places where there is an angle of 30 degrees from the line. I think with the lines they should run proper base lines, meridian lines, and also east and west, and plant posts at every mile and iron posts at every three miles, that is the proper method of doing it, for then we have something definite to go upon, either for timber locations, or townships if necessary, or mining locations. No doubt there is a certain amount of exploration necessary; at the same time, if a country is blocked out in that way, by base lines at stated distances apart, we will soon get a better knowledge of the country than we have at present. Our knowledge of that part of the country is very limited. Last year there was a geologist attached to the party and he went about as far as he could from the line, brought down a certain number of specimens of rock, but I have not heard yet as to what they contain. There was no mineral visible at any time, at least we saw no gold. If the geologist found any gold we did not know of it.

The President—Did you cross the height of land before you got out of the Huronian rocks?

Mr. Niven—We were in Huronian rocks after we crossed the height of land.

The President—How far past the height of land before you get into the level country?

Mr. Niven—I think it was about the 65th mile of my 100 that we crossed. That would be about 95 miles north of the Canadian Pacific Railway.

The President—How much farther did you go?

Mr. Niven—We went 100 miles; 132 miles altogether from the railway.

The President—How much of it was in level country?

Mr. Niven—The last ten miles was in very level country, and as far as we could see from a little elevation, from men climbing a tree, was level as far as the eye could carry. An Indian told me it extended far. Timber was spruce, tamarack, white birch, poplar, balm of

gilead, and so on, very large timber, clay land, and covered with a black mould, beautiful farming country. How far that extends I cannot tell, but it appeared to extend a long way, and I was told by the Indian and a white trader I met a short distance down, that it extended a long way north.

The President—On what waters were you then?

Mr. Niven—We were on the waters that flow into the Mattagami chiefly. This line extended north to Lake Abbitibi, and this would run parallel to it, although some distance east, as far as James Bay. That is as far as we know from the plans we had.

The President—Is it the intention to go on with that this year?

Mr. Niven—I cannot tell you. Probably somebody else could tell you better than I can.

Mr. Kirkpatrick—The Province would have been in a bad situation if they had not had those meridian lines running through the Rainy River District.

REPORT OF COMMITTEE ON CIVIL ENGINEERS' BILL.

GENTLEMEN,—This Committee has nothing to report, as the Canadian Society of Civil Engineers has not as yet applied to the Provincial House for an Act of incorporation. The Bill introduced into the Quebec Legislature to incorporate the Civil Engineering Society was withdrawn at its second reading. A copy of the Manitoba Act of Incorporation is in the hands of the Secretary.

WILLIS CHIPMAN,
Chairman.

DISCUSSION.

The President—Last year, as you will see from the Proceedings, page 180, in the Notes of Council Meetings, a deputation from the Canadian Society of Civil Engineers, composed of Sir Casimir Gzowski, Messrs. Allan Macdougal and M. J. Butler, was received by the Council. A copy of draft of proposed bill to incorporate that Society was presented, Sir Casimir Gzowski and Mr. Macdougal explaining at length the objects sought. The Council afterwards

appointed a special committee to discuss the bill and to report. (See page 6.)

I do not know whether that committee has ever reported or not, but we drafted a report in which we stated that we did not consider it advisable to take any action whatever at present, as the Canadian Society did not intend to bring in any bill at this Session of the Legislature. A similar bill was presented in the Quebec Legislature, a copy of which we have, which bill was withdrawn at the second reading, owing to some opposition from the land surveyors of that Province. That is all we have to report.

Mr. Stewart—What did they ask? What were the provisions?

The President—It is a close corporation.

Mr. Stewart—Did they wish to amalgamate with our Association?

The President—No.

Mr. Stewart—Why did they come to you?

The President—They came to us to allay any opposition. That was the main thing, and they desired to have the bill drafted in such a way as not to interfere with our Association if they can.

Mr. Stewart—What do they propose practising? Land surveying?

The President—No. We have copies of both bills here.

REPORT OF COMMITTEE ON DRAINAGE.

Parliament Buildings, Toronto, Canada, 5th November, 1895.

To Willis Chipman, Esq., O.L.S., Chairman Special Committee on Legislation, O L.S. Association, Toronto:

DEAR SIR,—We, the members of the Special Committee on Legislation, O.L.S. Association, to whom was assigned on August 1st, 1896, the duty of reporting upon the question of proposed amendments to the two Drainage Acts of 1894, beg leave to report as follows:—

Each and every member of the present Drainage Committee as well as a number of the members of former Drainage Committees of this Association have been requested to offer suggestions as to pro-

posed amendments of the Drainage Acts, and replies having been received from several of them, we find that the prevailing opinion of those who have replied is that no radical changes should be made to either of the Acts at the present time, they having been in force for only a comparatively short time.

A meeting of the Drainage Committee having been summoned for to-day for the purpose of considering suggested amendments and to submit a report to your Committee on Legislation, and none of the members excepting the Chairman having been able to attend, we think it advisable that nothing further be done in the matter until the next annual meeting of our Association, when any proposed amendments can be submitted by the Drainage Committee to the Association in time for action to be taken thereon by the Legislature at its next session.

T. Harry Jones,

B. J. Saunders.

DISCUSSION.

Mr. Jones—There is no report. Mr. Saunders presented a report at the meeting held here in December, a short report, the substance of which report was I think after a great deal of correspondence with different members of the Drainage Committee and others interested in drainage, that it would not be advisable to recommend at the present time any changes in the law.

The President—Shall we consider this the report or shall we draft a new report ?

Mr. Jones—I understand no members of the Drainage Committee are present at this meeting.

REPORT OF COMMITTEE ON TOPOGRAPHICAL SURVEY.

Mr. President,—Your Committee on Topographical Survey begs to report as follows :—

Confidence, we are told, is a plant of slow growth. So it is, and so it should be if progress is to be made on a solid, sound and lasting basis.

Of all the aspirations and endeavors of the Association, none is more important for the use, benefit and convenience of mankind, and at the same time more difficult to attain than a topographic survey.

The usefulness—permeating all classes of the community—has in former years been fully set forth. It would appear that the course now to pursue is to bring it annually before the Provincial Govern-

ment, supported by work of that nature being done in all other civilized countries. The primary triangulation, as stated in former reports, should be undertaken by the Federal Government.

Right here it may be stated that during the past year was issued the "Report of the Geodetic Survey of South Africa during 1883-92," under the direction of David Gill, Her Majesty's astronomer at the Cape. This triangulation survey extends from north of Natal, in latitude 27°.30′ S., through the colony of Natal, Griqualand East and Cape Colony, besides a chain of triangles to Kimberley, and one through Bechuanaland. Surely this is an object lesson for Canada, that claims the pre-eminent place in Greater Britain.

I cannot refrain from quoting the Directors: "Indeed, the influence of the Geodetic Survey has made itself felt by raising the whole tone of survey operations in South Africa. Strongly as it was at first opposed, and grudgingly as it was maintained, its advantages are now fully acknowledged, and by none more warmly than the Surveyors-General of the Cape Colony, Natal and Bechuanaland." It is hoped that this further evidence will be another step towards the desired goal.

It is expected to extend the South African triangulation northward to the mouth of the Nile, thereby covering 65° of meridional arc, say 4,500 miles ! !

Quoting again Dr. Gill: "Such a continuous chain of triangulation would afford to every traveller, explorer and surveyor points of departure which would give to his labors a precision and value that could be reached in no other way."

To the frame-work of the primary triangulation will be attached the topographic survey, the benefits of which are more readily discernible by the people than its necessarily preceding triangulation.

During the past year, in connection with the survey of the north shore of Lake Erie, a temporary observatory, with permanent pier, was erected at Port Stanley, and observations for latitude and longitude made. This point or its vicinity is suitable as a triangulation station.

Preliminary information and data with reference to the location of primary triangulation stations in Western Ontario have been obtained.

Recently, as stated in *Science*, the Ohio Academy of Science has taken steps to secure favorable action by the next Legislature for establishing a topographic survey of the State. It may be mentioned that Ohio has already primary geodetic stations.

Now, your Committee would suggest that a committee, armed with recent geodetic and topographic work, again wait upon the Commissioner of Crown Lands, and urge the inauguration of a topographical survey.

Perseverence is the price of success.

All of which is respectfully submitted.

OTTO J. KLOTZ,
Chairman.

February 20th, 1897.

DISCUSSION.

The President—I am sorry the Topographical Committee did not get some actual work done. While I was chairman last year we interviewed the Government and they promised to take the matter into consideration, at least Mr. Hardy did, but the matter was dropped by us through press of business. I had no time to attend to it and it appears no one else had any time. The question was dropped entirely, and soon after Mr. Hardy was promoted to the Premiership, and the matter, I suppose, is dead until it is resurrected again by us. Mr. Klotz is undoubtedly well fitted for the chairmanship, and I think perhaps during the coming year he may have time on his hands so he can bring the matter permanently before the Government. I have no doubt the matter will be taken up in earnest by the Government at an early date, probably not until the next general provincial elections.

Mr. Gibson—No work of this kind has ever been done in Canada ?

The President—No. The Government has not undertaken even to look into the matter. Mr. Hardy was presented with enough reading matter to keep him busy for a month.

Mr. Niven—Perhaps he has not had the month to spare yet.

REPORT OF COMMITTEE ON LAND SURVEYING.

Your Committee beg to report as follows:—

That considering the fact that a Special Committee on amendments to the Survey Act will report at this meeting, the Committee remained in "statu quo."

We would draw the attention of the Special Committee on Legislation to the following:—That the Registry Act be so amended as to establish a fixed fee to surveyors for the use of registered plans when making copies.

2. That where side lines between lots have never been formerly run by any surveyor, that the surveyor making the survey may de ermine the proportion of cost to each owner interested (having first given notice of survey to all parties interested). The cost of survey to be paid by the parties interested, or if not, then by the municipality similar to collections made under the Ditches and Watercourses Act.

We feel grateful to Mr. P. S. Gibson, O.L.S., and Mr. H. L. Esten, O.L.S., and Mr. A. P. Walker, O.L.S., for their papers on

" Sectional Surveys," and " Head Notes of Reported Land Cases," and " Natural Boundaries," respectively—as furnishing the class of paper fully in keeping with the aims of the Association.

We are sorry to say that very few questions have been forwarded to the " Question Drawer."

All of which is respectfully submitted,

J. L. MORRIS,
Chairman.

QUESTIONS.

R.S.O., Cap. 152, Sec. 50. If any division or side line between lots, or *proof line* intended to be on the same course as the division or side lines between lots, was drawn *in any* SUCH *concession*, bounded as aforesaid, in the original survey thereof, the division or side lines between the lots therein shall be on the same course as such division or side line or proof line.

Question 1.—The wording of above section would indicate that only in some concessions having proof lines, can these lines be taken as governing lines. Will the Committee kindly define SUCH concessions ?

Answer.—Such a concession is described in section 49.

Question 2.—Some townships surveyed shortly after the Order in Council, 27th March, 1829, were not surveyed exactly in accordance therewith. That is, instead of having all the section lines run only a few of the side-roads were run and called " proof lines." In these concessions would you take these proof lines as governing lines after the method set out in Sec. 51 of the Act, or would you disregard them altogether ?

Answer.—If survey made in accordance with instructions, the side-roads run would govern. If not run in accordance with instructions, would not use them to govern other lines.

Question 3.—In 1834 there was a village surveyed and laid out in town lots along the lake shore. The company that had this work done would never sell the lots, but leased them for a term of years. At one time this was a flourishing village, but there is now no trace on the ground that there had ever been such a place. But the lots have been on the township treasurer's books and on those of the local registrar and have been a source of annoyance ever since.

The portion of the village not included in the beach and roadway has been incorporated into the surrounding farms. Is it possible to have this survey retraced and ascertain what farms contain certain lots and thus get the taxes thereon.

The plan is neatly made to scale and measurements given, but

there are no bearings given, nor any starting point, no township lots mentioned, nor such lot lines shown. But there is a ravine and creek in the centre of it (the village), which is there still, there is also a given road back to Talbot Street, which road is still there and is supposed to be where it always was. Would it be possible with this data to re-stake it in accordance with the plan and get the required information ?

Answer.—No data for a re-survey.

Yours respectfully,

ANGUS SMITH.

DISCUSSION.

Mr. Niven—The first question has been settled. The second one is this : "Where side lines between lots," etc. [Reads.]

Mr. Foster—I do not see how they could make a municipality pay for a private survey of any party. As to dividing up the cost of lines this is an old matter, done every day. I have done it in a great many cases, done it by consent merely, and I have no legal authority for it either, and as to putting any cost on a municipality for a private line, I think it is simply an impossibility.

Mr. Davis—I think that is true as far as the municipality is concerned, but I do wish we had some clause in our Act that would compel parties to pay their proportion of the survey. There are people who sponge, they are willing to have the survey made, and encourage it in every possible way, but you make the survey and they will get out of paying a cent, and it is as much an advantage to them as to the neighbor, and I think that that should be covered, whether just in the words of the recommendation in the report or not, is a question, but there is a difficulty there that should be met.

Mr. Gibson—I think the present system is the best. I go and make a survey for parties, I wish to stick to the man who employs me ; but if it is divided up amongst the crowd they may not pay. If I, by law, had to take it proportionately I would not do the surveying.

Mr. Davis—Do you not find a farmer very often does not have a survey made, because he has to pay the whole expense of it ?

Mr. Gibson—Yes, but if you had to get your pay out of four or five farmers you would not get it at all. Of course if the public insists we are similar to the case of Ditches and Water Courses Act we could understand it. But in the case of a line between parties it is a different thing altogether.

The President—I think it is too late now, it will have to go to the Legislative Committee. It may come up on the next revision or next year.

REPORT OF THE ENGINEERING COMMITTEE.

MR. PRESIDENT,—Engineering work has for several years been quite inactive, and while your Committee cannot find that the prospects indicate any revolutionary change, the outlook promises a healthy development in lines which will require the services of the engineering profession. This is especially the case in municipal branches. The present tendency is for the towns and cities to increase in population more rapidly than the country districts. This together with an awakening knowledge on the part of the public of the value of waterworks and sewers, is gradually producing a condition in which all towns of any pretensions will demand these public works. The installation of municipal electric systems is a feature which promises to develop. A better class of pavements and improved streets is a branch which will add to the opportunity of the municipal engineer. While the tendency in the past has been to employ the services of the engineer for the first construction of these works, it is further beginning to be felt that a salaried and permanent town official is necessary to look after their proper maintenance.

Mining engineering, in view of the gold discoveries in Rossland, B. C., and in the Rainy River District of Ontario, will create a demand for expert services; while if mining operations become profitable, of which there is every probability, it is likely that a number of railway extensions and spurs will be required.

Various electric railways have been completed during the past year, while others are projected. The Hamilton and Dundas street railway will soon be operated by electricity. The track is now laid with 65 lb. steel rails, and will be trollied early in the spring. From Hamilton to Dundas is the first stage of a line which, in the near future, is to be pushed out to Galt, only fourteen miles, and here the existing Galt, Preston and Hespeler road will be utilized to make the missing link to Berlin from Preston, a distance of eight miles; so that twenty-two miles of electric road will complete this chain, uniting Hamilton with a large number of villages. It is quite possible that this will be accomplished, and perhaps even Guelph be reached before the end of 1897.

What is believed to be the largest ditch in America has recently been completed. This drain serves the townships of Raleigh, Harwich and Pilbury, and was constructed at a cost of $40,000, the work occupying two years. It is over ten miles in length, is 90 feet wide at the outlet, and tapers to 45 feet, and 9 feet deep. This class of work, which was commenced under the Drainage Act in 1883, is a field which will afford constant and increasing employment.

During the past year an exceedingly important link in the transcontinental system was completed—the Ottawa, Arnprior and Parry Sound Railway. This connects at Parry Sound with the lake grain route from the west. The road is practically an extension of the

Canada Atlantic Railway. At present freight is carried through to Boston, but by the building of 90 miles additional, chiefly in the Province of Quebec, Quebec city will be made the port of shipment. When completed the route from Duluth to Liverpool will be 800 miles shorter than by the lakes, Buffalo and New York.

A road is projected from Irondale Junction to Brockville, known as the Irondale, Bancroft and Ottawa Railway. This by an International Bridge across the St. Lawrence will connect with the New York Central Railway. When completed it will open up an important mineral and timber district in the northern portion of Hastings and Addington. Thirty-five miles of this road easterly from Irondale Junction have been completed, and about $20,000 has been spent on pier work at Brockville.

Two important roads are advocated, known as the Nipissing and James' Bay, and the Toronto and James' Bay Railroads, each with a view to opening up mining and timber districts in the northern part of the Province; and creating a port on Hudson Bay, for grain transportation.

A feature of the past year was the successful issue of the effort to harness the power of the Niagara River, whereby power is now furnished the city of Buffalo from that source. The question of long distance transmission of electric power in an economical manner remains still to be solved; but should this be accomplished, the possibility of utilizing the water power at Niagara has been demonstrated.

Your Committee of 1896 recommended the consideration of enlarging the scope of the Association. A special committee on legislation was appointed to deal with this matter, thereby relieving your Committee of such work. Your present Committee desire, however, to place themselves on record as in favor of extending the scope of the Association on lines laid down by your Committee of 1896.

J. W. CAMPBELL,

Chairman *(pro tem)*.

REPORT OF THE COMMITTEE ON ENTERTAINMENT.

MR. PRESIDENT,—Your Committee beg to report as follows: The annual meeting of the Association was held in the Association's Repository at the Parliament Buildings, Toronto, on February 23rd, 24th and 25th. This was the first annual meeting held entirely in our own rooms, which your Committee consider are quite suitable and convenient for the purpose.

Taking into consideration the number of members now engaged in staking out mining and other claims on the outskirts of the Prov-

ince, the attendance was extremely satisfactory. About 25 members were in attendance, and an interesting and instructive programme was duly carried out under the supervision of our worthy President, Mr. Willis Chipman

The annual dinner, held at McConkey's restaurant on the evening of the second day, was as usual one of the events of the meeting, and your Committee believe it was heartily enjoyed by all present. Owing to reasons given above and others, the attendance was not quite so large as on previous occasions, but your Committee are of the opinion that this was more than counterbalanced by the excellency of the speeches, and the good fellowship shown by the members present and their guests. While all the speeches were excellent, particular mention might perhaps be made of those of Messrs. E. Stewart, Aubrey White, A. W. Campbell and L B. Stewart, and of the address given in pure Choctaw by Prof. Galbraith. Your Committee regret that the phonograph provided for the occasion slipped a cog at the moment when most required and failed to record this address for the benefit of the Association, and also regret that the two able translations furnished by Messrs. King and Aubrey White differ in some important particulars.

The chair was taken by the President, Mr. Willis Chipman, supported by the guests of the evening, Messrs. Aubrey White, Assistant Commissioner of Crown Lands, and Kivas Tully of the Department of Public Works. The vice-chair was occupied by Mr. T. Harry Jones, and Mr. C. E. King represented the Engineering Society of the School of Practical Science. Letters were received from Hon. J. M. Gibson, Commissioner of Crown Lands, and A. Blue, Esq., Director of Mines, regretting their inability to be present. The other members and their guests arranged themselves around the table as shown on next page.

After due justice had been done to the repast prepared by Mine Host McConkey, the chairman proposed the health of "The Queen," which was right royally received ; and was followed by

Toast, "Canada," responded to by Mr. E. Stewart ;

Song, "Bacon and Greens," Mr. Niven ;

Toast, "Crown Lands Department," responded to by Mr Aubrey White ;

Recitation, Mr. T. Harry Jones ;

Toast, "Public Works Department," responded to by Mr. Kivas Tully and Mr. R. P. Fairbairn ;

Song, by Mr. Sewell, "Working on the Railway" ;

Toast, "Our Northern Heritage,' responded to by Messrs. Tyrrell and L. B. Stewart ;

Toast, "Board of Examiners," responded to by Messrs. Gibson and Sankey ;

Toast, "Good Roads," responded to by Mr. Campbell ;

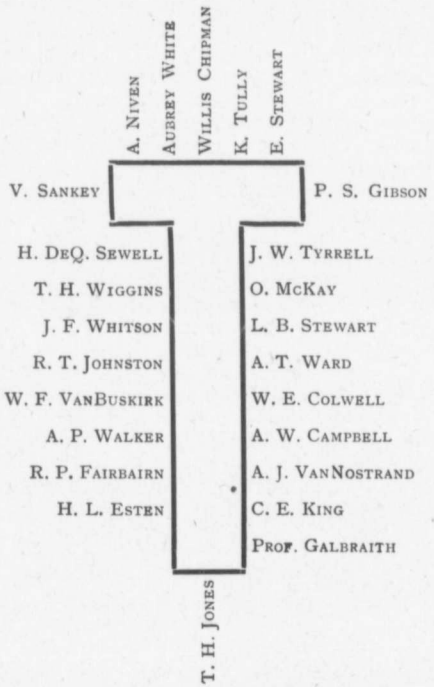
Toast, "City Engineers," responded to by Messrs. VanBuskirk and Wiggins;

Toast, "School of Practical Science and Sister Societies," responded to by Prof. Galbraith and Mr. King;

Volunteer toast, proposed by Mr. A. White, "The Association of Ontario Land Surveyors," responded to by the President;

Volunteer toast, "The Entertainment Committee," responded to by Messrs. Walker and Van Nostrand;

Toast, "The Ladies," responded to by Mr. Esten.



The toast list was agreeably interspersed with numerous selections on the phonograph, under the able supervision of Messrs. Colwell and Ward, to whom the especial thanks of your Committee are due.

Your Committee are glad to be able to report that with some little financiering the receipts from the sale of the dinner tickets has been found to just cover the expenditure. A statement of the receipts and disbursements has been filed in the office of the Secretary-Treas.

All of which is respectfully submitted.

A. P. Walker, *Acting Chairman.*

PRESIDENT'S ADDRESS.

GENTLEMEN,—From 1886 to 1894 it was the privilege of the President to deliver two annual addresses, but this is the first time that the duty has devolved on the President of delivering two addresses within two months.

Since our last annual meeting death has removed William Haskins, of Hamilton; Alfred Howitt, of Gourock; James Robert Peddle, of Doon; and Augustus Clifford Thomson (withdrawn), of Chicago.

Obituaries of Mr. Haskins and Mr. Howitt will be found on p. 182 of the Proceedings.

Owing to the enforced absence of many of our members in North-Western Ontario, who are doing their part in developing the natural resources of the country, the attendance at this, our twelfth annual meeting, may not be equal that of former years, and some of the Standing Committees may not be able to present reports. Those present should, therefore, make additional exertions to make this meeting equal in interest to that of any preceding meeting.

The work of the Committee on Legislation has been the most important of the year. Your further attention will be called to this matter. Prompt energetic action is necessary at the present juncture.

The reports of the Special Committees will be found of more than ordinary interest. The problems being grappled with by the Committees on Polar Research and Exploration in Ontario are gigantic, and too much should not be expected in immediate results.

I will conclude by welcoming you to this the twelfth annual meeting.

WILLIS CHIPMAN, *President.*

PAPERS.

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

REMINISCENCES OF AN OLD SURVEYOR.

By CHARLES UNWIN, O.L.S.,

Toronto.

1847.

I commenced to learn surveying in June, 1847, with the late John Stoughton Dennis, of Weston, but was not under articles until the following November. Mr. Dennis had a good country practice, as well as his city one in Toronto. He was principally instrumental in getting up the Institute of Surveyors, Engineers and Architects, from which has been evolved the Canadian Institute. Of this first named Institute he was acting as Secretary, and it was when posting a huge pile of circulars for him at the Weston post office that I first became acquainted with Mr. Thornhill A Agar, the father of my nephew (the reader of this paper). Mr. Agar was clerk in the store of John Andrew Donaldson, late Immigration Agent, in whose store the post office was kept. We had many rambles in the country round Weston when business was over for the day, and quiet little suppers afterwards. Mr. Agar had but recently arrived from the Emerald Isle, so dear to its children as the "First flower of the earth, first gem of the sea," and he thought it necessary to go armed with a pitchfork when on our evening expeditions, for fear of wild bulls or bears attacking us. There are more "bulls" and "bears" on King and Toronto Streets in our fair city to-day than were within many lots of Weston then.

The first survey of any consequence which Mr. Dennis undertook after I went to him was one to make a map of the city of Toronto, then extending from the Don to Dufferin Street and from the Bay to Bloor Street. I believe that I personally measured all the houses and most of the sheds within these boundaries, with the exception of the New Garrison. Mr. Sandford Fleming plotted the notes and lithographed the plan, and a more beautiful piece of lithography would be hard to find; but, unfortunately, the plan was on too small a scale to be of much practical use—12 chains, or nearly 800 feet to the inch, or, including the border which showed the principal buildings, only the size of a pocket handkerchief of moderate dimensions.

I may say that Messrs. Scobie & Balfour, the principal publishers in Toronto at that time, had purchased the notes and undertaken to publish the map, and thinking that a small one would sell best, fell into the error of having it much *too* small, as above noted. I have a mutilated copy of the map and were it not so shabby should have much pleasure in presenting it to the Association, but it is in so bad a condition that it would be no great acquisition.

1848.

My first bush survey was assisting in laying out lots on the Indian Reserve on the north shore of Balsam Lake in the Township of Bexley. T. C. Prosser was the surveyor in charge. The survey was made under instructions from the Indian Department to John S. Dennis. I was desired to bring a row boat from Atherley to Point Mara. Now, a Roman Catholic missionary (a fine specimen of a Frenchman, fully six feet high and stout in proportion) also wanted to go to the same place, but there being no room for him in my boat I told him that if he could get another I would let him have a couple of my men to row him down. After a good deal of trouble he succeeded in getting a boat, but it was a very leaky one, and his Reverence had to abandon the book he was reading and bail for all he was worth to keep afloat till he got to the nearest island, where they upset the boat and then pulled back to the mainland as quickly as possible. In spite of this, the missionary, being a capital walker, got to Point Mara shortly after my party. We arrived at Point Mara about sundown and seeing an empty shanty near our landing-place took possession of it for the night, and a very lively night of it we had, as I well remember. Being much fatigued after a hard day's work we turned in shortly after supper and lay down upon some straw lying upon the floor of the shanty, in our innocence supposing it to be clean. We had not been lying down long before we found we were not the first animals which had made a bed of it. Our first intimation of its having been previously used was the sight of our cook, a young fellow of about fifteen, who had turned in first, sitting up in his sleep and picking over the straw as if looking for something. When I and the rest of the party lay down we could not sleep a wink; we felt something biting us and making us perfectly miserable, but had to grin and bear it until daylight came, when we found our shirts literally covered with fleas—and we had a most difficult task in getting rid of them.

We took our stuff from Point Mara to Balsam Lake with an ox team, a distance of about 14 miles, and had to brush out the road in many places to get the team through. On our arrival at the lake I was invited to take tea at Mr. Stevenson's. Mr. S was father in-law to Admiral VanSittart, whose widow, I believe, owned the farm. It was quite a swell place with a squared log fence in front of it. I accepted the invitation, and although I was most cordially welcomed I was soon sorry that I had, for those horrible fleas had not been entirely got rid of, and all teatime I felt perhaps something like Job

of old when he took a potsherd to scrape himself withal, for the pesky things were very annoying.

We left the Stevenson's the following morning for the old Indian village, then deserted, and took up our quarters in one of the vacant log houses which the government had built for the Indians.

While on this survey I had my first experience of being lost in the bush. Mr. Prosser had given me a half holiday to go with dog and gun to try my luck at shooting partridges, which were plentiful in the neighborhood. I had not been long out before a covey was put up and I tried to get a shot at them, but they flew away before I had an opportunity. I followed them and tried again, and again they were off, and so on for a good many times until finally they had led me so far into the bush away from our line that I was completely lost, and a more miserable boy (for I was but a boy then) you could not imagine I climbed a tree to try and find the houses in the village, but could see none—nor even the lake.

I thought my dog could help me out of my difficulty so tore a leaf out of my field book and wrote a note on it to the party intimating that I was lost and begging them to hunt me up, tied the note around the dog's neck and tried to drive him away thinking he would go to the rest of the party, but the little brute stuck to me closer than a brother. Finally Mr. Prosser came in search of me and took me to the line the men were opening—but of course they were cutting in the wrong direction! At any rate I thought so.

After the completion of this survey, we made one in the Township of Mara which was then nearly all solid bush. We boarded with a man named Parsons. There was only one room in the house, and what with Parsons, his wife, three children and our surveying party, to say nothing of a woman visiting there, it was pretty full. There were only two beds in the room ; one of which, of course, was for Mr. and Mrs. Parsons and as many of the little Parsonses as could be crowded into it. Mr. Prosser and I were given the other. The rest had to sleep upon the floor. Our men, who of course slept in their clothes, were aroused in the morning by the woman visitor pulling the bedclothes off them. Our board was not the most recherché imaginable. It consisted of hard tack, salted cucumbers and boiled turnips. Whilst on this survey, fortunately for us, a poor old woman died and Mr. Prosser and I were invited to the wake and the funeral. We went to the latter which took place at Beaverton, then a small place but having at least one tavern ; it was probably some 13 miles from the funeral's place of starting. The body was put upon a sleigh, although it was summer time, or fall, and no snow upon the ground, but there being no wheel carriages to be had in those days in Mara it was the best that they could do. One would imagine that the poor old lady would have been jolted out of her coffin going over the numerous pieces of corduroy road. We walked behind the sleigh to Beaverton and were frequently refreshed on the way by whiskey dealt out to us by the daughter of the deceased, a woman of about forty, who carried the crathur in a black bottle and gave it to us out of a tin pepper-box.

When the procession arrived at Beaverton Mr. Prosser and I dropped out and had a good square meal at the tavern—a thing we had not enjoyed for about six weeks.

1850-51.

In 1850 Mr. Dennis was employed in laying out parts of the Townships of Bentinck and Glenelg. We walked behind an ox-team which carried our possessions and camp equipage from Owen Sound, then a small village, to near where the Saugeen River crosses the Owen Sound road. I well remember remarking to Mr. Dennis as we walked behind some of the provisions that there was a horrible smell and that it was like a sewer. He replied: "You smell the pork you will have to eat the next six months, my boy."

On this survey I was given charge of a party for the first time. Two parties were run part of the time, Mr. Dennis taking one and I the other—one taking the concession roads and the other the side roads—each trying to be first at the intersection. At one time the snow was very deep and I urged my party to hurry up and beat the boss by being at the intersection first. They did their best and got to where the lines should cross late in the afternoon and we were surprised neither to see nor to hear anything of the other party. Having several miles to walk to camp we did not remain long waiting for them, and getting no answer to our repeated shouts started for camp. We had to walk the last mile or two by torch-light. When we arrived in camp we found the other party busy making snow-shoes from pieces of dry cedar. Mr. Dennis' men, most of whom were middleaged, found the snow so deep that they refused to go out, and decided to get some dry cedar and make snow-shoes for both parties. My men tried the home made snow-shoes, but said they would not wear them, preferring to break track in turns, which they did, but found it to be hard work. On our way to camp by torch-light one of my chainmen, an old and a very credulous fellow lately from the Old Country, had a nasty knock across the eyes with a branch, and one of the men told him that he saw fire fly out of his eye and the foolish fellow fully believed it, and frequently told people that it was a fact for so and so saw it.

Mr. C. L. Davies, my chief chainman, and I had a very unpleasant experience one night. A settler wished to show us some hospitality and invited us to sleep in his bed. We accepted the offer, but were horrified to find after we had got very comfortably asleep that he had crept in at the foot of the bed, and that his feet were sharing our pillows.

1851-52.

Part of the last year of my apprenticeship and the summer and autumn of the year in which I obtained my diploma I was employed under Mr. Dennis in laying out the Indian Reserves on the north side of Lake Huron. We commenced at Parry Island and ended at the Soo. We had a very nice sail-boat called the "Upper Canada," and had an enjoyable time generally. The scenery amongst the islands resembles in many places that of the islands in the Saint Lawrence.

I remember that we were encamped on an island not far from "Grumbling" Point, which is very difficult to get around with a sail-boat unless the wind is fair. Our guide came to me one morning about four o'clock and told me that we had better make sail as fast as we could for the wind was fair for us. I called all hands up, and, although pretty tired after a hard day's work, all but one got up and loaded the boat There was one man however, my first chainman, who had strong objections to getting up before the day was aired, and he refused. I told the men to take down the tent and leave him on the island, when finding I was serious my gentleman aroused himself. Unfortunately for his comfort we had to make a still earlier start next day, for we had not succeeded in getting around Grumbling Point, but on this occasion my friend did not require calling twice.

There were many rattlesnakes upon some of these reserves; we killed eight one Sunday—"better day, better deed." Mr. Dennis had one of his party bitten on the finger. Mr. Dennis promptly took his razor (surveyors shaved in those days, fortunately for the bitten man) and cut the bitten piece out, put some gunpowder on the wound and applied a match. By this treatment without loss of time, he probably saved the poor fellow's life.

The last reserve I laid out was near the Soo. My instructions were to "begin at a pine tree at Maskinonge Bay (this tree had probably been squared and marked); thence north 43° E. (true if possible, if not magnetic and ascertain true) twelve and one-half miles. Then due north 12 miles; when near river (on which look out for Vidals' posts for mineral location) send party back to take batteau around up the river at head of Echo Lake; from here take a supply of provisions at line at end of twelve miles on north and south line. Start due west and run fifteen and three-quarter miles; during this time you may perhaps get supplies up Garden River, to which point batteau had better be sent. At end of east and west lines turn due south and run to crest of mountains north of River St. Mary's; from here run trial line down to boundary which Indians will show you at Partridge Point. Measure offset and calculate direction of true line to close, which run, taking angle between it and the first line where difference begins. When concluded make way to Penetang and so home.

The distances above were taken from Bayfields' chart, and agreed to by the Indians and Mr. Keating, their interpreter, and Mr. Dennis.

When I got to the crest of the mountains I could see St. Mary's River. I thought that if I had a smoke made at the post I could come pretty close to it, and determined to send a couple of men down to it and make a smoke, which when made we saw from the mountain's crest. I took the bearing and ran the line some three miles from top of mountain and came within two feet of the post, which I moved into my blazed line. The season was well advanced and the steamer was soon to make her last trip, so that I was afraid to adhere literally to my instructions, for in those days there was no C.P.R to take me home.

I had a rather pleasant experience at the end of this survey.

I had no money to bring my party to Penetanguishene, and only an order from Mr. Dennis on the Captain or Purser, I forget which, of the regular boat, and as it had met with an accident and been replaced by another I was doubtful as to whether my order would prove to be of any service to me. Meeting one Archie Dunlop, a well-known cattle dealer, trading from Penetang to the Bruce Mines and other places on Lake Huron, I told him my story. He kindly offered to lend me all the money I required to pay the passage of myself and party, and also advised me to take all my party down cabin passage, as the boat was so slow that it would cost more to pay deck fare with meals charged extra, than cabin fare with meals included. I took his advice and took cabin passage for all. I may say here that the order was accepted, and Archie's kindness was not trespassed upon, but I felt the generous offer very much, the more so as I had met him only once before.

1857.

On Saturday, the 17th January, 1857, I put in a miserably cold night, whilst surveying the road line from Lake Couchiching to Muskoka River. We had a ridge tent, but no stove, nor any means of having a fire inside and we had not too many blankets. The fire outside roasted one side of us, whilst the other side was freezing; the thermometer registered 38° below zero. On the survey of this road I had with me a gentleman who is one of our city ex-aldermen, and he used to sleep in all the clothes he could pile on—over-coat, boots and mitts.

In making road line surveys I thought it would be well to show some of the features of the country on my map on each side of my line. Having with me an Indian who knew the country well, I got him to sketch the lakes and streams near the line, and showed them on my plan. Of course this made a more symmetrical map and also made more square inches than the bare road line—and we were paid by the square inch!

The late David Gibson was much amused at the remark made by Mr. Cauchon (the then Commissioner of Crown Lands) upon seeing my plan. He said: "Meester Geebson, there ees no getting over you surveyors. Eef you pay them by the day they fool away their time, and eef you pay them by the eench—Mon Dieu: look at thees plan!!"

1858-59.

During parts of the years 1858 and 1859 I was engaged surveying the township of Lutterworth. There are numerous small lakes in this township and one large one—Gull Lake. At the time the survey was made it abounded in beavers. We were fortunate in having an old hunter in our party who killed a good many, and we were glad to have them served up for our suppers. They were in camp thought to be excellent eating, but on sending one home I was informed that it was not relished much, but then you see they had not the hunger-sauce that a bush life gives a man.

1860-61.

In surveying the townships of Esten, Spragge and Salter in 1860-61, I had occasion to cross a lake about 1¼ miles wide. We made a raft and my cousin (F. L. Foster), an axeman and I went across on it all right enough, but when we had completed our work the raft had soaked so much water that it would bring only two back again. There was a small island about a quarter of a mile from the southerly shore, and Foster, who was an excellent swimmer, said that he would swim the mile from the north shore to the island if I would swim the quarter mile. He did his part like a duck, but I lost heart altogether when I attempted my part, and had to lay hold of the raft. So long as I could just touch it I felt safe. However, we all arrived safely in due time.

There were several rather interesting circumstances connected with this survey. One of the men, a Mohawk half-breed, was very fond of whiskey, as was also the cook—a great friend of his. The Mohawk frequently pleaded illness and unfitness for work. I noticed at the same time that my supply of liquor was diminishing very fast, and suspected the cook and Mohawk of helping themselves in some way or other. My first chainman thought he would try an experiment, so put some tartar emetic in a bottle of whiskey one morning when the Mohawk pleaded sickness, and placed it so that there would be little difficulty in these worthies finding it. When we returned at night we found that Mr. Mohawk had been really very sick, and was not at all well pleased with the trick that had been played upon him.

Knowing that Indians do not like to work long at one job, I had made those hired by me on this survey sign an agreement that they would remain and work faithfully until the end of the survey or forfeit whatever money was due them. One man, an elderly one, named Esquemeaux, a man I frequently sent to La Cloche for letters and provisions, did not return when sent on his last trip, and when paying off the party at Little Current I requested the interpreter to give him a good fright and tell him that there was no money coming to him as he had left without leave before the end of the survey. The poor fellow was well frightened and promised never to serve any other surveyor such a shabby trick. He was highly delighted when he got his money. I have heard since that Mr. Niven, one of our ex-Presidents, had Esquemeaux afterwards and found him an excellent man.

During the time of this survey H.R.H. the Prince of Wales visited Canada, and my provisions getting short and money for obtaining more being exhausted, I determined to visit Toronto, raise the wind and get a fresh supply. I killed two birds with one stone, for I saw the Prince and also got my fresh stock of provisions, amongst them being a barrel of home-made mixed pickles, which were much appreciated by the party.

On returning to my survey I met three of my party at La Cloche and with them started off for camp, calling at store camp for supplies. One man reached the camp that night, but I was too much played out and remained out all night a mile or more from camp. It was a beautifully moonlit night, but too decidedly cold to sleep without

blankets and we had none with us, so were very glad when it was light enough for us to proceed on our journey.

After finishing the townships of Esten and Spragge we started from Serpent Bay, on the ice, about three p.m., walked about three miles and camped for the night, which was an awfully rough one. On getting up in the morning we found about four inches of snow on our blankets. After breakfast we started and walked to the mouth of Spanish River, a distance of about eighteen miles, with snow and sleet in our faces nearly all the way—and oh! how cold! We had to drag our provisions and camp equipage on roughly made hand-sleighs Several of us were pretty well played out and were more than pleased when we saw the mast of a schooner that was frozen in at the mouth of the river. It put new life into us.

There was only one man, if I remember rightly, on the schooner when we got there, but he was afterwards joined by two others who were bringing a barrel of whiskey from the Bruce mines to trade with the Indians. I think I may safely say that we all sampled that same barrel. In the morning we started off for La Cloche and made arrangements with the Hudson Bay factor there for such supplies as we might need for the survey of the Township of Salter. In walking up Spanish River I was bringing up the rear and was carrying my tripod, the men who preceded me all carrying loads. They had all got safely over a bad place in the ice where there was quite a current. When I came along I broke through. One of the men called out, "Save the tripod." Another more considerate one sang out, "Damn the tripod; save the man!" However, both were saved, and the man was not sorry to reach the store shanty he had made on the bank of the river and in which he had something to keep out the cold.

1880-81. MANITOBA.

I left Toronto on 29th July, 1880, to re-survey two townships on the Riding Mountains. Taking the steamer "Frances Smith" at Collingwood we had an exceedingly pleasant trip all the way from Toronto to Duluth. Our jolly travelling party consisted chiefly of relatives of one of my surveying party, Mr. Edward Gooderham, who when writing home afterwards said: "I can get through all my work and manage the food, but at washing I am a failure." The steamer called at Owen Sound and took on board a Miss Webb, a school teacher, and a brother—a young boy of about twelve years—who were on their way to Rapid City. Miss Webb informed me that she was going to keep house for her brothers who were out there. "Take my word for it," said I, "you will be married before a year is out." "Oh, no," she said, "I am going to keep house for my brothers." Nevertheless she *was* married inside of six months.

I left Miss Webb and her young brother at Winnipeg to wait for an elder brother who was to take her to Rapid City. They overtook me, however, two days after I left, just as we were having breakfast. I persuaded them to join us in our matutinal meal for they had not had theirs, and I advised Miss Webb to leave her ox-cart and take my buck-board, being more comfortable to ride in. Thus we travelled

together for several days to the ever-to-be-rembered music of the Red River carts.

The first township which I re-surveyed was a fearfully rough one, and if the surveyor who took the original contract took it at anything less than a good round figure I don't wonder at his scamping his work. It was while moving camp in this township that I learned of the marriage of my late travelling companion, and strange to say, my informant was her new father-in-law, and he drove the team with my camp equipage.

One of the longest tramps of my life was on the 14th of January, 1881, travelling from my first township to the second. We had a double team and a single horse; the team consisted of a horse and an ox yoked together; the single "horse" was an Indian pony, which gave out before we got half way to our destination. Although the distance was only about 30 miles it took us from 5 a.m. till 10 p.m. to accomplish it. When we started it was beautifully bright and clear, the moon was about at the full, but it was bitterly cold. We had to keep moving for there was no place to stop at until we reached a settler's shanty, our objective point. Certainly we stopped once or twice on the road to boil the kettle and have a meal, but were mightily glad to get to the shanty, have a good supper and go to bed—although the bed was on the floor of the said shanty. A tramp of 17 hours with the thermometer at 20° below zero gave me all I cared about having.

After completing my survey we made for Minnedosa, where I hired a horse and buggy, on May 2nd, and drove to Grand Valley to see a friend who lives opposite where Brandon now stands. After spending the night at my friend's, I returned to Minnedosa in the morning. In August, 1880, when I first saw the site of Brandon there were no houses; only the tents of the C. P. R. were standing there. To-day it is a populous city. It was supposed by many that Grand Valley would be chosen for the town plot. It was then a stirring little place containing 10 tents and 15 wooden buildings. While at Grand Valley I visited the grave of my old friend, Archie McNabb, who had died shortly before whilst on a Government survey in the neighborhood. He lies buried in a school section near the village. We left Grand Valley on the 16th of May by the steamer "City of Winnipeg," at 3 a.m., arriving at Winnipeg at 5 p.m. on the following day, and in Toronto at 6:30 a.m. on the 22nd, in good time for the Queen's Birthday.

Dear Queen!—she who has for nearly 60 years reigned over so vast an empire and in whose crown our own dear country, "Fair Canada, Land of the Maple Leaf," shines so bright a jewel—may she be long spared to occupy in health and strength her glorious throne, and when she is called home by the King of kings may her natal day, known to us all so well as "the 24th," our most charming and best enjoyed outing day, coming, as it does, in a month which in this Dominion is so fresh and fair and sweet, continue to be celebrated as a public holiday in perpetual remembrance of so noble and so good a woman and so greatly beloved a sovereign as is our Supreme Lady Victoria the Good, whom God preserve!

DISCUSSION.

Mr. Gibson—I was very much pleased with the reminiscences of my friend. Everything was as sweet as it possibly could be. That incident with reference to my father was repeated to me one day. I think it is a pleasant thing to have these reminiscences, and if they could have been extended a little further with a little fatherly advice I think it would have been very nicely rounded off. A man of his age and experience could give excellent advice to, I was going to say, us young men, though I think he is a few years younger than me, but no one would suppose it—a man of his age and experience could give excellent advice to us all. I think we should encourage the members of this Association, especially our young people, to make a start that way and hand them in every five or six years.

Mr. Niven—I must say I was very much pleased with the paper of Mr. Unwin. I remember perfectly well the interesting character he alludes to He did prove a very good man—thanks to his early training. I may say that I met Mr. Unwin at Sutton on the first survey I was ever on, when I had just become an apprentice. He mentioned the township of Lutterworth, and I may say that as that township is in the neighborhood of Haliburton I have occasionally had to make some surveys there, and I am very happy to say that when I am hunting up the base line there if I get between two blazed trees I can find the line.

Mr. Gibson—I too have gone over some of Mr. Unwin's work, and I must say he is very thorough in his surveys.

Mr. Stewart—I think I have had the pleasure of seeing the pine tree Mr. Unwin refers to. I think since then that portion has been surrendered and is now a township. I knew the Eskimo, and I remember his son, but whether his son developed like his father since I am not aware. I remember the other was not the best of servants that I had by any means. If I am not mistaken this is the first paper we have had of this kind, but I hope it will not be the last. I am sure that a great many of the older members of the profession would be able to prepare papers that would be of very great interest, and perhaps of historical value as well.

Mr. Chipman—I regret that Mr. Abrey is not here to make some remarks upon the paper of Mr. Unwin. While I was serving my time with him we covered part of the territory referred to. I remember very well travelling on Spanish River and making about the same trip he did, going across on the ice and climbing the La Cloche mountains. I was also at Brandon the year before he mentioned, 1880. At that time there was no house there at all, and I had during the illness of Mr. Abrey the pleasure of running both the north and south lines where the city of Brandon now is, Rosser Avenue, I think, is along one of my old lines. There are several people he mentions whose names are familiar to me. I remember the Eskimo family.

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

IRRIGATION IN THE NORTH-WEST TERRITORIES.

By WM. PEARCE,
Calgary.

THE object sought to be attained by sending your society an article on Irrigation in the North-West Territories, is not so much that the climate of Ontario is such that the subject is one of considerable interest to many in that Province, though one who has observed the beneficial efforts of irrigation will unhesitatingly assert that in very many localities, and in the majority of seasons, irrigation to a certain extent would be beneficial and highly profitable, nor does he require the gift of prophecy to foretell that within the life of the present generation it will be practised to a very much greater extent in the humid districts than even the enthusiasts on the subject anticipate. Before leaving this branch of the subject it may not be out of place to observe that few, if any, that were reared in a humid clime, and afterwards lived in an arid or semi-arid one, where irrigation was necessary, but were impressed with the neglected opportunities in irrigation in the humid portions. Particularly is this applicable to gardening and the growth of trees. Further, you in Ontario, irrigate to a much greater extent than you imagine; every gardener, in watering his plants, shrubs and trees, sprinkling his lawn, etc., is engaged in irrigation.

Writers of good repute have asserted that the Garden of Eden was irrigated, and that assertion may be true, if not actually proven, and slight reflection will convince anyone that all the ancient civilizations existed wholly in irrigated territory.

To the Association of Ontario Land Surveyors the subject is not new, but older than the earliest records, so that no apology is necessary because of its newness.

There is any amount of scope for the inventive genius, intelligently applied, by the members of this Association on lines for which your training has to a very considerable extent fitted you, and in which your tastes will no doubt find the most congenial employments, viz., in the solution of devices for accurate measurements of water and the division thereof. Although inventive genius of a high order has been brought to bear on these contrivances for centuries, we are far from arriving at anything like the accuracy desirable. This, to those who have not given the subject any attention, will no doubt seem surprising, but an investigation thereof will demonstrate its truth and the attempt at its solution will be found most interesting even should the result not prove successful.

Another branch of the subject equally interesting and valuable,

viz., designs for diversions of water from the beds of the streams or for creating reservoirs for storage thereof; head gates, and other gates required along the systems; falls or drops for water, which are necessary to a greater or less extent on all systems of any size; spillways or checks necessary to prevent the breaking of banks, etc., arising from local storms or cloud bursts; flumes of various designs for carrying water over or around obstacles of various kinds; tunnels, bridges, culverts, etc.; the best manner of making the topographical surveys necessary, not only to obtain the information requisite to design the minor ditches or canals of any system, so that economy and thoroughness in their construction may be attained, but also the same information over a lesser area required for the purpose of the distribution and application of the water when delivered at some point on or near the land on which it is to be applied; implements for levelling the land, so that the water can be more cheaply and thoroughly applied thereon. It may seem strange that after water has been applied on land for centuries that there should be room for ingenuity or a material improvement in this line, but such is the case; the conditions vary, so that what may be suitable in one case may not be applicable in another; and with us, where the products from irrigation must be sold at best at moderate prices, there is necessity for the greatest economy on the lines mentioned.

Anyone who may think this subject an uninteresting one will find himself agreeably astonished. Running water has a fascination for all.

In 1894 the Dominion Government instituted surveys, gauging of streams, and collection of data necessary to ascertain the amount of water available, and those portions of the territories on which it could be best applied; also for the location of sites for the storage of water. This last has a very important bearing, as has also the conservation of forest areas.

The experience of other countries, particularly that of our neighbors to the south, has demonstrated that no time is to be lost in making the reservations for the purpose indicated; as settlement and the construction of roads and railways, have naturally occupied the points which are most vital in storage of water, if such is to be stored at the minimum of cost and at the best points. At one point in the Rio Grande, the United States geological survey report that the creation of a reservoir at the best point, in fact the only one, will necessitate the reconstruction of a railway which would involve the outlay of hundreds of thousands of dollars. This might have been obviated without material cost to said railway, had the reservation been made before the construction thereof.

Up to the close of the season of 1896, the Canadian irrigation surveys had been extended over a considerable area. The complete work comprises 1,296 miles of line level, 3,811 square miles of contour topographical surveys, and 44 detailed surveys of reservoir sites. In addition to this some 223 miles of location have been completed for proposed irrigation canals, some of which are of considerable magnitude. The question of the water supply available for irrigation in the

portion of the territories requiring irrigation has been examined into, 319 gaugings of streams have been completed, and the discharge of a large number of springs and the volume of numerous lakes measured. The information needed in attacking the many complex problems connected with the flow of or storage of water, has necessarily to be of an exact character, and the field work in connection with the irrigation surveys has to be carefully performed, so that in some instances great rapidity is not attainable ; however, it will be seen from the above statement that good progress in this important work has been made.

There are now in operation in the Territories 157 irrigation canals and ditches, supplying water to areas varying from 10 acres to 10,000 acres. The total area under ditch, and capable of being irrigated, therefore comprises some 140,000 acres, of which only a portion is as yet being supplied with water ; but this portion is being rapidly extended as fast as the land can be prepared to receive the water, and from present indications and with fair encouragement the growth of irrigation will undoubtedly be rapid.

Very full reports of what has been accomplished, illustrated with maps, plates and diagrams, have been issued by the Department of the Interior, for the years 1894 and 1895, and the one for the past season will shortly be forthcoming ; and any member of the Association whose interest in this subject is aroused, would probably obtain copies thereof by application to the Secretary of the Department of the Interior.

The cost of irrigation in the United States has been $815 per acre for preparing the land, and $12.12 additional. With us the cost would be considerably less.

The district of country which requires irrigation may be described as follows : Bounded on the south by the International Boundary ; on the west by the Rocky Mountains ; the other boundary being described as follows : commencing at the intersection of the International Boundary, by longitude 102° west ; thence north-west to latitude 51° 30′ north ; thence west to the Rocky Mountains ; containing about 80,000 square miles, or upwards of 50,000,000 acres.

Its elevation on the east averages about 1,000 feet above the sea, and the western boundary of the arable district about 4,000 feet.

The duty of water will be high, as there is always considerable rainfall and the subsoil being a heavy clay. It is estimated that with storage facilities, which can be economically constructed, there will be water enough for seven or eight millions of acres.

The problems in connection with the application of water will require the greatest ingenuity, so that it may be so distributed that the irrigated portions may be as proportionately as possible distributed around the non-irrigated portions, so as to make the latter contribute to the maximum extent as pasturage in connection with the irrigated portion.

The best mode of settlement to be adopted in the arid or semi-arid areas has also to be solved. To utilize this vast area and

obtain the best results is a goal of the highest importance. This area must be devoted largely, if not wholly, to pastoral pursuits; and it is probable that the greatest volume of dairy products attainable on any portion of this continent—possibly, within the same area, in the world—may be raised in the tract under discussion.

It required considerable persistency on the part of a few who took up and agitated this question to prevail upon our legislatures to provide the legislation necessary for this subject, but in 1894 the country was fortunate enough to have an Irrigation Act placed in our statutes. It is probable in working out this question many defects will be found in the same; it is hoped, however, that it will not be so productive of litigation as the Drainage Act has proved in at least one Province in Canada. As the defects are discovered, they can, it is anticipated, be remedied by amendments to the said Act. With us in the Territories, fortunately the control of both the water and the land is vested in the same authority; thus we will avoid the great weakness that has been met with and has proved so fatal to such a large number of enterprises in the western United States. It has also been attempted, and it would seem successfully, to have the administration thereof under strong central control, thereby avoiding the rock which has frequently proved so fatal—viz., disputes and litigation. On no subject, even in connection with rich and valuable mines of the precious metals, has there been so much heart burning litigation, and in some cases many lives have been sacrificed in disputes arising out of water for irrigation purposes. It would prove much too lengthy to attempt in this to explain fully the provisions of the Irrigation Act, whereby such disputes are thought to be avoided; the making the title to water as secure as to land or any other property; doing justice to the consumer as well as the one who supplies the water; providing a speedy, equitable and non-appealable decision, regarding any and all controversies which may arise out of the construction and carrying on of irrigation. None of the very many technical points or problems arising out of this subject have been attempted. It would make it much too lengthy, they had best be taken up one by one by any members of this or kindred associations. There are dozens of problems which each in itself would justify the production of a paper sufficiently lengthy, interesting and valuable, to claim your attention at any one session.

He who makes a hobby of any subject cannot understand why his theme has not the interest to others that it has to himself, and it may be that to many of you this effusion may appear dry and uninteresting. It is at all events not a dry subject. But this promise can be safely given you, that at least 999 out of every thousand who take the trouble to enquire into this subject will be interested, and a goodly percentage will be as great enthusiasts as the writer. This is not a reckless assertion, but one fully borne out by experience. If even in a very small percentage of you interest in this is aroused, the writer will be highly gratified and a thousand-fold repaid for the slight trouble he has taken.

DISCUSSION.

Mr. Gibson—I am very much pleased with this paper. It opens up a very wide field for a surveyor and engineer. We are quite well aware that an engineer alone is not capable of carrying on works of that kind so well as a person who is a land surveyor as well as an engineer, and in view of the work, which apparently the Government is blocking out in the arid districts of the Northwest, I think this paper is suggestive to us all, and lays the foundations for a large amount of work which we surveyors will take deep interest in. I understand already there is a new machine that will be used among the farmers, run by storage batteries, by which the ground can be turned up and pulverized and seed sown at the rate of 25 to 40 acres a day. In view of that it is quite evident that our Western country will be developed very rapidly if you get a system of agriculture based on that manner of cultivation, and with this system of drainage supplying water in the manner spoken of, they will develop a large amount of land up there. I think in Ontario we make the water disappear too rapidly by our system of drainage. I remember when I was a lad we generally, about the middle of February, had all the fields flooded. Now we have our ditches and our tile drains so fixed that the water can hardly touch the land before it is hurried off into some ditch.

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

A FEW WORDS ON ELECTRIC STREET RAILWAYS.

By T. O. BOLGER, C.E., O L.S.
Kingston.

DURING the last five years Electric Railways have become a familiar object in every city in Ontario and in many of the larger towns, and, as the construction of such roads has been going on under the immediate observation of the general public, it is hard to find anything to say on the subject that will be of interest, still the writer hopes that he may have made some observations in his small experience in such work that may be worth setting forth.

In the first place, an Electric Railway is a very easy thing to locate, as you can run it up and down almost any grade and turn it round corners with curves of almost any radius; in fact, any road on which a horse and carriage can be driven in comparative safety, thereon can you locate and operate an Electric Railway.

For instance, in Kingston there are several grades of five per cent, and the cars go up them with apparently as much ease as if they were running on the level, and this too when they are filled to overflowing with passengers. Of course, it takes more amperes of current and makes a bigger call on the power-house, but, apparently, they go up as easily as they come down. The coming down part requires the most care, as a loaded car going down a five per cent. grade gets up a big speed, and if anything went wrong with the brake chains it might be awkward.

But five per cent. grades are not considered at all excessive, and roads are now successfully operated with grades as high as ten and even twelve per cent.

The sharpest curve that is allowable is one of forty feet radius for the inside rail, and curves should be made as much more than that as possible, as the wheels will grind and crack on a curve of that radius, while, with fifty and sixty feet radius they will go round quite easily; 100 feet radius is better still, when it can be placed, but it is not often that such a curve will suit the surroundings. Of course, getting round a right-angled corner in a business street, forty to forty-five feet radius curves have to be put in, but, in suburban localities, easier curves can nearly always be managed, and every additional foot of radius is a benefit to the road.

In the old horse car lines they always used that abomination a cast iron curved rail, which was a terror to the drivers of vehicles, but, with a nicely curved 60 pounds steel T rail the vehicles find no difficulty at all.

The writer has only had experience with T rails, although, of course, he has seen the girder rail used in Toronto, Montreal and other large cities where the streets are paved and where, owing to their depth, they are no doubt best adapted. But, for ordinary macadam streets, a good sixty or sixty-five pounds steel T rail makes a first-class road, and if properly tamped, lined and levelled, leaves little to be desired.

Railway Companies sometimes buy discarded steam railway rails, and think them good enough for their electric road; but this is a great mistake, as there will surely be little kinks and bends in the best of such rails, and nothing in the world will get these out of them ; and no matter what care is taken laying them, the result will be a rough road for ever. I have seen the poor track-layers in despair over such rails, as they are expected to make a good road out of impossible material. It will pay a company far better to buy new, clean, straight rails, and then they can have a track laid, over which their cars will run smoothly and not get shaken and jarred, as they surely will if the rails are kinked and bent.

The usual thing in laying a railway track in a macadam road is to cut trenches crosswise of the road, about two feet apart, in which to place the ties, and then other shallower trenches lengthwise of the road to receive the rails, and then, when the rails are spiked, tamp up the ties, with what broken stone and mud is most convenient, until the top of the rail is flush with the surface of the street, and then pack back as much of the macadam and mud as will make the street surface level, and the job is supposed to be finished. But this makes a poor job, because you cannot tamp ties properly with such stuff as is dug out of a roadbed, as the stony part is all too coarse and the mud will give way under the ties the first time it gets wet ; besides, the refilling of the trenches will absorb water the first wet season, and the ties will churn and get displaced, or will heave in frosty weather and disturb the alignment and level of the track.

To do the thing right, a trench the width of the length of the ties ought to be taken out continuously along the street to a depth of three to four inches below the bottom of the ties, and a cushion of good railway ballast put in for the ties to rest on. On such a bottom as this the ties can be tamped in a good and sufficient manner, which cannot be done if they are lying on the coarse stones which usually form the bottom course of an ordinary macadam street.

If the roadbed itself is not properly drained, some provision should be made for drainage under the ties; in fact, there ought to be a large-sized field tile laid between the rails, deep enough down to be below frost line, and the filling over this should be of a porous enough nature to allow all water to percolate down to the tile.

When the rails are all in place, duly lined and ready, the practice here has been to fill up the spaces round the ties and rails to about one inch higher than the street level, and then put on the eighteen ton steam road roller and roll till everything is solid. If the surface is made up in this way, with good, clean, broken stone and sufficient

good bedding, the rails are left just nicely flush with the street and are but very little impediment to vehicles, and the surface thus compacted keeps in good order for a long time. It was feared that the surface would wear away rapidly near the rails, causing them to stick up in a dangerous manner, but this does not appear to be the case to any great extent. Of course, a first-class electric road should be laid on concrete foundation and the surface finished with asphalt, brick, or granite block, such as has been done in the first-class streets of Toronto, or other large cities where they do things about right. But in smaller places the parties who put in an electric road have a good deal of pluck to risk their money in the venture, and if the municipality would insist on too expensive a roadbed, they would have to go without the road.

The engineer or surveyor who does the laying out of the work for a street railway generally has his work pretty well cut out for him, as the city or town engineer, on behalf of the municipality, always tells him where to lay out the tangents, either in the centre or at the side of the street, as the case may be, and also gives him the radius for the curves for every corner, and, in case of the grades, will also give him instructions; in some places making him keep flush with the street surface, and in others, where the municipality intend to alter or improve the street grade, will make the grade of the rails conform to the intended improvement. Still, the surveyor laying out the work will have enough to do to keep him interested, especially as the men digging the trenches are continually destroying his marks, and it is a most trying thing on his patience after carefully and laboriously laying out, say a forty-five foot curve round a right-angled corner by driving railway spikes ten feet apart, all exactly right, to find on coming back from dinner that they are all rooted up and some sixty or seventy men digging with picks and shovels within a distance of as many feet exactly on the sight of his curve, and that he is expected forthwith to lay it out all over again. Then, when laying the track round a curve, the rails have all to be bent with a rail bender, and the engineer in charge has to stand by and see that the proper curvature is attained, which he ascertains by measuring the middle ordinate. A handy little formula for finding the middle ordinate is as follows: One eighth of the square of the length of the rail divided by the radius gives the length of the middle ordinate in feet; that is to say, in bending a 30 foot rail to fit a curve of 40 feet radius you can find the ordinate as follows: the square of 30 is 900, which divided by 8 gives 112.5, which divided again by 40 gives 2.81 feet. It may be stated that a good bender will turn the circle true enough for practical purposes, and when you get the ordinate right your rail will be all right. The rail has to be put through the bender several times before you get it right, and as, including guard rail, it requires nearly 200 feet of rail to go round a right-angled corner, it is no small job to get a curve properly put in.

The men generally employed by the railway people to boss the track laying, are section foremen off some steam road, and are mostly

men of good intelligence ; but they always want to elevate the outer rail on a curve unduly, and much of an elevation makes an awkward appearance on the street.

The laying out of the switches, turn-outs, etc., has to be done very exactly ; the points, frogs, etc., are all castings and are made to fit exactly the kind of turn-out required, but then they must be placed exactly right distances apart and the rails curved and cut to fit exactly between, as a badly regulated switch is a constant source of annoyance on the road.

Generally speaking, the engineer or surveyor who lays out the road has nothing to do with the electric part of it. This is done by the electrician, and his functions are by far the most important, and even while laying the rails he takes a hand in.

All the electricity that is sent out of the power-house along the trolley wire comes back again to the power-house, either along the rails, if properly connected, or gets into the ground and finds its way back underneath, taking advantage of such convenient paths as may exist down there, such as water mains and gas pipes, etc. Now, it is not at all a good thing for such pipes to have such a use made of them, and it is very much to the interest of the municipality that the electricity should be confined as much as possible to the rails. If the rails formed a continuous bar they would make an excellent channel, but as they do not always touch, and as their contact is often broken by rust, etc., even when they appear to touch, something has to be done to connect them, and this is called bonding the rails and is accomplished by joining each rail to its neighbor by short pieces of copper wire 000 wire gauge or about $\frac{3}{8}$ inches in diameter, and this is what the electrician does to the rails before they are covered up.

The railway people do not care particularly how the electricity gets back, so long as it does get back, and it is not for the welfare of the water pipes that they are solicitous when they take such care in bonding the rails, but in very dry weather, or in very hard frosty weather, the ground does not conduct freely, and when the current cannot get away freely, either along the rail or through the ground, the difference of potential between the trolley wire and the rail is lessened and the efficiency of the current impaired. Up till some ten or eleven years ago, when electric lighting commenced to become general, the writer of this paper never heard of the terms volt, ampere, or ohm, and knew no more about electricity than to be aware that lightning was a display of that commodity and that you could exhibit electric sparks by rubbing a cat's back in frosty weather. He knew, however, a good deal about magnetism, as developed in an old-fashioned surveyor's compass, and was up to all its tricks and capers and was prepared to find a way to counteract its most malignant efforts, such as it constantly puts forth, to entrap an unwary surveyor and try and induce him to head his lines in a direction at right angles to the course he ought to go, and many are the conflicts he and magnetism have had on the non-impregnated mountains of North Hastings and Peterboro' and, in fact, all over the Huron and Ontario and

Algoma districts, and he fears that localities might be found where erratic actions of magnetism may have prevailed to such an extent as to cause divergencies in lines of his that ought to be straight.

But this familiarity with practical magnetism helped him not at all with electro magnetism and electricity, as it is utilized in lighting our cities and propelling our street cars, and it became necessary in his capacity as City Engineer in a small city to have sufficient knowledge of electricity to understand thoroughly the technical terms used, and be able to follow, intelligently, descriptions of electrical appliances for lighting, heating and power purposes.

Most of the works on electricity are so extremely technical that it is most difficult for a beginner in the subject to follow them; they always assume that you know just that something that you don't know; and, in order to find out that something, you read and read and puzzle your brains, wading through heaps of scientific facts that you do not want at all, and by the time you master the something you are after, you have forgotten a whole lot of things you had laboriously got up before.

Now, the writer wanted to know what an ampere is and he wanted to know it just as clearly as he knows what a gallon of water is, and the same for a volt, an ohm and a watt. And, as it gave him much trouble to get a clear understanding of these terms, he feels it would not be amiss to explain, in simple language, his conception of them, for the benefit of some few old-fashioned members of the Association who like him have no knowledge of electricity and who like him never expect to have the time or opportunity to acquire such knowledge.

Electricity, they now say, is not a fluid, but, for the purpose of this explanation, it will do no harm to assume that it is a fluid, also to assume that it will flow along a wire in the same way that water flows in a pipe, only the electricity flows along outside the wire, while the water flows inside the pipe. If the air were a conductor the electricity would leak off the wire in the same way that water would leak out of a pipe if there were holes in it.

Electricity will not have any inclination to flow along a wire unless it is pushed along, the same as water will not flow in a pipe unless it is pushed along by a difference of level in the water. If you put two equally high tanks of water side by side, connected at the bottoms by a pipe, the water in one will not try to flow into the other, as they are both on the same level, but if you take half the water out of one, the water in the other will flow through the pipe with a force, due to the difference of level or the head. Now, this difference of level or head in water is just the same as difference of potential in electricity; in water you designate the difference of level as so many feet head, in electricity you designate the difference of potential as so many volts.

Difference of level in water can be expressed in another way. That is as pressure, or so many pounds to the square inch, thus 1 foot head gives .43 pressure, and 100 feet head 43.4 pounds, but head

and pressure indicate the same thing. In electricity difference of potential is also called electro-motive force, but both terms mean the same as pressure or head in water, and a volt is the unit by which this electric pressure is measured. The quantity or current strength going along a wire is measured by a unit called an ampere, and this amount can be best exemplified by the analogy of the miner's inch of water, which is a method they have of measuring the quantity of water sold by those owning water rights in California. A miner's inch is the quantity of water that will flow through a hole of one inch sectional area bored through a two-inch plank with a head above the hole of six inches. Now, one ampere of current along a wire is just the same sort of a thing as a miner's inch of water flowing in a trough, and two or more amperes of current in a wire are the same as the current caused by two or more such holes leading into the same trough.

A watt is the unit of work, and to find the number of watts in a circuit you multiply the number of volts by the number of amperes; thus a circuit that has a current strength of 10 amperes and a pressure of 500 volts would give 5,000 watts, and as 746 watts equal a horse power, that circuit would be good for 6.6 horse power, which can be used for lighting lamps, running cars, etc.

Conductivity is a word peculiar to electricity, and expresses the capability of different kinds of wire to convey a current; thus a copper wire has six times the conductivity of an iron wire, and will conduct a current with as much ease as an iron wire of six times its sectional area, that is to say, it offers that much less resistance to the flow of the current.

Resistance to the flow of current in a wire is the same as friction in a water pipe, and in electricity they have a unit of resistance called an ohm; and thus we speak of a wire or a coil having so many ohms of resistance. There is no analogous term in hydraulics; and in speaking of frictional resistance in pipes, hose, etc., they put a value on it as the loss of head per 100 feet.

In speaking of water, in a former paragraph, it was stated that water would not flow in a pipe unless there was a difference of level to make pressure, but, of course, a pressure can be caused by a pump and applied at the lower end of a pipe and the water forced up hill. And this state of affairs is more like the condition of things in electricity where the dynamo takes the place of the pump.

If you visit a power-house in the evening, when all the lamps are on and the cars still running, you will encounter a busy scene and you can make some interesting observations. For instance, in our power-house here, if you observe the volt meter on the trolley circuit you will see that the hand indicates 550 volts and remains nearly steady at that, while the ampere meter twings from 75 up to 350, according as current is called for by the cars, but you will notice that the hand is more regularly about 110 and only swings up to the higher figures for a second or two as a sudden call is made for power. Now, an average of 110 amperes multiplied by 550 volts gives 60,500 watts, or something over 80 horse power. There are seven cars out on

the line, which is about 11 horse-power per car. This is only an average, as probably some of the cars are running down hill and using no power, while others going up hill are using, perhaps, double the average.

There are three circuits in the city supplying arc lamps with 40, 34 and 31 lamps respectively. Now, the ampere meters on these circuits show, or ought to show, a steady current of 9 amperes, and the voltage should be 2,000, 1,700 and 1,500 volts for the three circuits respectively, but there are no meters indicating such high voltage; but if you apply a volt meter to any of the lamps, you will find a drop of potential of 50 volts.

On the incandescent circuit, which also supplies power for small motors, you will notice that the three-wire system is used; and two dynamos, each dynamo sending out some 400 amperes of current at a uniform pressure of 115 volts.

It will be seen, from these observations at the power-house, that the different uses to which the current is applied require different combinations of the two properties, current-strength and pressure.

DISCUSSION.

Mr. Tyrrell—I would like some information given with reference to the rail. Mr. Bolger spoke of the use of the "T" rail and the Girder rail. I have heard a great deal of discussion as to the merits of the two, some engineers thinking the Girder rail alone should be used in cities, whilst other engineers think that the "T" rail is equally as good, if not preferable. I have had no experience myself in the matter. I would like to know if anyone here has had, and what is the general opinion. My own personal idea would be that for paved streets, such as asphalt or brick pavements, the Girder rail would be preferable, so that they could lay close up to the flange of the rail, whereas on the macadam streets probably the "T" rail will answer equally well. That is merely my own idea in the matter.

Mr. Jones—It is the Girder rail they have in Hamilton.

Mr. Tyrrell—On the paved streets.

Mr. Jones—They use the "T" rail at Brantford, and the reason they gave there that it was advocated was, that it would be more suitable than the other rail in case they wished to carry freight. They thought they might wish to do so to some of the outlying factories.

Mr. Abrey—In Toronto Junction they used the Girder rail on Dundas Street and on one of the other streets, on the others they laid the "T" rail. At the time it was put down I insisted strongly for the Girder rail on all the streets, but a good deal of pressure was brought to bear by the Company on the Council and they were permitted to put the "T" rail on the other streets. We have no paved streets. I think the "T" rail would be as good, certainly a good deal better for the street cars. The Girder rail is easily filled up with mud and stones and there is lots of expense, and it does not work so

well with them. On paved streets I think the Girder rail would be much better.

In reference to grades, we use grades there of 6 per cent. on the western hills, and the cars seem to work very well on that grade. They are a good distance from the power house there. We have a good grade on the Lambton hills, and when they get on the hills they work slower. They try to arrange to get some of the cars going up hill and some down, but that is impossible in such circuits as we have there. The 6 per cent. grade seems to work very well.

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GOLD MINES IN RAINY RIVER DISTRICT.

By J. F. WHITSON, O.L.S.,
Toronto.

I HAVE been asked by our Secretary to prepare a short paper on Gold Mining in the new district of Rainy River. I will endeavor to give some of the information I gathered during the two years I was an active explorer in the district, 1890-91, and from what I have gathered during the last few years, when I have been somewhat closely connected with the mining interests of that district, so that you may have some idea of the great mineral wealth of Ontario's most westerly possession. I am fully alive to the responsibility resting on anyone writing about a new mining country, and shall hew closely to the line, so that no one going to the new field will be disappointed in not finding things fully as good as stated in this paper, but rather be able to say, "the half had not been told."

UNTOLD WEALTH.

Indeed it would be very difficult to over estimate the possibilities regarding the mineral wealth of new Ontario. Up to the year 1856, when Napier made his first exploration trip through the district, but little was known of the new region, and in fact that statement would almost hold good at the present time with reference to a great portion of the country lying even south of the C. P. R., between it and the northern boundary of Minnesota, while the country to the north of the railway is as yet a closed book. The building of the great railway, the C. P. R., has done much to open up the western country, and no portion of Ontario has been more benefited than this new district. It occupies that great stretch of country lying between Thunder Bay District and the Province of Manitoba, 192 miles in width, and extending from the northern boundary of Minnesota, north to Lake Seul, 175 miles in length on its eastern boundary, and averaging not less than 125 miles, and comprising an area of nearly 20,000 square miles, or about 12,000,000 acres; including within its limits the Lake of the Woods with its 1,400 or more islands, Rainy Lake with its 600 miles of coast line, or more than that of Lake Ontario; Lakes Manitou, Wabigoon, Eagle, Lonely and more than a thousand other lakes, in fact one might call it "the land of a thousand lakes."

GENERAL CHARACTERISTICS.

The general physical characteristics of the country are very similar to those found in other glacier swept Archean tracts, such as

the north shore of Lake Huron, Muskoka, or Parry Sound. In few places is the country as mountainous as the north shore of Lake Superior, nor as difficult to explore as the region north of Lake Huron. Within the district are to be found many large and magnificent streams. Rainy River is 80 miles in length, with an average width of not less than 500 feet. Winnipeg, English, Seine, Manitou, Eagle and many more streams are quite navigable for large boats in places. The geological formation of the district is either Laurentian, Huronian or (Keewatin), and post glacier, the Laurentian rocks predominating. The most recent, the clays and sands, form the agricultural section of the region along the Rainy River and around Wabigoon.

THE GOLD-BEARING ROCKS.

Of the total area of the district nearly 5,000 square miles is covered with the Huronian or gold-bearing rocks. It will, therefore, be seen what a vast field there is for prospectors in this new district. I believe that this new Ontario will be one of the richest gold districts in the Dominion within the next ten years; yes, on the continent.

The success which has attended mining in that thinly populated and undeveloped condition of the country in the past two years is but an evidence of the great success which awaits the future exploration not only for gold but for other minerals.

The history of the district since attention was first drawn to it by the discovery of gold about fourteen years ago, shows that nearly all the exploration to which the country had been subjected up to within the last eighteen months has been confined to the shores of the Lake of the Woods, Rainy Lake, and a few of the larger streams tributary thereto. Few prospectors have ever penetrated into the interior; in fact this will apply even up to the present time; they having contented themselves in prospecting the main waterways which are easy of access, going back but a short distance inland, so that at the present time but a very small portion of the country, even convenient to the C. P. R. or the larger lakes, has as yet been even partially explored.

GOOD RESULTS AHEAD.

Long after the first discovery of gold on the Lake of the Woods, very little development work was done except on the Pine Portage and Sultana Mines; this was partly owing to the want of capital, but more particularly to the belief that there was little gold to be found in the district. The good results attending the development of the Sultana Mine has done much to encourage others to prospect and develop discoveries, and in nearly every instance where development work has been done, the results have been highly satisfactory, so much so that during the last two years prospecting has been very active, and has resulted in the discovery of a great many veins of gold-bearing quartz, many of them are undoubtedly rich, and will yield large profits when mined.

HALF DOZEN STAMP MILLS.

Mining, properly speaking, can scarcely be said to have been more than begun, except in a few cases ; prospecting, however, has been very active, and many of the leads are well stripped and opened into, so no less than 100 different mines are being developed or partially so ; with the increased shipping facilities, the building of new roads by the Government, the investment of English and foreign capital in the district of late, it is confidently anticipated that this year will see extensive mining operations and good returns therefrom ; in fact there are no less than half a dozen stamp mills either being shipped into the district or being erected at the present time.

The good results of the last six months' mining has given to those interested in the future of the Lake of the Woods unqualified satisfaction. Everything, with few exceptions, has gone to show that their confidence has been well grounded.

SCEPTICISM REMOVED.

Those who were at first sceptical as to the permanency in depth and richness of the deposits have candidly yielded in the face of the unquestionable evidence offered them in the splendid showing of such mines as the Sultana, at a depth of 400 feet, with an enormous body of rich ore at that depth, and every appearance of an unlimited quantity, which can be mined and stamped, with even a 10-stamp mill, at less than $4.00 per ton.

The Regina Mine, at a depth of 286 feet, with a similar mill, is producing gold at nearly the same cost per ton. Other mines in the district, such as the Mikado Yum Yum, Cornucopia, Gold Coin on Shoal Lake, Gold Hill, Black Jack, Princess, Scramble, Trojan, Triumph, Bath Island and many others on the Lake of the Woods are producing large quantities of rich ore, and there is scarcely the shadow of a doubt but that most of them will do so. The Mikado yielded well at first clean up ; so also did the Saw Bill, Lake Harold, Hawk Bay. Folger and Hammond are producing large quantities of ore, and are undoubtedly splendid mines.

SUCCESSFUL RESULTS.

On Seine River the Foley Mine has a 20-stamp mill at work and can work the ore at $3.00 per ton. They are down several hundred feet in the shaft, and there is every appearance of it being a permanent mine.

The Porcupine, the Weigand, Proudfoot and many other mines on the Seine River, are turning out successfully.

Rainy River as a gold district can be conveniently divided into five sections. First, and probably the most important, is the Lake of the Woods section, including all the country north west of Rainy Lake and around Shoal Lake ; west of the Lake of the Woods, com-

prising an area of not less than 2,000 square miles in which there has been over 1,500 claims surveyed. The Rainy Lake section, comprising the Seine River, has over 1,100 claims surveyed. Gold was first discovered on a small island in Rainy Lake on the Minnesota side of the line, in the fall of 1893. In the spring of 1891 was found a small nugget of pure gold on Hunters' Island. Since that time the prospecting has been very active and several good mines located, on which stamp mills are now working.

GOOD VEINS WELL DEVELOPED.

The Manitou section, comprising the country round Manitou and Wabigoon and Eagle Lakes, in which there are over 300 locations surveyed and several good veins well developed, and from all appearance this has every likelihood of being a very good gold district. One of my Indians in 1890 found a sample showing free gold at the head of this lake, and I arranged with him to take me to the place, but a few hours before starting the Indian got drunk and I was never able to get him sober enough to go.

The Saw Bill Lake section, including the country around Saw Bill and Harold Lakes, in which about 125 claims have been surveyed; this is one of the most promising sections in the district, and contains the great Folger and Hammoud dyke from 10 to 300 feet in width, and nearly a mile in length, and which appears to assay from a few dollars per ton up to $100 or more; this is probably one of the largest quartz ledges ever discovered in the Province, and is probably one of the most enticing properties on the market.

FOUR THOUSAND CLAIMS SURVEYED.

The year 1883 marks the beginning of surveys of mining locations on the Lake of the Woods. No less than 4,000 claims have since been surveyed, during the last two years 2,500, and over 1,500 during the last twelve months, within the district 1,500 patents and mining leases have been issued, covering over 2,000 claims. From fifteen to twenty Ontario land surveyors and their assistants are in the field at the present time hard at work. Of the 4,000 claims already staked out, there are, of course, as in all gold fields, a very large number of worthless, or comparatively worthless properties, but at the same time there appears to be an unusually large number of promising veins.

BEST IN THE DOMINION.

If one claim in every 100 proves a paying mine, 40 gold mines in the district mean a great deal; if 2% prove a successful property, it will make one of the best gold regions in the Dominion; if 5%, it will surpass that of California.

A purchase carefully and judiciously made may be safely calculated upon as likely to yield, under proper and economical management,

profits that will compare very favorably with some of the best known gold districts. It is not improbable that even a few very rich claims will be found, but the legitimate claims of the region are based upon the free-milling character of the ore, the large quantities of ore in sight, the true fissure veins, the economy with which the ore can be worked owing to the abundance of fuel, the splendid shipping facilities afforded by the navigable streams and lakes and the abundance of good waterpower.

CAPITAL WANTED.

One great drawback, however, to the mining development of Western Ontario is the fact that so many of Ontario's investors are land speculators rather than mining developers. They are willing to lease or purchase large tracts of mining land at $1 or $2 per acre with the hope of selling it at a fabulous price without spending one single dollar in development work, and thus the barter and sale of mining lands go on. Many of the small investors in the poorer claims will never reap a dollar in return and there are hundreds of worthless claims in this district. I fear that in the course of only a few years, at the mouth of the shaft of many of these partly developed claims could be erected a slab and on it the inscription written "Died for want of sufficient capital to develop."

A PROVINCE OF ITSELF.

This new district is a province within itself, with a future, possessed as it is with great natural advantages as a mining country, and peopled with an industrious race, her progress cannot be checked, as her resources are becoming better known, her towns and villages are becoming more populous, while sturdy farmers from the east are filling her agricultural areas, and on every hand can be seen abundant evidences of prosperity and advancement.

DISCUSSION.

Mr. Niven—I was very much interested in Mr. Whitson's paper, and although I have been through a good part of that district, unfortunately I never discovered anything. The fact of the matter is, surveyors never have time to look for gold. When you are out there with fifteen men around you, and expenses of $25 a day, you do not feel much like stopping. I hope some of the many surveyors who are up there now may be more fortunate than those that have preceded them. Mr. Whitson has been through the country a good deal and is pretty well posted with reference to those matters, and I have no doubt that what we have heard from him is reliable.

Mr. Tyrrell—Is gold found in the Mispickle ores of the Lake-of-the-Woods? I know Mispickle ores are very common in that district.

Mr. Whitson—They have made no development work in the Mispickle ores yet. It is in the free milling with very few exceptions.

Mr. Sewell—I believe the rule is there, when you get sulphuret you very seldom get gold. In the Foley Mines on one occasion I got a lot of sulphuret and found some four or five pounds, and I tested it very carefully, and I could not get any gold out of it, but out of the rock you can get any amount. That is one of the peculiarities of the Lake-of-the-Woods and the whole of the Rainy River District, that in that sulphuret you get very little gold. It is generally saved as concentrates, but the amount of gold in it is very small, so that it is practically free milling

Mr. Kirkpatrick—There is one feature that is encouraging to Canadians, and that is the more recent developments have been principally among Canadians. In the Seine River and Vermilion Lake, Wild Pigeon Lake and Manitou, it was almost invariably Americans who were dealing, and Canadians did not seem to be in the country at all; but I think now people are waking up and realizing that they should not let everything go past out of their hands; and it is a feature of the last, if we may call it, "boom," it has been principally amongst Canadians, and I hope we will have the benefits of their courage, and not, as Mr. Whitson says, sit down and expect somebody else to come in and buy it at fabulous prices, because that is the thing we do not want to do. English capital is coming into the country. The Portage Mine was sold, I think, for $18,000 to a firm in England who represent a South African Company, who turned it into the Mikado Mine. Before very many weeks passed over the gentlemen who sold it for $18,000 were ready to kick themselves for having done so, for nearly half the purchase money had been taken out in those few weeks, as I understand, to pay for the mine. I am very glad English capital is coming in, because if they get a few good paying mines I do not know any country in the world that is better able to furnish capital than England, and I believe it will be put on a sure basis.

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HINTS TO PROSPECTORS.

By HENRY DeQ. SEWELL, M.E., O.L.S., D.L.S., A.M.I.C.E.
Port Arthur.

THE object of this paper is to furnish a few practical suggestions or hints for the guidance of prospectors when in the field, which the author trusts may prove useful to many who have little or no knowledge of chemistry, and in the absence of being able to take an extended course of scientific study on this subject that they may be benefited by the few simple rules here given. Especially as when they are far from their homes, and out in the bush, they cannot conveniently carry much additional weight beyond possibly a few ounces. Thus by making a few practical tests of their discoveries on the ground, they may be enabled on their return to give others a fairly definite idea of their discoveries.

First of all it is self evident that any serious addition to their kit, amounting to say even ten pounds, would be entirely out of the question, as the prospector has generally to carry everything he takes with him on his back, and therefore the length of time he can spend on a trip is closely governed by the available weight for provisions that he can conveniently take with him after deducting the weight of his blankets, tent, etc.

Such being the case, the Ontario explorer, when he has found a good looking vein, simply wishes to determine whether it contains gold or not (other minerals being practically outlawed, owing to the Royalty clause imposed by our would-be wise M.P.P.'s), and he will also naturally wish to find out whether the gold is present in a free state, or whether it is mixed with any mineral that will materially affect the cost of extracting the gold.

The method he commonly adopts is to load himself well with specimens of the ore (more or less picked). On his return home, where he usually keeps or borrows from a neighbor, a large, heavy mortar, sieve, and pan, with which he goes through the usual method of panning, and if properly carried out it should afford him a fair idea of the value of the ore.

By such means, however, his tests are usually confined to the veins he may consider most likely, and thus he easily passes over many fairly good veins, that may possibly contain gold in paying quantities (particularly if they should happen to be at some distance from the travelled watercourses, which he generally follows with his

canoe), simply because he does not consider it worth while to carry the samples of ore to his camp.

Thus by taking with him a small box containing a few reagents, and a blowpipe kit, which will hardly weigh more than a pound and can be purchased for $2.50, to which may be added a small text-book, he can readily determine with absolute certainty any mineral he may come across.

Since, however, the law practically restricts his search to gold, with its associated minerals, a much smaller kit will do equally as well, and thus be the means of preventing him from passing over too lightly and without proper examination many desirable veins that he otherwise might have been hardly disposed to have given even a thought.

If then he takes with him in addition to his ordinary kit a blowpipe with a spirit or grease lamp, a small hammer, anvil, forceps, magnet and a clay pipe for cupelling, with a little soda carb, bone ash, litharge and charcoal (the latter he can generally make in the woods if required), he is in a position to make a satisfactory test for gold with its associated minerals.

By heating with the blowpipe on charcoal, commonly called roasting, a small quantity of the powdered ore, the presence of sulphur, arsenic, antimony and tellurium can be readily detected, the first two by their smell, sulphur, being that of a match, whilst arsenic smells like garlic or onions, besides giving off white fumes. Antimony also gives off white fumes, which form a white coating on the charcoal, but they have no smell.

Tellurium also gives off white fumes, which form a dense white ring deposit, slightly yellowish when hot and tinging the flame point light green.

As, however, there may be some difficulty experienced in distinguishing sulphur from arsenic without practice, where both are associated together in the same mineral, it may be desirable to give another simple test for sulphur. It is well known that sulphur will tarnish silver; so we mix a little of the powdered ore with a little soda carb. and powdered charcoal, place the mixture on a silver coin, then gently heat it with the blowpipe, and should there be any sulphur present, it will betray itself by the usual stain or tarnish on the silver.

Iron is another associated mineral. It can always be detected by the magnet, magnetite being magnetic, whilst hematite becomes so when heated.

Having thus made all the usual tests for associated minerals, it only remains to determine the presence of gold and siver by cupellation. This can either be done from a small portion of the ore direct, if sufficiently rich, or the process can be simplified by concentrating from a somewhat larger quantity of the ore. In the absence of a mortar and pan, it is surprising what a handy man can do with an axe or pick, whilst a fairly serviceable pan can be extemporized by burning the grease off a frying-pan. Then taking a small quantity of the powdered ore, or concentrates, after roasting it carefully on char-

coal, mix it with a little litharge, fuse it into a button on charcoal, and afterwards proceed to cupell it, on a cupell which can be easily made by pressing a small quantity of bone ash into the clay pipe. This will take rather more time and trouble than the foregoing tests, but it can be accomplished with a little practice.

After having determined the presence of gold in the vein to his satisfaction, the next thing to be done is to make a careful examination of the vein, noting its size and direction, whether it goes with or across the formation, and what the formation consists of. He should also note whether the hill (if any) extends above the vein, and if so, to what extent. If there is any water in the neighborhood, that should also be noted.

The next point to be determined is the topography surounding the vein. Should he be an adept at free hand sketching, he can show the vein with the principal features surrounding it ; otherwise, and perhaps still better, he can provide himself with a small photographic camera, with which he can rapidly take all the views he may require. A camera using film cartridges (each cartridge providing for 12 exposures), making pictures $1\frac{1}{2}'' \times 2''$ will measure $2\frac{1}{4}'' \times 2\frac{7}{8}'' \times 3\frac{7}{8}''$, weighs five ounces, and can be purchased for $5.00.

The principal advantages of this kind of camera is that anyone entirely ignorant of photography can use it successfully, as the cartridges are so made that they can be placed in and removed from the camera at will, in broad daylight, the film only being exposed to light when taking the picture ; and the views so taken, can, on his return, be developed, printed from, or enlarged by any photographer, should the explorer either not have the desire or the ability to do the work himself. Thus with very little trouble or expense he can place himself in a position to convey to others a fair idea of his discovery, that, generally speaking, would considerably facilitate his prospects of making a sale, and possibly of getting a higher price.

In conclusion, I would particularly warn prospectors against the use of high flown names for common rocks, such as " protogine " for " granite," which are apt to be exceedingly misleading, and may possibly terminate, as the writer once heard from a would-be English expert, who wanted a location with good veins on it, but it must be in the " Antipyrine."

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THE SAULT STE. MARIE AND HUDSON BAY RAILWAY.

By JOSEPH COZENS, O.L.S.,

Sault Ste. Marie.

As THE original promoter of this line, I am asked for a short paper on the proposed route. I shall not present this from an engineering standpoint—that is for the near future—but as showing the *possibilities* in regard to the country and the advantages to be derived by Ontario from its construction.

"From ocean to ocean"—from Canada's great chain of lakes to her greater inland sea. What the construction of the Canadian Pacific Railway has been to the Dominion of Canada, the building of the S.S.M. & H.B. Railway will be to Ontario. As Sault Ste. Marie is the key to Lake Superior so is it also the key to Hudson Bay.

Nearly 17,000,000 tons of freight passed through the Sault Ste. Marie canals last season. A few miles north of the town of Sault Ste. Marie and of the line of this great traffic highway, is what? An unbroken wilderness! Not in the sense of a barren waste, as all the elements of successful settlement are there—but there are no roads, and hence no settlers. For the past twenty years Ontario has been depopulated for the benefit of Manitoba and the North-West, leaving her magnificent northern territory—which, according to Dr. Ball, of the Geological Survey, "Contains in the valley of the Moose River, alone more good land than the whole of the present cultivated portion of Ontario"—to lie fallow, uninhabited, save by a few miserable Indians. It is generally conceded that an enormous amount of benefit has accrued to Ontario from the settlement of Manitoba and the North-West territories—how much greater the benefit had this settlement been *at home*, within her own territory.

What would this railway do for Ontario? It would open up a grand farming country—easily accessible—close to good markets, close to lake navigation, with no "*magnificent distances*" of which every mile means so much less in profit to the settler. It would develop the mineral country lying north of Sault Ste. Marie, as the Canadian Pacific Railway has developed the Sudbury District, and more than all, it would bring Hudson Bay close to our doors, and enable us to utilize the enormous fishing resources of that great inland sea.

How few people realize that Sault Ste. Marie is only 400 miles distant from the sea coast of the second greatest inland sea in the world!—a sea which is practically land-locked, and *entirely within*

the Dominion of Canada. How few again have any idea of the immensity of this sea! If an island of the combined area of all the great lakes were in the centre of Hudson Bay it could not be seen from the shore. This sea is closed from the ocean for about nine months in the year, while the season of navigation *upon* it is longer than on Lake

Superior—hence the necessity for a *portage* to the south by which its enormous resources can be developed and its products marketed.

Of all the proposed routes to Hudson Bay, that from Sault Ste. Marie is without comparison the best one. It is the most direct and shortest between the great lakes and the seaboard, the connections at Sault Ste Marie with lake navigation and with existing lines of railway are unequalled, and the route between the crossing of the

main line of the Canadian Pacific Railway and the ocean the shortest possible (250 miles).

Concerning the railway itself. I trust it will be the first electric through line on the continent. The waters on the route will furnish more than sufficient power. And that electricity will be used for the railway of the future is beyond question.

Again concerning easy access to the northern part of the North-West Territories. A glance at the accompanying map will show that a line of steamships to Chesterfield Inlet, and a short portage railway to the connecting waters of the Mackenzie River will bring the northern gold fields of the Rocky Mountain chain in closer connection with Ontario than even with British Columbia. The enormous oil fields of the section lying between Mackenzie River and Hudson Bay will also be tributary to this route.

In 1889 I took the first steps towards obtaining a charter for the line. Since then I have travelled many a weary mile, and spent some of the best years of my life in gaining knowledge of the country to be traversed. I had more or less previous knowledge of this section, and my various trips have more than confrmed my idea that this route of all others is the one most eminently suited by nature for the opening up by Ontario of its northern seaboard.

NOTES ON FISHERIES.

"Whales abound in Hudson Bay as nowhere else in the world, also walrus and porpoises in vast numbers."

Lieutenant Gordon, in his reports to the Dominion Government of 1884-5-6, of his exploration in Hudson Bay, mentions the countless number of porpoises he saw along the coast, estimating there must have been 10,000 in one "school" near the mouth of the Nelson River.

The salmon fisheries are so extensive that the Hudson Bay Co. at one time fitted up a steamer to take cargoes to England, but the long voyage to Liverpool and the detention at the Straits involved too much expense to afford a profit.

From the report of one of the officers of the Gordon expedition: "We anchored and commenced to jig. The water was very clear and and I could see down some ten or twelve feet. At a depth of ten feet the cod were so thick that the only way I can describe their numbers would be to say that there were millions and millions of them to the acre."

NOTES AS TO MINERAL INDICATIONS.

Ontario Bureau of Mines Report, 1894, page 124, contains the following remarks:—

Lignite: "Lignite outcrops for 60 miles along the Moose River. Mr. Borron reports the thickness to be from 6 to 9 feet where examined. A sample brought by Professor Bell, in 1875, proved to contain 46% of fixed carbon. Under the new process now adopted in Sweden

this can be made into merchantable condition for shipment, and provides a satisfactory substitute for a large proportion of the coal now brought into Ontario from the United States."

Iron Ores: A very large body of iron ore exists in the Matagami branch of the Moose River This is reported by Professor Bell as in one place exposed for 1,000 feet, and rising 15 feet above the level of the river (analysis shows 52.42% of metallic iron). Mr. Borron found the same 20 miles above Mamatawa. He says this is the same sort of ore that is worked so largely in England, and forms the basis of her enormous iron industry.

Gypsum: Banks of pure gypsum, from 10 to 20 feet high, occur on both sides of the Moose River, twenty-one miles above Moose Factory. The only place where this mineral has been discovered upon the chain of great lakes is near Tawas Bay, Michigan, where the material for the covering of the Centennial Buildings in Chicago was mined. This industry attracted around one mine alone a population of several thousand people.

Kaolin: On the banks of the Missanaba branch is found an immense deposit of Kaolin in its purest state. Mr. Borron, who has had experience in glass making, reports it as superior to anything in England or Scotland.

The Geological report on these minerals concludes by saying: "When the extension of population and transportation facilities to this region confer a value upon its minerals they will be found in quantity and richness sufficient to form the basis of a large and important industry."

In the limits of this paper I have only been able to notice some of the salient features of this route. That I shall have the hearty co-operation of the Association in the enterprise, I am confident, it "goes without saying." The interest of the surveyor is in the development of the country.

May we see during the next decade many a prosperous settlement and many a flourishing mining camp on the line of the Sault Ste Marie and Hudson Bay Railway.

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WATER WORKS.

By T. H. WIGGINS, C.E., O.L.S.

Cornwall.

Our genial Secretary has chosen this subject for my paper in rather a novel way. I presume he imagines other people are as good natured as he, and I have submitted to his choice; although two days are hardly sufficient to prepare a paper to be read before a Society many of whose members have devoted much more time to the subject than the writer.

In the published Proceedings of the Society I have noticed that papers have been read upon "The Brantford Water Works," "The Georgetown Water Works," "The Kincardine Water Works," and "The Protection of the Source of Supply of the Owen Sound Water Works." In the list of papers read before the Engineering Society of the School of Science are "The Beeton Water Works," by the late J. R. Peddar, O.L.S., and the "North Bay Water Works," by T. R. Deacon, O.L.S.

Water works is a wide term and may embrace much. In this paper I will deal with the subject in a general way, firstly speaking of what I have considered interesting in the construction of systems old and new, and then giving a short description of the Cornwall water works system.

It would be interesting to study the earlier developments of the utilization of water power. The Egyptian tympanium was a water wheel in a current or fall of water which, as it revolved raised up on its concaved blades to the height of its diameter small quantities of water which was emptied into wooden troughs and conveyed by gravity to its place for use. In our daily papers a short time ago a sketch and story were given of how a clever and probably lazy boy watered his father's stock from a pond near the barn by arranging a hose around a wheel so as to work on the same principle as the tympanium. His scheme required the motive force to revolve the wheel, and the construction of troughs from the wheel to the barn.

The wind mills, which are so plentiful to-day in rural districts, save an immense amount of labor.

I remember seeing illustrated a rude water works system in a recent engineering paper. It represented a yoke of oxen, driven by a Chinaman, turning an old-fashioned crank power which revolved a bucket chain and thus brought water from a well and discharged it into a ditch which probably led to a neighboring town.

The following statements were taken from the *Engineering News* of July, 1892, relating to the water works of Constantinople. Part of the system dates back to the Byzantium period, and has preserved its peculiar characteristics up to the present time. Recent additions to the system are similar to those in other countries.

"The wooded foot hills of the Balkan Mountains, eleven miles north of the city, were selected for collection ponds from which water was conducted by gravity to the city. The dams have vertical walls reinforced by buttresses, which walls of masonry are from 30 to 40 feet thick and are sometimes lined with marble. From the ponds water is conducted to the city in arched conduits, 24 to 28 inches in width, with slab channels 12 to 16 inches wide at the bottom, and the water flows 8 to 12 inches deep. A two story aqueduct 14 feet high was at one time at least 4,000 feet long, and 2,000 feet yet remains. It spans a valley in the city and was finished 368 A.D. Another aqueduct, built by Justinian, is 115 feet high. The largest existing aqueduct is of Turkish origin and consists of two stories with pointed arches. Its length is 2,289 feet and height 83 feet."

To-day some of the most picturesque spots about our towns and cities are at the storage basins or reservoirs for supplying water. Many of the basins are artificial and the water is impounded by dams of great or small dimensions as the case requires.

The valleys adjacent to many of the towns in Ontario seem naturally fitted for artificial storage basins. Of course cases arise even in our inland towns where it is not advisable to adopt the gravity system, but to adopt the more expensive methods of pumping water from lower levels by steam or water power into a water tower, storage basin, or by direct and constant pressure.

Many of the towers or tanks are built without thought of beauty of design, and the word tank expresses them better than towers. I can scarcely conceive of any structure of design that mars the natural beauty of a hill top more than a plain iron stand pipe. A writer has said: "They mark the hill tops of Eastern Massachusetts in every direction, but with few exceptions they are not as beautiful as they are conspicuous. They are usually plain cylinders of iron thrust into the air like enormous steam boilers much elongated and set on end, or like very thick unsharpened lead pencils, and they disfigure the landscape as a heavy black perpendicular mark defaces a fine painting." All our designs should bear marks of art and symmetry, and we are apt to lose sight of these matters in iron structures.

In early days of water works the purity of water was but superficially considered. If it had a good color, taste, was free from odor and solids the eye could detect, it was pronounced good. The following is from the *Engineering Record* of August 8th, 1896:—

"Jersey City Water. Bids for filtered supply from the Passaic River. The water shall at all times maintain a standard of purity to be stated in the bids, and which shall give the following particulars in parts per 1,000,000:—

"Total organic matter,

"Total free ammonia,

" Total albuminoid ammonia,

" Total nitric acid.

" The number of bacteriæ in one cubic centimeter must be stated."

London, Eng., takes its water from the Thames and Lea Rivers, whose banks are thickly populated, and filters it through large beds of sand.

Hamburg, Germany, filters and uses water from the polluted Elbe.

Chicago, Ill., although taking its water from the voluminous Lake Michigan, from cribs three and four miles out from the shore, has had considerable trouble in pacifying the citizens as to its purity. This was especially the case in 1892. When freshets occur the canal discharges its fifthy waters into the lake and refuse of all kinds is seen floating toward the intake.

About one half of the 2,000 water works systems in the United States, on which have been expended over $600,000,000, are owned by the municipalities. New Orleans, Louisiana, bought its water works plant in 1868 and sold it again in 1878, and is the only instance, I believe, of a city selling its water works plant after once assuming control.

In the earlier systems wooden pipes were used of small bore. In 1652 Boston, Mass., had a reservoir 12 feet square fed from neighboring springs. Providence, Rhode Island, laid two miles of wooden pipes in 1772 and built a reservoir 13½ feet by 30 feet and 10 feet deep for domestic use.

Some time ago I read a most interesting article on the Vancouver, B.C., water works. The pipes are of steel, rivitted. In the crossing of Burrard Inlet cast iron flexible joints are used where bottom is uneven. The size of the pipe is 22 inches, 16 inches and 12 inches, and it is coated with asphaltum. The 22 inch and 16 inch pipes are eleven-hundredths inches thick.

In Denver, Colorado, the water is partly supplied through large wooden stave pipes. The staves are 1⅝ inches thick. The pipes are 48 inches in diameter, banded with steel rods. The top staves are California red wood and the lower ones are Colorado pine. These pipes lead the water from the Platte River (in the mountains) to the city. The hauling of large iron pipes would have been very expensive. The staves have a thin tongue of metal at the end, which is driven into a corresponding groove in the stave abutting it, thus making a firm joint. The writer of the article on Denver wooden stave pipes stated that old pine log pipes 5 inches bore laid in 1797 were found sound in 1870. Denver's water supply is taken from cribs underneath the bed of the stream. The gravelly bed forms a natural filter. These cribs have open joints and the water from them is clear. The pipes from the cribs terminate in a 12,000,000 gallon reservoir from which the water is pumped into the mains.

The Citizens' Co., of Denver, put in a line of stave pipes 30 inches in diameter and 16 miles long. The maximum pressure is 185 feet static head and the average pressure is 70 feet static head. The

bands of steel rods are spaced 3.86 inches apart. The total cost of the pipe was $1.36½ per foot.

On the Maxwell land grant in New Mexico a red wood stave pipe 72 inches in diameter and staves 2½ inches thick was constructed.

Paris, France, with 2½ millions inhabitants, is supplied with water from springs 60 to 100 miles distant.

Vienna, Austria, is supplied from springs fed from the neighboring snow-capped mountains.

Munich, Bavaria, is also supplied from springs. Liverpool and Manchester, England, have expended millions in buying watersheds for water supply. Birmingham, England, is developing a scheme of bringing water a distance of 80 miles.

Much has been written upon the advisability of municipalities buying or constructing their water works plant. Those who contemplate owning their system need not be deterred by the following interesting and expensive experience of Omaha, Nebraska.

The Omaha case is stated thus in the *Engineering Record* of Jan. 9th, 1897:—

"A reorganization committee has taken a water works plant, worth at a conservative estimate about $3,000,000, and watered the stock and bonded the plant until somebody is expected to pay interest on $11,750,000, with the result that either the people (consumers) or innocent investors, and probably both, must be swindled. The rates are high. The net receipts are $239,000." These statements are partly denied in a later issue by one who is interested in the Omaha water works.

CORNWALL WATER WORKS.

The system was constructed in 1886 and 1887 by Messrs. Moffitt, Hodgkins & Clark, the well-known firm who put in several systems about that time.

The franchise from the town reserved the privilege of purchasing at the end of ten years. This option is now being taken, and in June the arbitrators' award will be given, when the ratepayers will have an opportunity of declaring whether they wish to acquire the plant at the sum fixed by the arbitrators. The source of supply, as all other sources for towns and cities on the banks of the St. Lawrence, is from the river, at a point about five miles below the Long Sault Rapids and about three-quarters of a mile above the town. It is thus above all danger of pollution, and where the current flows swiftly over a pebbled bed, pure and clear.

The pumping station is on the north bank of the river, between the river and the canal. It contains the pumping plant and residence for the engineer. Although not a beautiful structure it is finely located and answers its purpose admirably.

The engine-room floor is 22 feet above the intake pipes which only run out in the river a short distance. The pumping plant consists of two Worthington compound duplex engines, condenser, feed water pump, etc. Each engine is guaranteed to pump 1,000,000

gallons of water in 24 hours with 90 pounds steam on high pressure cylinder against 140 pounds steam fire pressure.

The comparative elevations of the main points in the system are as follows:—

Elevation of St. Lawrence River at pumping station (low water), 36; extreme high water, 60; water surface of canal, 65; bottom of engine pit, 52; base of water tower, 95.25; main parts of tower, 40 to 70.

From the pumping station two 12 inch force mains convey the water across the canal, where they join in one 12 inch main, which continues northerly up Hazel Avenue to the main on Montreal Road. At this point one 12 inch main leads to the distribution system of the town, and another 12 inch pipe to the water tower. The tower is about 2,000 feet from the pumping station in a northerly direction. It is 120 feet high and 20 feet in diameter, and holds 280,000 gallons. It is constructed of wrought iron and weighs about 80 tons, with plates ranging from eleven-sixteenths of an inch to three-sixteenths of an inch in thickness. The tower is not of beautiful design, simply a number of plates rivetted together.

The water pressure, gauged at engines, shows 72 pounds where the tower is filled and the gauges in the main parts of the town 50 to 60 pounds. The difference between the elevation of the water pressure gauge and the top of the tower is 154 feet.

The system comprises

5,200	feet	approximately	of	12	inch pipe;
5,900	"	"	"	8	"
18,850	"	"	"	6	"
8,500	"	"	"	4	"

and 63 fire hydrants.

The town of Cornwall pays $2,500 a year for hydrant service, water for flushing sewers, etc.

A number of the hydrants are fed from 4 inch mains, the company having followed the system, too often followed, of putting in mains of less diameter than 6 inches. The grade of the pipes was not considered important in the original construction, or laying of mains, neither have blow-offs been placed at the low points of the pipe system. Valves are placed at most of the branches, so that almost any section of the town may be cut off for repairs.

The stand pipe when first constructed leaked considerably, but with recaulking and gradual rusting of joints it was made perfectly water tight and to-day is in good condition.

A few years ago rumors were current that the water in the tower contained decaying fish, birds, etc., but upon examination it was found free from impurities.

At each filling of the tower the engineer causes it to overflow and thus gets rid of all floating material.

With a few extensions and improvements Cornwall will have one of the best systems of any town in Ontario.

DISCUSSION.

Mr. Ross—There is one point that is brought out in this paper, that four-inch pipes should never be used in a water works system, that six-inch is small enough for supplying hydrants. There is a great deal of information of different parts of the world that would be of use to members that Mr. Wiggins has collected, and I think his paper is a very valuable and timely one.

The President—I think I should say something in defence of the practice of using four-inch pipes. The size, you must remember, depends on the pressure. Where the pressure is light I would use six-inch, but in places where the pressure is high I see no objection to using four-inch pipe. This year, on a large work, I use six-inch branches altogether, the reason being the pressure would be light; but in the town of Galt, for instance, that is another large work, they used four-inch altogether, and I have heard no complaint whatever with a four-inch main and four-inch branch.

Mr. Wiggins—You mean the main on the street would be four inches?

The President—Yes, and the hydrant.

Mr. Wiggins—What do you think of Mr. Peary's idea of four-inch pipe? Will it fill with rust after a time?

The President—I have seen four-inch pipes, not filled with rust, but the diameter decreased very materially and the flow decreased very materially by rust inside. but those pipes were uncoated. There is no question about it, a six-inch pipe is to be preferred to a four; and for the same reason, an eight inch is preferred to a six, and so on; but to say you should never use a four-inch pipe for fire purposes is putting it too strong altogether.

Mr. A. R. Davis—Do you use less than a four-inch?

The President—No. The size of the pipe, in my mind, depends on the pressure altogether, the pressure available.

Mr. Gibson—Does this rust cling to the pipes very tenaciously, or would not the force of the water wash it out?

The President—No. The tubercles form on the inside of the pipe, some of them are very soft, you could rub them off—in getting the pipe out they generally drop off; but the others you can hardly get off with a cold chisel, that is on pipes that are not coated.

Mr. Wiggins—I would like to ask if it is usual to place the blow-offs at the lower portions of the pipes on the hydrants on systems that you know of—on the systems, that is, separate from the hydrants?

The President—The majority of the works in this country have no blow-offs; they should have. Perhaps Mr. Davis could answer a question I would like to have answered. A gentleman stated to me

within the last two months that in Belleville the water tower there was examined and it was found that the bottom was paved for two feet in thickness with dead sparrows. Do you know anything about it ?

Mr. A. R. Davis—No.

Mr. Wiggins—I think after that was rumored about the people of Cornwall had the same idea, and as I stated in my paper, sent a man up to the top of the tower to examine the floating material, and he said there were lots of floating things about the top of the tower. I said in my paper an engineer always overflows the tower once a day as a rule, and takes off all floating material.

The President—But there might be two feet of birds at the bottom ?

Mr. A. R. Davis—Your remark recalls a conversation I had with some party, I cannot remember who he was, but it occurs to me it was in Kingston, where they climbed to the top of the tower and to their consternation they found about a foot of sparrows floating around on the top of the water, and he argued that those towers should never be left open, but should always be covered. Is there any reason why that tower should not be covered ?

The President—No, except the cost. But I never heard of any reason for covering them before.

Mr. Wiggins—I think this overflowing would do away with the floating material.

Mr. Gibson—A fine wire netting over it would stop that I should think.

Mr. Wiggins—In Cornwall it would not do, for I have seen snow and ice up above the tower some ten feet in thickness.

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A FEW HINTS RELATING TO THE SURVEYING OF LINES, AND ABOUT INSTRUMENTS NECESSARY TO PERFORM THE SAME WITH.

By SHERMAN MALCOLM, O.L.S.,

Blenheim.

My experience at surveying, extending over a period of some forty years, teaches me that a good transit-theodolite (a combination of the transit and the theodolite) is a safer instrument for starting and running lines with than a transit is without the combination.

A proper transit-theodolite should or must have two distinct sets of standards or Y's in which to use or handle the telescope, either set being easily removed and the other set substituted in their places by the surveyor using it. The higher set being standards to revolve the telescope with in taking astronomical observations, which, after observations taken, may be removed and the lower Y's substituted for them to hold the telescope while finishing the survey. While the transit alone has but one set of standards or Y's, with a crossbar attached to plunge or revolve the telescope with, and from frequent wear at the top of the standards by the revolving of the telescope (as required in running lines) may cause the telescope (or combination of the same) to tip sideways, and not follow accurately a plumb line extending from the earth to Polaris, or the sun's upper or lower limb; should this be the case on starting a survey in a wilderness country, no instrument maker could have a chance to adjust the same, and few surveyors could make the necessary change needed to start the line correctly, which might be required at that time.

In the use of the compass and magnetic needle, first of all a true north and south line must be obtained in the field of survey. Then a good compass with a five-inch needle and proper verniers attached, one of which should be a floating *nonius*, attached to the south end of the needle, to sub-divide the degrees on the circle of the compass into small portions. The compass should then be tried on the governing line and the bearing noted before proceeding to correct for annual variation (in case of an old survey). Also, the needle should be tested at the starting point to ascertain if there be any local attraction, which is best proven by sighting at different points of a small circle surrounding the starting point, thence reversing the bearings back from the points in the circle to the starting point, which should read the same if there were no local attraction.

Diurnal variation (in parts of Ontario in the summer time, seems to be caused by the greater heat of the sun, apparently generating electricity so as to swing the needle westerly) should be corrected as much as possible while using the compass, by frequently showering the compass cover with cold water. Another way will help to reduce it, viz., to sight on the governing line, getting the bearing at a certain hour of one day, and starting the line to be run at the same hour on the following day.

DISCUSSION.

Mr. Foster—I have run a good many compass lines in the same region of country Mr. Malcolm has. I noticed that variation, but I never thought for a moment it came from electricity, or the difference between heat and cold, for there is really very little difference in the heat and cold of some days; and as to sprinkling the compass glass with cold water it may check electricity, but it certainly would not make any difference in diurnal variation; but I do not think he is right about the cause of it.

Mr. Sewell—I think it would check the needle working freely; that would be the effect on a rainy day, but at no other time.

The President—I do not think that should go into our Proceedings without the opposition being stated. [Reads from paper down to 'by frequently showering the compass cover with water."]

Mr. Gibson—This diurnal variation begins in the morning. In a cloudy day the needle is not affected as much as on a warm, sunshiny day, there is no question. But the diurnal variation in the winter time is not as great as in the summer. Now by the action of the sun, the heat upon the glass of course is produced in this way, as my friend suggests; if you are carrying your instrument under your arm, and you put your damp finger on it, you will take the electricity off. The effect of using anything that is wet would carry the electricity off the glass. It holds the electricity. If you rub the glass with the hand it may play the mischief with the needle, and the application of moisture in that way will carry off the electricity

The President—Is this diurnal variation merely a local affair? Is it in the instrument itself or outside of the instrument?

Mr. Gibson—It is the effect of the sun. The glass is nonconductive. The electricity will stay there unless you put a damp finger on it.

The President—That is not the diurnal variation.

Mr. Gibson—The diurnal variation is the effect of the sun.

The President—He states a diurnal variation of 15 minutes per day should be corrected as much as possible by frequently showering the compass with cold water.

Mr. Gibson—That surely is not what he means.

The President—He should have an opportunity of correcting that.

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ISLAND SURVEYS—GEORGIAN BAY, LAKE HURON.

By CHARLES E. FITTON, O.L.S., D.L.S.,

Orillia.

BEFORE going into details of the survey, it might interest some of our members and others who read the reports of our Association to know that the Georgian Bay, with its numerous islands, has for years been a favorite resort, not only for Canadians, but also for our American cousins, large numbers of whom may be seen there every summer, and any one not having visited that part of Lake Huron would be surprised at the number and size of some of the summer residences. Another favorite way of spending a few weeks in this beautiful locality is a sojourn in the "ark" so called; the "ark" being a fair-sized house, with large veranda, built on a scow and then towed out by a tug boat or steam launch to any desired bay or island and anchored. The fishing is excellent and the smooth shadowed water between the islands cannot be surpassed for boating and canoeing.

In the past, islands were chosen by private individuals, and before they could get a deed the Department required a survey to be made and a plan and field notes filed showing the relative position of the island, giving its area and also properly connecting it with the township survey on the main land. In time these private surveys became quite numerous, and designations, by name or number, were duplicated, and owing to the difficulty of making proper connection with the township surveys on the main land, it was found that many inaccuracies crept in. The surveys sometimes overlapped each other, and in some cases the same islands, applied for by two parties, but under a different name or number, would be so inaccurately connected with the main land that the Department could not detect the error. Under these circumstances the Department decided to have a regular survey made, and last year issued instructions.

The islands lying between Waubaushene and Moose Deer Point belong to the Indians, and consequently the instructions were issued by the Department of Indian Affairs, and briefly read as follows:

"All islands, even if only mere rocks, are to be surveyed, with the exception of those already shown with reasonable accuracy, on Capt. Bayfield's or Commander Boulton's and Mr. Stewart's charts. All are to be connected with each other by triangulation, and also connected with the township surveys on the main land at convenient points."

"Every island, however small, must be numbered, beginning at the extreme south, giving the first large or saleable island the number 50 and then consecutively. The system to be pursued is to give every large or saleable island a separate number and all small islands the same number as the main island with a letter added, for example: if the main island is number 50, the numbers of the adjacent small islands would be 50a, 50b, 50c, etc., etc., care being taken to include in each group only the islands that may properly be considered to be adjacent to the main island. A Book of Reference and Valuations is to be made, with the usual field notes, and a plan on a scale of ten chains to an inch, on mounted paper, in equal sections not greater than three feet by four feet."

In accordance with these instructions I proceeded with the survey, beginning at the extreme south, measuring a base along a concession line on the main land and calculating the distance out to the first island, and from that point I carried on a system of triangulation, and, gradually extending it, located stations on all the large islands and prominent places on the main land, at the same time connecting them with the concessions and side lines of the townships. The stations were numbered consecutively, and the work was repeatedly checked by astronomical observations. The field notes were plotted every evening, and when corrections were required they were duly made.

By adopting this method of having fixed points on all the large islands and convenient places on the main land to tie in the traverse, I was enabled to see that everything came in correctly as the work progressed. A careful traverse of each island of reasonable size was then made with chain and compass, and, where necessary, with transit, and the very small islands and rocks were sketched in. The courses were then taken with a compass or angle with transit, as the case might be, from the nearest station on a traversed island already fixed by triangulation, and the distance was ascertained by means of micrometrical measurements.

The main land shore line for the whole distance was taken partly from the shore line, as shown on the township maps, and partly by actual traverse. The lot, concession and township lines, as shown on my plan, are connected with the islands by triangulation. In some cases it was a difficult matter to find the concession and side lines on the main land, the original blazes and posts having been, to a great extent, destroyed by fire; and often I found it necessary to go inland a mile or two to locate a line and then carefully trace it back to the shore.

A Book of Reference and Valuation was made and contained the following information. Under the heading "Designation" was given the number and name (if there was one) of the island, and under the heading "Remarks" a short description of each with reference to its timber, soil, boat harbors, boat landing, etc., etc.

The area and value of each and every island, however small, was ascertained. The areas varied from a thousandth part of an acre to hundreds of acres.

The numbers on each island were painted with white paint in plain figures, at least two feet long, on a rock in two and often three conspicuous places, generally in one place at the north end and in another at the south end. The notes show all bearings astronomic, distances in chains and links, and the areas in acres and hundredths.

An account of my experience with discs of various colors in taking the micrometrical readings on the islands and across water may not be uninteresting. The instrument used was a form of the double image micrometer, and was made by Mr. James Foster, Toronto. The discs I first used were of galvanized iron, 6 inches by 10 inches, one painted white and the other red, attached to a base rod, 10 links apart, and held in a vertical position, the lower disc six feet above the ground to avoid refraction as much as possible. Finding I could not see those colors clearly along the shore of the islands and across the water, I changed them to both black and then to both white, and again to both red, and finally found that one white disc and one red disc gave the best result. Not being satisfied, however, I had Mr. Foster make me a frame similar to that he constructed for the Department of the Interior, and used discs made of opal glass. With these I uudoubtedly obtained the most accurate readings.

Of course a great deal depends on the weather, and while I got very satisfactory results by taking two readings of each distance on days that were favorable, I found that on days that were unfavorable four readings were necessary.

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EVIDENCE.

By J. L. MORRIS, C.E., O.L.S.,
Pembroke.

REFERENCE is made to "evidence" in three distinct sections of the Survey Act.

1. Sections 31-33, inclusive, where the mode of compelling a witness to give such evidence *and information* as he may possess, touching the boundary or limit in question, is given.

2. Section 60. In all cases where a surveyor is employed to run any side line or limit between lots, and the original post or monument, from which such line should commence, cannot be found, he shall obtain the best evidence that the nature of the case admits of, respecting such side line, post or limit.

3. Section 71. For better ascertaining the original limits of any township, concession, range, lot, or tract of land, every land surveyor acting in this Province shall and may administer an oath or oaths to each and every person whom he examines, concerning any boundary, post or monument, or any original landmark, line, limit or angle of any township, concession, range, lot, or tract of land which such surveyor is employed to survey.

Section 72. All evidence taken by a surveyor as aforesaid shall be reduced to writing, and shall be read over to the person giving the same, and be signed by such person, or if he cannot write he shall acknowledge the same as correct before two witnesses, who as well as the surveyor shall sign the same.

The first reference, sections 31-33, inclusive, is explanatory only of the mode of compelling a witness to give evidence, and will not be further considered.

The second reference, section 60, under the heading of this paper, has reference only to the best evidence and information which the nature of the case admits of to determine side lines or limits of lots. It is not necessary to administer any oath or oaths nor to take affidavits for future use. It has been the supposition of most young surveyors that the statute compelled them in all cases to administer an oath to any witness whom they might examine with reference to the position of an original post or monument from which any side line should commence. Most surveyors during practice find that the administering of an oath is not inconvenient, yet no authority is given them under this section to do so.

Much useful information can be secured by interrogation of a witness without oath, whilst if the same witness were under oath he would be reticent and give little useful information.

The best evidence is the use of surveyor's chain, his plan, and field notes, to prove or disprove the statements which are made to him. Though as a witness on a suit, a surveyor may be asked if he swore his chainman, yet it is an exception if he is asked whether or not he gave an oath to witness concerning posts or boundaries.

The courts place little value on affidavits of witnesses examined by surveyors, as it has been found in many cases that the surveyor has shown carelessness in their preparation, and it is questionable if the evidence of any witneess placed before a court by affidavits prepared by a surveyor on the ground, will have much weight affecting the decision of that court,

The surveyor is a unique personage in his official capacity. As a grand jury he opens the preliminaries by determining if there is evidence sufficient to proceed further; as examiner he helps the memory of the witness by hints from notes of former surveys; as cross-examiner he severely examines the witness, should he find signs of ulterior motives; and as judge he decides the value of the information given, under his own examination and cross-examination.

It is therefore not surprising that the courts are anxious to have the witness before them and judge of his evidence, where no pressure can be brought to bear upon him when making his statements.

It is wise and indeed beneficial to our profession that this is the case. The surveyor is careful and becomes an adept in determining the value of evidence produced before him, and will make use of no evidence which he would consider weak in a court of law. He falls back on that part of section 60 of the Survey Act, which gives more satisfaction to the surveyor and to the parties having the survey made, than any evidence which can be produced; viz., if the same cannot be satisfactorily ascertained, then the surveyor shall measure the true distance between the nearest undisputed posts, limits or monuments, and divide such distance into such number of lots as the same contained in the original survey, assigning to each a breadth proportionate to that intended in the original survey.

The cause of this dual satisfaction concerning a resurvey in this section of the country is the irregularity of the widths of lots and blocks in the original survey, and the settled conviction of the older settlers that during the years of lumbering operations, original posts were tampered with, by subordinates of the lumber-merchants.

A subdivision of the lots between original boundary lines is the best evidence to the land owner that he is receiving justice.

Again referring to sections 71 and 72, "For better ascertaining the original limits of any township," etc. The wording of the first part of this section 71 has a peculiar form, and refers to some former section of this Act where the mode of securing evidence regarding boundaries is laid down, and no doubt has reference to section 60 just discussed.

As section 60 has reference only to side lines, section 71 has reference to all boundaries referred to in this Act.

Where the position of any original post or monument, determining the limit of any township, concession, range, lot or tract of land is in question, we can easily see the necessity for the surveyor having the full powers to secure evidence affecting the work entrusted to him.

The possibilities of such evidence being worthless is great. "Personal interest of the parties giving the evidence; the surveyor requiring such evidence as proof of work previously done; including absurd information which the surveyor knows is very improbable." Other influences as well, affect evidence when taken by the surveyor on his work.

The reducing of all evidence to writing is necessary under section 72, and may at the discretion of the surveyor be filed or not in the Registry Office of the county.

Though the statement has been made that evidence by affidavit has much less effect in a court of law than personal evidence, yet for future reference it would be advisable to have all affidavits taken on work by surveyors, filed as records.

Would it not also be advisable to follow the example of Quebec Province, to have the notes and plans of all surveyors (deceased) filed at the Registry Office of the district in which he lived and practised; as no evidence is so valuable to the practising surveyor as the notes of the surveyor who has preceded him in local practice in the same section of the country. The notes of the earlier surveyors in all sections of the country have been destroyed or misplaced, and valuable evidence to the practising surveyor is lost.

DISCUSSION.

Mr. Gibson—Regarding one suggestion there, the surveyor should be more careful about taking the affidavits. I am very careful to do so. As to the value of those affidavits we take we cannot expect the courts will take them. If the party is living he can give evidence, you have to produce him; but if he is dead, then there may be a possibility of the affidavits being taken.

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SEWAGE DISPOSAL.

By CAPT. W. F. VanBUSKIRK, C.E., O.L.S.,
Stratford.

The question of sewage disposal has assumed considerable importance in Ontario during the last few years, as many cities and towns have constructed, or are constructing, sewerage systems, and will, in the near future, be forced to consider some means of purifying their sewage before it is turned into the rivers and streams.

The use of bodies of water as receptacles for sewage and refuse is as old a custom as employing them for washing, bathing, or drinking. The ancients acted like the moderns. We still look upon disease as a visitation of Providence; and we still pollute our supplies of water.

The maintenance of a body of water in a state of absolute purity is impossible, owing to the many sources of pollution along the banks; the legal right, therefore, of riparian owners to have the waters of a stream or river flow in its natural course without corruption, must be compromised.

Sewage, however, should never be discharged into a body of water used as a public water supply, and it should be also borne in mind that a sewage polluted stream is not a safe source of drinking water for animals.

In cases where streams are not used for public water supplies, or are not likely to be so used in the future, the question to be considered is, what degree of pollution is permissible without making the water offensive.

It will be found that, in nearly all cases, some means of purification or partial purification is desirable, even when not made compulsory by law.

Many of the prevalent ideas regarding sewage treatment have been gleaned from newspaper articles written by non-professionals, and may well be classed with those popular delusions which still cling even to educated minds.

The utilization of sewage, the restoration of all the human and animal manure, which the world loses, to the soil, instead of being discharged into bodies of water, has been the dream of thinkers for centuries. It is to a large extent still a dream.

In the early days of sewage utilization in England it was confidently expected that large profits would accrue from the application of sewage to land. Several companies were formed for the purpose; large sums were expended, but in not one single case have the sanguine anticipations of the promoters been realized.

The problems are those of to-day. Ancient history is of little value, since the discovery of the natural laws involved in the destruction of organic matter is of recent date.

All idea of making a profit, either by utilization in broad irrigation, or by the sale of sludge from settling tanks, must be discarded. Experience has proved that, ordinarily, little profit can be realized from sewage utilization, except in cases where irrigation, independently of the manurial ingredients of sewage, would be of value. We must be content to purify sewage in the least expensive manner and not attempt its utilization in a commercial sense. In the consideration of the subject it is important to thoroughly appreciate this fact.

The literature on the subject of sewage purification has become so voluminous that it is almost impossible to write anything that has not been said or written before; therefore in the following remarks on the subject no claim is made to originality. The attempt will be made, however, to present the best information in a concise form, merely emphasizing the importance and complexity of the subject.

The determination of the degree of purification required, and the best means of effecting it, are exceedingly difficult problems, and require special knowledge and skill in solving them. In any method of purification, the result will depend to a very large extent upon the skill bestowed upon the design of the works and the care exercised in their construction and operation, irrespective of the materials used or the process adopted,

NATURE OF SEWAGE.

The ordinary idea of sewage is a vile putrifying mass, possessing a most offensive odor. Such an idea arises from the inspection of cesspools and improperly constructed and operated sewers and drains. Ordinary sewage delivered at the outfall of properly constructed sewers is nothing more than dirty water; contains, approximately, one part mineral matter and one part organic matter to 998 parts water. Of the two parts of mineral and organic matter, about one-half is in suspension and can be strained out, provided the strainer be fine enough; the other half is carried in solution and cannot be taken out in the same way.

Sewage also contains almost incredible numbers of micro-organisms with the organic matter; and it is found impossible to remove them without also extracting the organic matter. The mineral matter may be regarded as harmless in most cases; so that the object of purification may be stated to be the removal of the one-thousandth part of organic matter and the bacteria.

In designing purification works for barracks, hospitals, prisons, etc., it should be borne in mind that the sewage is generally of greater density and concentration than that of towns.

QUANTITY OF SEWAGE.

Accurate information as to the quantity of sewage to be treated and the variation in the rate of flow in any one case is difficult to

obtain, and the question is one that must be very carefully studied in detail. Guess work is expensive. It may be stated that in places where storm water was kept out of the sewer system, the quantity is closely related to the water supply and varies with it. Variations in quantity of flow also occur through pervious joints, admission of cellar water, and more or less rain water from roofs.

The periods of greatest consumption of water occur in either very dry or very cold weather, while the greatest admission of ground water, etc., occurs during very wet weather. Obviously, the variation in quantity of flow will be very much less where the separate system is in operation than in places where storm water from streets, etc., is provided for. The advantages of uniformity are so great, and the cost of all methods of purification so considerable, that whenever it is necessary to purify sewage in any way all rain water should be kept out of the sewerage system if at all practicable.

Many different processes have been devised for the purification of sewage, and it would be impossible in a paper of this nature to describe very many of them. With the exception of a few remarks on bacterial purification, therefore, only those systems or methods will be considered which have been proved successful and which are in use to a considerable extent.

BACTERIOLOGICAL PURIFICATION.

The writer is of opinion that some system of cheap and effective bacteriological purification will be developed in the future, although the "Scott-Moncrief" system has not proved successful.

In the "Scott-Moncrief" system sewage is passed upwards through a filtering medium 14 inches in depth, composed of successive layers of flint, coke and gravel. The system depends on the following recognized truths:

"(1) That bacteria under favorable conditions are capable of indefinite multiplication.

"(2) That bacteria exist in sewage which are capable of peptonizing solid organic matter, or, in other words, of preparing it by a process comparable to that of digestion, for its final decomposition.

"(3) That in nature, the purification of the refuse of the organic world is effected by the life history of these or similar organisms."

The *Sanitary Record* describes a scheme of bacteriological purification devised by Mr. W. J. Dibdin, chemist to the London County Council, which appears to be both cheap and effective.

Mr. Dibdin obtained permission from the Sutton Council to experiment with one of the city settling tanks. The following is a brief outline of the experiment:

A complete system of underdrainage was first laid down, on which was placed a bed of burnt ballast four feet thick, and then water from a filter bed, which contained considerable numbers of micro organisms known as micrococcus candicans, was pumped upon the bed. The bed being now ready for sewage, it was accordingly

charged with 25,000 gallons, the full quantity it was designed to hold. No chemicals were used. The sewage was turned in exactly as it came from the sewers, and was left in the tank for two hours for the bacteria to do their work.

The effluent, though not pure enough to be portable, is said to have been certainly much cleaner and much better looking than that which comes from the settling tanks. At present two hours are allowed for the bacteria to do the desired work, and a period of aeration of the same length is then allowed in order to prevent the bed becoming choked.

BROAD IRRIGATION.

Broad irrigation or sewage farming is defined as "The distribution of sewage over a large surface of ordinary agricultural land, having in view a maximum growth of vegetation (consistently with due purification) for the amount of sewage supplied."

The land employed for this method of purification should be composed of a fairly light porous soil, as when the soil is heavy and wet the crops cannot stand much water, the sewage must be applied sparingly, so that a large area of land and much labor must be provided.

Experience has demonstrated that the land should have a subsoil of gravel or sand; that in most cases it should be under-drained by drains about five feet below the surface; and that in times of heavy storms other methods of treatment must be resorted to or the sewage turned into the stream without treatment.

The surface of land used should have a gentle slope, in order that the sewage may travel slowly forward in a lateral direction, and thus admit of the surface being regularly wetted and of the liquid draining off readily, so that the surface may dry readily after the application of sewage. Not only does the top soil require levelling to effect this, but the surface of the subsoil should be similarly disposed parallel to it, the top soil being carefully removed for the purpose, and afterwards replaced.

"The action of an irrigation field in the purification of sewage is threefold; the sewage is mechanically strained and the suspended matter separated; the dissolved organic matter is also removed by oxidation in the presence of bacteria, and the ammonia and minute quantities of nitric and sulphuric acids given off. The plants absorb the fertilizing substances, especially the dissolved organic matter, and in a lesser degree the products of the preceding process."

The main objection to sewage farming is the difficulty in finding a sufficient area of suitable land conveniently situated for the purpose.

The area required may be stated to be, approximately, one acre for each one hundred of population.

INTERMITTENT FILTRATION.

The Rivers Pollution Commission defines filtration as "The concentration of sewage at short intervals on an area of specially chosen porous ground as small as will absorb and cleanse it, not ex-

cluding vegetation, but making the produce of secondary importance. The intermittency of application is a *sine qua non* wherever complete success is aimed at."

The process consists of intermingling the sewage in the pores of the filter with sufficient air, for a sufficient time, in the presence of micro organisms which immediately establish themselves there.

A good filtering material should be composed of clean, sharp sand, with grains of uniform size, but good results have been obtained with even screened gravel.

The action of the beds is somewhat similar to that described in the case of broad irrigation.

Properly constructed filter beds can be depended upon to completely purify sewage at a rapid rate, as compared with irrigation fields. Roughly, an area of one acre of filter is sufficient to purify the sewage of one thousand of population, although a much less area gives satisfactory results in several towns the writer has examined.

Filters may be artificially constructed where suitable land is not available.

The following conclusions in regard to the action and practical working of filters are of interest in connection with the land treatment of sewage, and are extracted from a paper read by Mr. Lowcock before the Institute of Civil Engineers, vol. cxv., p. 229:

"(1) Filtration is not only a mechanical, but also a chemical and biological process, when it is properly carried out, and when sufficient aeration is provided for.

"(2) That no chemical process yet devised will alone do more than remove the suspended matter in sewage and a very small proportion of the dissolved impurities.

"(3) That dissolved impurities can only be removed by the action of micro-organisms, *i.e.*, by nitrification; and this can only be effected subsequently to the decomposition of the organic matter and the formation of ammonia, and in the absence of undecomposed organic matter.

"(4) That organic matter cannot be destroyed or converted into plant food until it has been dissolved.

"(5) That, as nitrification proceeds far more rapidly in a moistened and aerated porous soil than in a liquid, and as the nitrifying powers of soil are capable of cultivation, the process should be carried on by means of filtration, so that the organisms can be cultivated and supplied with food in the filter.

"(6) That the most important factor in the process of decomposition and nitrification, and the subsequent preservation of the nitrates formed, is an ample supply of air.

"(7) That the suspended matters in sewage should not be allowed to pass on to the land or filter beds, as they clog the surface, and have to remain until decomposed before they can be destroyed."

CHEMICAL PRECIPITATION.

Various materials are used for the purpose of precipitating the solids of sewage in the tanks. Among those most frequently used are

lime, sulphate of iron, alumina, etc., or combinations of two or more of these.

Ferozone is the trade name for a precipitant used by the International Company. The following is a chemical analysis of a sample of ferozone, made by J. Carter Bell, A R.S.M., county analyst, Cheshire, Salford, Birkenhead, etc.:

Moisture	20.00
Sulphate iron, anhydrous	16.28
Sesqui sulphate iron, "	6.07
Sulphate alumina, "	22.20
Carbon	4.47
Insoluble in water	15.20
Water of constitution and other matter not estimated	15.78
	100.00

Almost every sewage requires a precipitant especially suited to it; for instance, a purely domestic sewage requires different treatment from sewage containing large quantities of manufacturing wastes. For this reason the manufacturers of ferozone alter the relative proportions of ingredients to suit the sewage to be treated.

The mixing race-way should be long enough to allow the chemicals to become well incorporated with the sewage before it enters the settling tanks.

SETTLING TANKS.

Settling tanks are now generally operated upon the continuous flow system, and are either long and narrow or circular in plan. In the long narrow tanks the sewage flows continuously through the set of tanks until one compartment has collected sufficient sludge to require cleaning. This tank is then cut out and left a short time, the clarified sewage being drawn off from the top gradually through a hinged pipe, generally controlled by a float. The sludge is then taken off in another pipe, the inside of the tank being scraped and swept out, washed and disinfected by hand before being again put in use.

The largest and most perfect system of tanks of this pattern in America is located at Worcester, Mass.

The following is a description of the "Caudy" circular tank, which is in use in many places in England and France:

The tank is circular, continuous upward flow. A tank 25 feet in diameter and 16 feet deep will treat, it is claimed, from 275,000 to 362,000 gallons per 24 hours. An open channel is formed in the masonry round outside of top for about three-quarters of the circumference, into which sewage flows from the mixing race-ways. In this channel are inserted several vertical pipes, which deliver sewage into tank a short distance above bottom, through pipes placed at an angle to the sides, in order to impart a rotary motion to sewage. Sewage rising to the top of tank flows into a series of parallel troughs

laid across the tank, and is conducted by them into an outlet channel, extending round the remaining part of the circumference, not occupied by the inlet channel. In the centre of the bottom, which is perfectly flat, is pivoted a horizontal perforated pipe, which reaches to side of tank, this pipe being pivoted on another pipe, which is carried up to within about two feet of the full water level, and at that point the sludge is discharged. The pivoted pipe is capable of being revolved from the outside of the tank by means of suitable gearing, and when the tank is being cleaned out the pipe is so revolved. The perforations in the pipe being upon the underside thereof, and only a few inches apart, and the pipe itself being but a very little above the bottom of the tank, it will be seen at once that the rotation of the pipe will draw in the sludge from the whole bottom surface of tank. The pressure of water in tank forces the sludge through the connecting pipe and out at the height of about two feet below water level, as above mentioned, from whence it can be run into a sludge pit.

The advantages claimed for this tank over all other forms are: The removal of sludge does not interfere with the flow of sewage through it, and the rotation of sludge pipe can be made to clean the sides of tank by attaching a suitable arrangement to it.

The time taken to remove sludge is extremely short—two to five minutes. The sludge produced is about twice as thick, and therefore only half the volume of that from any other tank.

The sludge is discharged from tank at a higher level and can be conducted to well without pumping.

The rotary motion imparted to the liquid in the tank has the effect of aggregating the fine particles of suspended matter, and thereby causing their complete and rapid removal by precipitation when the sewage is discharged into the tank, and obtaining the greatest and most effective work from the least quantity of precipitant and enabling the tank to purify the largest quantity of sewage per day.

SLUDGE.

Sludge is the necessary result of any chemical treatment of sewage, and its ultimate disposal is a serious problem. Most sludge is offensive in odor and possesses very little value as manure. The general experience has been that a town is lucky if it is able to induce anyone to haul the sludge away.

Sludge from the lime process is rather more offensive in odor and is bulky as compared to that produced by other precipitants.

Sludge may be run onto land from tanks, and there left to dry, or it may be pressed into cakes and burned or sold for manure. A glimpse at the masses of lime sludge deposited on land adjacent to the Worcester, Mass., precipitation works, is enough to convince one that it should not be deposited on land and left there for any length of time.

The sludge produced by the International system is apparently of some value, judging from the following analysis made by Mr. J. Carter Bell.

Analysis of two samples of International sludge, produced at Royton disposal works, and a sample of rotted farm-yard manure:

	Sample No. 1.	Sample No. 2.	Sample of ordinary rotted manure.
Moisture	61.000	50.500	75 424
Organic matter	14.998	18.630	15.922
Nitrogen equals	.694	.732	.....
Ammonia	.842	.888	.736
Silica	11.005	18.226	1.611
Lime	3.417	3.673	2.142
Oxides iron valumina	4.433	5.916	1.684
Phosphoric acid	.487	.520	.....
Phosphate lime	1.063	1.135	1.121
Chlorides and sulphates of magnesia and the alkalies	3.966	1.803	1.360

EFFLUENTS.

Chemical precipitation does not remove more than a very small proportion of the dissolved organic matter in sewage; and although the effluents may appear bright and clear on leaving the tanks, they are liable to become decomposed and foul a short distance down the stream into which they are turned.

The degree of purification obtained by different methods is ordinarily compared by the percentage of albumenoid ammonia removed. The following comparison of results obtained by several different methods is taken from the report of the Massachusetts State Board of Health, 1890:

Conditions of Treatment.	Percentage of Albumenoid ammonia removed
Settled one hour—	
With 1,800 pounds of lime per 1,000,000 gallons	52
" 650 " alum " "	51
" 1,000 " copperas and 700 pounds lime	57
" 270 " ferric oxide in form of ferric sulphate	59
" no precipitant	21
Filtered through paper	39
" intermittently through four or five feet of sand	98

It will be seen from the above that there is left in the effluent, from precipitation by chemicals, an abundant supply of food for the

unlimited growth of the bacteria remaining in the liquid, so that we must classify all chemical precipitation as methods of partial purification.

Where further purification is demanded the effluent from the precipitation tanks must be filtered or run onto irrigation fields before being turned into streams.

The Local Government Board of England will not loan money to towns for chemical precipitation works unless a considerable quantity of land is purchased for irrigation; generally one acre of land for 1,000 of population. They will, however, sanction the use of one acre of land for each 2,000 of population where the International system of purification is used.

The International system provides for filtering the effluent from precipitation tanks through artificially constructed filters of Polorite, sand and gravel.

The following are extracts from a report on the International system works at Acton, Middlesex, made by Prof. E. Frankland, at the request of Major Tulloch, R.E. (the chief engineer-adviser to the Local Government Board):

"These results show that the raw sewage contained a very large proportion of highly-polluting suspended matter, and an unusually large amount of foul organic matter in solution; and further, that the effluents from the subsidence tank and filter were derived from sewage of about equal polluting power as regards dissolved organic matter.

"In the subsidence tank the suspended matter was reduced from 240.80 parts per 100,000 of raw sewage to 5.92 parts per 100,000 of tank effluent, whilst the effluent from the filter was free from suspended matter. It was clear and transparent. This is a satisfactory result.

"The effect upon the dissolved organic matter in the subsidence tank is very remarkable, its amount being reduced to little more than one-tenth of that present in the original sewage.

"In its subsequent passage through the filter, the dissolved organic matter is still further reduced to nearly one-sixteenth of that present in the original sewage. It is now in a state of purity greatly exceeding that prescribed by the standards of the Rivers Pollution Commission.

"No chemical process of purification of sewage has ever in my experience approached this in efficiency; and if the results obtained at Acton can be accomplished in other places, a most important advance will be made in the purification of sewage of towns.

"I need scarcely add that the effluent is not only clear but inodorous and inoffensive. It is, of course, not fit for dietetic purposes; but it may be admitted in large volumes into running water without creating a nuisance."

The following are some of the results obtained under the International process :

Place.	Albumenoid Ammonia.		
	Crude Sewage.	Effluent.	Per cent. of Purification
Acton	.70	.035	95
Glasgow	.32	.28	12½
Salford	.68	.06	91
Stirling Asylum	3.414	.056	98½
Cahir, Cavalry Barracks	2.62	.498	81½
Hendon	.....	.....	98.7

In conclusion, it may be stated that the question of sewage purification is now so well understood that the familiar plea, "that sewage purification is as yet in too experimental a stage" to be considered practicable, no longer carries any weight.

DISCUSSION.

Mr. Campbell—I do not know that the question of Sewage Disposal is just in my line at the present time. I might say that in travelling round the Province I find that there is a disposition for the smaller towns and cities to undertake a system of sewerage. This, I think, is the first step which a town should take, and is really an important adjunct to a complete system of water works. A great many of our towns at the present time are taking their water supply from living streams, and invariably along the streams we find towns are discharging their sewage without any attempt at filtration or purification before it enters that living stream. The question of how the sewage of towns and cities should be treated before entering these living streams, is one which certainly deserves the greatest attention and consideration from our municipal engineers. You, Mr. President, I presume, will be more familiar with the question of sewage disposal than I am, and in having to deal with this subject, you, no doubt, are in a position to give us from the result of your experience some idea of the very great amount of skill which is required in judging of the merits of any of these different systems. The system of chemical filtration, of broad irrigation, of intermittent filtration, and I believe of mechanical filtration, are all systems which are demanding public attention at the present time, and I believe towns have adopted each of these. Engineers from their actual experience in the construction of these systems seem to be at a loss as to which one possesses the greatest merits and offers the greatest inducements to the towns requiring their adoption. Mr. VanBuskirk has evidently gone into this question very fully. I am well aware that he is a student of the sew-

age question, and judging from the comprehensive manner in which he has dealt with this subject, I have no doubt that in reading the paper over more carefully the engineers of this Province will find it of very great assistance to them in making reports to the Councils employing them. I see that it goes very fully into the necessity of protecting our water supplies, and of curing all sewage matter before it is deposited, even in some remote part of our now much settled country. I believe that the system, or that the theory of germ pollution of water supplies, the theory of decomposition, the microbe organism in water and sewage which was formerly held by scientists and experts has been largely exploded, and to-day the cause of disease is largely attributed to the disease-carrying germ of diphtheria and such diseases which are very prevalent at the present time in this country.

It is a question that I do not feel able to discuss here this morning just on the spur of the moment. Though I have given it some consideration, and from listening to-day I see that it has been fully and very ably handled, and I believe that it is well deserving of the most careful study by those who have anything to do with the question of sewage disposal in the different towns of the Province of Ontario.

I feel very much pleased with the manner in which the question has been dealt with, and I think that it will add very much to the valuable literature which this Association sends out from year to year. Our volume is increasing rapidly, and it is surprising to find how anxiously it is looked for by the members of the profession. I think it would be advisable to try and get those reports out as early as possible, because I am satisfied the municipal engineers all over the country look forward with a great deal of interest to your annual reports, and they take these papers and study them. And they believe it is better to get the report, and study the paper carefully and fully at home, than to come here and listen to it being read.

Mr. Wiggins—I heard Mr. Campbell say the question of sewerage did not come under his jurisdiction ; he is saying what is hardly right ; I think sewerage and drainage come together a great deal. In many towns the question of sewerage and drainage is considered at the same time, and certainly drainage should be considered in good roads. I thought Mr. VanBuskirk would probably have spoken on the question of the drainage of roads as well as of sewers. In towns I have had to do with, drainage and sewerage come together. In Brockville, when they put down a sewer pipe they put down a drain pipe alongside, and in Cornwall we have catch-basins all over the town which lead water into the sewers.

Mr. Gibson—I had a problem submitted to me on the local improvement system to put a system of sewerage into one of the suburban towns, in the township of York, adjacent to the city. We have no means of connecting with the city system. In fact it was impossible to do so, because they could not pay the money to make the connection even if they had the opportunity afforded them, on account

of the tax to be levied on it, so much for every foot of pipe laid down. The sewage had to be disposed of, and I looked up every system; the great drawback of all these systems was they cost too much for a small place. There is no question as to how we can dispose of the sewage in Toronto and in all these large cities, but if you have a problem submitted to you for a place like the village of Weston it is a different thing Take the village of Moore Park, that I am speaking of. I went over every system and called upon the Inspector in Toronto, here, in reference to the sewers, and I carefully considered the matter, and acted according to the amount of money that was on hand. As there were no water works in the place, that added to the problem. We carried the rain water from the roofs into the pipes. I hit upon the scheme they go on in the wilderness, they always filter upwards. Much depends on the amount of pollution to be accommodated. We have two rooms, a partition across. The partition goes from the top down to three or four feet from the bottom, and there is a screen, a very porous one, the sewage has to pass through this, which keeps all the larger material out. Then there is a box of quick-lime in here and any other chemicals you wish to put in. The sewerage passes from the first chamber into the second, and there it has to rise and pass through a gravel bed of sand and this is covered with quick-lime. I did not put the quick-lime into the compartments at first to see the effect, and you would be surprised to see what a great deal of fungus started almost immediately at the out-let or top of the gravel filter, beautiful fungus too, something like the charlotte russe we had the other night at the dinner. (Applause) We have hit upon the system that seems to eat up this animal matter or whatever it was. We have a fall of 100 feet, and the chambers we prepared were almost on a level with the inlets. The next problem was to carry our 60 or 70 or 80 feet of pipes down to the bottom of the valley; our scheme was this, we ran the pipes forward on an easy grade and then dropped 4, 8, 10 or 12 feet. In order to protect our pipes we put brick walls across at intervals, so if water got under the pipes it would not wash them away. We put in a 4½-inch brick wall and carried that up above the top of the pipes. This has been in operation five or six years now, and we have not spent ten cents on it except to put in the lime. We adopted this system in Moore Park, and it has been operating there for years, and I am under the impression it is a success. For a larger filter we would increase the size of the chambers and have separate ones, distinct, so that one could be cleaned out while the others were in operation. It is a surprising thing how little material accumulates in the bottom of these chambers, the quick-lime seems to eat it up, and when it is taken out it has very little smell. At the outlet it is hardly discernable. This is only from the water closets of the houses; we do not allow the surface water to enter our system at all.

Mr. Ross—How much lime did you use in a year?

Mr. Gibson—I could not tell you, we used plenty of lime. When there is a flush of water in the spring or fall we flush it out. We have

outlet pipes for letting it off if we wish to. For instance, with three or four days' rain the whole thing will be taken down with a rush. And then we have a gate to get the sludge out. When you want to turn it out on the land it is easy to get rid of it.

Mr. Jones—What did your system cost a head ?

Mr. Gibson—I could not tell you exactly. The population is 500 or 1,000. No sludge should be allowed to enter the creek. That is a waste of material, for the farmers all want it and it is better for them to get it that way. I think even in the city of Toronto they might adopt something like this instead of turning it into the bay. With the fall of 100 feet into the creek there is very little chance for anything to form.

Mr. Ross—In your system, Mr. Gibson, you kill the bacteria with lime.

Mr. Gibson—We do not allow it to get cold. That sewage matter should not be allowed to germinate.

Mr. Davis—Does the gravel require to be renewed often ?

Mr. Gibson—We rake it over perhaps once in a season and throw in plenty of lime.

Mr. Davis—Have you anything that would dispose of the sludge ?

Mr. Gibson—We pay for having the sludge taken away. The whole of the water closet collecting is done by individuals in Toronto, and they make it up into manure for the farmers. For instance, at the present time you can hardly get any from the stables at all, it is taken up.

Mr. Campbell—You spoke of the drop. It was open to the atmosphere, there was no pipe at the place where it dropped ?

Mr. Gibson—We have a gully, where the air can circulate : there is quite a draft up this just like a chimney. We have a pipe running right down and then built the pipe into the man-hole and then dropped and came to another man-hole, and then dropped again. There was a man-hole at each drop.

Mr. Campbell—You spoke of building a brick wall to protect the pipe.

Mr. Gibson—That is across the pipe, a 4-inch wall.

Mr. Campbell—You put those walls pretty close to one another ?

Mr. Gibson—It depends upon what the fall is, what the drainage is. We have had the whole system working there for years, and it has not cost us ten cents except for putting in the line.

Mr. VanBuskirk—There is a new thing about the upward filtration. No filtration methods will serve to purify any sewage unless the filter is aired. I think in the case of the one Mr. Gibson de-

scribed that the filter is aërated, owing to the intermittency of the flow in the sewers. He says there is no water supply.

Mr. Gibson—We get water from the houses.

Mr. VanBuskirk—In any case I do not think that would thoroughly purify the sewage. It cannot possibly take off the bacteria, and in case of any disease, such as typhoid fever, in the village, they are very likely to be found in the water down the stream a short distance. I think it would be dangerous in a case where streams were used for water supplies, or to water cattle or anything of that kind.

Mr. Gibson—Do you propose cultivating bacteria, that one should live on the other, or what is the scheme?

Mr. VanBuskirk—A properly constructed filter, if it is operated intermittently and used well, has the faculty of cultivating bacteria. Those organisms you will find all about in the New York State Board of Health Report. They are cultivated in the ground, but they will not live in ground, or filter that is not aerated, that is if the filter is covered with water all the time. These bacteria will not greatly multiply, and the consequence is purification takes place. That is done at Berlin, at the sewage farm there, and there is no more intolerable nuisance. It has come through not understanding the true action and not carrying it out. I do not believe that it was ever intended to operate the Berlin system in the way it has been operated, in fact I am sure it was not. It was only intended as part of the purification scheme in any case, but there they do not even strain the sewage. All sewage before being turned into tanks or on the land should be strained by large strainers of iron bars to take out the heavy matter. The lime has the effect of aggregating the suspended matter. That is about one-half of the organic matter, and if you do not take that out you cannot take out the bacteria.

Mr. Gibson—Is not it a fact that all these sewage systems, unless a great expense is gone to, are failures?

Mr. VanBuskirk—They are unless properly operated. I have seen a great many places down in Massachusetts, and one in South Birmingham, where you could not wish to have anything better. They are perfect. The great cost there was the pumping. The cost of the farm itself is not much. Two men live there all the year round and they grow enough corn to live on.

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

MACADAM FOR TOWN STREETS.

By A. W. CAMPBELL, C.E., O.L.S.,

Toronto.

There is a very common impression among the general masses of the people that macadamized roadways are all very well for country highways, but that for town streets a higher grade of paving material —brick, or wood, or asphalt—is necessary. This opinion, so adverse to macadam, has no doubt arisen from the common practice of terming a "macadam" road, any allowance between concessions that has had an irregular layer of gravel dropped along the centre of it. This was somewhat the idea people had of roads before the time of MacAdam, the main feature of whose roadmaking, however, was a firm, unyielding sub-soil, maintained in that condition by a thorough system of deep drainage; and a covering of stone, impenetrable to moisture, and shaped so as to shed water quickly to the gutters. All kinds and classes of paving have their proper place, and, in its proper place, there is none more serviceable and capable of giving greater satisfaction than macadam.

One place in which macadam can be rightly employed is in paving certain town and city streets, those of a residential character, not subjected to traffic so great as to render the maintenance of macadam excessively expensive. There are, of course, other limitations which individual cases will suggest. Business thoroughfares, or a street in its business section, requires a less absorbative material, and one which presents a smoother surface, more easily cleaned. With horses standing, moving slowly, tied and pawing, as so frequently is the case on a business street, and generally with an excess of heavy traffic, a macadam pavement retains a great amount of street filth, is difficult to maintain, and should be, if possible, replaced with vitrified brick or asphalt. A well-kept macadam driveway is in keeping with well-kept boulevards, lawns and shade trees, the characteristics of a residential street; it has a cool appearance, the dust can be readily kept down by sprinkling, and for light driving is the favorite among horsemen. Bicyclists, now an important section of the community, usually favor macadam, in preference to the more costly classes of pavement. A comparison of macadam with asphalt or vitrified brick, in point of utility and beauty, will not result unfavorably to the former.

Preliminary to undertaking the improvement of the streets of a town, levels should be taken on all the streets to establish a system of grades which will provide a proper union of street intersections. Care should, of course,be taken to equalize cuts and fills as far as practicable, and to utilize surplus earth in filling up the boulevards or low lots adjoining the street. In this, the handling of much earth is often necessary to obtain the best results.

In the finished street it is ordinarily advisable to have the crown of the roadway at about the same elevation as the surface of the sidewalk ; and, in any case, the sidewalk should not be lower than the crown of the roadway. It will be necessary to excavate below this elevation in the centre of the allowance to provide for the reception of the road metal. The depth of this excavation must provide for the thickness of the metal to be used, and for surface drainage. The present tendency is to narrow the width of the driveway. It is found that to occupy a 66 foot allowance with a four foot walk on each side, and to devote the remainder to the driveway, is a needless expense, both in cost of first construction and in maintenance. From 22 to 26 feet is, on the great majority of the residential streets of towns, ample to accommodate traffic. A broad driveway is very handsome, but so also are broad stretches of nicely sodded boulevard, ornamented with shade trees. At present, on improved streets, we ordinarily find a row of shade trees outside the walk. In commencing the reconstruction of a street, it is generally advisable, if not absolutely necessary, to take up the sidewalk to permit a proper grading of the road allowance. When the earthwork is finished, the sidewalks may be placed immediately outside the row of trees, and the space originally occupied by it, sodded, and if the fences are removed, the strip is, in appearance, added to the depth of the lawn. This arrangement will usually leave a space for a strip of sod between the sidewalk and the carriageway. If this part of the boulevard can have a width of about two feet or more, it takes away a certain dusty, business appearance which it would otherwise retain. The sidewalk should have a distinct elevation above the sod, sloping slightly toward the roadway to provide for proper drainage. The strip of sod between the walk and curb should have a fall toward the curb of six or more inches, and on a 24 foot roadway having a one-foot crown at the same elevation as the walk, this will leave from 6 to 8 inches of curb exposed.

The crown referred to above, about one inch to the foot, will seem to many, perhaps, excessive. This applies to the newly made roadway and provides for settlement. Two-thirds of an inch is the convexity ordinarily adopted on newly constructed English and French roads ; but with the material available in most localities of our Province it is not sufficient. I do not regard limestone, gneiss, fieldstone and gravel obtainable as sufficiently durable ; hollows are apt to appear, dust accumulates, and unless there is ample fall for the water, it will be found lying upon the road surface. The tendency invariably is for traffic to use the centre of the roadway, and this is always increased with the narrower driveways. But in choosing between

two evils it is better practice, I find, to provide ample crown. It is better that travel should be less distributed than that water should lie in pools on the road.

The shape of the crown has been a subject of some discussion. A circular rise, I believe, to be the best principle to follow in practice. Two planes, joined at the top by a short curve, do not provide for settlements and wear. A flat ellipse, sometimes advocated, does not provide for settlement, and gives an unduly steep fall at the edges, increasing the wear at the sides, and practically narrowing the roadway.

For curbing, flagstone, which is easily obtained in many districts, is the more handsome and more durable material. A good substitute is 3 x 10 cedar, which should be spiked to cedar posts 2½ feet long and 6 in. diameter. By bevelling the posts, the curbing may be inclined at an angle of about 30 degrees. It presents a better appearance than when perpendicular, the tops of the posts are protected, and there is less liability to decay.

In nearly every locality throughout the Province good material will be found within easy distance. Crushed stone is usually regarded as the only material for macadam roads ; but MacAdam really used and advocated any material which would provide a good wearing surface, not readily penetrated by moisture. Thus we have, in Ontario, a choice of gneisses, limestones, field boulders, pit and creek gravels, or if we wish the best material, trap rock is available. Of these materials we have all qualities, from that which is exceedingly good to that which is little better than clay. The gneisses are usually a harder and tougher rock than the limestone, but the latter offsets this defect largely by their better cementing qualities. Fieldstone makes a very good metal if care is taken in its selection. Pit gravel usually needs screening and crushing, to remove sand and earthy matter, and to reduce the large stones to suitable dimensions. Creek gravel is often sufficiently clean to be applied directly to the road, but some attention should be given to breaking large stones. In choosing the metal, a judicious selection must usually be made between a cheaper and poorer material in the immediate vicinity, and a more expensive but more durable metal from a distance. The selection will be based on the expenditure permissible, and the nature of the traffic which is to be accommodated. The depth of stone needed will vary with the nature and extent of traffic, and the quality of stone used. Twelve inches is sufficient for the heaviest travel, and a thickness of seven inches is admissible. The coating should be heavier at the centre than at the curb. These measurements are after consolidation with a roller.

The use of binders is another question of considerable importance. The best that can be had is usually the clean chips and dust, the screenings of the metal used. The amount of vacuum in a surface covering consolidated without a binder is very considerable, but I regard the mechanical grasp which one stone takes upon another, under pressure, as infinitely preferable to the consolidation obtained by a

mixture of sand and stone. Sand attracts and retains moisture, while a vacuum will permit the water to pass away, at the same time affording space for the expansion of the frozen water retained. The action of frost on clean metal is much less serious than upon a roadway having a temporary bond of sand. Of course, rolling is an absolute necessity in obtaining a proper surface covering of crushed stone. Broken stone dropped upon a roadway permits water to pass into the sub-soil as through a sieve, and the process of consolidation not only results in a very great wear and waste of metal, but mixes it with the earth, which of itself is very injurious; and in so doing destroys the crowning, and therefore the proper surface drainage of the subsoil. The subsoil should be crowned, and, like the covering, thoroughly consolidated by rolling. The metal should be applied in layers three or four inches thick, each layer being thoroughly rolled before the next is applied.

The weight of the roller should be from 10 to 15 tons, the former generally producing the better results. An excessive weight tends to crush the metal, especially if of the softer local varieties, instead of working it into position. The heavy rollers produce consolidation more quickly, but the lesser weights have more permanent results. Less than ten tons is not advisable, except in the instance of a horse roller, a cheaper, but not very satisfactory, substitute for a steam roller.

The necessity of underdrainage has been referred to. The means must usually be common field tile. The location and extent of drainage must depend on various circumstances, the nature of the soil, the opportunity for outlets, and whether or not there is a sewer beneath the roadbed. Ordinarily a three or four inch tile placed beneath the edge of the roadway on each side, and below frost line, is the best rule to follow, but this, if the soil is loose and porous and has a natural outlet for sub-soil water, may be more than is necessary. A line of tile placed in the centre of the road allowance disturbs the earth foundation and settlements are likely to occur, a condition which is difficult to repair and is very injurious to the stability of the road.

If gravel or broken stone is used on a business thoroughfare, the gutters should be cobble-stoned to protect them from the stamping of horses; but on residential streets this is not necessary, the angle between the road surface and curb forming a sufficient waterway. Outlets for surface and sub-drainage must be procured as frequently as possible so as to dispose of water before it gains force and headway. If a system of sewers exists, with provision for storm water, the matter is very much simplified. When necessary through settling basins, which should be very carefully guarded, to prevent obstruction.

Street improvement in towns is a matter to which municipal engineers have not been called upon in the past to give very much attention, nor have the advantages of well-built and tastefully designed streets received sufficient consideration from municipal councils or the public generally. To discover the best ways and means to do away with the existing shapeless and badly constructed roads which disfigure the majority of Ontario towns, and to replace them with works

which will give a park-like appearance, is a problem worthy of study; and in its solution the engineering profession must take an active part. The first step is to teach citizens what good streets are; when the public and councillors know this they will know that the engineer's services and advice must be necessary for their construction. When a man knows how and why a horse should be shod, he goes to a blacksmith, to the advantage of the horse, the owner and the smith.

Economy, a necessary part of the subject, must be measured by the standard of services rendered, as compared with the ultimate, not the primary cost. This primary cost varies very much with different localities, and any estimate would require considerable revision for each district. An average cost per mile of a driveway 22 feet wide may be placed at $3,000. It is not well, however, to frighten the public with the estimate of a mile of street. Very few streets are a mile in length, and no citizen has to pay more than his own frontage. This, when extended over a term of years, is a very small annual amount, and the benefits resulting from the improvement, will popularize the expenditure. A man's standing is judged, to quite an extent, by the clothes he wears and the house he lives in. A town is criticized from a similar standpoint, and no municipality can afford to leave its public highways in a state of neglect. The condition of the streets of the majority of towns in Ontario is neither in keeping with true economy nor with an age of civilization.

DISCUSSION.

Mr. Campbell—The system in operation in the majority of towns in Ontario to-day is very poor. It is inefficient, incompetent, and in a majority of cases it would be a disgrace, a reflection upon the statute labor employed in the rural districts. It is very largely due to the fact that municipal councils are constantly using the appropriations of money applied or appropriated for this purpose as legitimate campaign funds! They simply scatter the money over the whole street area of the town, wherever it is demanded by one or more of the influential citizens. In this way the money is not put to the best use. If the money was properly concentrated and expended on a well defined system, which must be prepared by the local engineer, and followed out by him, the streets of the towns in the Province of Ontario as well as the roads of the rural municipalities would, in a short time, compare favorably with the streets of the towns of more settled countries.

Mr. Davis—I wish we could have that paper in the hands of our municipal councils. I read with very much pleasure and profit the pamphlet that was circulated by the Department, written I believe by Mr. Campbell some few years ago, in reference to road making. Of course that found its way into the hands of a good many people, and it opened the eyes of a large number of people in this Province to the fact that road-making in our towns is done in a very slip-shod manner, and this article that is so full and comprehensive would be a valuable addition to the information that our municipal councils have

in reference to this matter. Councils never think of employing an engineer. I know of towns ranging from three to five thousand inhabitants in this Province who never think of consulting an engineer in reference to the expenditure of thousands of dollars annually. They leave it to their Chairman of the Street Committee to expend this money, and they do it in the same manner that their fathers and grandfathers did. I am sure a paper of this kind, not only in the hands of the surveyors and of the municipal engineers, but in the hands of the members of the councils, the people who have authority, would awaken them to a sense of the fact that they are squandering the money, as Mr. Campbell says. There is no doubt that he hits the nail on the head when he says this money is being used for campaign purposes.

Mr. Ross—I think this is a particularly valuable paper, and should be in the hands of all municipal councils. Of course papers somewhat similar have been scattered pretty well over the Province by the Good Roads Association, and other kindred associations, and it is well known Mr. Campbell is doing very valuable and efficient work in every county, and I look for great improvement in roadmaking from his efforts.

Mr. Niven—I quite agree with the remarks of Mr. Davis and Mr. Ross regarding the work Mr. Campbell has done. I know in a great many of our country towns the administration is worse than in some of the country places, some of the townships.

Mr. Gibson—Here is a by-law that was passed by the York Township Council, and it touches a little of the subject of our roads. The idea was heretofore the moneys in the Township of York had been frittered away; the engineer was only on fees. Now the engineer is on salary, and the effect of the by-law now is to compel compliance with the wishes of the engineer. [Mr. Gibson hands in copy of by law, which he read.]

Mr. VanBuskirk—Mr. Campbell has put the subject so well that he has left us nothing to say. Of course it will save us some trouble, but I think we have a grievance against Mr. Campbell for saying all that is to be said and not giving us a chance to say a word.

The Vice-President—I think we should be very much pleased to have the paper in our Proceedings as one of the papers of the members of this Association, and it will be very valuable for reference.

Mr. Campbell—I could do a great deal in the Province of Ontario towards the betterment of our roads, but I can do nothing by myself. I must have the services of the people and their co-operation, and that of the engineers, or my office may as well be dispensed with. It is a very large field to pass over the whole Province, and at best all I can do is to hold meetings here and there in different sections. The local engineers must be employed to do the work; all I can do is to stimulate an interest and educate the people in the interests of good roads, and it remains for them to make these good roads.

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

"UNDISPUTED" POSTS, LIMITS OR MONUMENTS.

By HENRY CARRE, C.E., O.L.S.

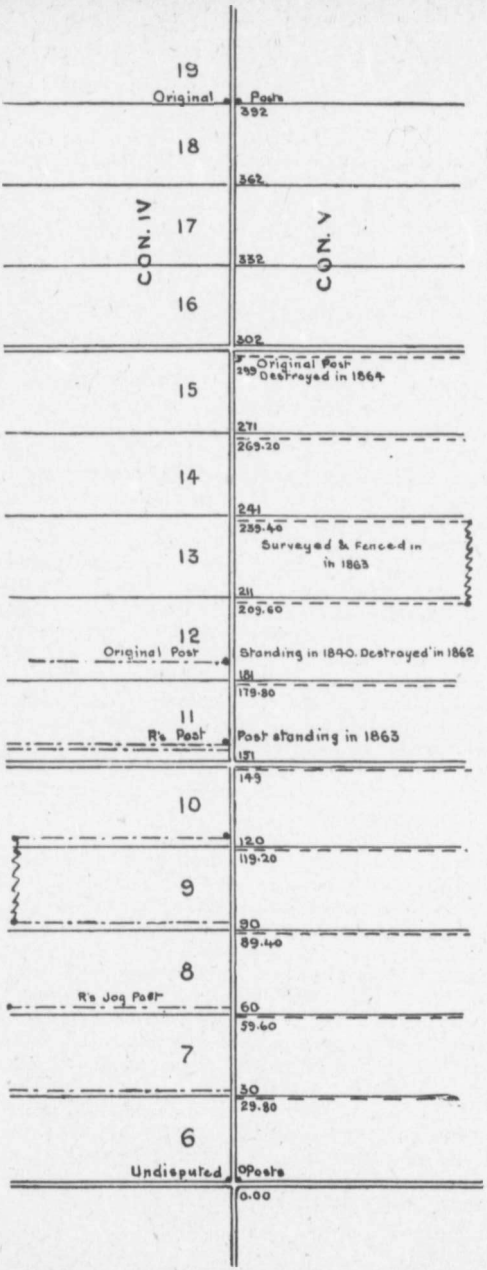
Belleville.

SECTION 60 of the Land Surveyors' Act makes use of the above heading, but does not state what the word "undisputed" means. Is it sufficient for the owner of a lot of land to say "I dispute that post" to render it a *disputed post*, and cause the opposite party to go to all the expense of proving it to be a true "original post"? Is there no limit as to the time during which a "post limit or monument" having remained "undisputed" becomes so legally?

Some years ago the law gave a man legal possession of property, which really belonged to his neighbor, if he had held it in peaceable possession, and enclosed, for twenty years. Now the time limit is reduced to ten years. On the same principle why not grant the same privilege to a man who, owning bush land in a wild, unsettled country, has had his lands surveyed, by a duly authorized surveyor, who runs his lines, plants posts, and blazes the trees on either side the line, so that it can be easily traced, but who sees no necessity for building fences to keep deer and bears from roaming over it. This, according to the present law, does not give possession, even though the timber has been cut according to those lines, and the land bought and sold by them for thirty years past.

In many of the back townships in this district valuable mining privileges have been bought, on lands defined in this way, and it is considered safer, in sections where valuable timber is found, not to build fences, which in case of fire become nothing but trains laid to conduct the fire more quickly from point to point. Still, if you don't fence your land in, and your posts are destroyed, some other man buys the next lot to you and has a survey made; and you find that a fine lot of timber or a valuable mine, for which you paid a high price, is not on your land at all, and your neighbor who paid little or nothing for his lot, because *there was nothing on it*, "takes the cake."

As time flies on, and old settlers die or move away, it is becoming more difficult to prove "old originals." Fires have devastated the country and left nothing but bare rocks, which for years back were considered worthless, but are now found to contain valuable minerals. Old posts and lines have been wiped out of existence, and the difficulty of getting "undisputed posts" is great indeed in townships surveyed as "double fronts," as far back as 1819.


19
Original Posts
392
18
362
CON. IV
17
CON. V
352
16
302
Original Post
299 Destroyed in 1864
15
271
269.20
14
241
235.40
Surveyed & Fenced in in 1863
13
211
209.60
12
Original Post
Standing in 1840. Destroyed in 1862
181
179.80
11
R's Post
Post standing in 1863
171
149
10
120
119.20
9
90
89.40
8
R's Jog Post
60
59.60
7
30
29.80
6
Undisputed
Posts
0.00

This was the case in 1865-6 during the "Madoc gold fever," as it is called, when lands were bought and mining privileges granted for all sorts of land. Lines were then run and posts planted by surveyors from the best evidence then obtainable, but the fever wore off and the lands and boundaries were uncared for.

Now the fever is coming back to us. New processes for the extraction of minerals from the refractory ores of this neighborhood have been perfected, and mineral lands are once more coming to the front; and "right here," as our "confreres" across the line say, comes in the point I want to make. Are posts planted by surveyors in those days, which have been undisputed ever since, to be classed as "undisputed posts, limits or monuments"?

Old original posts are now hard to establish; it was easier in those days when men were crazy over mines. Surveyors had to be careful and sure they were right before running a line. The writer was one of them and knows something of the matter.

To show the confusion into which this matter has brought things—and it is easy to see the confusion will increase as property becomes more valuable—I have prepared a rough sketch of a concession line, showing the effect of different surveys, made at different times, and by different surveyors, all acting according to the law as they understood it. I may here say that in my own practice I have seen similar cases, though not all in the same locality as I now give them. Chainage is assumed so as to simplify matters.

Referring to sketch. In the year 1840 P.L.S. R. was called upon to "run lines" and establish the boundaries of Lot No. 9 in the 4th concession. He found "original monuments" planted in the year 1819 between 5 and 6 and 11 and 12, chained the distance, and gave each lot a width of 31.00 chs. The owner of Lot No. 9, like a wise man, fenced in his lot and cultivated it. The remaining owners held their lands according to the lines run by R., who had planted posts in front and at the "jog," in the centre of the concession. All were satisfied the survey was correctly made under the Act. I show R.'s work (— · — · — · —) thus, upon sketch.

In 1862 the post between 11 and 12 was destroyed by fire. It had stood on a high rocky knoll. Not a trace of it was left nor of the witness trees. The only thing remaining of R.'s work were the posts around Lot 9, the post between 10 and 11, and a portion of the blazed lines between 7 and 8 at the centre of the concession and jog post.

In 1863 the owners of Lot 13 in the 5th called upon P.L.S. B. to run his lines. He disputed the survey made by R., said that the lots were each a chain too wide, and as the post between 11 and 12 was destroyed, and no one could be found to prove it, the nearest point was an "old original" between 15 and 16. This was found and sworn to. Chaining from 5 and 6 post to 15 and 16 gave each lot 29.80 chs. Lot 13 was fenced in upon astronomic lines run by B., and no one objected. B.'s work is shown (— — — —) thus.

The 15 and 16 post was destroyed in 1864, but astronomic lines run from it by B. were to be traced, also jog posts. B. was dead and his field notes could not be obtained.

The owners of Lot 17 in the 4th and 5th concessions required their lines run in 1886, and engaged P.L.S. Q. to run them. No trace or evidence of old post 15 and 16 could be found. B.'s and R.'s work was disputed; they, the owners, must have the subdivision made from 5 and 6, and would stand the consequences of its being disputed.

Q. chains from 5 and 6 posts, subdivides and finds each lot to be 30 chains in width, same as in the original field notes.

Q.'s work shown (——) thus on sketch. As Q.'s work was done in 1886, the owner of Lots 9 in the 4th, who had fenced in his land, also of 13 in the 5th, held their land "by possession," and could not be moved; but what about lines run by R., which had never been fenced? Some of the lots had been sold as mineral lands, and were considered very valuable. If R.'s survey held, they were all right; but if either B.'s or Q.'s held, then they lost.

Ques.—Where are the true lines of Lot 10 in the 4th? Sec. 60 says: "The limits of each lot so found shall be the true limits thereof," but the true limits vary, as the years roll on, and old posts are destroyed. What will it be one hundred years from now? Are lines which were legally run when the original posts were standing, and there was no possibility of doubt, to be passed over, and new lines run, making totally different limits to the lots, just because a certain post has been destroyed by fire, or quietly removed by some interested party? If so, what is the use of employing a surveyor to run your line, unless you are prepared to fence in your property, and maintain it so for ten years, before you have a sure title?

As stated above, why cannot lines so run and undisputed for a set term of years be made legal boundaries, as well as the concession lines run in the same way?

Were a law passed compelling property owners to register plans of any survey made for them, same as town plots, and that said plans be drawn to a fixed scale, showing plainly all existing monuments at the time of making the survey, the true astronomic bearings and distances of all lines established, with complete field notes of survey, would not that be of importance, if said plans and field notes were made legal evidence in court, and what an assistance it would be in case of a Topographical survey being made, if attention was paid by every surveyor, in making said plans, to fix the crossing of all travelled roads, streams or rivers, lakes, mountains or hills and swamps? These plans need not be very elaborate or costly, and the Registrar could file them away for each township and concession, so that a surveyor could have a chance to examine them, and guide himself accordingly. The law as it now stands gives nearly all I mention; but I think it might go a little further, and declare that plans and field notes must be filed in all causes, and it would add very little to the cost of survey, and do away with the danger of old field notes being lost.

I should like very much to be able to give a short sketch of the work and evidence taken at a trial for trespass, decided only a week or so ago, in which most of the points brought forward in this paper came forward, and I had intended doing so, but have been suddenly called away and I fear there will not be time to do it.

Hoping for a full discussion of the different points alluded to, and sorry that I cannot be with you all at the coming meeting, I come to a full stop; feeling very sorry that I have not the time to rewrite this all over again, and lick it into better shape.

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THE DITCHES AND WATERCOURSES ACT AS APPLIED.

By G. SMITH, O.L.S.,

Woodville.

THE writer has had some experience of the working of this Act during the past tweve years, and although in that period of time much has been done to improve it, he cannot but admit that much still remains to be done in that direction, before it can be, in his opinion, practically useful, if, as is supposed, its object is to afford a prompt means of getting an outlet for small drainage systems.

The proceedings are fairly good until the award is filed, after which the average onlooker would be puzzled to know whether the Act was made for the use of the farmers, or for the purpose of farming the farmers.

In the writer's experience the municipal councils generally consider their duty done when they have passed their by-law appointing their engineer, and seldom trouble themselves further until that official makes an award, in which, like the old man getting his jackass over the bridge, he fails to please all parties, when some of its members will not scruple to make capital for the next municipal election out of the dissatisfied element even at the expense of the professional reputation of their own engineer.

When the appealed award comes before the judge for hearing, it is generally on the day of the sitting of the Local Division Court, and when he is fatigued, after hearing, perhaps, several lengthy cases.

An adjournment follows, and although the engineer, and perhaps a couple of them, besides a dozen of witnesses may be in attendance, they must be all called together a second time.

When the case again comes up the appellants have warmed to their work and are arranged for action, when the question is raised as to who is going to defend the award. The council says the engineer must defend his own award. The judge rules that that official is a witness, and that only the respondents look to the council, and in the confusion the case goes on, and ends in a draw, or is not lost, chiefly because the engineer descends from his position of strict impartiality, and acts as advocate in defending his award.

Another adjournment follows, as the court feels called upon to inspect the premises, and then become apparent the weak points of the Act.

His Honor, attended by two or three lawyers, a couple of engineers, and about half a score of farmers, climbs fences, tramps through rough land or soft plowed ground and over ditches, etc. Meanwhile

his attention is called to the many different points under consideration, by as many different parties, and the writer has, when attending on more than one such occasion, wondered at the ignorance of our law-makers in imposing such a duty upon our county judges; and he is of the opinion, formed from close observation, that these gentlemen, while conscientiously striving to do their best, feel quite satisfied that any practical farmer is much better qualified to form a correct opinion as to the merits of such cases than they are.

The next proceeding is to hear argument by the opposing counsel, and the case drags along for months, during which time its fame has extended from one end of the township to the other, and even into those adjoining, and each prudent farmer who hears of it comes to the conclusion that he will let alone that "drainage matter" of his.

When the end comes and the award is sustained, the farmers wonder how such a big row—and such a big bill of costs too—could grow out of such a small matter.

When our lawmakers can succeed in forming a competent court to hear drain appeals, then, and not until then, will the countless number of watercourses, seen in all directions over the face of our country, be put into proper shape to speedily carry off the spring freshets, and so enable the better cultivation and use of the soil.

Our farmers manage their own cheese factories, creameries, and farm buildings in their own practical manner, with fair results, and none of these are of greater importance to our Province than drainage; then, why not let them manage that too? Can none of the writer's professional brethren suggest something?

How would it answer for each municipal council to appoint annually about a dozen drainage commissioners from among their ratepayers, and provide each one with a copy of the Act.

Have the drainage appeal made direct to the township clerk of the municipality wherein the drainage works were commenced.

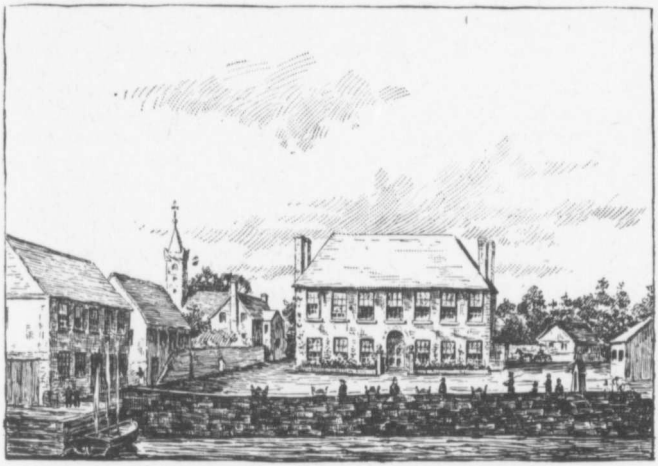
Have the clerk immediately notify all parties interested in the award to meet at his office, at an appointed time, at which meeting let him call upon each one to select a name from the lists of commissioners furnished by adjoining municipalities, and from the number of names so obtained, let the clerk ballot in the same manner as in the selection of jurors until he draws three names.

Let these three be sworn in by the clerk as a Board of Works having full power to hear and decide without appeal all matters relating to the award.

Let the commissioners' pay be $2.00 per day, and mileage at 10c., and let no one be allowed to act in a municipality in which he has a vote, and outside of twenty miles from the municipality in which the award was made.

These are only suggestions, but they are the result of sixteen years' experience in drainage matters, and in the writer's opinion if such an arrangement could be made to carry out both the provisions of the Ditches and Watercourses Act and the Ontario Drainage Act, the drainage work undertaken would soon be increased tenfold.

APPENDIX.



BIRTH-PLACE OF SURVEYOR-GENERAL HURD, BERMUDA.

BIOGRAPHICAL SKETCH.

THE HON. SAMUEL PROUDFOOT HURD was born in Bermuda, 30th November, 1793. He was the son of Captain Thomas Hurd, R.N., Hydrographer to the Admiralty and Surveyor-General for the admeasurement and surveying of lands in Cape Breton. He was an officer in the Guards, and was present at the battle of Waterloo. He was appointed Surveyor-General of New Brunswick in 1825, and in 1830 was appointed to the same office for Upper Canada. He died 10th August, 1853.

The following is an extract from a letter written to the subject of this sketch by his father, Captain Thomas Hurd, on 30th June, 1815:

"We were all made happy yesterday by the receipt of two letters which assured us of your safety up to the 23rd instant, and we all flatter ourselves that you have no more (or at least very little) personal risk to undergo, but only much fatigue at times. I shall nevermore recount my naval services on board the 'Hercules' under Rodney, or in the 'Unicorn' under Ford, or of our great exploits in other fights

where I have been present—they are all eclipsed by the 18th June. Long may you live to relate and enjoy the honor you have acquired by flashing your maiden sword in an action which has no parallel in history. The enquiries after you are numerous and flattering. Amongst others I have one congratulatory note from Major Rennel, who says that you have had the happiness of seeing at the very commencement of your military career what few general officers have had the opportunity of witnessing during their lives. He also adds, that the worst being now over, all that follows is plain sailing—a substantial peace must be the consequence of such a glorious victory, and you will return to us with a delightful and enviable feather in your cap and receive the applause of everybody. At any period after this campaign you may quit the army with honor."

LETTER OF APPOINTMENT AS SURVEYOR-GENERAL OF UPPER CANADA.

DOWNING STREET, 2ND SEPT., 1829.

SIR,—I have the honor to acquaint you that his Majesty has been pleased to appoint Samuel Proudfoot Hurd, Esquire, to be Surveyor-General of Upper Canada in the room of Mr. Ridout, deceased, and I am to acquaint you that on his arrival in the Province you will put him in possession of the office.

[Sgd.] G. MURRAY.

To Major-General Sir John Colborne.

During his term of office as Surveyor-General in Upper Canada, the claims of the United Empire Loyalists appear to have occupied a good deal of attention. Among his papers is to be found a copy of a report made to His Excellency, Sir John Colborne, Lieutenant-Governor of Upper Canada, by the Inspector-General on the subject of lands granted to United Empire Loyalists, etc., accompanied by a letter to himself.

GOVERNMENT HOUSE,
TORONTO, MAY, 1834.

SIR,—I am directed to transmit to you the accompanying report of the Inspector-General of Accounts on the subject of United Empire Loyalists' claims; and to acquaint you that the Lieutenant-Governor desires that this document may be made public and communicated to the agents of United Empire Loyalists applying at your office for location tickets, as it may be convenient to them to be informed that all grants sanctioned under the proclamation of 1789 will probably, in future, be unconditional.

I am also to state that, in conformity to the order of the 14th February last, no locations are to be granted to the agents of United Empire Loyalists in the townships in which 10,000 acres have been

already granted on United Empire Loyalists' rights, but that United Empire Loyalists who intend to settle on their lots are to be located in any of the townships open for location.

I have the honor to be, sir,

Your most obedient humble servant,

[Sgd.] WM. ROAN.

S. P. Hurd, Esq., Surveyor General.

The report of the Inspector-General closes with this memorandum :—

It may be satisfactory to the U. E. Loyalists, etc., to be informed that the quantity of land described or located, or for which orders have been duly filed in favor of U. E. Loyalists, and also of Militia claimants, amounts :

For U. E. Loyalists, to	1,664,600	Ac.
" Militia Claimants	504,100	"
Giving a total of	2,168,700	"

being equal to the number of acres at the disposal of the Crown, in $45\frac{3}{4}$ townships.

In the names of some of our Toronto streets we find traces of Captain Hurd's presence at the C. L. Department, Bathurst street, Portland Street and Clinton street, having been all named by him from reasons of personal friendship, after Earl Bathurst, the Duke of Portland and General Sir H. Clinton, G.C.B., respectively.

It may not be amiss in concluding this sketch to quote from two very interesting documents, relating to the father of the subject of this sketch, namely, his commission as Surveyor-General of Cape Breton, and the instructions given him as to his duties in the discharge of that office. Both of these are signed by King George III. and also by William Pitt.

The commission begins " George the Third, by the Grace of God King of Great Britain, France and Ireland, Defender of the Faith, and so forth—To all to whom these presents shall come, greeting : Know ye that we, reposing especial trust and confidence in the abilities, care and fidelity of our trusty and well beloved Thomas Hurd, have nominated, constituted and appointed, and by these presents do nominate, constitute and appoint him, the said Thomas Hurd, to be our Surveyor-General in our Province of Cape Breton in America, with power to the said Thomas Hurd to do, execute and perform by himself, or his sufficient Deputy or Deputies, all things whatsoever belonging to the said office ; To have, hold, exercise and enjoy the same during our pleasure, together with all salaries, fees, perquisites, profits and advantages thereunto or of right, belonging or appertaining."

After charging the said Thomas Hurd, his Deputy or Deputies to observe and follow all such rules, orders and instructions as " We, or

the Commissioners of Our Treasury or our High Treasurer or Our Committee of Council relating to Trade, etc., and all Our Governors, Lieutenant-Governors, Commanders-in Chief, etc., shall see fit to order, direct and appoint," the document concludes with, "Given at our Court at Saint James's, this 24th day of March, 1785, in the 25th year of Our Reign."

The instructions begin "Instructions to be observed by Thomas Hurd, Esquire, Surveyor General for Admeasuring, Surveying and setting out of Lands in Cape Breton," and go on to say that "Whereas We have been Graciously pleased to give Instructions to Our Trusty and Well-beloved Joseph Frederick Waller Desbarres, Esquire, Our Captain-General and Governor-in-Chief of Our Island of Cape Breton for the Regulation of his conduct in granting Lands to Our Loyal Refugees who have taken Refuge in that Island and others who may become settlers therein; and among other things to signify Our Will and Pleasure that no Grant whatever be made of Land within our said Island until Our Surveyor-General of the Woods, or his Deputy lawfully appointed, shall have viewed and marked out such Districts within Our said Island, as Reservations to us, Our Heirs and Successors, as shall be found to contain any considerable growth of Masting or other Timber fit for the use of Our Royal Navy."

The instructions provide for the "Deputy Surveyors" taking an oath previous to their entering on the duties of their office, and also for their giving good and sufficient security for the due and faithful execution thereof.

Every person employed as a chain bearer, to assist in the survey of the lands, is also to be sworn before entering upon his duties.

When surveys are to be made at the expense of the Crown it is provided that, if they can be spared, the chain bearers and other assistants are to be had from the troops doing duty in the Island.

When the survey of any district is completed maps are to be delivered to the Governor or Commander-in-Chief for the time being, in order to their being transmitted "home." Great care is to be taken in returning plans to the Governor to show how much of the land surveyed is barren and rocky and how much plantable. The lands to be surveyed by virtue of Warrants from the Governors are to be run in such a manner as to allow to each tract an equal and proportionate share of local advantages, as nearly as can be, in respect to the vicinity and access to the sea shore, to rivers, or highways, when the lands shall be near the sea shore or rivers; and in the interior parts the tracts surveyed are to be as nearly as may be run in squares.

These instructions are dated from "Saint James's, this 20th day of April, 1785. In the twenty-fifth year of Our Reign."

OBITUARY.

Mr. William Robert Burke.

Mr. William Robert Burke was the son of the Rev. Canon Burke, of Belleville, who was himself once a Provincial Land Surveyor. He was born in Canada, near the town of Renfrew, on 13th Aug., 1855. Having finished his education in the Canadian schools, he entered the Dominion Telegraph office in Prescott, and rapidly gained promotion in that company, holding several important posts, being employed as manager at Pictou, N.S., North Sidney, Cape Breton, and Halifax, N.S. On the breaking up of the company, he settled at Ingersoll, and had charge of the N.W. Telegraph office there. Desiring to embrace the profession of Land Surveyor, he was apprenticed to Mr. J. D. Evans, P.L S., of the firm of Evans & Bolger, Belleville, and having passed the necessary examinations, he was sworn in as a P. L. Surveyor on April 5th, 1878; he also qualified as a Dominion Land Surveyor, and had charge of several important surveys under both the Dominion and Provincial Governments, and gave every satisfaction to his employers.

He married Miss A. J. Ferguson, of Cookstown, in December, 1896. He was latterly in a poor state of health, and died suddenly at Ingersoll on June 10th, 1897.

His high principles and generous kindness made him beloved by his many friends and relatives. His wife, his father, mother and sister survive him to deplore his loss.

Mr. Richard Coad.

With much regret we have to announce the death of Mr. Richard Coad, a member of our Association. He was the eldest son of Richard and Elizabeth Coad, of the Township of Eckfrid, in the County of Middlesex. He was born in London, Canada, on August 16th, 1856, and was educated for the profession of Land Surveyor, and after being articled for three years with the firm of Wadsworth, Unwin & Browne, P. L. Surveyors, in Toronto, and passing the necessary examinations, he was sworn in, and admitted to practise as a P. L. Surveyor for Ontario, in October, 1879. He commenced practice in West Middlesex, and in 1884 removed to Glencoe, and soon after entered into partnership with Mr. James Robertson. He was well known in his practice for his knowledge in regard to drainage questions. He was employed by the Ontario Government to survey new townships in the

Algoma and Nipissing districts; and he made many municipal surveys under Government instructions. He was also agent for the Canada Company. He was highly esteemed by the members of his profession, and after the incorporation of the Ontario Land Surveyors, he was chosen as one of the members of the Board of Examiners, which office he retained till the time of his death.

He ever proved himself worthy of public confidence and esteem, by his unflinching uprightness and sound common sense.

He leaves a wife and three children to mourn his loss.

MICHAEL DEANE.

The death of Michael Deane, C.E., D.L.S., which occurred at Windsor, Ont., April 3rd last, removed from our ranks one of the oldest and most prominent land surveyors in Canada. Mr. Deane was born in the parish of Birr, or Parsonstown, King's County, Ireland, April 25th, 1819, and began the study of his profession at Dublin University at the age of seventeen. He was employed on the ordinance surveys in Ireland, and in his twenty-first or twenty-second year he went to England. There he was engaged on municipal works in London and Darlington, and in the construction of the London and Manchester Railway, where, for a time, he worked under the celebrated civil engineer, I. K. Brund. In 1847 he came to Canada, and was admitted as a Provincial Land Surveyor, May 28th, 1848. After a short stay at Gananoque, he took up his residence at Lindsay, where he resided for forty-five years. In 1869 he headed the surveying party employed by the Government to lay out the extensive Crown Lands in the Nipissing District, and took part in the construction of the Toronto and Nipissing Railway and of the Grand Trunk Railway from Lindsay to Kingston. In the latter section of the province he built many bridges and other public works.

The Dominion Government sent Mr. Deane to Manitoba and the Northwest Territories in 1878. There he remained for fifteen years, during which time he assisted in laying out many, townships. His adventures in that wild region were many, and when he could be induced to recount some of them, the recital was deeply interesting. But the labors and privations of that region, added to the burden of seventy-four years, had impaired his health, and in 1893 he retired from active sevice, removing with his family to Windsor, Ont., where he resided until death ended a long life spent in usefulness.

Mr. Deane was highly respected by a large circle of friends for his sterling integrity and upright character. He left an unblemished record of fifty-five years' practice of his profession. His wife, two sons and three daughters survive him. The ending of a life like this, connecting the present day with the history of the early settlements in the Dominion, is the loss of an important link with the past. After his years of labor, we may say "he sleeps well," with all eternity to rest in.

Mr. J. R. Peddar.

Mr. J. R. Peddar was a native of Waterloo County, having been born at Doon on June 5th, 1868. After attending school at Doon and Blair, he went to the Berlin High School for some years. From it he entered the School of Practical Science, Toronto University, and graduated in 1890. After the usual apprenticeship with an O. L. Surveyor, he passed the required examination, and obtained the certificate of O. L. Surveyor on Nov. 10th, 1891, and in the year 1892 he was elected an Associate Member of the Canadian Society of Civil Engineers. He was employed on important water, sewerage, and railway works. In 1895 he was elected Provisional Director of the Grand Valley Railroad, and was occupied with the plans and surveys for that road when he was taken ill; he gradually lost strength and vigour until he passed peacefully away on Jan. 17th, 1897, greatly regretted by his sorrowing family and friends.

Mr. Clifford E. Thomson, O.L.S.

The late Mr. Clifford E. Thomson, O.L.S., was born at Inverness, Ontario, in 1837. He served his apprenticeship with Mr. Chas. Unwin, O.L.S., and was afterwards employed in the survey of Longford and Stephenson Townships in Ontario, and of other townships in the North-West Territories. For many years he has occupied on the staff of different railway companies in the location of railroads in the United States. He was City Engineer of Jersey City for some time. During the location of the Hamilton and Northern Railway, Ont., he was Chief Engineer.

We regret that we have to record his death in Chicago, in December, 1896.

Mr. Charles J. Wheelock.

Mr. Charles J. Wheelock was removed from amongst us on 4th July, 1897, after a protracted and painful illness. He was born in County Wicklow, Ireland, more than 83 years ago, and was brought up as a Land Surveyor and Civil Engineer. In 1850, accompanied by his wife and three children, he came to Canada, and settled in Toronto. In order to be permitted to practise his profession in this country, he had to study under a Canadian Surveyor. In 1856 he removed to Orangeville, which was then a small village, where he commenced to practise, and proved an active spirit in all the early enterprises calculated to benefit the town and neighbourhood. He was one of the promoters of the "Orangeville Tramway Co." He was Engineer for a portion of the Toronto, Grey and Bruce Railway, and subsequently located the line of the Credit Valley Railway from Cheltenham to Orangeville. He also laid out the Hockley Road from Orangeville to Hockley. For many years he was County Engineer for Wellington County, and assisted in the construction of the fine system of gravel roads in that county. He was besides, Township

Engineer for twelve of the neighbouring townships, and in this capacity located and superintended the construction of over 300 miles of drains, together with many other works.

He ever gave patient, painstaking and conscientious attention to the works he was entrusted with, and they bear enduring testimony to his ability as an Engineer as well as to his artistic taste.

He was also a poet of no mean calibre.

A man of undoubted honour and integrity, his kindly disposition endeared him to his wide circle of friends and acquaintances.

His wife, two sons and four daughters survive him.

In Memoriam.

NAME.	LATE RESIDENCE.	DATE OF P.L.S. CERTIFICATE.	DATE OF O.L.S. REGISTRATION.	DIED.
Bolger, Francis	Lindsay	10th October, 1863	1892	3rd November, 1895.
Bowman, Leander Meyer	Toronto	14th April, 1892	1892	20th September, 1895.
Burke, William Robert	Ingersoll	5th April, 1878	1892	10th June, 1897.
Coad, Richard	Glencoe	8th October, 1879	1892	17th May, 1897.
Deane, Michael	Windsor	26th May, 1848	19th December, 1892	3rd April, 1897.
Gibbs, Thomas Fraser	Adolphustown	31st May, 1841	1892	17th April, 1893.
Haskins, William	Hamilton	5th July, 1855	1892	5th July, 1896.
Howitt, Alfred	Gourock	12th January, 1856	1892	6th May, 1896.
Peddon, James Robert	Doon	10th November, 1891	23rd December, 1892	17th January, 1897.
Robinson, William	London	—May, 1846	1892	11th October, 1894.
Thomson, Augustus Clifford	Chicago	14th January, 1861	1892	— January, 1897.
Walsh, Thomas William	Simcoe	25th April, 1842	1892	14th March, 1895.
Wheelock, Charles John	Orangeville	———, 1856	1892	4th July, 1897.

LIST OF OFFICERS OF THE ASSOCIA SURVEYORS

1886 TO 1892 (BEFORE

OFFICERS.	1886-7.	1887-8.	1888-9.
President.....	Geo. B. Kirkpatrick	Geo. B Kirkpatrick	A. Niven ... .
Vice-President	John Galbraith.....	John Galbraith.....	Villiers Sankey.....
Secretary-Treasurer	Willis Chipman	Willis Chipman	Willis Chipman ....
Councillors	M. J. Butler	M. J. Butler	John McAree.....
	E. Stewart.....	Villiers Sankey.....	H. B. Proudfoot....
	Villiers Sankey.....	P. S. Gibson.....	W. R. Aylsworth...

1892 TO 1897 (SINCE

OFFICERS.	1892-3.	1893-4.	1894-5.
President.....	E. Stewart.....	E. Stewart.....	M. J. Butler.....
Vice-President	M. J. Butler.....	M. J. Butler.....	M. Gaviller.....
Secretary-Treasurer	A. J. VanNostrand .	A. J. VanNostrand.	A. J. VanNostrand.
Members of Council.	Hon. A. S. Hardy..	Hon. A. S. Hardy..	Hon. A. S. Hardy..
	P. S. Gibson	Geo. B. Kirkpatrick.	Villiers Sankey*....
	M. Gaviller.....	A. Niven	Herbert J. Bowman.
	John McAree	P. S. Gibson	Geo. B. Kirkpatrick
	Villiers Sankey*....	M. Gaviller.....	A. Niven .....
	A. Niven	J. McAree	P. S. Gibson. .....
	Geo. B. Kirkpatrick	Villiers Sankey*....	Willis Chipman ....

TION FORMED IN 1886 BY THE LAND OF ONTARIO.

INCORPORATION).

1889-90.	1890-1.	1891-2.	1892 (to 1st July).
A. Niven.....	Villiers Sankey.....	Villiers Sankey.....	E. Stewart.
Villiers Sankey.....	E. Stewart.....	E. Stewart.....	M. J. Butler.
Willis Chipman	A. J. VanNostrand .	A. J. VanNostrand .	A. J. VanNostrand.
E. Stewart.....	H. B. Proudfoot....	M. J. Butler.	John McAree.
John McAree.....	M. Gaviller	H. B. Proudfoot....	M. Gaviller.
P. S. Gibson.....	T. H. Jones.	M. Gaviller.....	P. S. Gibson.

INCORPORATION).

1895-6.	1896-7.	1897-8.
M. Gaviller.....	Willis Chipman....	T. Harry Jones ....
Willis Chipman....	T. Harry Jones	P. S. Gibson.....
A. J. VanNostrand .	A. J. VanNostrand .	A. J. VanNostrand .
Hon. A. S. Hardy..	Hon. A. S. Hardy..	Hon. J. M. Gibson .
P. S. Gibson.....	Geo. B. Kirkpatrick	Villiers Sankey*....
F. L. Foster.....	A. Niven	J. W. Tyrrell.....
Villiers Sankey*	P. S. Gibson	Geo. B. Kirkpatrick
Herbert J. Bowman	F. L. Foster.....	A. Niven .....
Geo. B. Kirkpatrick	Villiers Sankey*....	F. L. Foster .....
A. Niven	Herbert J. Bowman	J. L. Morris (vice P. S. Gibson)

* Chairman of Council.

LIST OF MEMBERS.

15th July, 1897.

The names of those members granted exemption by By-laws ratified by the Association are marked*.
The names of those granted exemption by By-laws passed by Council since the annual meeting are marked†

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Abrey, George Brockitt, Toronto Junction ..... 10th Jan., 1860
D.L.S., Town Engineer.

Allan, John Richard, Renfrew ..... 6th Nov., 1894
Grad. S.P.S.

Anderson, John Drummond, Trail, B.C..... ..... 13th April, 1892

Aylsworth, Charles Fraser, Sr., Madoc..... 2nd April, 1861
D.L.S.

Aylsworth, Charles Fraser, Jr., Madoc..... 8th Jan., 1886

Aylsworth, John Sidney, Selby, P. O. Box 23..... 9th Jan., 1871
D.L.S.

Aylsworth, William Robert, Belleville, P.O. Box 2.. 8th Nov., 1861
D.L.S.

Baird, Alexander, Leamington ..... 7th July, 1877
D.L.S.

Barrow, Ernest George, Hamilton..... 4th Oct., 1877
D.L.S., M.C.S.C.E., Assistant City Engineer.

Bazett, Edward, Burk's Falls..... 8th July, 1881
D.L.S.

Beatty, David, Parry Sound..... 12th July, 1869
D.L.S.

Beatty, Herbert John, Eganville..... 8th Nov., 1893
Grad. S.P.S.

Beatty, Walter, Delta..... 19th July, 1858
D.L.S., M.P.P.

Bell, Andrew, Almonte ..... 6th Oct., 1866
D.L.S.

Bell, James Anthony, St. Thomas ..... 11th Oct., 1875
D.L.S., Co. Engineer, Elgin; City Engineer St. Thomas.

Bigger, Charles Albert, Ottawa, 68 Daly Ave..... 6th Jan., 1882

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Bolger, Thomas Oliver, Kingston ..... 6th July, 1865
D.L.S., City Engineer.

Bolton, Ellsworth Doan Ottawa, Geo. Survey Dept., 7th Nov., 1895
B.A.Sc. (McGill).

Bolton, Jesse Nunn, Toronto, 264 Major st..... 6th April, 1867
D.L.S.

Bolton, Lewis, Listowel..... 9th July, 1864
D.L.S.

Booth, Charles Edward Stuart, Kingston,
196 Colborne st ..... 6th April, 1882

Boswell, Elias John, Rat Portage.....7th Nov., 1896
Grad. S.P.S.

Bowman, Clemens Dersteine, West Montrose..... 10th July, 1879

Bowman, Herbert Joseph, Berlin..... 7th Jan., 1887
Grad. S.P.S., Town Engineer.

Bray, Edgar, Oakville..... 6th Oct., 1866
D.L.S.

Bray, Harry Freeman, Oakville ..... 10th July, 1882

Bray Samuel, Ottawa, Dept. of Ind'n Affairs..... 6th Jan., 1877
C.E., D.L.S.

Brown, David Rose, Cornwall..... 10th Oct., 1850
D.L.S.

*Brown, John Smith, Kemptville ..... 8th July, 1852
D.L.S.

Browne, Harry John, Toronto, 17 Toronto st.....6th July, 1872
D.L.S., C.E.

Browne, William Albert, Toronto, 17 Toronto st...10th April, 1876

Burt, Frederick Percy, New York, N.Y..... 8th July, 1885
Manager and Treasurer Eng. News Pub. Co., Tribune Building.

Butler, Matthew Joseph, Napanee, P O Box 359... 11th Jan., 1878
M.I.C.E., M.A.S.C.E., M.C.S.C.E., C.E.

Byrne, Thomas, Sault Ste. Marie..... 15th July, 1862
D.L.S.

Caddy, Cyprian Francis, Campbellford.....10th July, 1860
D.L.S.

*Caddy, Edward C., Cobourg..... 18th Dec., 1846
D.L.S.

Caddy, John St. Vincent, Ottawa, 559 King st..... 6th Oct., 1866
D.L.S.

Cameron, Alfred John, Peterborough..... 9th April, 1889

Campbell, Archibald William, Toronto, Parl. Bldg...10th April, 1885
Provincial Instructor in Road Making.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Carre, Henry, Belleville, P.O. Box 203..... 8th Nov., 1861
City Engineer, B.A. and C.E. (Trin. Coll., Dublin), D.L.S.

Carroll, Cyrus, Rat Portage..... 10th Jan., 1860
M.C.S.C.E., D.L.S.

Casgrain, Joseph Philippe Bâby, Morrisburg..... 5th Jan., 1887
D.L.S., P.L.S. (Que.), C.E., A.M.C.S.C.E.

Cavana, Allan George, Orillia..... 8th July, 1876
D.L.S.

Chalmers, John, Rat Portage..... 14th April, 1896
Grad. S.P.S.

Charlesworth, Lionel Clare, Rat Portage..... 14th April, 1896
Grad. S.P.S.

*Cheesman, Thomas, Mitchell..... 11th July, 1856
D.L.S.

Chipman, Willis, Toronto, 103 Bay st.....4th Oct., 1881
Retiring President of Association O.L.S., B.A.Sc. (McGill), M.A.S.C.E., M.C.S.C.E.

Code, Abraham Silas, Alvinston..... 14th April, 1896

Cozens, Joseph, Sault Ste. Marie ..... 7th July, 1875
D.L.S.

Creswicke, Henry, Barrie ..... 8th July, 1864
D.L.S.

*Cromwell, Joseph Miller Oliver, Perth..... 1st Oct., 1846
D.L.S.

*Davidson, Alexander, Arkona..... 11th Oct., 1858
D.L.S.

Davidson, Walter Stanley, Arkona.....9th April, 1884

Davis, Allan Ross, Wabigoon ..... 8th Jan., 1886
B.A.Sc. (McGill).

Davis, John, Alton.....5th April, 1878

Davis, William Mahlon, Woodstock.....11th April, 1885
Grad. R. M. Coll.

Deacon, Thomas Russ, Rat Portage..... 12th Nov., 1892
Grad. S.P.S., Town Engineer.

Deans, William James, Oshawa..... 11th July, 1884

DeGurse, Joseph, Windsor, P.O. Box 167.....5th April, 1883
Chief Eng., L.E. & D.R.R.

DeMorest, Richard Watson, Sudbury.....9th April, 1889
M.E.

Dickson, James, Fenelon Falls..... 6th April, 1867
D.L.S., Ins. of Crown Land Surveys.

Dobbie, Thomas William, Tilsonburg..... 11th July, 1856
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Doupe, Joseph, Winnipeg, Man., 169 Edmonton st .... 13th Jan., 1863
D.L.S., P.L.S. (Man.), C.E. (McGill).

Ducker, William A., Rat Portage ..... 6th April, 1882
D.L.S., P.L.S. (Man.)

Ellis, Henry Disney, Toronto..... 7th April, 1877
D.L.S.

Esten, Henry Lionel, Toronto, 157 Bay st ..... 7th Jan., 1887

Evans, John Dunlop, Trenton..... 8th July, 1864
D.L.S., Chief Eng., Cent. Ont. Ry.

Fair, John, Brantford..... 13th April, 1875

Fairbairn, Richard Purdom, Toronto, 127 Major st., 7th Oct., 1876
Surveyor for Dept. of Pub. Works.

Fairchild, Charles Court, Simcoe..... 9th April, 1894
Grad. S.P.S.

Farncomb, Alfred Ernest, London, 213 Dundas st., 9th April, 1895

Farncomb, Frederick William, London,
213 Dundas st..... 6th Nov., 1889

Fawcett, Thomas, Ottawa, Dept. of Interior..... 6th Jan., 1881
Dom. Topographical Surveyor.

Fitton, Charles Edward, Orillia, Box 142..... 10th April, 1879
D.L.S.

FitzGerald, James William, Peterborough, Box 333, 13th July, 1857
D.L.S.

Flater, Frederick William, Chatham..... 9th April, 1888

Foster, Frederick Lucas, Toronto, 157 Bay st..... 9th April, 1863
D.L.S.

Francis, John James, Sarnia, P.O. Box 304..... 16th Oct., 1861
D.L.S.

*Fraser, Charles, Wallaceburg..... 5th Aug., 1847
D.L.S.

Galbraith William, Bracebridge ..... 4th April, 1883
D.L.S.

Gamble, Killaly, Toronto, 193 Bloor st. e..... 6th April, 1888
D.L.S., P.L.S. (Man.), Captain R.A. (Ret'd).

Gardiner, Edward, St. Catharines..... 6th Jan., 1866
D.L.S.

Gaviller, Maurice, Collingwood, Box 773..... 6th Jan., 1866
C.E. (McGill), D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Gibbons, James, Renfrew..... 15th April, 1890
Grad. S.P.S.

Gibson, Harold Holmes, Willowdale..... 8th Sept., 1891

*Gibson, James Alexander, Oshawa..... 7th April, 1855
D.L.S.

Gibson, Peter Silas, Willowdale..... 19th July, 1858
C.E., M.S. (Mich. Univ.), D.L.S., M.C.S.C.E., Engineer Tp. of York.

Gilliland, Thomas Brown, Eugenia ..... 11th July, 1868
D.L.S.

Gillon, Douglas John, Fort Frances..... 9th Nov., 1895
Grad. R.I.E.C.

Graydon, Aquila Ormsby, London..... 8th July, 1880
City Engineer.

Green, Thomas Daniel, Ottawa, Dept. of Indian Affairs ..... 7th Jan., 1885
D.L.S.

Griffin, Albert Dyke, Woodstock, P.O. Box 612....11th Nov., 1890

Hanning, Clement George, Preston, Lock Box 130..19th July, 1858
D.L.S., C.E., (Trin. Coll., Dublin).

Hart, Milner, Toronto, 103 Bay st..... 11th July, 1863
D.L.S.

Harvey, Thomas Alexander, London, 1 Oxford st..13th Nov., 1893

Heaman, John Andrew, London, Albion Building .. 16th Nov., 1896

Henderson, Eder Eli, Henderson P.O., Maine..... 7th April, 1887
Grad. S.P.S.

Henry, Frederick, London, Albion Building ..... 7th April, 1887

*Hermon, Royal Wilkinson, Rednersville..... 13th July, 1857
D.L.S.

Hewson, Thomas Ringwood, Hamilton, 42 James st. n..... 6th July, 1877
D.L.S.

Hobson, Joseph, Montreal, G. T. Ry. Office..... 3rd Oct., 1855
D.L.S., Chief Eng. Grand Trunk Railway System.

Hopkins, Marshall Willard, Rat Portage.....13th Nov., 1893
B.A. Sc. (McGill), A.M.C.S.C.E., Chief Eng. I.R.R. Co.

Hutcheon, James, Guelph..... 10th Nov., 1891
Grad. S.P.S.

Innes, William Livingstone, Peterborough, 372½ Water st..... 14th April, 1892
C.E. (Toronto Univ.)

Irwin, James Moore, Rat Portage ..... 27th Dec., 1893
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

James, Darrell Denman ..... 3rd Nov., 1891
B.A., B.A.Sc. (Toronto Univ.)

James, Silas, Toronto, 77 Victoria st. ..... 19th July, 1858
D.L.S.

Johnson, Robert Thornton, Rat Portage ..... 9th April, 1889

Jones, Charles Albert, Petrolea ..... 8th April, 1881
D.L.S.

Jones, John Henry, Sarnia ..... 10th Oct., 1863
D.L.S.

JONES, THOMAS HENRY, Brantford ..... 10th Oct., 1878
President Association O.L.S., City Engineer, B.A.Sc. (McGill).

*Keefer, Thomas Coltrin, Ottawa ..... 14th Aug., 1840
D.L.S., C.E.

Kennedy, James Henry, St. Thomas, P.O. Box 434, 7th April, 1887
C.E. (Tor. Univ.), M.C.S.C.E

Kippax, Hargreaves, Huron, South Dakota ..... 7th July, 1877
C.E. (Tor. Univ.), Assistant to Surveyor-General

*Kirk, Joseph, Stratford, P.O. Box 373 ..... 16th Feb., 1843
D.L.S.

Kirkpatrick, George Brownly, Toronto,
Dept. of Crown Lands ..... 13th April, 1863
D.L.S., Director of Surveys.

Klotz, Otto Julius, Ottawa, 437 Albert st. ..... 6th Jan., 1876
C.E. (Mich. Univ.), Dom. Topographical Surveyor.

Laird, James Steward, Essex ..... 6th April, 1867
D.L.S.

Laird, Robert, Rat Portage ..... 11th Nov., 1887
Grad. S.P.S.

Lewis, John Bower, Ottawa, Brunswick House. .... 4th Oct., 1883
D.L.S.

Lougheed, Aaron, Port Arthur ..... 12th Nov., 1888
D.L.S.

*Low, Nathaniel Edward, Wiarton ..... 11th July, 1856
D.L.S.

Lumsden, Hugh David, Toronto, 63 Homewood ave...4th Jan, 1866
D.L.S., M.I.C.E., M.C.S.C.E.

*Lynch-Staunton, Francis Hardwick, Hamilton ....11th Oct., 1856
D.L.S.

Macdougall, Allan Hay, Port Arthur ..... 11th April, 1859
D.L.S.

Mackenzie, William, Rat Portage, Hilliard House. 11th April, 1896
Grad. R.M.C.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

MacKenzie, William Lyon, Vankleek Hill ..... 7th April, 1887
Asst. Eng. M. and O. Ry.

MacNabb, John Chisholm, Hamilton, 111 Elgin st.. 8th Jan., 1880
C.E.

MacPherson, Duncan, Montreal.....9th Jan., 1884
Eng. Dept. C.P.Ry.

McAree, John, Rat Portage .....6th April, 1867
Dom. Topographical Surveyor, B.A.Sc. (Toronto).

*McCallum, James, Fort Frances ..... 30th Mar., 1849
D.L.S.

McCubbin, George Albert, St. Thomas, Box 423.... 9th Nov., 1895

McCulloch, Andrew Lake, Galt..... 10th Nov., 1888
Grad. S.P.S., A.M.C.S.C.E.

McDonell, Augustine, Chatham,
4 & 5 Ebert's Block ..... 11th July, 1863
D.L.S.

McDowall, Robert, Owen Sound ..... 11th Nov., 1890
Town Engineer, Grad. S.P.S.

McEvoy, Henry Robinson, St. Marys ..... 10th July, 1875
D.L.S.

McFadden, Moses, Neepawa, Man..... 1892
D.L.S.

McFarlen, George Walter, Toronto, Court House...11th Nov., 1889
Grad. S.P.S.

McGeorge, William Graham, Chatham,
5 Sandwich st. w.....8th Jan., 1866
D.L.S.

McGrandle, Hugh, Huntsville ..... 5th Jan., 1883

McKay, Owen, Windsor, P.O. Box 167..... 7th Jan., 1887
Grad. S.P.S.

McKenna, John Joseph, Dublin.....9th July, 1860

McLatchie, John, Ottawa, 28 Stanley ave..... 9th Jan., 1864
D.L.S., P.L.S. (Que. & Man.)

McLean, James Keachie, Edmonton, N.W.T..... 8th April, 1876
D.L.S.

McLennan, Murdoch John, Williamstown..... 13th Nov., 1893
B.A.Sc. (McGill).

McLennan, Roderick, Toronto, 115 Avenue rd .... 20th June, 1846
D.L.S.

McMullen, William Ernest, St. John, N.B..... 11th Nov., 1892
Assistant Engineer, C.P.R.

McNab, John Duncan, Owen Sound ..... 9th Oct., 1879

McPhillips, George, Rat Portage ..... 9th July, 1885
D.L.S., P.L.S. (Man.)

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Malcolm, Sherman, Blenheim ..... 11th Oct., 1858
D.L.S.

Manigault, William Mazyck, Strathroy, P.O. Box 300..... 8th July, 1876
D.L.S.

Marshall, James, Holyrood..... 6th Oct., 1866
D.L.S.

Miles, Charles Falconer, Rat Portage, Hilliard House, 13th Jan., 1862
D.L.S.

Miller, Frederick Fraser, Napanee ..... 8th Jan., 1885

Moore, John Mackenzie, London, Albion Building....9th Oct., 1879

Moore, John Harrison, Smith's Falls ..... 11th Nov., 1889
Grad. S.P.S.

Morris, Alfred Edmund, Perth ..... 10th April 1879

Morris, James Lewis, Pembroke ..... 7th July, 1886
D.L.S. C.E. (Toronto Univ.)

Mountain, George Alphonse, Ottawa..... 9th Jan, 1884
M.C.S.C.E., D.L.S., P.L.S. (Que.)

Murdoch, William, Rat Portage..... 10th Jan., 1860
D.L.S., C.E.

Murphy, Charles Joseph, Toronto, 157 Bay st..... 6th Oct., 1886

Newman, William, Windsor, 57 Sandwich st. w.....12 Nov., 1892
Grad. S.P.S.

Niven, Alexander, Haliburton..... .....8th July, 1859
D.L.S.

Ogilvie, John Henry, Rat Portage ..... 8th April, 1876
D.L.S.

Ogilvie, William, Ottawa, Dept. of Interior .....12th July, 1869
D.L.S.

O'Hara, Walter Francis, Chatham..... 14th April, 1892
D.L.S.

Paterson, James Allison, Toronto, 23 Adelaide st. e., 5th April, 1878
C.E.

Patten, Thaddeus James, Little Current..... 5th Jan., 1883

Peterson, Peter Alexander, Montreal. P.Q..... 16th July, 1863
Chief Engineer Can. Pac. Ry.

Pinhey, Chas. Herbert, Ottawa, 630 Wellington ave. 12th Nov., 1888
D.L.S., Grad. S.P.S., A.M.C.S.C.E.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Proudfoot, Hume Blake, Bonheur ..... 6th Jan., 1882
D.L.S., C.E. (Toronto Univ.)

Purvis, Frank, Eganville ..... 7th April, 1875
D.L.S.

Rainboth, Edward Joseph, Ottawa ..... 11th Nov., 1887
D.L.S.

Rainboth, George Charles, Aylmer, Que. ..... 11th July, 1868
D.L.S., P.L.S. (Que.)

Ritchie, Nelson Thomas, Kincardine ..... 9th Nov., 1888

Roberts, Vaughan Maurice, St. Catharines ..... 5th April, 1887

Robertson, James, Glencoe ..... 11th July, 1885
Grad. S.P.S.

Roger, John, Mitchell ..... 10th Nov., 1888
Grad. S.P.S.

†Rombough, William R., Durham ..... 14th Nov., 1848
D.L.S.

Rorke, Louis Valentine, Sudbury ..... 14th April, 1890
D.L.S.

Ross, George, Welland ..... 10th July, 1879
B.A.Sc. (McGill).

*Rubidge, Tom S., Cornwall ..... 9th Feb., 1849
D.L.S., Asst. Eng. Dep. Rys. and Canals.

Russell, Alexander Lord, Port Arthur ..... 16th April, 1873
D.L.S.

Sankey, Villiers, Toronto, City Hall ..... 11th Jan., 1878
D.L.S., City Surveyor.

Saunders, Bryce Johnston, Fort William ..... 7th Jan., 1885
B.A.Sc. (McGill), D.L.S.

Scane, Thomas, Ridgetown ..... 7th Jan., 1865
D.L.S.

*Schofield, Milton C., Guelph ..... 28th Sept., 1843
D.L.S.

Schwitzer, John Edward, Rat Portage ..... 16th Nov., 1896
B.A.Sc. (McGill.)

Seager, Edmund, Rat Portage ..... 8th July, 1861
D.L.S.

Selby, Henry Walter, Dinorwie, C.P. Ry ..... 8th Jan., 1876
D.L.S.

Sewell, Henry DeQuincy, Rat Portage; cable, "Quincy," Toronto ..... 9th July, 1885
D.L.S., A.M.I.C.E.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Silvester, George Ernest, Sudbury..... 12th Nov., 1892
Grad. S.P.S.

Sing, Josiah Gershom, Meaford..... 9th Jan., 1879
D.L.S.

Smith, Angus, Ridgetown ..... 14th April, 1896
Grad. S.P.S.

Smith, George, Woodville, Box 77..... 7th April, 1881

Smith, Henry, Toronto, Crown Lands Dept..... 8th Nov., 1861
Supt. Colonization Roads, D.L.S., M.C.S.C.E.

Speight, Thomas Bailey, Toronto, Yonge St. Arcade, 6th Jan., 1882
D.L.S.

Squire, Richard Herbert, Brantford, Box 169..... 14th April, 1896
B.A.Sc. (Toronto).

Steele, Edward Charles, Goderich, Box 169..... 9th April, 1889

Stewart, Elihu, Rat Portage..... 8th April, 1872
D.L.S. Crown Lands Mining Agent.

Stewart, John, Montreal..... 11th Nov., 1887
D.L.S.

Stewart, Walter Edgar, Rat Portage..... 12th April, 1892

Stewart, Geo. Alexander, Banff, N.W.T..... 8th June, 1879

*Strange, Henry, Rockwood ..... 30th Nov., 1838
D.L.S., C.E.

Taylor, William Verner, Gananoque ..... 7th Nov., 1896
Grad. S.P.S.

Tiernan, Joseph Martin, Tilbury Centre..... 7th Jan., 1886

Traynor, Isaac, Dundalk..... 16th April, 1873
D.L.S.

Turnbull, Thomas, Winnipeg, Man., C.P.R. Office.. 6th July, 1878
D.L.S., C.E. (Toronto Univ.)

Tyrrell, James Williams, Hamilton, 42 James st. n... 8th April, 1885
Co. Eng. for Wentworth, C.E. (Toronto Univ.), D.L.S.

†Unwin, Charles, Toronto, 157 Bay st..... 12th April, 1852
D.L.S.

Ure, Frederick John, Woodstock..... 7th April, 1887
C.E.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

VanBuskirk, William Fraser, Stratford ..... 7th April, 1888
Grad. R.M. Coll.

VanNostrand, Arthur J., Toronto, Yonge St. Arcade..30th Oct., 1882
D.L.S.

Wadsworth, Vernon Bayley, Toronto, 103 Bay st....9th April, 1864
D.L.S.

Wagner, William, Ossowa, Man. ..... 12th April, 1897

Walker, Alfred Paverley, Toronto, Room 508 Union Station, C.P.Ry., Eng. Office ..... 6th Jan., 1882
A.M.C.S.C.E.

Wallace, Charles Hugh, Hamilton, 206 Bay st. s....9th Nov., 1889

Ward, Archeson Thomas, Wabigoon ..... 10th April, 1897

Warren, James, Walkerton, Box 190 ..... 7th Oct., 1864
D.L.S., A.M.C.S.C.E.

Watson, John McCormack, Orillia, P.O. Box 224...13th April, 1892

*Weatherald, Thomas, Goderich, P.O. Box 273.....12th Jan., 1856
D.L.S., C.E.

West, Robert Francis, Orangeville..... 7th April, 1881

*Wheelock, Charles John, Orangeville..... 11th July, 1856
D.L.S.

Wheelock, Charles Richard, Orangeville ..... 7th Jan., 1886
Treasurer County of Dufferin.

Whitson, James Francis, Toronto, Crown Lands Dept..... 9th Jan., 1886

Wicksteed, Henry King, Cobourg..... 7th Jan., 1886
D.L.S., C.E.

Wiggins, Thomas Henry, Cornwall .... 10th Nov., 1891
Grad. S.P.S., D.L.S., Town Engineer.

Wilde, John Absalom, Sault Ste. Marie..... 9th April, 1889

Wilkie, Edward Thomson, Carleton Place..... 11th April, 1891
D.L.S.

Williams, David, Kingston ..... 9th April, 1864
D.L.S.

†Winter, Henry, Thornyhurst ..... 11th July, 1853
D.L.S., C.E.

*Wood, Henry O., Billings' Bridge..... 10th Oct., 1855
D.L.S.

*Yarnold, William Edward, Port Perry, P.O. Box 44..... 7th April, 1854
D.L.S.

REGISTERED AND WITHDRAWN.

The names of those who have become "Associates" under By-law No. 39 are marked *.

NAME AND P. O. ADDRESS. DATE OF ADMISSION BY BOARD.

Apsey, John Fletcher, Cumberland, Queen City Hotel, Md.. ..... 6th Jan., 1886
Grad. S.P.S.

Blake, Frank Lever, Toronto, Meteorological Office..... 13th April, 1875
D.L,S.

Bowman, Arthur Meyer, Mahan, Beaver Co., Pa.. 11th Nov., 1887
Grad. S.P.S., Staff of U.S. Engineers.

Bowman, Franklin Meyer, Bellevue, Allegheny Co., Pa .....11th April, 1892
Grad. S.P.S., Engineer Structural Iron Works.

Brady, James, Victoria, B.C., Box 815..... 15th July, 1862
M.E.

Burnet, Hugh, Victoria, B.C.....5th April, 1887
P.L.S. (B.C.).

Cambie, Henry John, Vancouver, B.C..... 8th July, 1861
P.L.S. (B.C.).

Coleman, Richard Herbert, Toronto, 204 King st. e. .....6th Oct., 1877

Drewry, William Stewart, Ottawa, Dept. of Interior.....5th April, 1883

Edwards, George, Thurso, Que..... .....6th Jan., 1866

Fowlie, Albert, Orillia ..... 13th Jan., 1863
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Galbraith, John, Toronto, Sch. of Prac. Science.... 13th April, 1875
M.A., D.L.S., Prof. Engineering.

Gibson, George, St. Catharines..... 10th April, 1860
D.L.S.

*Gilmore, Robert, Toronto, 22 Russell St.
D.L.S.

*Harris, John Walter, Winnipeg, Assm't Com. Dept.....6th Oct. 1866
P.L.S. (Man.), D.L.S.

Hermon, Ernest Bolton, Vancouver, B.C..... 7th Oct., 1885
P.L.S. (B.C.), D.L.S.

Jephson, Richard Jermy, Calgary, Alta ..... 7th April, 1877
P.L.S. (B.C.), D.L.S.

Johnson, Sydney Munnings, Rossland, B.C..... 9th Nov., 1895
B.A.Sc. (Toronto).

Kains, Tom, Victoria, B.C..... 11th July, 1873
Surveyor-General, B.C.

Lane, Andrew, Sparrow's Point, Md..... 4th April, 1895
Grad. S.P.S., Draftsman Maryland Steel Co.

Lendrum, RobertWatt, South Edmonton, Alta..... 8th Jan., 1874
D.L.S.

Livingstone, Thomas Chisholm, Winnipeg, Man.... 10th Jan., 1859
D.L.S.

MacLeod, Henry Augustus F., Ottawa,
340 Cooper st..... 11th Oct., 1856
C.E., D.L.S.

MacMillan, James Alexander, Calgary, Alta..... 6th Jan., 1877
P.L.S. (B.C.).

Magrath, Charles Alexander, Lethbridge, Alta..... 1st Nov., 1881
B.A.Sc. (McGill), D.L.S.

Moore, Thos. Alexander, London, South..... 12th Nov., 1892

Munro, John Vicar, New York, N.Y., 359 W. 31st st..9th April, 1895

Pearce, William, Calgary, Alta..... 12th Oct., 1872
Dom. Insp. of Mines.

Ponton, Archibald William, Regina, Assa.... ..... 9th April, 1880
D.L.S.

Pope, Robert Tyndall, Ireland..... 13th April, 1875
C.E., D.L.S.

NAME AND P. O. ADDRESS. DATE OF ADMISSION BY BOARD.

Reid, James Hales, Bowmanville, Box 35..... 6th Oct., 1860
C.E., F.G.S.

Reiffenstein, James Henry, Ottawa, Dept. of Interior. 16th April, 1873
D.L.S.

Reilly, William Robinson, London, 361 Simcoe st... 7th April, 1881
D.L.S., P.L.S. (Man.).

Rogers, Richard Birdsall, Peterborough .. .. 9th Jan., 1879
B.A.Sc. (McGill), D.L.S.

Ross, Joseph Edmund, New Westminster, B.C..... 11th Nov., 1890
P.L.S. (B.C.).

Sanderson, Daniel Leavens, Coral, Mich.....4th Oct., 1882

Shaw, Charles Æneas, Victoria, B.C., P.O. Box 815..6th Oct., 1877

Sherman, Ruyter Stinson, Vancouver, B.C.....12th April, 1890
P.L.S. (B.C.).

Simpson, George Albert, Winnipeg, Man.,
N. P. & M. R'y..... ..... 7th Oct., 1864
C.E., D.L.S.

Spry, William, Toronto.... ....19th July, 1858
C.E., D.L.S.

*Stewart, Louis Beaufort, Toronto,
Sch. of Prac. Science..... 6th April, 1882
Dom. Top. Surveyor, Lect. in Surveying.

Strathern, John, Vancouver, B.C..... 5th Oct., 1876
P.L.S. (B.C.), D.L.S.

Tracey, Thomas Henry, Vancouver, B.C..... 8th April, 1870
P.L.S. (B.C.), C.E., D.L.S.

Vicars, John Richard Odlum, Kamloops, B.C..... 5th Jan., 1887
P.L.S. (B.C.), D.L.S.

Weekes, Abel Seneca, Wetaskiwin, Alta..... 12th April, 1890
D.L.S.

Wheeler, Arthur Oliver, New Westminster, B.C..... 8th July, 1881
P.L.S. (B.C.), D.L.S.

Willson, Alfred, Toronto, 204 King st. e..... 6th Oct., 1866
D.L.S., Com. Canada Company.

Wilkins, Frederick William, Ottawa, Dept. of the
Interior..... 6th Jan., 1877
D.T.S.

SUMMARY.

Active members subject to dues	210
Active members exempted from dues	23
Withdrawn from practice (including Associates)	48
Dead	12
Total number enrolled since incorporation	293