JOHN MACAULAY,
Acting Surveyor General, 1836 to 1838.

No. 13.

PROCEEDINGS

OF THE

ASSOCIATION

OF

Ontario Land Surveyors

At its Sixth Annual Meeting since Incorporation

HELD AT

TORONTO

22nd February and 8th, 9th & 10th March

1898

Being the Thirteenth Annual Meeting of Land Surveyors for Ontario.

The Seventh Annual Meeting of the Incorporated Association will be held in Toronto, commencing on Tuesday, 28th February, 1899.

PRINTED FOR THE ASSOCIATION BY
HENDERSON & CO., LOMBARD STREET,
TORONTO.

NOTICES.

Members and others can be supplied with copies of the Annual Reports for 1886, 1887, 1888, 1889, 1891, 1892, 1893, 1894, 1895, 1896 or 1897 by remitting fifty cents to the Secretary for each copy required.

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

In addition to exchanges from eight kindred societies, copies of "The Ontario Land Surveyors' Act" and "The Surveys Act," also the Report of the Clerk of Forestry will this year be sent free of charge to each member and associate not in arrears of dues.

Each member of the Association is reminded of the fact that for the next Annual Meeting a good programme should be forthcoming, and to ensure this it is not now too early to consider subjects for papers and reports.

Members are invited to inspect and to contribute additions to the growing collection of works, etc., at the Repository.

Published annually by the Association of Ontario Land Surveyors. Edition, 1,350 copies; price, 50 cents.

PATRONIZE OUR ADVERTISERS.

PREFACE.

To the Members of the Association of Ontario Land Surveyors:

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

The Association is to be congratulated upon the generally increasing activity shown by the various standing and special committees.

Two serious but unavoidable delays have arisen to make the issue of this Report much later than was contemplated.

Respectfully submitted on behalf of the Council,

A. J. Van Nostrand,
Secretary.

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ASSOCIATION OF

ONTARIO LAND SURVEYORS

(INCORPORATED 1892)

Organized 23rd February, 1886.

OFFICERS FOR 1898-99.

PRESIDENT.

P. S. GIBSON, O.L.S., - - - - Willowdale.

VICE-PRESIDENT.

HERBERT J. BOWMAN, O.L.S. - - - Berlin.

CHAIRMAN OF COUNCIL.

VILLIERS SANKEY, O.L.S., - - - Toronto.

SECRETARY-TREASURER.

A. J. Van Nostrand, O.L.S., - - - - Toronto.

MEMBERS OF COUNCIL.

HON. J. M. GIBSON, Toronto,
J. L. MORRIS, Pembroke,
F. L. FOSTER, Toronto, } For Term ending April, 1901.

VILLIERS SANKEY, Toronto,
J. W. TYRRELL, Hamilton, } For Term ending April, 1900.

G. B. KIRKPATRICK, Toronto,
ALEX. NIVEN, Haliburton, } For Term ending April, 1899.

AUDITORS.

A. W. CAMPBELL, - - - - - - Toronto.
H. L. ESTEN, - - - - - - - Toronto.

BANKERS.

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

BOARD OF EXAMINERS.

Villiers Sankey, Toronto, Chairman.

A. J. Van Nostrand, Toronto, Secretary-Treasurer.

Geo. B. Kirkpatrick, Toronto, for term ending April, 1901,
M. J. Butler, Napanee, for term ending April, 1900,
} Appointed by Lieut-Gov. in Council.

P. S. Gibson, Willowdale, for term ending April, 1901,
A. Niven, Haliburton, for term ending April, 1901,
} Appointed by Council of Management.

M. Gaviller, Collingwood, for term ending April, 1900,
B. J. Saunders, Brockville, for term ending April, 1900,
} Appointed by Council of Management.

STANDING COMMITTEES, 1898-9.

LAND SURVEYING.—A. Niven (Chairman), C. F. Aylsworth, Jr., E. Bazett, R. W. DeMorest, Wm. Galbraith, M. Gaviller, W. L. Innes, T. Harry Jones, T. B. Speight.

DRAINAGE.—Geo. Ross (Chairman), Lewis Bolton, A. S. Code, C. C. Fairchild, F. W. Farncomb, J. B. Lewis, O. McKay, Jas. Robertson, Geo. Smith.

ENGINEERING.—Willis Chipman (Chairman), E. G. Barrow, M. J. Butler, A. J. McPherson, D. MacPherson, J. L. Morris, W. F. Van Buskirk, A. P. Walker, H. K. Wicksteed.

ENTERTAINMENT.—A. P. Walker (Chairman), H. L. Esten, R. P. Fairbairn, Henry Smith, T. B. Speight, J. F. Whitson.

PUBLICATION.—Killaly Gamble (Chairman), H. J. Browne, Geo. B. Kirkpatrick, C. J. Murphy, A. J. VanNostrand.

TOPOGRAPHICAL SURVEY.—Otto J. Klotz (Chairman), Geo. B. Abrey, C. A. Bigger, M. J. Butler, Willis Chipman, G. A. McCubbin, B. J. Saunders, J. E. Schwitzer, E. Stewart.

SPECIAL COMMITTEES.

POLAR RESEARCH.—J. W. Tyrrell (Chairman), E. D. Bolton, Willis Chipman, William Ogilvie, J. A. Paterson. H. B. Proudfoot, L. B. Stewart, J. N. Wallace.

REPOSITORY AND BIOGRAPHY.—H. L. Esten (Chairman), A. G. Cavana, Willis Chipman, M. Gaviller, G. B. Kirkpatrick, M. C. Schofield, C. Unwin, H. O. Wood.

EXPLORATION.—James Dickson (Chairman), G. B. Abrey, W. R. Aylsworth, Jos. Cozens, A. R. Davis, W. M. Davis, J. Doupe, E. Stewart.

PROGRAMME OF THE

Association of Ontario Land Surveyors

(INCORPORATED.)

AT ITS SIXTH ANNUAL MEETING HELD IN TORONTO, MARCH 8th, 9th AND 10th, 1898.

PROGRAMME.

Tuesday, March 8th—Morning at 10 o'clock.

AT THE REPOSITORY, PARLIAMENT BUILDINGS.

Meeting of Council.
Meeting of Standing and Special Committees.

Afternoon at 2 o'clock.

Reading of minutes of previous meeting.
Reading of Correspondence.
Report of Council of Management (including Reports of Board of Examiners and Secretary-Treasurer.) Villiers Sankey, Chairman, Toronto.
President's Address.
Report of Committee on Publication. Killaly Gamble, Chairman, Toronto.
Report of Committee on Repository and Biography. H. L. Esten, Chairman, Toronto.
Report of Committee on Polar Research. J. W. Tyrrell, Chairman, Hamilton.
Paper—"Irrigation of Dominion Lands." A. W. Ponton, Regina, Assa.
Paper—"Acetylene Gas and its uses." V. M. Roberts, St. Catharines.
Paper—"Specifications." Jas. Hutcheon, Guelph.
Paper—"Progress on Lake of the Woods." H. DeQ. Sewell, Rat Portage.

Evening at 8 o'clock.

Paper—"Unrecorded Original Field Notes." J. J. Murphy, Toronto.
Report of Committee on Exploration. E. Stewart, Collingwood.
Paper—"The Economic Resources of the Hudson Bay District." J. W. Tyrrell, Hamilton.
Paper—"Forestry in its Relation to Land Surveying." Thos. Southworth, Toronto.
Paper—"Some Causes of Loss in Gold Mining in Ontario." Capt. J. D. Williams, Rat Portage.

Wednesday, March 9th—Morning at 10 o'clock.

Report of Committee on Engineering. A. W. Campbell, Chairman, Toronto.
Paper—"The Sewage Purification Works of Worcester, Mass." W. F. Van Buskirk, Stratford.
Paper—"Sand Cement." M. J. Butler, Napanee.
Paper—"Sudbury Water Works." L. V. Rorke, Sudbury.
Paper—"The York Street Bridge." A. P. Walker, Toronto.

Afternoon at 2 o'clock.

Report of Committee on Land Surveying with Question Drawer. M. Gaviller, Chairman, Collingwood.
Paper—"Assessment Plans." P. S. Gibson, Willowdale.
Paper—"An Illustration of the Necessity for Accurate Descriptions." Geo. Ross, Welland.
Paper—"Evidence." M. J. Butler, Napanee.
Report of Committee on Topographical Survey. Otto J. Klotz, Chairman, Ottawa.
Paper—"Lake Erie Survey." Otto J. Klotz, Ottawa.

Evening at 8 o'clock.

ANNUAL DINNER.

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

Thursday, March 10th—Morning at 10 o'clock.

Report of Auditors. H. L. Esten, Toronto, and A. R. Davis, Napanee.
Report of Committee on Drainage with Question Drawer. W. G. McGeorge, Chairman, Chatham.
Paper—"The Kinburn Swamp Drain." F. W. Farncomb, London.
Paper—"Arbitrators and Witnesses. H. J. Bowman, Berlin.
Paper—"The use of Field Tile for Large Drains." W. M. Davis, Woodstock.
Report of Committee on Entertainment. A. P. Walker, Chairman, Toronto.

Afternoon at 2 o'clock.

Ratification of New By-Laws.
Unfinished Business.
New Business.
Nomination of Officers (President, Vice-President, Two Members of Council, Secretary-Treasurer, and Auditors.)
Appointment of Scrutineers.
Adjournment.

ASSOCIATION OF

ONTARIO LAND SURVEYORS

(INCORPORATED 1892)

Minutes of the Sixth Annual Meeting

(Thirteenth Annual Meeting of Land Surveyors for Ontario)

MARCH 8TH, 9TH AND 10TH, 1898.

Minutes of regular meeting.

The Association met at the Repository, in accordance with the statute, on Tuesday, 25th February.

Members present:—Messrs. W. A. Browne, C. J. Murphy, H. L. Esten, A. P. Walker, A. T. Ward, A. J. Van Nostrand, K. Gamble, A. W. Campbell, W. A. McLean, B. J. Saunders, F. J. Robinson, R. P. Fairbairn, Henry Smith, G. B. Kirkpatrick, J. F. Whitson, H. B. Proudfoot.

Moved by Mr. Esten, seconded by Mr. Browne, That Mr. A. P. Walker take the chair. Carried unanimously.

Mr. Walker then presided.

Moved by Mr. Campbell, seconded by Mr. W. A. Browne, That whereas it has been considered advisable, in the interests of the Association, that the Annual General Meeting of the Association be adjourned until the 8th day of March prox. Be it resolved that the meeting be so adjourned. Carried.

The meeting was then adjourned.

(Signed)

A. P. WALKER, Chairman.

Tuesday, 8th March, 1898, at 10 o'clock a.m., the meeting of the Council and of Committees took place at the Repository.

Two o'clock p.m. the President, T. Harry Jones, Esq., opened the meeting.

The first business was the reading of the minutes of the previous meeting.

It was moved by Mr. M. J. Butler and seconded by Mr. George Ross, That the minutes as printed in the proceedings be taken as read and confirmed. Carried.

READING OF CORRESPONDENCE.

The Secretary, Mr. Van Nostrand, read a letter from Mr. E. G. Barrow, the City Engineer of Hamilton, extending an invitation on behalf of that city to hold the next annual meeting in Hamilton.

The President nominated a committee, composed of Messrs. M. J. Butler and George Ross, to whom the invitation be referred, and that they draft a suitable reply acknowledging the courtesy of the Mayor of Hamilton in reference to this matter.

The Secretary also read communications from Sandford Fleming, K.M.G.; C. E. Gauvin, Quebec; Joseph Kirk, Stratford; W. F. King, Capt. E. Deville, Surveyor-General, Ottawa; Herbert Wallis, ex-president Can. Soc. C. E.; C. H. McLeod, Secretary of Can. Soc. C. E., and E. S. Jenison.

The question raised in the communication of Mr. E. S. Jenison was referred to the Committee on Land Surveying.

The President introduced Mr. W. Hamilton Merritt, M. E., to exhibit to the Association a field equipment for prospectors.

Mr. Merritt then delivered an address thereon.

The President, at the conclusion of Mr. Merritt's remarks, extended the thanks of the Association for his kindness in presenting the outfit for their inspection.

The President then read his address, which was received with applause.

Mr. Sankey presented the report of the Secretary-Treasurer. He asked that the report of the Board of Examiners and Council of Management be deferred to a later period in the meeting. He then moved that the Secretary-Treasurer's report be referred to the auditors for report.

The President nominated Mr. Ross, in the absence of Mr. Davis, to act with Mr. Esten as auditors.

The report of the Committee on Publication was then read by Capt. Gamble, who moved the adoption of the report, seconded by Mr. J. W. Tyrrell. Carried.

Mr. H. L. Esten then read the report of the Committee on Repository and Biography. He then moved it be adopted, seconded by Mr. Kirkpatrick. Carried.

The President stated that an album had been obtained by the Secretary and requested that all the members present their photographs to the Association for insertion therein.

The President requested Mr. H. H. Gibson, in the absence of Mr. V. M. Roberts, of St. Catharines, to read a paper on "Acetyline Gas and Its Uses."

A paper on "Progress on the Lake of the Woods" was read by Mr. H. DeQ. Sewell, of Rat Portage.

A paper on "Water Power from the Niagara River," by Mr. V. M. Roberts, was then read by Mr. D. D. James.

It was then moved by Mr. James, seconded by Mr. Jones, That the meeting adjourn. Carried.

5.30 o'clock p.m.

Evening Session.

March 8th, 1898.

Chairman—Before calling on Mr. Stewart to read his report, I would beg to nominate the committee about which I spoke this afternoon to confer with a similar committee appointed by the Canadian Society of Civil Engineers, to consider their proposed bill. I would nominate Messrs. Sankey, Butler, Niven and Gaviller to act on behalf of the Association.

Mr. E. Stewart read "Report of Committee on Exploration," and moved its adoption.

Mr. Niven seconded the motion. Carried.

Chairman—I would now ask Mr. Southworth to read his paper on "Forestry in Its Relation to Land Surveying."

Paper read by Mr. Southworth.

Chairman—I will now call upon Mr. Tyrrell to read his paper on "The Economic Resources of the Hudson Bay District."

Mr. E. Stewart—Before that I think we owe a vote of thanks to Mr. Southworth. I don't know that we are permitted to give a vote of thanks to a member, but I think when an outsider comes in he deserves the thanks of the Association.

Chairman—That is the only reason why a formal vote of thanks was not immediately given to Mr. Southworth; we have a regulation of that kind, but I think this is an occasion when making an exception will not form a precedent.

Mr. Gaviller—I have much pleasure in seconding the motion.

Mr. Stewart—I think, Mr. Chairman and President, that the only thing we have to regret is that Mr. Southworth was not appointed a great many years ago. I think in our newer territories an immense amount of waste has been incurred in various ways.

In the first place a great many districts have been surveyed and set apart for settlers—at least have been made free grant lands—and settlers have gone into districts that really should have been preserved for forest growth, being more valuable for that than for anything else.

Then, again, with regard to fires, there is no question that since the system of Fire Rangers has been established fires are much less frequent than formerly, and in a report on explorations last year I think I referred to this. When I speak of explorations I mean roughly explored, simply to find out what is a good agricultural district, a good timber district, or a mineral district. I have very much pleasure in moving a vote of thanks to Mr. Southworth.

Chairman—Moved by Mr. Stewart and seconded by Mr. Gaviller, that the thanks of this Association be tendered to Mr. Southworth for his paper read to us on "Forestry in its Relation to Land Surveying." Carried.

I have much pleasure, Mr. Southworth, in presenting you with the thanks of this Association.

Mr. Southworth—Mr. President, I thank you and the gentlemen of the Ontario Land Surveyors' Association very much for the cordial manner in which you have received my weak attempt for your entertainment. I am thoroughly delighted that the matter has received the attention it has, and I hope that all the surveyors will just keep in view that we have a large area of country now unproductive that can be made a revenue-producing territory from this time forward with proper management.

Chairman—I will now call upon Mr. Tyrrell to read his paper upon "The Economic Resources of the Hudson Bay District."

Paper read by Mr. Tyrrell.

Chairman—I would now ask Captain J. D. Williams, of Rat Portage, to read his paper on "Some Causes of Loss in Gold Mining in Ontario."

Paper read by Captain Williams.

Adjourned till 10 a.m. March 9th.

MORNING SESSION.

March 9th, 1898.

Chairman—The *Canadian Engineer*, which has always been very good in reporting our proceedings, and in fact reporting all matters at all times in connection with the Association, has sent us a number of copies of the February number. That number contains two portraits of Mr. Ogilvie, one taken as he used to be, and one taken as he is, and the numbers are for distribution among any of the members who may desire them.

I would now call upon Mr. Campbell for the Report of the Committee on Engineering.

"Report of Committee on Engineering" read by Mr. Campbell.

Mr. Campbell moved the adoption of the report, seconded by Mr. Saunders.

Chairman—It has been moved by Mr. Campbell, and seconded by Mr. Saunders, that the report of the Committee on Engineering be adopted. Carried.

Chairman—I would now ask Captain W. F. Van Buskirk, of Stratford, to read his paper on "The Sewage Purification Works of Worcester, Mass."

Paper read by Mr. Van Buskirk.

Chairman—I will now call upon Mr. Butler to read his paper upon "Evidence."

Paper read by Mr. Butler.

The next paper on the programme is one on the "Sudbury Water-Works," by Mr. L. V. Rorke, of Sudbury.

Mr. Rorke is not present. Perhaps Mr. James would kindly read this paper to the Association.

Paper read by Mr. James, Jun.

Professor McLeod entered and was introduced to the Association.

Prof. McLeod—I thank you for the kind welcome, and I can only say I have been very much delighted indeed to come here and to listen to the papers treating, as they do, upon interesting subjects in connection with engineering.

I, of course, have a special mission. I was to meet particularly those gentlemen who are considering the question of legislation, which the Canadian Society of Civil Engineers, of which I am Secretary, have in their hands.

Chairman—I now ask Mr. Tyrrell to read his "Report of Committee on Polar Research."

Report read by Mr. Tyrrell.

Mr. Tyrrell moved, seconded by Mr. Van Nostrand, that the report of the Committee on Polar Research as read be adopted. Carried.

Adjourned to meet at 2 p.m. in Private Bills Committee room.

AFTERNOON SESSION.

March 9th, 1898.

Chairman—I will call upon Mr. Jas. Hutcheon, of Guelph, to read his paper upon "Specifications."

Paper read by Mr. Hutcheon.

Chairman—I will now call upon Mr. Walker to read his paper upon "The York Street Bridge."

Paper read by Mr. Walker.

Chairman—I would now call upon Mr. George Ross, of Welland, to read his paper on "An Illustration of the Necessity for Accurate Descriptions."

Paper read by Mr. Ross.

Chairman—I would now call upon Mr. P. S. Gibson to read us his paper on "Assessment Plans."

Paper read by Mr. Gibson.

Chairman—Before calling on Mr. Gaviller to read his report of the Land Surveying Committee, I would ask Mr. L. B. Stewart, in the absence of Mr. Klotz, if he will kindly read the "Report of Committee on Topographical Survey."

Report of Committee on Topographical Survey read by Mr. L. B. Stewart, who moved that it be adopted, seconded by Mr. Butler. Carried.

Before calling on Mr. Gaviller I might state that Mr. Milton C. Schofield, a gentleman who was admitted to the work of land surveying some fifty-five years ago, has kindly prepared for the Association a list of reported cases.

Now, we have already included in our reports a list of such cases, I think prepared by Mr. Esten, and it is likely that many of these cases reported are already included, so it will be necessary that these be considered by a committee, and I would suggest that this be referred to the Committee on Land Surveying. Of course it will not be taken up by this year's committee; it will take some time to revise these cases and look up the statutes, but I think Mr. Schofield's work should be recognized, and I have drawn up a motion, if it will be kindly moved by someone, that the list of reported cases so kindly furnished by Mr. Milton C. Schofield, of Guelph, be referred to the Committee on Land Surveying, so that the same may be prepared for insertion in our reports. I think that will cover the matter.

Mr. Gaviller—I might mention, Mr. Chairman, that in that list the particulars are not given sufficiently to look the cases up. In some cases there is no record of what report they are in, and also it would require an extensive law library to hunt up those cases and make a few remarks upon each for insertion. That takes some time, and besides we must have a library at our hand to be able to do so.

Motion by Mr. Gaviller, seconded by Mr. Gibson. Carried.

Mr. Kirkpatrick—If any of these subjects are interesting to the profession I think it would be a good thing if a synopsis were given.

Mr. Gaviller reads "Report of Committee on Land Surveying, with Question Drawer."

Chairman—Mr. Butler will now read his paper on "Sand Cement." Mr. Butler is an expert in this matter, and from what information he has given me it will be interesting to each of us.

Paper read by Mr. Butler.

MORNING SESSION.

March 11th, 1898.

Chairman—I will ask Mr. Esten to read the report of the auditors.

"Report of Auditors" read by Mr. Esten, who moved the adoption of the report, seconded by Mr. Niven. Carried.

Chairman—In the absence of Mr. Farncomb, of London, I would ask the Secretary to read his paper on "The Kinburn Swamp Drain."

Paper read by Mr. Van Nostrand.

Chairman— I would now ask Mr. H. J. Bowman, of Berlin, to read his paper on "Arbitrators and Witnesses."

Paper read by Mr. Bowman.

Chairman—In the absence of Mr. Davis and his partner, Captain Van Buskirk, I would ask Mr. Code if he would read the paper prepared by Mr. Davis, of Woodstock, on "The Use of Field Tile for Large Drains."

Paper read by Mr. Code.

"Report of Committee on Entertainment"—Mr. A. P. Walker, Chairman of Committee.

Mr. Walker—I may say I think everyone was satisfied with the dinner; that the number present was greater than at any previous dinner, so far as I am aware; we had a great many guests, I think thirteen in all, including representatives from the Canadian Society of Civil Engineers, and I think everything passed off remarkably well.

The usual practice in the past has been for the report of the Entertainment Committee to be taken as read, and I would move that this report of the Entertainment Committee be taken as read and printed in the proceedings.

Seconded by Mr. Niven. Carried.

Chairman—Professor McLeod, of McGill University, Secretary of the Canadian Society of Civil Engineers, is with us, and would like to say a few words to this Association upon the question of affiliation. No action will be taken by us at present until the report comes in from our committee, but I am sure that all the members of the Association will be very glad if Mr. McLeod

can throw any light upon the question. I will now call upon Professor McLeod.

Professor McLeod—Mr. President, I recognize, of course, that a large number of the members of your Association are members of the Canadian Society of Civil Engineers, but there may be some who perhaps have not got a very distinct idea of what our aim is.

First of all the Canadian Society of Civil Engineers is a body having a Dominion incorporation. As such it has the ordinary rights of incorporated bodies. The Dominion, of course, has no power to grant exclusive professional rights—these powers are given by the Acts of the Federation to the Provincial Legislatures, so that in order to secure any exclusive rights along the lines of professional work it is necessary to go to the Provinces.

Now, our intention is to go to the provinces and to ask them to define the professional status of the Engineer in the several provinces, to say what he has a right to do, and what he has a right to do exclusively—the object, of course, being to make the profession of civil engineering a close corporation in the several provinces. Our Act, then, as we bring it before the Local Legislatures, is not an Act of Incorporation; it is simply an Act to define the status of the Civil Engineer in the provinces, and it is along those lines we have been working heretofore.

As many of you know, an Act drawn up on these lines was before the Quebec Legislature last year, and is now law in the Province of Quebec, so that after a period of one year has elapsed—that period will elapse at the end of the present year—it will not be legal for anyone to practise civil engineering in the Province of Quebec unless he has conformed to the Act, unless he has become a member of the Canadian Society of Civil Engineers, or had some rights granted to him as a civil engineer prior to the time of our legislation. As a matter of fact, there are none.

Now, in advocating our proposition, we have drawn up a memorandum to explain our position before the members of the several Legislatures to whom we present this Bill. I might just review briefly what that memorandum states.

First of all, it goes on to say that in the European countries, including Great Britain, engineers are required to pass an examination, or to be regularly apprenticed for a term of years before they can call themselves Civil Engineers, or practise as such.

In Canada civil engineering is the only learned profession to which an unqualified person can claim to belong, and the civil engineer is the only professional title which can be assumed by any person.

The statement that it is necessary to pass an examination in

Great Britain may seem not to be quite in accordance with the fact, but, as many of you know, it is practically impossible for a civil engineer to practise in Great Britain unless he is a member of the Institution of Civil Engineers. That body something like three or four years ago, perhaps more—I haven't the exact date— passed a resolution making it necessary for students who desired admission to the Institution to pass an examination. That was the first step. More recently, only a year ago, they made it necessary that members desiring admission to the rank of Associate, that is a junior position to full membership, similar to our own Associate, should pass an examination. So that practically in Great Britain for a man to enter civil engineering by examination, he must submit to the examination proposed by the Institution.

Then, as you all know, in France and in Germany, and many of the other countries, engineering is very largely, almost exclusively, a State matter. So that there also it is necessary that a civil engineer shall submit to certain requirements in order to secure his standing as an engineer.

Now, the objects which the Society have in view in seeking this legislation scarcely need to be stated. However, perhaps, I had better run over these.—(Reads from proposed Bill.)

Following that, we go on to define the difference in the office of civil engineers and land surveyors, but in this body I think that is quite unnecessary, it being properly understood.

Then the Bill, as laid before the Local Legislatures, has been submitted to the law officers of the Government and approved by them, and of course these law officers, particularly in the Province of Quebec, where we had a very long and careful consultation with them, would naturally be the guardians of any legislation that had granted powers to other bodies, so that we took very great care there that we were not treading on the toes of the land surveyors in any way. Our Society does not desire to act in an aggressive spirit, its sole aim being the advantage of the profession as a body.

It courts a free discussion and interchange of views with all whom the legislation may in any way affect, and should any branch or branches of the profession not desire to participate in the benefits to be sought under the Act, the Society would not for a moment desire to include such in the proposed legislation.

It seems to me, however, that for the successful organization of any profession it is essential that there should be a representative corporation deriving its powers from the Crown, to be entirely free from bias. I think, sir, that is a principle recognized by your own body.

It has been argued that no private corporation has any right to arrogate to itself the powers we are seeking, but I think all members of any learned profession will see that the profession can

be much better regulated by the body immediately concerned than by any other body.

Then, as regards another matter, which perhaps requires explanation in view of what I think appeared in the Toronto press, and perhaps generally in the press of Canada, because people who spread abroad the report take great pains to publish themselves as fully as they can—that is, in regard to the report which came from the Mining Association when it met in Montreal, somewhat over a week ago. (Reads.) It was reported that our Bill, the Bill of the Canadian Society, had been killed in the Nova Scotia Legislature, and there was a resolution carried approving of the action.

Now, this was simply setting up a man of straw in order to knock him down. There never was any such proposition before the Nova Scotia Legislature, and, as a matter of fact, we long ago excluded this Mining Association from the operations of the Act, because we had gathered that they considered that they were the representatives of mining engineers in Canada.

I suppose you know, as we all know, it is not an engineering body at all. It is a body of mine owners, a very important body, no doubt, in the country, but still not a body of engineers, and we should be very sorry if any other branch of the profession should feel that they could not be included in the legislation we are asking. However, if representation of that character is asked, the Society will, of course, at once exclude them from the operations of the Act, as we do not for a moment wish to be in the position of asking legislation for an unwilling body.

Then, as concerns my object in coming to you, it is to assure this Association there is no desire on the part of the Canadian Society of Engineers to do anything that will obstruct in any way the Land Surveyors. We want to work in harmony with this body, and of course we want the co-operation and assistance of the members of the Society who are members of our own Association.

I thank you very much, Mr. Chairman, for giving me this opportunity, and would be glad to answer any questions that may be asked.

Chairman—I am sure we have listened to Prof. McLeod with a great deal of pleasure, and thank him for his courtesy in appearing before us as a body; and while any discussion of the matter before the report of our Committee comes in will be out of order, yet, as Prof. McLeod has kindly offered to answer any question propounded in reference to the matter, I would like to ask if this proposed legislation was approved of by the Association of Quebec Land Surveyors ?

Prof. McLeod—Well, the answer to that is yes and no. We experienced some difficulty, but when we came before the Legis-

lature we found that the members of the Legislature took very strongly the view that the Land Surveyors of the Province of Quebec had no right at all to say anything about what was not concerned directly with land surveying; that they were protected in their own profession, and they had no right to interfere with other bodies. That was the plain fact, and legislation went through on that understanding.

The reports of Council and Board of Examiners were next read by the Chairman, Mr. Sankey, and, after discussion, adopted.

Moved by Mr. Gaviller, seconded by Mr. Niven, That we have learned with regret of the removal by death since our last meeting of Messrs. E. C. Caddy, J. M. O. Cromwell, Michael Deane, C. J. Wheelock, H. Creswicke, Richard Coad, W. R. Burke, Jos. DeGurse and J. C. MacNabb, and that the Secretary be requested to convey to the relatives this expression of sympathy for them in their bereavement and to insert in the forthcoming Annual Report an obituary notice of each, except in the case of those already published. Carried.

The President—There are two By-laws for ratification. Will the Secretary kindly read them ?

Moved by Mr. Van Nostrand, seconded by Mr. Niven, That By-laws Nos. 45 and 46, as read in the Report of the Council of Management, be ratified. Carried.

The President—It was thought advisable, as there have been so many changes made in the Acts by the recent amendments which have been passed, that a Manual be prepared for Land Surveyors containing the Acts and Amendments to the Registry Act, and portions of the Municipal Act relating to surveys, this to be prepared by the Council and to be put in the hands of every surveyor. I don't know what the expense will be in connection with it, but it is a thing every surveyor should have, and it will be very useful to him.

Moved by Mr. Gibson, seconded by Mr. Butler, That the Council be instructed to prepare a manual containing the different Acts and portions of Acts relating to land surveying and drainage, and a list of the special Acts, and to furnish each active member of the Association with a copy free of charge. Carried.

Moved by Mr. Van Nostrand, seconded by Mr. Niven, That Mr. J. J. Murphy's paper, "Unrecorded Original Field Notes," be taken as read and printed in the proceedings. Carried.

Moved by Mr. Gaviller, seconded by Mr. Gibson, That Mr.

Otto J. Klotz' paper on "Lake Erie Survey," be taken as read and printed in the proceedings. Carried.

Moved by Mr. Van Nostrand, seconded by Captain Gamble, That any omissions or clerical errors in the records of the proceedings of this meeting now in the hands of the Secretary and stenographer be corrected by the Committee on Publication before publishing the same. Carried.

Moved by Mr. Saunders, seconded by Mr. Gaviller, That the Report of the Committee on Drainage be taken as read and printed in the proceedings. Carried.

Moved by Mr. Niven, seconded by Mr. Gibson, That the Association take an intermission of five minutes. Carried.

NOMINATION FOR PRESIDENT.

The President—The time is about up, and we will proceed with the nomination for officers, and the first is that of President.

Mr. Niven—Mr. President, I have much pleasure in proposing as President a gentleman, who but for his excessive modesty, would probably have been President long ago. I refer to my friend, Mr. P. S. Gibson. I think that you will all admit that he has taken an active part in the affairs of the Association ever since its commencement, and would no doubt have been President long ago had he desired it. Even now, I understand, he would like to get out, but I think the time has come when we should have him as our President. I have much pleasure in proposing Mr. Gibson.

Mr. Gaviller—Gentlemen, I have much pleasure in seconding the nomination made by Mr. Niven of Mr. Gibson as President.

The President—There being no other nominations, I have very great pleasure in declaring Mr. P. S. Gibson elected as President of the Association of Ontario Land Surveyors. (Applause.)

NOMINATIONS FOR VICE-PRESIDENT.

Mr. Saunders—I have pleasure in nominating Mr. H. J. Bowman for the office of Vice-President.

Mr. Kirkpatrick—I have very much pleasure in seconding that.

The President—Mr. H. J. Bowman has been nominated by Mr. Saunders and seconded by Mr. Kirkpatrick. There being no other nominations, I have great pleasure in declaring Mr. H. J. Bowman elected as Vice-President of the Association. (Applause.)

NOMINATION FOR SECRETARY-TREASURER.

Mr. Butler—Mr. President, I have very great pleasure indeed in nominating Mr. A. J. Van Nostrand for the position of Secretary-Treasurer. I do not think we can afford to let Mr. Van Nostrand out.

Mr. Gibson—I have very much pleasure in seconding his nomination. He is getting old in the service. I see he has a gray hair here and there. He is a faithful servant.

The President—Moved by Mr. Butler, seconded by Mr. Gibson, That Mr. A. J. Van Nostrand be elected to the position of Secretary-Treasurer. Carried.

The President—There are two retiring members of Council this year—Mr. F. L. Foster, of Toronto, and Mr. J. L. Morris, of Pembroke—Mr. Morris having served only the one year, he being elected on the retirement of Mr. Gibson, not having the full term of service.

NOMINATIONS FOR MEMBERS OF THE COUNCIL.

Mr. Gaviller nominated Mr. Morris.
Mr. Butler nominated Mr. George Ross.
Mr. Kirkpatrick nominated Mr. F. L. Foster.
Mr. Campbell, nominated by Mr. W. F. Van Buskirk.

AUDITORS.

Mr. Niven nominated Mr. Campbell.
Mr. Morris nominated Mr. Esten.

The President—There being no other nominations, I declare Mr. Campbell and Mr. Esten elected as Auditors. (Applause.)

The President—The appointment of scrutineers rests with the President, I believe. I hereby appoint Captain Gamble and Mr. J. F. Whitson.

Mr. Butler—Mr. President, seconded by Mr. Sankey, I move that you do now leave the chair, and that the President-elect take the chair. Carried.

Chair taken by Mr. Gibson.

Mr. Butler—Mr. President, I have very great pleasure indeed in moving that a vote of thanks be extended from the Association to the retiring President, Mr. Jones, for the efficient and able manner in which he has fulfilled his duties during the past year. He has

brought an added dignity to the Ontario Land Surveyors' Association.

Mr. Gaviller—I have much pleasure in seconding Mr. Butler's motion. Our President has certainly been a model presiding officer and one which, in future years, it would be well to follow. His method of putting questions to the meeting has been admirable. I have much pleasure in seconding the motion.

Mr. Gibson—Gentlemen, I do not suppose this is a matter for a long discussion. Mr. Jones, I have much pleasure in extending to you the thanks and congratulations of the Association.

Mr. Jones—Gentlemen, I cannot find words to express my thanks for your kind motion. My connection with the Ontario Land Surveyors has been one of pleasantness only. I was one of the charter members and, with two exceptions, have attended every annual meeting, but all my associations with the Society have been most pleasant, and not only so, but most profitable to me. I thank you for your kindness.

Mr. Jones then returned to the chair.

Mr. Gaviller—I think there is one more duty to perform, and that is with regard to our hard-worked Secretary. I have pleasure in moving that this year the amount of the remuneration be $180. Perhaps some member of the Association would think the amount not sufficient. I would be very happy to amend the motion.

Mr. Niven—I think, Mr. Chairman, Mr. Gaviller should make the amount $200. (Applause.) I know Mr. Van Nostrand does a great deal of work. The correspondence is something very large in the office, and I think that if we pay him $200 we are getting off pretty cheaply.

Mr. Gaviller—I have great pleasure in amending my motion and making the amount $200. I don't think it one cent too much for the amount of work.

Mr. Walker—In connection with this matter, I might say that we have heard a great deal about the economy of the Ontario Government and other institutions, but I don't think that any Society that I know of is run on such economical basis as this Association. If we look at the accounts of other Societies, we see items for telephone rent and librarian's fees, rent of rooms, and all such things as that. Now, in this case, everything seems to be supplied by the Secretary-Treasurer, and I think that it is well worth $200, and is small remuneration for Mr. Van Nostrand's services.

Mr. Gibson—I am quite of the same opinion. Mr. Van Nostrand not only has the duties of the Secretary-Treasurer to

carry out, but I think he does pretty much all of the work besides. I was Secretary-Treasurer once, and I found out before I was through I was President and everything else.

Mr. Campbell—I would like to say, too, Mr. President, I do think we should give Mr. Van Nostrand at least $200 a year. If he has as much trouble in connection with every member of the Association as he has with myself, I would think it advisable to make it $400. I am heartily in accord with this resolution.

The President—Before putting the motion, I might just say I heartily agree with all that has been said in reference to Mr. Van Nostrand. I think the retiring President last year suggested that the question of having a paid Secretary-Treasurer ought to be taken up by our Association. Nothing is provided at present in the Constitution or By-laws for paying the Secretary-Treasurer in any way, and every year it has to come up in the form of a motion.

Moved by Mr. Gaviller and seconded by Mr. Niven, that the Secretary-Treasurer be paid the sum of $200 for his services during the past year. Carried.

Mr. Van Nostrand—Mr. President and gentlemen, I must thank you for this oft-repeated mark of esteem you have shown me. I feel that I ought to be pretty nearly a back number by this time in my office, and I suggested that others be nominated and take the position while I stepped out, but for the present I desire to accept your kindness. I feel sure that you have acted generously in giving this additional grant, but you may over-estimate your generosity to a certain extent, because there has been at least $20 to $25 worth of extra strain on my modesty from the four or five speeches made, and I hope that fact will be considered.

Apart from joking, I may say that, although I am Secretary-Treasurer and perhaps have to do nearly everything that is being done in that office, I have always found a great deal devolves upon the Chairman of Council. When I have been puzzled, I have always had Mr. Sankey to fall back upon, and I have given him a great deal of trouble and expense in the loss of time. When we are speaking of granting salaries to different people and giving a money consideration for the time spent I feel very small indeed in accepting anything when I see so much time devoted to the interests of the Association by others who get nothing for it. Of course I don't mean to say that anything would be accepted by them, but I would like it understood that I do not claim credit for anything like all the work done.

Mr. Gibson—Mr. President, it is suggested that I say something to show I want the office to which I have been elected.

There is one thing that occurred to me in reference to our land surveyors. A man once said to me he wanted to do something in this world. He wasn't an Ontario Land Surveyor. I said he had better get married; if he got married his boys might do something.

Now, with reference to land surveyors when they are entered on the roll or list of Ontario Land Surveyors in good standing and get into practice, their names will remain on the history of our country in documents and papers long after the Governors-General and Lieutenant-Governors of our Province have been forgotten. Only yesterday one of our youngest land surveyors was mentioned by the court. Turn up the old documents, you find such and such surveyors' names; so if you wish to have yourselves recognized in future generations as having been men filling positions of trust, who were looked up to and respected, and put in positions where they were expected to do the fair thing between man and man, you will turn to the list of Ontario Land Surveyors and find we have them acting as arbitrators, and I believe they do their duty fully as well as any other class of men.

Take, for instance, Mr. W. Ogilvie. See what a character the men in our great North-West Territory give him.

Now, with reference to our Association, I have had the idea that when a young man wishes to become a land surveyor his aim should be to be qualified as a land surveyor, a civil engineer and a municipal lawyer, then he is equipped for his work.

I remember a man stating of a land surveyor, "That man is a land surveyor, he is an engineer, and he is a municipal lawyer." And I declare, gentlemen, you cannot get along very well without being the three. When you are called upon in your public position as a land surveyor they always assume you are a civil engineer, anyway. (Applause.)

Mr. Bowman—Mr. President and gentlemen, I thank you very much for your kindness in electing me as Vice-president for the ensuing year. I shall endeavor to assist the President and help on the ends of the Association in every way possibly. I think it is a case that does not often taken place, that a gentleman should be President and one of his ex-apprentices be Vice-president, as it happens this year, but the boys are coming to the front.

Moved by the Secretary, seconded by Mr. Walker, that a vote of thanks be given to the members of the press.

Responded to by Mr. Greenwood, of the World, and Mr. Boltby, of the Globe.

The President—Moved by Mr. Gaviller, seconded by Mr. Saunders, that a committee consisting of Messrs. Kirkpatrick.

Niven and Sankey be appointed to look after the interests of our Association in any legislation which may be proposed by the Canadian Society of Civil Engineers.

The President—Is it your pleasure that the motion should be passed, gentlemen ?

The President— Mr. Butler, would this resolution cover the ground ?

Mr. Butler—It leaves the whole authority to these three men.

Mr. Jones—As we are not adjourned yet, Mr. Sankey has a report ready that could be read and then this motion, which is already passed, could stand in reference to that report. Mr. Sankey has taken a good deal of trouble to put it in definite shape.

Report read by Mr. Sankey, who moved the adoption of the report, seconded by Mr. Niven.

The committee appointed to meet a committee of the Canadian Society of Civil Engineers in Ontario beg to report as follows:

The committee met the representatives of the Engineers' Society and discussed the proposed Bill with them. As this Bill is one which will be of great importance to almost every surveyor in Ontario, your committee feel that they cannot at present advise any definite expression of opinion by the Association as a body with regard to it. Your committee has not sufficient information before it to be able to advise as to the appropriateness of the limit of $1,000 value of work as defined in the Bill for the standard of an engineering work. The Bill does not specify on what standing in the Engineering Society Ontario Land Surveyors will be admitted, nor the fees which they will be required to pay. The Bill does not specify what powers, if any, the Society has for increasing or decreasing the fees payable by the members to the Society. The Bill does not make provision for the possibility of a member retiring from practice and again resuming practice. These appear to be the most important points on which definite information is desirable, but the whole question being one of such great personal importance to most of the members of our Association, the committee would recommend that steps be taken to bring the matter before the individual members of the Association for their opinion as to the effect of this legislation before any action binding the Association as a body be taken. A reasonable method of carrying this idea out would be to ask the Engineers' Society to put in the form of a letter its idea of the position in which an Ontario Land Surveyor who is now and has been in the habit of doing general engineering work in this Province would be placed on the

passing of this Bill if he does not see fit to join the Engineers' Society, and referring to such clauses of their constitution and Bill as would enable each surveyor to clearly understand the position in which he will stand. This information should be forwarded to each of our members and a definite expression of opinion asked before the Association should bind itself as to what action it may take in the matter.

(Signed) V. SANKEY,
Chairman of Committee.

The President—It has been moved by Mr. Sankey and seconded by Mr. Niven, that the report of the Committee re Civil Engineers' Bill be adopted.

Mr. Morris—I would just say, as a member of the Land Surveyors, that the report as presented by Mr. Sankey, and his being on the committee appointed to deal with that question, will meet with the approval of the Land Surveyors throughout the Province. I don't think there will be any dissent from the action they may take after hearing that report.

The President—Motion carried.

This other motion I will put as a substantive motion. It is moved by Mr. Gaviller, seconded by Mr. Saunders, that a committee consisting of Messrs. Kirkpatrick, Niven and Sankey be appointed to look after the interests of our Association in any legislation that may be proposed by the Canadian Society of Civil Engineers. Carried.

Moved by Mr. Walker that we adjourn. Carried.

MEMBERS IN ATTENDANCE AT THE REGULAR SIXTH ANNUAL MEETING.

22ND FEBRUARY, 1898.

W. A. Browne.
A. W. Campbell.
H. L. Esten.
R. P. Fairbairn.
K. Gamble.
G. B. Kirkpatrick.
C. J. Murphy.
W. A. McLean.
H. B. Proudfoot.
F. J. Robinson.
J. F. Whitson.
B. J. Saunders.
Hy. Smith.
A. J. Van Nostrand.
A. P. Walker.
A. T. Ward.

MEMBERS IN ATTENDANCE AT THE ADJOURNED SIXTH ANNUAL MEETING.

8TH, 9TH AND 10TH MARCH, 1898.

L. Bolton.
H. J. Bowman.
H. J. Browne.
W. A. Browne.
M. J. Butler.
A. W. Campbell.
W. Chipman.
A. S. Code.
R. H. Coleman.
John Davis.
H. L. Esten.
R. P. Fairbairn.
J. Galbraith.
K. Gamble.
M. Gaviller.
H. H. Gibson.
P. S. Gibson.
W. S. Gibson.
T. R. Hewson.
Jas. Hutcheon.
D. D. James.
Silas James.
C. A. Jones.
T. H. Jones.
G. B. Kirkpatrick.
W. A. McLean.
A. J. McPherson.
J. L. Morris.
C. J. Murphy.
A. Niven.
J. F. Whitson.
H. B. Proudfoot.
F. J. Robinson.
Geo. Ross.
V. Sankey.
B. J. Saunders.
H. DeQ. Sewell.
Henry Smith.
Wm. Spry.
E. Stewart.
L. B. Stewart.
J. W. Tyrrell.
W. F. Van Buskirk.
A. J. Van Nostrand.
A. P. Walker.
A. T. Ward.

RESULT OF ELECTIONS.

President.....P. S. Gibson..... (by acclamation).
Vice-President.....Herbert J. Bowman.....(by acclamation).
Secretary-Treasurer.....A. J. Van Nostrand..... (by acclamation).

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

J. L. Morris. F. L. Foster.

Auditors for the ensuing year : (by acclamation).

A. W. Campbell. H. L. Esten.

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

A. J. VAN NOSTRAND,
Secretary-Treasurer.

Certified correct.

K. GAMBLE,
J. F. WHITSON,
Scrutineers of Ballots.

PRESIDENT'S ADDRESS, MARCH 8TH, 1898.

GENTLEMEN OF THE ASSOCIATION OF ONTARIO LAND SURVEYORS:

It affords me great pleasure to welcome you to this, the thirteenth Annual Meeting of our Association, after the arduous duties which during the past two weeks I have no doubt many of you were called upon to perform, and on account of which our meeting is held a fortnight later than the regular date.

To a Divine Providence we render thanks for His goodness to us in the past, and His aid we implore for our future guidance.

It is gratifying to see so many members present, and while we miss the familiar faces of some of those who in other days contributed to the success of our meetings, it is satisfactory to know that in many cases their absence is owing to the fact that our members are in so great demand in doing important work in the development of this Canada of ours.

I have to announce the removal by death of eight members of our Association: Edward C. Caddy (Cobourg), J. M. O. Cromwell (Perth), Michael Deane (Windsor), Charles John Wheelock (Orangeville), Henry Creswicke (Barrie), Richard Coad (Glencoe), Wm. Robt. Burke (Ingersoll), and J. C. McNabb (Hamilton). Further reference to these events will be found in our obituary column.

The past year has been a progressive one in the history of our Association.

In December, 1896, a special meeting of our Association was called by Mr. Chipman, the President, and important amendments to the Land Surveyors' Act were drawn up. At our last annual meeting a good deal of our time was taken up in considering these and other amendments to this Act, and a draft bill was approved by the Association, and the Committee on Legislation instructed to bring the same before the Honorable the Commissioner of Crown Lands; and as a result the bill, excepting the part relating to the Registry Act, has become law and is embodied in the Revised Statutes of Ontario now being issued. In reference to the proposed amendments to the Registry Act, it will be necessary to have them brought before the Legislature at its next meeting.

In the Act as passed, among other important amendments, provision was made for raising the standard at both the preliminary and final O. L.S. examinations, and for holding but one examination during the year; for the prompt confirmation of municipal surveys; and for the simplifying of the method of survey in certain parts of the Province.

The Act of Incorporation has also been amended by making provision for compelling the attendance of witnesses at the meet-

ings of the Council when cases of irregular practice are being considered.

The Association is under a debt of gratitude to the Hon. J. M. Gibson, the present Commissioner of Crown Lands, and to the Hon. Arthur S. Hardy, the former Commissioner of Crown Lands, and now Premier of Ontario, who as officers of this Association and members of the Government, have done so much to forward the interests of the Association in matters of legislation, and who have always given a kindly and ready response to the requests of the Association.

The Canadian Society of Civil Engineers have applied to our Association for its assistance in obtaining an Act of incorporation from the Ontario Legislature similar to one they have already received from the Province of Quebec. Between our Association and a Society which has among its numbers so many of our members the kindliest feelings should exist. I will, with your permission, at an early stage of our proceedings nominate a small committee from our Association to confer with a similar committee already appointed by the Canadian Society of Civil Engineers, and to report to the Association as to the nature of the proposed legislation sought and its bearing on us as a body; so that during the present session we may take whatever action we may deem advisable in the matter.

During the past year our gracious sovereign, Queen Victoria, completed the sixtieth year of her reign, and we, in common with all loyal subjects, rejoiced in the celebration of her Diamond Jubilee. Canada, as the largest and most important of the British possessions, through its representatives, occupied a place in the historic celebration of that event second to that of no other country.

The meeting of the British Association for the Advancement of Science, held in Toronto in August last was another historic event worthy of notice, some interesting papers being contributed at that meeting by members of our Association.

Owing to the better knowledge obtained in reference to the Yukon Territory, that portion of our heritage to-day occupies the thought of the English-speaking nations of the earth, and thousands are rushing to obtain a share of the Klondyke gold. The work of defining the boundaries and exploring the resources of this territory was performed by members of this Association. We are glad to know, too, that not only as explorers, but in a literary sense, members of this Association are taking an important part in making the resources of our country better known. "Across the Sub-Arctics," by Mr. J. W. Tyrrell, O.L.S., deserves all the praise which this work has called forth from the press.

By reference to the programme for this session, it will be seen

that a great number of very interesting papers have been contributed, and it is hoped that the new members as well as the old will freely take part in their discussion. We all expect to learn much from the exchange of ideas. Let us feel, too, that we each should have a part in contributing to the success of our meeting.

I thank you, gentlemen, for the high honor conferred upon me in electing me to the office of President, and would now ask your attention to the further business awaiting our consideration.

T. HARRY JONES,
President of the Association of Ontario Land Surveyors.

March 8th, 1898.

REPORT OF THE COUNCIL OF MANAGEMENT.

MR. PRESIDENT,—The report of the Council includes the report of the Board of Examiners, and also the report of the Secretary-Treasurer.

The Council had a special meeting 29th March, 1897; a regular meeting on the 8th of April, 1897; a special meeting on the 29th December, 1897, and a regular meeting on the 17th February, 1898.

The revision of the Act last year as submitted by the Committee on Legislation came up in the form of a Bill before the Ontario Legislature in 1897. It is now on the Revised Statutes of Ontario, as Chapters 180 and 181.

The Council desire to point out that no portions of the Registry Act, of the Land Titles, of the Municipal Act, or of the several Acts in which surveyors are mentioned, are included in either of these chapters; and they decided that the Council will issue a manual of the two chapters above named and all the other sections of the various Acts which apply to surveyors.

The attention of surveyors in the Province generally is called to the rearrangement of many of the old clauses that they have known for now probably 20 or 25 years to be almost on a certain page of the book, there is a considerable change and close reading of the new Act is decidedly necessary.

As no copies of the Act are yet to be had in the form of the two chapters, the Council would suggest that either a paper be presented next year or that some committee be appointed now to meet and issue something in the form of a paper or a memoran-

dum with regard to the changes so as to have the various changes before the members of the Association, and not wait until some case comes up before them for attention and then find out they have to go and learn the statute that governs the matter in hand.

Under the head of changes in the By-laws of the Association there are just one or two that will have to be changed, and one or two that it is advisable to change, in addition to those mentioned in the Report of the Board of Examiners.

No. 6, the present By-law, is : "There shall be three regular meetings of the Council in each year, one to be held on the first day of the Annual Meeting of the Association, and one during each of the meetings of the Board as prescribed by the Act." There is only one meeting of the Board now, and the Council suggest as follows: There shall be two regular meetings of the Council in each year, one to be held during the Annual Meeting of the Association and one at the Annual Meeting of the Board of Examiners in the month of February.

Under By-law 11, the report of the Board of Examiners now received should be made in the month of November. The Council recommends that the Board of Examiners shall make its report at the Annual Meeting of the Association.

With regard to some of the duties of the Secretary-Treasurer, it has been suggested that the report of the result of the examinations should be sent to the Commissioner of Crown Lands, the officers of the Association, and to the successful and unsuccessful candidates. That means a few cents in postage; that is the result of that, and the advantages are obvious.

With regard to the examinations, reference is made to the subjects and the marks in the report of the Board of Examiners, but these matters are under the head of By-laws No. 28 and 29, and if you accept the suggestions of the Board, of course these will be corrected.

That constitutes all the changes in the By-laws that the Council wish to bring before you.

With regard to unprofessional conduct, several cases came before the Council last year. The cases in point were surveyors signing the certificate now required by the Commissioner of Crown Lands on plans and field notes of mining locations. As you are aware, that certificate reads : "I hereby certify that the foregoing plan and field notes are correct and are prepared from actual survey made under my personal supervision." Now, the whole difficulty occurs in those words, "personal supervision." In May of last year the question was submitted to the Council. There was no opportunity of calling a special meeting of the Council, but the Secretary, as instructed by me, issued a letter to the members of the Council asking what each individual member thought of the meaning of

those words. The result was a circular sent to about 38 surveyors in the western part of the Province who are principally engaged in mining matters, stating that it was considered by the Council that "personal supervision" meant "that the surveyor making such certificate should be personally present and direct the survey at the time of its performance, as in the case of any other survey regarding which he may be called upon to give evidence in a court of law."

One case was brought before the Council, giving particulars of a surveyor in the western part of the Province who had signed this certificate on applications for two or three mining locations. The matter was investigated and it was perfectly clear the surveyor had not been on the ground. A pupil of his had gone out with the parties interested, had made the survey, and the plan and field notes now on record in the Crown Lands Department are signed by the surveyor.

The Council desired to make this a test case, and on consulting our solicitors, we were advised by them first of all, that the Council was the proper place to try the case to see if the man was guilty of unprofessional conduct or not. The advice we got was, that it was better for the Council to try him than to bring him before a police magistrate, which would be the first court to take him to for improper practice; he would possibly be fined $5 there, and the next time he infringed might perhaps be fined $5 or $10 again.

On looking into the Act as it then stood, we found we had the power to try a surveyor for unprofessional conduct. The evidence must be taken by a proper stenographer and the party, if punished, has an appeal to the High Court of Justice for Ontario. On the advice of our solicitors then, we went before the Government and we got an addition to our powers, and that was that a subpoena issued by the Council has the same effect as a subpoena issued by the court. The weak point in our case heretofore was we had not the power to compel the attendance of the person accused, or of a witness. Now we have. I may say, with regard to this particular case, no further action has been taken by the Council. The matter complained of happened some six months ago, and as the Annual Meeting was approaching, we desired to have instructions from the Association as to what action should be taken in this case, or in any other cases in the future.

I may say that, with regard to the Commissioner of Crown Lands, when the matter was up before him, there was a very great objection to making any alteration in the Act so recently passed as 1897. However, when he saw the condition that the matters were in, he very readily and without any trouble whatever had the proper correction made. See Chapter 18 Ont. Stat. 1898.

The Council would ask to get either a ratification of their interpretation of the words "personal supervision," or that the Association itself should define it so that in future the Council will have some distinct definition to be guided by.

At the regular meeting held in February, an application was received from the Canadian Society of Civil Engineers enclosing a draft of the Bill and asking for the co-operation of this Association. The matter appeared to the Council to be one of such importance, and the Annual Meeting was so nearly at hand, that it was suggested that the President should name a small committee on the first day of the meeting to consider this matter.

Under the head of New By-laws, there are two that the Council passed during last year and now present for ratification.

By-law No. 45, passed by the Council 8th April, 1897.

"Whereas, any registered surveyor desiring to give up practice, can have his name removed from the list of practitioners at any time upon giving written notice of such desire; and whereas it is desirable that such surveyors may contribute papers and secure the reports of the transactions of this Association. Therefore, this Council hereby enacts that such surveyors shall have the aforesaid privileges upon the payment of an annual fee of one dollar, and their names shall be printed in the list of members in the Annual Report of the Association and properly marked."

By-law No. 46, passed by the Council 17th February, 1898.

"Whereas, under Sub-sec. 4, Sec. 42, chap. 180, R.S.O. 1897, the Association may, by by-law, exempt from the payment of the annual membership fee to the Associaion any land surveyor who has been in the actual practice of his profession for a period of 35 years or more as a duly qualified land surveyor; and whereas, George Alexander Stewart has satisfied the Council that he had been in practice and so qualified for a period of not less than thirty-five years previous to the date of the assenting to of Chapter 34 of the Ontario Statutes of 1892. Be it resolved that the said George Alexander Stewart is hereby exempted under the said Sub-section 4 of Section 42, Chapter 180, R.S.O., 1897."

There is just one more matter which the Council desires to bring before the Association, and that is the amendment proposed last year with regard to registered plans and compiled plans of cities, towns and villages. The proposed amendments to those sections of the Registry Act were submitted with the rest of our proposed legislation to the revisers of the Act, and they received the approval of Mr. Scott, who is the member of the commission to whom such matters were referred.

When the rest of our amendments were sent to the Commissioner of Crown Lands last year these were sent among them, but

on the Law Clerk finding they were amendments to the Registry Act, they were not included in our Bill.

The members of the Council who had charge of this matter did not find out until too late that it was the Attorney-General's Department, not the Department of Crown Lands, to which this matter belonged, and when the matter was brought before their attention this year we were told the Government did not propose to make any changes in the Acts revised the year previously. There was no objection to the amendments, and without any absolute promise, I may say there is no reason to doubt that at next session of the Legislature we will get these very desirable amendments placed in the Statutes.

Respectfully submitted,

VILLIERS SANKEY,
Chairman of Council.

REPORT OF THE BOARD OF EXAMINERS.

The Board of Examiners met in April of 1897, and also in February of 1898. The following candidates passed the preliminary examination:—

APRIL, 1897.

Herbert Paterson, Rat Portage.
Roland Andrew McGuire, St. Catharines.
Charles Wilfrid McPherson, Toronto.
Robert Law Benson, St. Catharines.
Edward Francis Troughear Handy, Emsdale.

FEBRUARY, 1898.

John Herbert Jackson, Windsor.

The successful candidates for final examination were duly sworn and admitted to practice, as follows:—

APRIL, 1897.

Archibald John McPherson, B.A. Sc. (Toronto), Galt.
Archeson Thomas Ward, Toronto.

FEBRUARY, 1898.

James Nevin Wallace, B.A., B.E. (Dublin), Hamilton.
James Samuel Dobie, B.A. Sc. (Toronto), Port Arthur.
William Walter Meadows, Grad. S. P. S., St. Thomas.
Franklin Joseph Robinson, Grad. S. P. S., Middlemarch.
William Arthur McLean, Toronto.
William Butterton Ford, Hamilton.
Wilbert Silas Gibson, Willowdale.
John James Newman, Windsor.

George Laing Brown, Grad. S. P. S., Pembroke, passed a supplemental examination and was duly sworn in.

Articles were filed by apprentices as follows:—

ARTICLES FILED.

Name of Pupil.	Name of Surveyor.	Residence.	Date of Articles.	Term.
Proudfoot, Hart, W., Grad. S.P.S.	H. B. Proudfoot	Toronto	6th May, 1897	1 year.
Carpenter, Henry Stanley, C.E. (Toronto)	H. J. Bowman	Berlin	1st June, 1897	1 year.
McPherson, Charles Wilfrid	J. F. Whitson	Toronto	7th April, 1897	1 year 8 months.
Reinhardt, Carl, B.A., Sc. (McGill)	A. E. Morris	Perth	3rd May, 1897	1 year.
Laing, William Francis, Grad. S.P.S.	M. W. Hopkins	Rat Portage	7th June, 1897	1 year.
McGuire, Roland Andrew	V. M. Roberts	St. Catharines	4th May, 1897	3 years.
Nicholson, Charles John, Grad. S.P.S.	J. W. Tyrrell	Hamilton	1st April, 1897	1 year.

TRANSFERS OF ARTICLES FILED.

Name of Pupil.	Transferred From.	Transferred To.	Date of Transfer.	Term Expires.
Wallace, James Nevin, B.A., B.E. (Dub.)	C. H. Wallace	H. W. Selby	8th May, 1897	7th Nov., 1897.
Laing, William Francis, Grad. S.P.S.	M. W. Hopkins	J. E. Schwitzer	13th Nov., 1897	7th June, 1898.
McPherson, Charles Wilfrid	J. F. Whitson	B. J. Saunders	7th June, 1897	7th Dec., 1898.
Robinson, Franklin Joseph, Grad. S.P.S.	T. R. Deacon	Walter Beatty	1st July, 1897	11th Jan., 1898.
Armstrong, John	T. R. Deacon	Thos. Turnbull	26th July, 1897	26th Oct., 1897.

The following bonds were approved and filed as provided in the Act:—A. J. McPherson and A. T. Ward.

The recommendation of the Board of last year that there should be only one examination per annum was made legal by the recent changes in the Act, and it does not seem that any inconvenience has been occasioned thereby.

Owing to the above-mentioned changes in the Act, a rearrangement of some of the By-Laws and Rules and Regulations of the Board have become necessary, and these are now submitted for the approval of the Association.

As you are aware, there are two new subjects added to the preliminary examination, namely, Canadian History and Geography. They will change in a small degree the standing of the subjects, but there are other subjects of the same class, such as Linear Drawing, and other subjects of that kind. The Board are of opinion that a total of 50 marks, with a minimum of 25, for these two subjects, will be sufficient; in other words, requiring a minimum of 50 per cent.

With regard to some of the other subjects in the Preliminary Examination, the Board think that under the head of Numbers One and Two, that is, Penmanship and Orthography, Dictation may take the place of these two. It would be clearly within the spirit of the Act. Dictation would be just as good a test of a man's acquirements in Penmanship and Orthography as asking him to write an Essay or anything of that kind.

Of course candidates at future examinations will have to be warned that that is the proposed method of examination.

With regard to Arithmetic, the Board are of opinion the minimum should be 60; it is now 40. In other words, it is now 40 per cent., and the Board are of opinion that it should be 60 per cent.

With regard to Euclid, the four books, the marks now stand at 30 per cent.; the Board recommend 60 per cent. I may add the reason of that is that Euclid and Plane Trigonometry, and some of those similar subjects, when they are brought up in the Final Examination, take up a great deal of time, and it is better to have those subjects more fully dealt with in the Preliminary Examination, and then when the men come up for their final there is more time for Astronomy and Surveying.

With regard to Plane Trigonometry, we think the standard should be 60 per cent.

Mensuration of Superficies, 30 per cent. out of 50 per cent.

And the two other, that is, Geography and History, should be 25 out of 50.

With regard to the final subjects, "Botany and the Forest Flora of Canada" has been added on.

The other subjects that I would like to draw your attention to are as follows:—In Algebra, 50 per cent. is not too high for the minimum, and 60 per cent. in Plane and Spherical Trigonometry.

In laying out of Curves, 30 out of 60 is considered fair.

With regard to the Survey Act, 90 out of 150.

Levelling, 50 per cent.

Principles of Evidence and Drawing up Affidavits, 35 out of 50.

Taking of Field Notes and Preparing Plans, 50 per cent.

Geology and Mineralogy, 40 out of 75.

Now, that will necessitate an increase of the total minimum. As you are aware, a man who just makes the minimum marks on each subject cannot pass, because the original By-laws provide that he must at least make under our old regulations a total of 900 marks.

The Board are of opinion that the total should be increased to 1,000, so that a candidate must make at least 1,000 marks to pass. That will be a fraction over 62 per cent.

We did propose 1,100, I may say, but that was thought a little too high, and of course a great deal depends upon the papers and the class of the examination.

With regard to By-law No. 31, it would be advisable to let the Board of Examiners make from time to time such regulations as it considers necessary for the proper carrying out of the examinations. At present the Council makes them.

When the Board of Examiners meet and have these matters before them, I think it would be the proper body to control the carrying out of the examination.

With regard to Rule No. 4, a little clerical change will be made; we don't fold our papers now, we attach them to a cover.

There are two rules that the Board suggests for adoption.

The first one refers to preliminary candidates. Each applicant for examination, previous to apprenticeship, or person exempt from such examination by law or by resolution of the Board, shall on or before the first day of the examination as to the first, or with the transmission of articles to the Secretary as to the latter, also transmit to the Secretary a statement, signed by himself, on form A (to be procured from the Secretary), setting forth the place and date of his birth, the nationality of his parents, his father's occupation, the course of his education, and the schools and other places of instruction which he has attended.

With regard to applicants for final examination the following is suggested : Each applicant for final examination shall, in addition to the other requirements of the Act or By-laws, on or before the first day of the examination, transmit to the Secretary a statement, signed by himself, on form B (to be procured from the Secre-

tary), setting forth the nature of the work performed by him, or in which he has assisted, during his apprenticeship or at any previous time; the locality in which such works were performed, and also the names of the schools, colleges or other places of instruction attended by him.

The Board has to report a very great improvement in the qualifications of the candidates who have presented themselves at the recent examinations, both preliminary and final. This is no doubt partly due to the printing of the examination papers, and the Board would recommend that in future a selection of these papers be printed every second year.

Forms of articles and transfers are now printed and can be procured from the Secretary.

VILLIERS SANKEY,
Chairman of Board.

REPORT OF THE SECRETARY-TREASURER.

MR. CHAIRMAN,—I beg leave to submit the following report of the official business of the Association transacted in my department between 23rd February, 1897, and 8th March, 1898.

The following circulars were issued:—

No. 37	Ballot for 1897-8	225	copies.
" 38	Explanation of ballot, with names of candidates	225	"
" 39	Concerning Crown Lands circular of 1st April, 1897	230	"
" 40	*Re* dues for current Association year	75	"
" 41	Announcing annual meeting for 1898	325	"
" 42	Announcing adjournment of annual meeting	325	"
" 43	Programme for annual meeting	375	"
	Copies of 1897 amendments to Survey Act	225	"
	Crown Lands circular of 1st April, 1897, *re* certificate for mining plans	225	"

Letters and accounts sent from Secretary's office	830
Post Cards	35
Letters and Post Cards received	518
Copies of 1897 Proceedings sent to Exchanges	605
Copies of 1897 Proceedings sent to members	233
Exchanges sent to members	600

The exchange of reports for members was continued with the Engineering Society of the School of Practical Science and with our sister societies in Michigan, Illinois, Iowa, and Ohio, that with Indiana has been revived upon a very satisfactory basis, and arrangements have been made for an exchange with the newly-organized Wisconsin Engineering Society.

Some of these exchanges have not yet come to hand, but are expected at an early date, and will then be distributed.

In accordance with a resolution of the Council, exchanges are not now sent to members until dues for the current Association year are paid.

From the report of the Committee on Biography and Repository, it will be seen that that interesting part of our Association is in a flourishing condition, some valuable additions having been made during the year.

All of which is respectfully submitted,

A. J. VAN NOSTRAND.

STATEMENT OF BALANCES, RECEIPTS AND EXPENDITURES BETWEEN 23RD FEBRUARY, 1897, AND 8TH MARCH, 1898.

DR.

To balance on hand, 23rd February, 1897		$1,322 09
" Amount collected from advertisements in 1896 Report	$ 9 50	
" " " " " 1897 "	83 00	
" " from Proceedings sold	3 25	
" " collected from fines	5 00	
		100 75
" " Registration Fees 15 at $1.00 each	15 00	
" " Commuted arrears of dues	32 00	
" " Annual fees for 1895-6, 3 at $4.00 each	12 00	
" " " " " 1896-7, 18½ " " "	74 00	
" " " " " 1897-8, 140 " " "	560 00	
" " " " " 1898-9, 18 " " "	72 00	
" " " " Asso. 1896-7, 1 " $2.00 "	2 00	
" " " " " 1897-8, 3 " " "	6 00	
" " " " " 1898-9, ½ " " "	1 00	
		774 00
" Accrued interest on deposit in Savings Bank		27 97
" Receipts in Board of Examiners account including Government grant of $200		777 00
		$3,001 81

CR.

By publishing Proceedings of 1897 meeting, with extra copies of parts	$275 95	
" Amount granted to Secretary-Treasurer for 1896-7	175 00	
" " Paid for postage	64 73	
" " " Printing and Stationery	43 70	
" " " For extra copies '97 exchange reports	39 00	
" " " Stenographer for reporting annual meeting, 1897	35 00	
" " " Additions to Library and care of Repository	18 50	
" " " Typewriting *re* revision of statutes, etc	17 80	
" " " Expenses of members of Council	16 50	
" " " Solicitor's fees	13 00	
" " " Customs, brokerage and entries	4 95	
" " " Freight on exchanges	4 84	
" " " Photographer *re* cuts in '97 Report	3 50	
" " " Cartage to and from Repository	2 45	
" " " Map mounting	2 05	
" " " Office sundries	1 85	
" " " Bank collections	1 20	
		720 02

By Amount paid Disbursements in Board of Examiners account			$569 60
" Balance on hand in Savings account, 8th March, 1898	$1,027 97		
" " " " Current account 8th March, 1898	684 22		
			1,712 19
			$3,001 81

A. J. VAN NOSTRAND,
Secretary-Treasurer.

Mr. Sankey—I beg to move the adoption of the Report of Council together with those of the Board of Examiners and Secretary-Treasurer, but later on it will be necessary to move the adoption of these two by-laws separately.

The President—Moved by Mr. Sankey, seconded by Mr. Niven, that the Report of the Council of Management be adopted.

DISCUSSION.

Mr. Sankey—I would ask Prof. Galbraith if he would be kind enough to give his ideas on the subject of examinations. I refer particularly to the matter of whether it is well to put a high minimum on a subject or let the test of the candidate's efficiency be more upon the class of the paper he gets than upon the actual standing of marks. That is the point the Board of Examiners would like information upon.

Prof. Galbraith—Mr. President, this question of standards and of papers is of perennial interest. It is coming up continually, and I suppose that in any institution, such as universities, those professors and teachers who are acting continually as examiners have perhaps the best means of forming an opinion on the subject. I know that we usually have to discuss this question when passing students every year. Once a year this has to be gone through, and whatever experience we have acquired during the year is added to past experience, and so on, so that I have formed fairly decided opinions upon the method of examinations.

Now, in the first place, as far as the Statute is concerned, I understood certain regulations as to marks are fixed. Is this the case ?

Mr. Sankey—In answer to that, I may say the subjects are mentioned in the statute; the Association cannot add any subjects on, but the marks assigned to a new subject are fixed by by-law of the Council. Of course, the Council can pass all such by-laws in the interest of the Association, and therefore in that way the marks are really statutory.

Prof. Galbraith—Well, as far as any allotment of marks for the subject is concerned, and as far as the minimum required for passing in such subjects is concerned, I think that the prominence given to that sort of thing may be altogether misleading.

I do not care what marks are assigned, at least I do not care very much. It is not an important matter what marks are assigned, to a subject, or what the minimum assigned for passing in a subject is. It has to be taken in connection with all the rest of the examination.

Again, you have to consider in connection with the marks and the minimum the nature of the paper, and even when you know the nature of the paper and the marks and the minimum it is extremely hard to make any hard and fast rule.

Now, the third difficulty arises from the personal inclinations and feelings of the different examiners. Some tend to be severe, others to be easy. The question is, what is the fair thing for the profession and the candidate when you take all these things into consideration ?

In the first place, let every examiner acquaint himself with the statutory rules as to numbers of marks allowed to the paper and the minimum.

Then let him arrange a paper in accordance with his knowledge of those marks, so that he can see, after a rough reading of that paper, that a man who has not made 30, or 40, or 50, or 90, or whatever you may put as the minimum, does not know the subject well enough to pass.

If the examiner has arranged his paper in accordance with those marks and his judgment, then it is pretty straight.

I know my regulations as to the minimum required, I read over the candidate's answers, and with a great many candidates there is no doubt at all, I pass them at once. But it is the men who are on the edge that you have to be careful about, and with these men you may have to read the answers at least twice, sometimes even three times. Then mark and allot the value to such answer that you think it deserves, according to the number of marks you allotted to each question.

Now then, glance over it again, asking yourself the question, does this man know his work well enough for our purpose ? If that is your candid opinion, then this ought to be put down; your marks then ought to be revised. Remember your first glance at them is simply to help you to see whether your paper itself is what you thought it was; whether it was the proper class of paper to assign to that standard. And if you think on the whole that that candidate does not know enough for the purposes required to pass, then he ought to be marked under the minimum, no matter what you value his marks at.

In other words, if you think, on the whole, that a man deserves his minimum, give it to him.

Now, a candidate passes under different examiners, and there are degrees of slackness and hardness, some too slack and others too hard. The meeting of the examiners removes this. They see how one candidate has gone through with a second and a third, and each examiner has a chance to see how his neighbors have treated each one; so, by discussion among themselves, the easy examination may be made hard and the hard may be made easy. They can settle that.

Now, I think that as far as the individual examiner is concerned, he ought to ask himself the question, does the candidate know the subject well enough for the purpose for which we require this. The examiners then should occupy themselves with this other problem of equalizing standards and then asking the question over again, and then mark them. You can see how all that may be done without any standard at all. You need not print marks or standards or anything, but let an examiner make what he thinks a fair paper, and it serves the purpose in the long run, only there is a little assistance in marks. It helps to keep you straight yourself in your work. It is of assistance. That is the way I feel about it.

Mr. Sankey—I am obliged, indeed, to Prof. Galbraith for the way he has answered the question.

I might point out, though, there is a difficulty. I think probably the way our difficulty came up was this: We are not examining a man as to his absolute knowledge in geography or trigonometry, or astronomy; we are examining a man in some fourteen or fifteen subjects to see whether he is fit and proper to be an Ontario Land Surveyor, and in deciding the ratio that these answers bear to that fact is where I think our Board of Examiners have found their difficulty.

There is clearly a difference between a Board of Examiners such as ours and the examining body of a college where each man is bound to give a certain standard in his particular subject. The one subject there possibly has a greater importance, with us the total, that is, a certain number of subjects are grouped together. We have to see that the candidate has such a knowledge of all those in the aggregate as will warrant our giving him a certificate. I may say that idea has just struck me since Prof. Galbraith has spoken as to the actual number of the marks. These are of assistance to the examiner. The object of the examination, it appears, has a very great effect upon the attitude the examiner or the Board as a whole should take.

Prof. Galbraith—I think it is altogether from the point of view of what the purpose of the examination is that the paper should be

set and read. I think that is always the case. And I think it is also true that in every combined examination there are some subjects of less importance than others.

Mr. Sankey—Of course anyone will notice, in reading our by-laws, the Board and the Council endeavored to go closely into that matter. Some subjects require higher marks than others in matters considered of greater importance to surveyors than others. For that purpose the examination of these under the by-law was set in that very way.

Prof. Galbraith—I think the great value of the meeting of the examiners afterwards to discuss the results is just in that, that they have an opportunity of knowing each other's opinions and of feeling what the important subjects are, and if there is an unimportant subject they may decide to disregard the rule about it. They are the final arbitrators, and what they want is substanial justice and fairness for the purpose of the examination.

The President—Just before we adjourn, I would like to ask for an expression of opinion from the members of the Council's definition of "personal supervision."

Mr. Morris—Mr. Chairman, with regard to the personal supervision of surveys, I know that in the outlying districts of Algoma, Nipissing and Rainy River, surveyors have found it a necessity to employ the assistance of students to do much of their work. Now, the Crown Lands Department having found fault, or, rather, complaints having been made to the Council, of certain surveys, we are very apt to go to the other extreme and require the surveyor, as stated by the Chairman of the Council, to be able to go into a court of law and give such evidence as will establish each survey.

The question is, what evidence is required to establish a survey in a court of law. If it is necessary for the surveyor that he must see the survey through from beginning to completion, then we tie the surveyor, practically limit him as to the amount of work he is able personally to control during the year. Now, we know that in a Government survey the surveyor has competent assistants to do much of the work, and that they complete much of the work without his supervision.

Now, I think that if the survey has been begun under his inspection, the surveyor should have the same privileges as the Government allows to its own surveyors when making township surveys in employing competent assistants. It is all that could be asked in those outlying sections, and I think that a surveyor should not be bound to remain on that survey and see the actual work and survey to completion. It would then tie the surveyor and give him

no chance to enlarge his practice or to go further than the actual work he does himself; so that I think the possibility is that the Chairman, with a committee of two others, if they would take that into consideration and leave it to the next meeting of the Council, or the next meeting of this Association, and report at the next meeting, that it would be satisfactory. We all have our different views on this matter, and I suppose there are some of them who are very conscientious and some not so conscientious in regard to what is necessary. My own views are, if any surveyor goes on to the ground, sees his survey properly begun, sees the method of survey, and that his assistant's work is being properly commenced, then the personal supervision is being carried out.

Mr. Sankey—I would say, in answer to Mr. Morris, the difficulty the Council has had is this : It is objectionable to define in every point what "personal supervision" means for this reason. If you are going to put a hard and fast rule down for the meaning of that expression, then each surveyor will be judged by how far he has or has not carried out that rule.

I suppose there are no two surveys of exactly the same character, and if a surveyor is acting up to his duty, he should be the judge, I think, as to how much actual assisting in a particular survey is necessary.

But the Council is decidedly of opinion that personal supervision does not mean the sending of a pupil or any paid assistant away from headquarters, or the dwelling of that surveyor where he may happen to be working, with instructions to go out with a prospector who wants to have a claim surveyed. How can a surveyor honestly sign a certificate if he never was on the ground, or saw the starting point ? He cannot swear the post was planted; he never saw it marked.

I don't think it is advisable that we should have hard and fast rules that way, but if the definition the Council has already given is too severe, or not severe enough, then this Association is just as well able to give their decision now as to wait for another year. The trouble we have is there is only one meeting in a year. Our difficulties arise, are brought before the Association this year, and we have to wait a whole year for some definite settlement of them. I hope the Association will give a definite decision one way or the other. If the meaning put to these words by the Council is not strong enough, then say so, and say what it ought to be; and if too strong, say so.

The President—This is the copy of the letter which was sent, under the direction of the Chairman of Council, to the surveyors practising in the mining districts:

TORONTO, 26th May, 1897.

Dear Sir,—The Council has been asked for an opinion as to what constitutes "personal supervision" of surveys as intended by the certificate required by the Crown Lands Department.

The conclusion arrived at is, that the surveyor making such certificate should be personally present and direct the survey at the time of its performance, as in the case of any other survey regarding which he may be called upon to give evidence in court.

This seems to be the only way in which a surveyor can place himself in a position to honestly make such certificate.

Irregularities of practice having been reported to the Council, Mr. W. J. Keating, barrister, Fort Frances, has been appointed as representative, and it is expected that existing abuses will be terminated.

Yours truly,

A. J. VAN NOSTRAND,
Secretary-Treasurer.

Mr. James, sen.—There seems to be a difficulty as to what might be considered "personal supervision" in this way. For instance, take a surveyor having a survey to make at a long distance. If he had to take his pupil along and go himself it would increase very much the costs to the client, and, of course, I suppose each surveyor is desirous of keeping down the expense of a survey.

I think, of course, "personal supervision" would mean for the surveyor to be on the ground; there is no doubt about that. That I quite agree with.

The President—That is what the Council has stated.

Mr. James—I think he should see some part of the work and be with the assistant a portion of the time at any rate; I certainly think that.

The President—It is a wide question. "Personal supervision" may meet it. As you say, I think the surveyor should be on the ground. He may have an assistant a practical surveyor who has had great experience. It will be not necessary for the surveyor to remain with him to personally supervise that matter, and will not require his being on the ground nearly to the same extent as if he had a pupil who had had comparatively little experience.

Mr. James—It might be as well to discriminate between the years of service of the pupil.

The President—I don't think we could go further.

Mr. Morris—I might state a case in my own work. I went to one of the upper lakes and laid out a mining claim of 80

acres. I marked all the posts myself and had my assistant with me, a man I always take with me, no matter what work I do. Then, being in the same locality and wishing to mark off a point of land for another claim, consisting of 50 acres or thereabouts of broken front, I sent my assistant to start from one of those posts I had planted when he was with me. He traversed around the river front to the other post I planted without my presence on the ground at all. He brings me his notes. I find that his traverse round the river front checks with my former survey, and the marks which he shows and the notes and returns agree. I consider in this case that the evidence is sufficient to satisfy the surveyor that the work has been carried out as faithfully as if he had been on the ground.

Mr. Sankey—Of course, I might state to the Association, in bringing the matter in the shape it is now, a surveyor infringing or making a mistake in his duty is not going to be tried before a technical Court of Law, but will be tried before a Council of Surveyors. Each case will govern itself. And, take the position Mr. Morris has just put before us. I question very much if any three or four surveyors you could pick out by chance out of our Association would say he had done wrong if he had signed a personal certificate in that particular case.

For that reason, if, as I said before, our definition of personal supervision is general enough and severe enough, let it stand. If it is not severe enough, explain it more fully; but I do not think it would be right to say a surveyor should go on the ground to see the first post planted, or that he must see all posts planted, or that he must take an observation to get his meridian.

The President—Is the Association prepared to take action on this ?

Mr. Gaviller—I don't think there is any other construction to be put on it, Mr. President. It simply, as Mr. Sankey says, lies in the hands of the Council, if a man is brought before them; they are practical men. And how to word it in any other manner I don't know.

Mr. Niven—I don't think that personal supervision can mean anything less than you have stated. Of course, as to this matter, most of you are aware how it originated. Certain surveyors got a lot of apprentices during the boom in the gold country, sent them all over the district, and charged full fees for their work, though they did not know anything about the work done by the apprentices, and then they certified to the plans. This state of things has not yet ceased.

I could mention an instance where a surveyor at the present

time has apprentices working in that district, and he is not within 600 miles of them, and yet plans are coming into the Department signed by himself. Is that in accordance with the spirit of the circular issued from the Crown Lands Department ?

Mr. James, Sen.—That there is a good deal of difficulty in the way I see, but there is no doubt there ought to be something done. I know one instance myself in which a party suggested that an unqualified man should make a survey and they could easily get it certified to.

The President—The Council desires a resolution passed approving of this circular. Will the Association take action in the matter ? If so, a resolution will be in order. It can be voted down if it is not the feeling of the Association, but the discussion is, perhaps, a little irregular now.

Mr. Sankey—Mr. President, with all due respect, I would suggest, if this is going to have an effect with the public, that this resolution should not come from a member of the Council.

Moved by Mr. Gaviller, seconded by Mr. M. J. Butler, That this Association hereby endorses the opinion of the Council of Management, expressed in the circular letter of 26th May, 1897, with regard to the meaning of " personal supervision " in the certificate required on plans of mining locations. Carried.

The motion for the adoption of the Report of Council of Management was then carried.

End of discussion on Report of Council.

REPORT OF AUDITORS.

We hereby certify that we have examined the accounts of the Secretary-Treasurer and vouchers therefor, also Financial Statement, and have found them correct.

GEO. ROSS,
H. L. ESTEN,
Auditors.

March 9th, 1898.

REPORT OF COMMITTEE ON LAND SURVEYING.

MR. PRESIDENT,—Your Committee have great pleasure in congratulating the members of our Association upon the great increase in the demand for their services and the constant addition of territory requiring their professional attention.

The large demand for mining location surveys and supplying information as to the development of the same has afforded a promising opening to those who, before qualifying as land surveyors proper, have taken the technical course now so well supplied by several of our colleges.

We are happy to announce that the great majority of the candidates for the final O. L. S. examination have availed themselves of this privilege.

In connection with the survey of mining locations, two important circulars have been issued during the past year by the Commissioner of Crown Lands. One, dated 27th August, refers to Amended Mines Act, Sec. 27, and suggests "instead of keeping the plans till paid for, or handing them to parties whom they cannot trust, inasmuch as they are strangers, immediately on conclusion of survey, to file the plan, field notes and description in the Department of Crown Lands for the discoverer, filing at the same time, if it has not already been done, an application in the name of the discoverer, together with the necessary affidavit by the discoverer, of the discovery of mineral; then if the discoverer fails to get a backer, and by the operations of the Mines Act loses all interest in the land, any other person making another discovery could pay the cost of survey into the Department at the rate of 50 cents per acre, to be refunded to the surveyor."

In the case of small islands that there should be a minimum cost for such survey of $20.

The second circular, dated April 1st, directs that "all plans and field notes accompanying applications to this Department must be certified to by the surveyor making the survey in the following form:—

"I hereby certify that the foregoing plan and field notes are correct, and are prepared from actual survey made under my personal supervision.

".....,

"Ontario Land Surveyor.

"Dated this .... day of ....., 18..."

We would also draw attention to the addition of Botany and the Forest Flora of Canada to the list of subjects for final O. L. S. examination.

The investigation commenced by the Royal Commission on Forestry in Ontario we consider of the greatest importance, and also that a continuation of the same will undoubtedly prove most beneficial to this Province. The almost universal ignorance as to the growth and protection of the timber in our forests has been

a source of loss to the country, the amount of which it would be difficult to estimate.

We have also to congratulate the Association as to the Act respecting the Surveys of Lands, chapter 181 R. S. O. 1897. By the amendments in this Act municipal surveys are placed in a more satisfactory position, and the survey lines in a number of townships much simplified.

In concluding, your Committee would press upon the Association the necessity of giving the proposed Bill of Incorporation of the Ontario Civil Engineers a most careful consideration as to those clauses affecting the employment and standing of an Ontario Land Surveyor, and trust that an amicable arrangement will be arrived at that will prove beneficial to all parties concerned.

A number of questions in surveying have been sent in. These and replies to same are appended.

All of which is respectfully submitted.

M. GAVILLER,
Chairman.

QUESTION DRAWER.

Question 1.—Is an affidavit required to verify the surveyor's signature to a plan for registration ?

Answer.—No.

Question 2.—Can a plan of sub-division be registered when more than three months have elapsed after the date upon it ?

Answer.—Yes.

Question 3.—Must all parties signing a plan for registration as owners show proof of ownership ?

Answer.—Yes, by deed or otherwise.

Question 4.—Can a Registrar refuse to register a plan if he considers that a line shown on the plan has been improperly described ?

Answer.—He may call attention to what he considers an error before registering the plan, but the surveyor is, in most cases, the best judge as to the correctness of lines shown on his plan.

Note.—Answers to questions 1, 2, 3 and 4 are rulings of Inspector of Registry Offices on the several points.

Question 5.—In making a survey of the last four lots of a concession containing 30 lots, I find no post between lots 26 and the town line. The original notes give 26.46 chains as the width of each lot. A portion of the north half of lot 30 has been since granted as 100 acres, more or less. I find on the ground that the four lots occupy a width of 108.60 chains. What width ought I to give to lot 30 ?

Answer.—27.15 chains—one-fourth of distance on ground.

Question 6.—In making a Government survey, I encounter a lake on my line that I cannot get a sight across with the telescope on my transit. How am I to proceed ?

Answer.—Traverse round the lake and find by "latitude and departure" the point where your line produced would intersect the further shore.

Question 7.—In a township in the District of Muskoka the line between lots 21 and 22, in the fourth concession, was run prior to July 1st, 1897, on the astronomic course N. 19 deg. 50 min. W., being the course of the straight line A B joining the front and rear ends of the governing line. Since July 1st, 1897, this line has been disputed, on the ground that it is not run truly parallel to the line A B. A second surveyor is called upon to run the said line. Should such surveyor run the line on the same course as the line A B, or on the astronomic course N. 20 deg. 51 min. 40 sec. W., as shown in the plan and field notes of the original survey ?

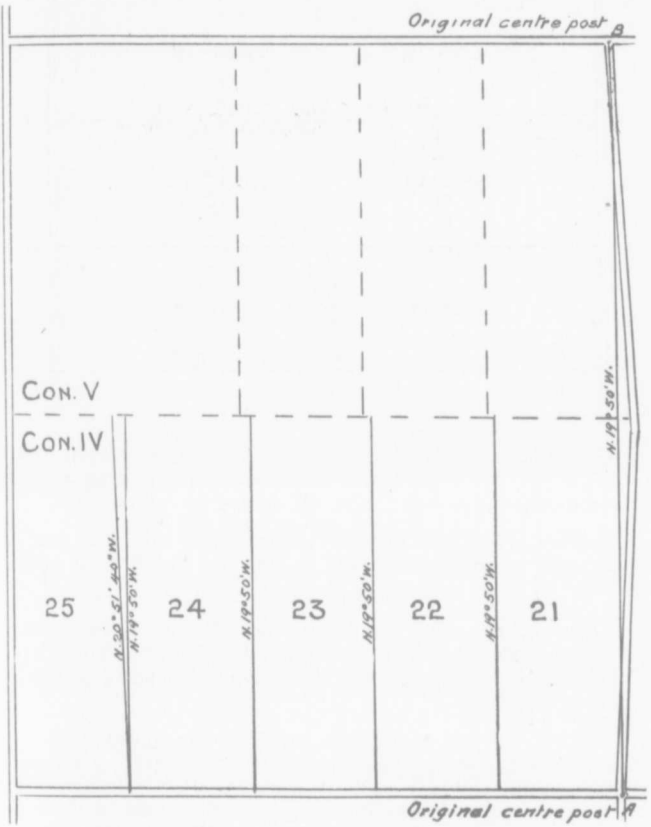
Answer.—The line between lots 21 and 22 was run in accordance with the statute in force at the time, and if re-run should be parallel to A B. R. S. O. 1897, c. 181, sec. 28 (2) latter part.

Question 8.—The lines between lots 21 and 22, 22 and 23, and 23 and 24, concession four, were run prior to July 1st, 1897, on the astronomical course of the line A B, viz.: N. 19 deg. 50 min. W. Since July 1st, 1897, a surveyor has been called on to run the line between lots 24 and 25, concession four. Should he run such line on the course stated in the plan and field notes, viz.: N. 20 deg. 51 min. 40 sec. W., or should he run the line on the course N. 19 deg. 50 min. W., so as to conform with the lines already run in the block ?

Answer.—Lines in the block in question having been run previous to July 1st, 1897, the new method in section 17, amending section 52, 1887 Act, cannot be adopted. See R. S. O. 1897, c. 181, sec. 28 (2) latter part.

Question 9.—How do you establish the "blind line" between concessions in those townships where only each alternate concession line has been run with double fronts.

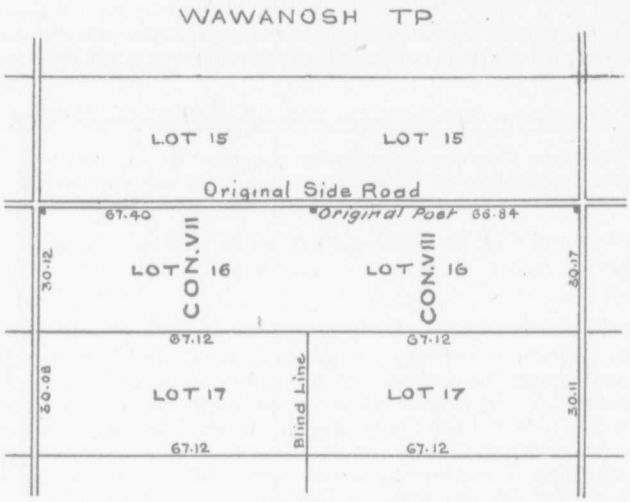
Answer.—Each lot line must be run from the posts on each side of such alternate concession to the centre of the space between



such alternate concessions, or to the proportionate depth intended in the original survey, and the lines joining the points so found will form the blind line. R. S. O. 1897, c. 181, sec. 14 (2).

R. S. O. 1887, c. 152, sec. 57, or R. S. O. 1877, c. 146, sec. 62.

To join the extreme points in a case where the concession lines were crooked would be an unfair division of some lots.



Question 10.—How would you run the line between lots 16 in the 7th and 8th concessions, the measurements being as shown on accompanying sketch. Lots all deeded as 200 acres ?

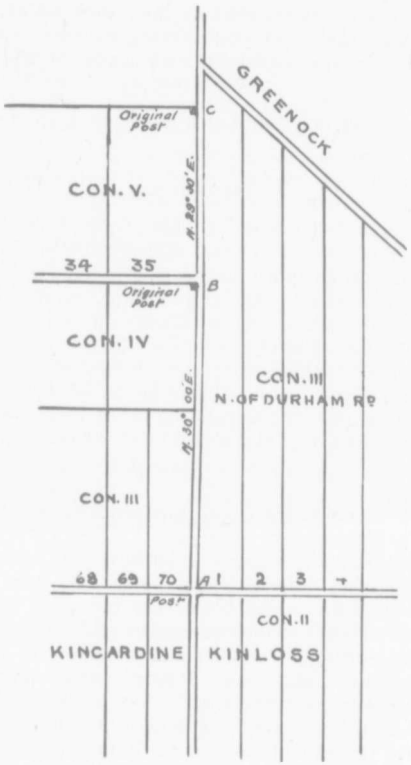
Answer.—Join the original post on the side road and the centre point of line between lots 16 and 17. See R. S. O. 1897, c. 181, sec. 14 (2).

Question 11.—How would you run the line between lots 1 and 2, concession 3, north of Durham Road, in the Township of Kinloss, the town line opposite lot 1 having a bend of 30 min., as shown in diagram ?

Answer.—From information given in the question, the line between lots 1 and 2 should be run on the course of a straight line between the original posts at A and C, R. S. O. 1897, c. 181, sec. 36. But instructions for survey of that part of Township of Kinloss and Kincardine referred to should be examined.

Question 12.—The Township of Clarence was resurveyed about thirty-five years ago and posts defining the lots were planted down the centre line of the concession roads and also at 50 links

on each side of said centre line. Each set of three posts are planted in line, but not on the bearing of the governing line, so that if the outside posts are taken for running lot lines from a lot in one con-



cession will sometimes be five or six feet wider than the lot in the opposite concession. How should the lot lines be run ?

Answer.—If re-survey last mentioned was performed under proper authority, the post in centre or on opposite side would govern, being best evidence. R. S. O. 1897, c. 181, sec. 37 (2).

Question 13.—When a surveyor lays out the "chain reserve" along the margin of a lake or river, where does he begin ?

I find, on consultation with many surveyors, that the custom is to begin at ordinary high-water mark, or where the land vegetation begins or ends, but I can neither find any rule for taking such high-water mark or edge of vegetation, nor that the surveyors have any instructions to take such point.

I respectfully ask that you investigate this, and if you find that the custom is as stated take such action as will establish the position.

(See discussion on communication from E. S. Jenison.)

DISCUSSION.

Mr. Gaviller—In concluding this report I might say I only heard the report read by Mr. Campbell this morning, and had I had the opportunity of hearing what he has done, that is in connection with the engineering work performed in the Province, I would have made an endeavor to mention here all the surveys of any large extent that have been made; and I think in future it would be a good idea to include that in the report, but as far as we have gone we had very little opportunity of ascertaining what those works were. I move, Mr. President, that the report of the Land Surveying Committee just read be adopted. Seconded by Mr. Niven. Carried.

Land Surveying Committee Question Drawer, by Mr. Gaviller. (Reads question as to shore line.) Now, this has reference to the Association at large, and as such we did not take it up in the Land Surveying Committee in particular, and I think it is a position open to discussion before the members of the Association, but I may state this in connection with it, Mr. Jenison has made searches through the instructions given to surveyors for Government surveys, and most of us are aware there is nothing definitely laid down in those instructions except that there shall be four rods left for a road allowance around everything that is considered a permanent lake, not around beaver meadows, nor anything of that kind.

He says his experience is that when you get on the ground one surveyor has been there when the water is low in the lake, and he has put his post in at four rods from the edge of the water. Another one has gone there in the spring and made a survey of another township, in which part of this lake might be situated, in time of high water, and plants his post some ten or fifteen rods back, in what would be in the bush when the water was low.

He wants to know where this four rods ought to be, as there is nothing really definite in the instructions given by the

Government as to how a surveyor shall determine where his four rods is to commence, next the water.

Of course the only ground we have to go upon is the general ruling of Courts as to what high water means, and the common sense of the thing is that this four rods should commence at what is usually called high-water mark. This is a question that has been discussed in the Courts and elsewhere a great many times, but I think it has come down now simply to determine what has been taken as high-water mark in rulings, and from the Courts in the United States, and in our own country, and opinions, all show that high-water mark should be defined as "that point at which the water arrests vegetation, where vegetation ceases," and that should be the point of commencement. Now, I leave it before the Association to express their opinion. If Mr. Jenison wishes for the opinion of this Association, it lies in the hands of the members to put it in such shape that we can give it in our next annual report. I have no doubt if this is done in a satisfactory manner that in the future, where such road allowance is considered necessary, instructions will be issued by the Commissioner to define the matter in some way. In many cases the posts are lost, they invariably are when in a swamp or lake. It is often very rocky land, and the posts do not stand long, and then where is a man to commence the four rods?

Chairman—Now, gentlemen, I would ask for an expression of opinion and discussion upon the question referred to us in reference to the high-water mark.

Mr. Niven—Mr. President, in regard to the high-water mark, I agree with what Mr. Gaviller says. It has always been my practice to take the line of vegetation—that is, where trees commence to grow—not the highest water mark, not the flood mark, because in the spring of the year you will find that the water has been away up in the bush in many places. The high-water mark is generally conceded to be "that point where vegetation begins and where trees and bushes begin to grow." I think this is the opinion of the majority of surveyors.

Sometimes this line is very well defined, and there is no trouble. At other times there is a little difficulty in defining it, but in such cases I think the surveyor simply has to use his judgment.

It would be a good thing if this Association arrive at a decision on this point, so that the Commissioner of Crown Lands in his instructions to surveyors may locate definitely the position of the road allowances in question.

Regarding the other matter Mr. Gaviller spoke of (Question 12), as to posts being planted in the original survey, it often hap-

pens that posts are not on the line, if the line is intended to be at right angles.

For instance the surveyor in the original survey, or rather his chain bearers, have not taken sufficient pains to put these posts at right angles to the line which is being run. I have known the posts to be three or four feet out of position, and sometimes the farmers get very much out by taking these posts and running a line themselves.

If these posts were planted in the Municipal Survey I think that you would have to adhere to the posts where they were put.

Mr. Butler—Mr. President, in reference to the point raised as to posts on the water front, I have a resolution I would like to move. Where the post is found you must follow it, of course. If the post is gone, then it should be, I think, upon the whole, more likely that the line of vegetation, or very near that, would have to be taken as the high-water mark, and a line run parallel to this line at four rods distance.

I move, seconded by Mr. Bowman, "That the Secretary be instructed to communicate with the Commissioner of Crown Lands, placing before him the necessity for accurate instructions to surveyors with respect to planting posts on the shores of inland lakes and navigable rivers."

I think if the Commissioner gives such instructions in the future, it will overcome difficulties.

Chairman—The only question is whether the Director of Surveys would wish to take upon himself the responsibility without knowing the wish of the Association. It would strengthen his hands if the Association can agree upon a definition such as Mr. Gaviller has given. Would you add that to the resolution?

Mr. Butler—Yes.

Mr. James, Sen.—In reference to this matter, I think it would be a good thing in that resolution to ask the Commissioner of Crown Lands to have a stake planted in the centre of road allowance, that would be, say, two rods from the high-water mark, and one at four rods, then there would be two chances of finding the original mark.

Mr. Walker—Mr. Chairman, if I understand this motion of Mr. Butler's aright, it is to the effect that he wishes the Commissioner to issue instructions to the surveyors to fix the boundary of the lake. A difficulty arises in this connection—that is, with regard to the law of accretion. The boundaries of our lakes are continually changing, and although it may do very well to fix the boundary of a lake where the slopes are very precipitous, on

the sandy shores of a lake it would hardly do, they are continually changing. The owner of a lot that goes to the edge of the lake is entitled to the accretion which falls in front of his lot, and if he is only to be held to this post we are interfering with the law of the land when we say that the accretion which forms in the front of his lot shall not belong to him.

Mr. Butler—The question we want to decide is, where is the road. The object of the resolution is that the instructions shall be so given that they could be used in Court for information as to what was the actual intention of the Government in laying out that road. With the discovery of minerals, and one thing and another around the shores of the lakes, it will become a live question, and when it is I think the lawyers will get most of the valuable property in the future.

Now, if there is any increase of level, and the land rises, it might be a movable line, provided the definition is accurately given in the instructions that the chain widths shall be taken from that point where vegetation ceases parallel with the shore of the lake. That would provide for any increase or decrease of shore line.

What we want is that in the instructions a definite meaning should be attached to what is meant by the road allowance round the lake. At present it is so loose it may be anywhere.

Mr. Sankey—Mr. President, on this matter I hold that once a post is planted that post should govern, and the instructions should be definite as to the planting of that post. On the other hand, if the posts are not planted where the lot lines come to the water's edge then the definition of what is the water's edge becomes most important. I don't think the man owning a lot if he gets the acreage the patent calls for has much to find fault with. He pays for the acreage and he gets it.

The question seems to me more to define what the water's edge is to be in the future rather than actually giving instructions to plant the post, because if the post is planted and can be found I think that is final.

A Member—Have the Courts not already decided what is the high-water mark ?

Mr. Walker—I think it is pretty well decided by the Courts already what high-water mark is. It is a matter that has come before them very often and has been pretty well discussed. In some cases the limit of the vegetation would be a very good mark, but not always—for instance on our own Toronto Island. I should like to hear Mr. Sankey speak as to the boundaries there.

The limits are continually changing. Even in my own recollection the shore line has changed as much as 100 feet, and I don't know whether that would be considered as part of the road, or entirely new land belonging to the Government.

Mr. Sankey—In answer to the question Mr. Walker has propounded with regard to the Toronto Island, I do not think there is much difficulty.

The city of Toronto somewhere about the year 1867 got a patent from the Crown of the island or peninsula lying to the west of the Gap, saving and excepting thereout the right of way and free access to and from the shores of the island, one chain in width, now used for fishing purposes, that is the exception on the island. Whether that particular clause in the patent was carefully considered at that time or not I cannot say.

The city of Toronto assumed they owned the island; they issued instructions to a land surveyor to make a survey and a proposed subdivision. That was done. That subdivision was accepted, and he was instructed to stake it out. He did so, and he took what he has since told me was a generous allowance of a chain from the water's edge, as he found it the day he made the survey. I am sorry to say he did not refer to the standard gauge at the Queen's Wharf, the Harbor Commissioner's Gauge of the level of Lake Ontario.

If he had done that I would have no trouble in now defining the shore line, but he planted stakes and marked them. A plan was registered. The lots have been leased to various parties according to that plan, and the question that Mr. Walker has propounded has very often come up, What are the rights, the respective rights of the parties with regard to that road allowance that was laid out by a registered plan ?

This free access to a strip of land 66 feet wide is in the patent, the city possibly considering they enjoyed a road allowance around the island. They planted stakes and marked them, and then leased their lots. Now comes the question how far is that road binding on the city and on the parties who have leased the lots ?

In one law case which has been already decided, an accretion occurred, and a tenant on the island admitted he occupied what he considered was an accretion coming to him on the land side of the road. In that case I proved I had found the original stake. It had been pointed out to me by the surveyor who made the survey; it was marked with the letter R on the west side, and Judge McMahon held that stake bound him, no matter what happened.

And on the south shore of the island the road allowance is cut away and also parts of the lots are cut away.

If the leases from the city to the tenants create a liability on the part of the city to keep up a road allowance, I suppose these tenants will have a very good civil action, for the road is gone. That road belongs to the city and the land under the water belongs to the tenant. He is the lessee of it, and if that land should come up out of the water they could go on and occupy the land, the old survey could be re-established, the old posts replanted and we would be just where we were, and whether the tenants have a good civil action against the city for not keeping up a road allowance in front of them, is something I cannot answer. I do not think there has been really a definite decision by our Courts in Canada as to high-water mark. They generally take an English decision, and that goes to tide water. They haven't the great lakes of Canada, they haven't the River St. Lawrence, where these matters become of very great importance. If our great lakes in Ontario and our River St. Lawrence are going to be governed by the same law as in England where there is tide-water, then possibly any man owning a piece of land along Lake Ontario where there is no road allowance, and where there are very few reservations, owns to the middle of that lake. But I think you will agree with me there is no definite decision on that matter with regard to the riparian rights on our large lakes and rivers.

Of course where the road has been reserved under the authority of the Crown there is a road allowance, and that will stand or fall according to the law on that point; but regarding the riparian rights on our big lakes and rivers, it is a matter I cannot decide, and questions are more likely to come up in the future than they were in the past.

Mr. James, Sen.—This high-water mark seems to me a very uncertain thing. I will give you an instance which came under my own personal observation. The beavers had dammed the outlet of a lake and the water consequently rose around the banks considerably. We removed the dam and went on with our work. We had to cross the lake and leave the chain for the road allowance. Well, we simply tore away the dam and lowered the lake to natural level and took the high-water mark as the direct point from which to lay off our chain. When we returned after being absent some time, we found it dammed up again.

Mr. Gaviller—The question was asked whether the Courts have decided what high-water mark means. Now, here are some decisions given in the Courts of the United States, and I think that they correspond with what have been given in our Courts. (Reads from Hodgman's Manual.)

Chairman—Gentlemen, I will put this resolution, which is

still open for discussion; it will be then properly before the meeting.

Moved by Mr. M. J. Butler, seconded by Mr. H. J. Bowman, "That the Secretary be instructed to communicate with the Commissioner of Crown Lands, placing before him the necessity for accurate instructions to surveyors with respect to planting posts on the shores of inland lakes and navigable rivers, and it is the opinion of this Association that high-water mark ends at the line of vegetation."

The Commissioner is asked to issue instructions, and I think unless he differs very strongly from us he will follow the opinion of the Association. Then he can state in reference to details whether it would be advisable to put the stake at the two rods or four rods in those instructions which he is to issue. Are you ready for the question?

Captain Gamble—Suppose the shore of a lake is worn away, and on resurvey of a registered plan you find twenty feet less than there was originally, where is the shore line?

Mr. Gaviller—I don't think in the case Captain Gamble mentions any Government or anybody else could give a title covering a lot that had been already conveyed by registered plan.

Chairman—Are you ready for the question, gentlemen? Motion carried.

REPORT OF COMMITTEE ON DRAINAGE.

[NO REPORT PRESENTED TO THE MEETING.]

REPORT OF COMMITTEE ON ENGINEERING.

MR. PRESIDENT,—The past year has brought forth a considerable number of important engineering works and numerous developments in the science of the profession. Possibly one of the most striking works, and one with which all the members of the Association are in a measure familiar, is the projection of a railway from Glenora, on the Stikene River, to Lake Teslin, designed to assist in opening up the region of the Klondike. This railway is

to be the most rapidly constructed of any railway yet built, the contract requiring that about 150 miles be completed in about seven months, the work necessarily including even the preliminary survey of the proposed route. Other routes into the Klondike are being discussed, and some will no doubt materialize in the near future. In Ontario the building of a railway from a point on the Canadian Pacific Railway northward to James' Bay is being actively agitated. These works will undoubtedly open up additional engineering work in developing the mines and other resources of the country traversed.

Since the last Annual Meeting of this Association, the outlook in mining has developed to a considerable extent, and with the success of several mines in Northern Ontario assured, together with a promising outlook in Central Ontario, the demand for engineering skill is certain to increase.

The water power of Canada is being exploited to a considerable extent, and the possibilities of utilizing this power by converting it into electricity and transmitting it long distances, are very great. Notable works of this description are the power plants at Chambly and Lachine, which are among the most important engineering works of the year. The general design of the Lachine work is a dam thrown into the river about a mile from the foot of the rapids; and a dike parallel with the shore, extending up the river nearly a mile, thus forming a head race with a fall of eleven feet. The power thus obtained is converted into electricity and transmitted a distance of six miles to Montreal. The Chambly plant is located on the Richelieu River, about 25 miles from Montreal, is one of the finest hydraulic works on the continent, and consists of a dam 2,000 feet long and a power house of 20,000 h. p. capacity, the greater portion of which will, it is expected, be transmitted to Montreal.

In mining, water-power and electricity promise to play exceedingly important parts, since the former is everywhere available in our mining districts.

Municipal engineering appears to record no special departures in actual construction, although our knowledge of numerous departments, water supply, sewage disposal, lighting, and paving has been largely increased, and municipalities are making distinct progress toward an era when the absolute necessity of the best experience and skill in these matters will be acknowledged.

In bridge construction, Canada has produced another of the notable works of the year in replacing the old Victoria tubular structure at Montreal with a modern design. Other interesting features of bridge work on the Canadian Pacific have been stated in the following interesting letter from A. P. Walker, a member of the Engineering Committee of this Association.

"The past year has been an exceedingly busy one with the engineering staff of this railway. No less than sixteen large, new iron or masonry structures having been put in in place of old wooden spans or temporary trestles on this Division (Ontario and Quebec) alone. These include spans varying from 50 to 100 feet, and the general design is a plate deck girder on masonry abutments or piers. This has been varied in the case of the crossing of the Upper Lachine Road, near Montreal, when three graceful semi-eliptical masonry arches, two of 40 feet and one of 60 feet span, and 20 feet high, have been erected. As regards appearance, there can be no question that these arches are a step in advance of the rather prosaic looking plate girder, and the continued scraping and painting required with these girders in order to keep them from rusting tends towards making the ultimate cost not very much greater. The low prices of iron and steel during the past few years has developed a change in the designs of iron bridges. Formerly it was considered good practice to make the iron span as short as possible consistent with the size of the stream and hold the earth embankment back with large abutments or retaining walls. Now the tendency is to increase the span, reduce the quantity of masonry to a minimum, and allow the earth embankment to run out beyond the masonry. This is quite noticeable in the case of three bridges built last year, when spans of 50 feet, 47 feet and 78 feet would have been ample to have carried the water, yet spans of 80 feet, 60 feet and 100 feet have been put in, respectively, and money saved thereby.

There is also the continual tendency towards increased weight in rolling stock, necessitating continual increase in the strength of bridges and heavier rails. In 1884 an average passenger engine weighed about 141,000 lbs., of which about 48,000 lbs. would be on the drivers. Now a first-class passenger engine weighs about 218,000 lbs., of which 103,890 is on the drivers, and this company propose to build this year a freight engine weighing 140,000 lbs., with 125,000 lbs. on the drivers.

"Three large bridges have been finished in Toronto during the past year, viz.: Queen Street Subway, John Street and York Street Overhead bridges. With regard to the latter, the writer is engaged in compiling a description of it, and may be able to present a paper on the subject to the Association at its coming meeting."

The use of cement concrete in engineering works is every year attaining great prominence. In response to an inquiry, Mr. M. J. Butler, Engineer of the Bay of Quinte Railway and Navigation Company, writes:—

"I have built the following bridge abutments and piers of concrete, viz.: At Gananoque, on Thousand Islands Railway, 5

piers 5 feet by 22 feet by 12 feet high. On Bay of Quinte Railway, 1 arch culvert, 10 feet opening, 9 feet high under crown; 12 abutments under short span bridge, size average about 5 feet by 16 feet by 12 feet high; also a number of smaller culverts. I have also put in 4 abutments at Oshawa on the railway and built the engine and chimney foundations. At Deseronto we have put in a number of engine foundations, and I also used it in the foundation blocks under the water tower and in the pumping station engine foundry at Deseronto. Usual proportion, 1 part Star cement, 3 parts clean, sharp sand, 5 parts field gravel, screened so that largest piece will pass through 2 inch ring and the smallest piece over 1-4 inch. A varying size in the grains of sand and of gravel will give a denser and more economical concrete."

All of which is respectfully submitted,

A. W. CAMPBELL,
Chairman.

DISCUSSION.

Mr. Campbell—I might say, Mr. Chairman, in connection with this report that I do not imagine that the report covers or deals with all the important works which have been undertaken in the country during the past year, but I think we have dealt with all the important works which are going on at the present time, or which have been completed during the past year.

I might say that it is a matter of considerable importance to prepare a report giving a review of all the works which have been undertaken and constructed during the year and for this purpose it is necessary that we should have, or the Committee should have, the assistance not only of its own members, but also the entire membership of this Association.

In the preparation of this report I certainly have had the hearty co-operation of all the members of the Committee. We have held several meetings. We held meetings in my office, and then I presume we each of us held individual meetings outside of that, and I feel very grateful to the members of the Engineering Committee for the assistance rendered in connection with the preparation of this report, and trust that you will advise the Engineering Committee of next year to at least assist the Chairman as ably as the Committee of 1897 have assisted me, and the report will no doubt be of very great value to the Association.

Chairman—I thought perhaps the report would have referred to the progress made in road-making throughout the Province, but

of course we receive very full reports in reference to that in the reports published by the Government of the work done by the Provincial Instructor in road building.

REPORT OF ENTERTAINMENT COMMITTEE.

MR. PRESIDENT,—Your Entertainment Committee for 1897-98 beg to report as follows :

The Annual Meeting of the Association for 1898 was opened in the Association's Repository in the Parliament Buildings, and was afterwards continued in the Private Bills Committee Room, for the use of which the thanks of this Committee are hereby tendered to the members of the Ontario Government.

Your Committee's chief care has been the annual dinner, held at McConkey's on the evening of 9th March. We are glad to be able to report that it was one of the best attended and enjoyable of these annual social functions. The guest list was unusually large, and included Mr. Aubrey White, Assistant Commissioner Crown Lands; Prof. C. H. McLeod, of McGill University, Montreal; Mr. C. H. Rust, City Engineer, Toronto; Mr. Blue, of Bureau of Mines; Mr. Kivas Tully, of Department of Public Works, Ontario; Mr. Weeks, representing the Engineering Society of the School of Practical Science, Toronto; Messrs. Jarvis and Skeats, and Messrs. Robertson, Greenwood, Boultbee and Johnson, representing the "Canadian Engineer," "World," "Globe" and "Mail," respectively.

The chair and vice-chair were occupied by the President and Vice-President, and the diagram shows the names of those present.

Due justice was done to the good things provided, and the following programme was carried out :

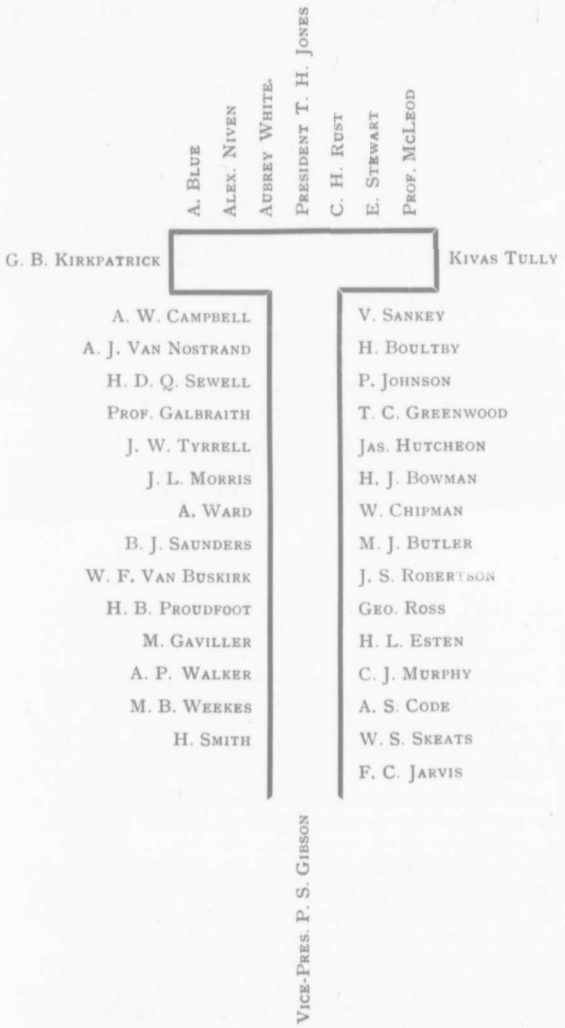
Toast, "The Queen," proposed by the President and right loyally received.

Toast, "Canada," proposed by the President, responded to by Messrs. Aubrey White and Kivas Tully.

Selections on the graphophone by Mr. Ward.

Toast, "Sister Societies," proposed by the President, responded to by Prof. McLeod and Messrs. C. H. Rust and M. J. Weeks.

Recitation, "Our Wilfrid," by Mr. Butler.


A. Blue
Alex. Niven
Aubrey White.
President T. H. Jones
C. H. Rust
E. Stewart
Prof. McLeod
G. B. Kirkpatrick
Kivas Tully
A. W. Campbell
A. J. Van Nostrand
H. D. Q. Sewell
Prof. Galbraith
J. W. Tyrrell
J. L. Morris
A. Ward
B. J. Saunders
W. F. Van Buskirk
H. B. Proudfoot
M. Gaviller
A. P. Walker
M. B. Weekes
H. Smith
V. Sankey
H. Boultby
P. Johnson
T. C. Greenwood
Jas. Hutcheon
H. J. Bowman
W. Chipman
M. J. Butler
J. S. Robertson
Geo. Ross
H. L. Esten
C. J. Murphy
A. S. Code
W. S. Skeats
F. C. Jarvis
Vice-Pres. P. S. Gibson

Toast, "Our Northern Heritage," proposed by the Vice-President, responded to by Messrs. A. Blue, E. Stewart and J. W. Tyrrell.

Recitation, Mr. Greenwood.

Toast, "Our Guests," proposed by the Vice-President, responded to by Mr. Jarvis.

Toast, "The Association of Ontario Land Surveyors," proposed by Mr. White, responded to by the President.

Song, "Bonnie Dundee," Mr. Niven.

Toast, "The North Pole," responded to by Mr. Chipman.

Song, "The Extension of the Railway," Mr. Sewell.

Toast, "The Entertainment Committee," responded to by Mr. Walker.

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

An enjoyable evening was then brought to a close with the singing of the National Anthem.

A statement of the receipts and disbursements has been filed in the office of the Secretary-Treasurer.

All of which is respectfully submitted,

A. P. WALKER,
Chairman.

REPORT OF PUBLICATION COMMITTEE.

MR. PRESIDENT,—The Committee trust that after their pleasing labors, through the industry and zeal of those who were good enough to furnish "papers" for publication, they have this year been enabled to present a Report of our Proceedings which will meet the approval both of the profession and of our general readers.

We hope that those contributing papers for our next Report will kindly see that the accompanying diagrams are neatly executed and small enough for insertion.

The thanks of the Association are due to Mrs. Broughall for her kindness in sending us a portrait of her father the late Hon. Samuel Proudfoot Hurd, Surveyor-General, and also some details of his life.

A "tender" was received for the publishing of our Report, but as it was considerably higher than the price paid in former years, we again employed C. Blackett Robinson, by whom the work has been carefully executed. Twelve hundred and fifty copies were printed at a cost of $275.95.

The interests of those advertising with us should not be overlooked by the members of the Association.

We have exchanged Reports with other societies, as follows:—

EXCHANGES SENT TO

School of Practical Science Engineering Society	200
Michigan Engineering Society	130
Ohio Society of Surveyors and Civil Engineers	130
Illinois Society of Engineers and Surveyors	125
Indiana Engineering Society	90
Iowa Civil Engineers' and Surveyors' Society	60
Wisconsin Engineering Society	20

Respectfully submitted,

KILLALY GAMBLE,
Chairman.

REPORT OF THE COMMITTEE ON TOPOGRAPHICAL SURVEY.

Your Committee on Topographical Survey begs to report as follows:—

There is apparently some misconception regarding this survey, judging from the opening remarks in the discussion of last year's report. The inauguration of a topographic survey is a matter of great moment and should not be begun without a well-matured plan—a scheme not expedient, but devised so that its work will be permanent and lasting.

As a topographical survey must be based on geodetic survey, the latter should be first instituted, and this properly falls within the scope of the Federal Government, while the former is the work of the Province.

The functions of your Committee (and the Association) are directed primarily to a topographic survey, and through our efforts it is hoped to induce the Provincial Government to ask the Federal authorities to begin the geodetic survey, so that no surprise need be expected that in the past year no "actual work" was done.

It is with regret your Committee has to report that the Provincial Government has not yet taken any "active steps" in the matter, but the prosperous condition of the Province and the country at large will certainly hasten the consummation of our aim.

Some most valuable letters have been received from the eminent director, Dr. D. Gill, of the Cape Observatory, that it is desired to put the pertinent points thereof on record here:—

"I rejoice to hear that you have been urging the undertaking of a geodetic survey of Canada. It is strange that such a survey has not yet been undertaken, and there are few objects to which a man having the best interests of the progress of the country at heart could devote himself to with more advantage both for the benefit of the country itself and for the cause of science, than to initiate and carry out such a work.

If I can advise or assist you in this endeavor I shall be only too happy to do so.

I am glad to tell you that I have succeeded in persuading the Chartered Company to undertake a geodetic survey of Rhodesia, and I have just started the work." . . . "I am deeply interested to find that you have a Surveyors' Association, and that one of your objects is to urge the commencement of a geodetic survey in the Dominion. Surely something ought now to be done. The experience of all civilized nations goes to show the waste and extravagance of postponing principal triangulation. It means survey after survey without finality—the fatal mistake of attempting in survey to proceed from small to great instead of from great to small.

Here, as you know, I have at last got the geodetic survey of the Cape Colony and Natal completed, and now I have just started that of Rhodesia. I think also there is a proposal of getting the geodetic survey of Egypt started, so we are on the way to a great triangulation, which I hope will one day extend from the North-Cape to Cape Town.

But we come back to Canadian survey. Apart entirely from the immense practical importance of a geodetic survey in Canada, you have the scientific inducement that you can connect with the Coast and Geodetic Survey of the United States, and as the scientific value of a geodetic arc increases as the square of its length, your work would be of peculiar scientific importance. I should be deeply interested to hear what progress you are making in showing Government its duty in the matter. May I suggest that I think you could get much aid from the Intelligence Department of the War Office, London, in pushing the question on the attention of Government."

Respectfully submitted,

OTTO J. KLOTZ,
Chairman.

Ottawa, March 5, 1898.

DISCUSSION.

Chairman—The Association is glad to feel, while Mr. Klotz is not able to be present with us this time, that he still has a deep interest in our welfare, and on this occasion, as on many others, has helped us.

REPORT OF COMMITTEE ON POLAR RESEARCH.

MR. PRESIDENT,—Your Committee regrets to have to report that, notwithstanding its efforts, the North Pole still remains undiscovered.

The failure of its discovery can in no way reflect discredit upon your Committee, since its members are quite prepared and anxious to discover the Pole as soon as the means of getting there are provided, i.e., those most contemptible and mercenary means, the love of which is at the root of all evil.

Last spring an effort was made by your Committee to secure, under the auspices of this Association, during the holding of our Annual Meeting, a lecture from Dr. Nansen, but it was found impossible to arrange the lecture for any time other than November last, and since the conditions asked were that we should guarantee fifteen hundred dollars ($1,500), this enterprise was dropped; but those of us who were in or near Toronto had the pleasure of hearing the distinguished Arctic explorer, without putting up the fifteen hundred dollars guarantee.

Coming nearer home. We are all familiar with the work of that most distinguished member of our Association, William Ogilvie, whose statements, or supposed statements, have been so extensively quoted by every newspaper in the land.

The Council of this Association, wisely thinking that it would be well to secure Mr. Ogilvie for Massey Hall, one evening of this week, deputed the Chairman of your Committee to try and arrange the matter with Mr. Ogilvie, and this he endeavored to do; but, though all available influence was brought to bear, the great explorer's modesty was too great to be overcome, and, without even giving a definite reply, he settled the matter by sailing away to England.

Before concluding its brief report, your Committee desires to express its sincere hope that ere long such Canadian patriotism may be found as will in the prosecution of Polar research and Arctic exploration place the Beaver side by side with the Lion, the Pine and the Eagle.

J. W. TYRRELL,
Chairman Committee.

REPORT OF COMMITTEE ON REPOSITORY AND BIOGRAPHY.

MR. PRESIDENT,—The Committee on Repository and Biography has to report as follows:—

A considerable number of reports, pamphlets, etc., have been added to our collection during the year. A copy of Jackson's "Aid to Survey Practice," by Mr. Butler, and a copy of Tyrrell's "Through the Barren Lands," by Mr. Tyrrell; several volumes have been presented by Mr. Chipman, and Nansen's "Farthest North" has been purchased by the Association; a catalogue of all such additions will be printed in the next annual report. Several absolutely necessary articles of furniture have been ordered for the "Repository," and arrangements have been made with one of the caretakers to have it looked after and kept clean. Hitherto, unless the Committee took it upon itself to dust, etc., it was very likely to remain dirty. As the position of the Association with regard to the possession of the second room seems to be somewhat uncertain, the Committee would suggest that steps be taken by the Council to have it placed on a more decided footing or that some other room or rooms in the building be applied for before it is too late, as already considerable difficulty is felt in providing accommodation for our increasing collection of maps, charts, etc. A small sum will have to be paid yearly for the cleaning before mentioned, which the Committee requests the Council to grant.

An album has been purchased, as directed at last year's meeting, to contain the photos already received. Several have been added to the collection during the year. Biographical sketches of Hugh Black, P.L.S., and Chas. Kennedy, D.P.S., have been sent in by James Warren, O.L.S., of Walkerton, also a sketch of the late J. M. O. Cromwell, O.L.S., by his son, J. M. Cromwell, Esq., and an autobiography of M. C. Schofield, O.L.S., written on the day he entered his 80th year. The Committee desire to express their thanks to these gentlemen for the considerable trouble they have taken. Chas. Unwin, O.L.S., of this city, has kindly expressed his intention of contributing a number of photos of members of the profession, collected by himself during his term as Secretary to the Board of Examiners. In conclusion, the Committee asks the assistance of every member of the Association in its efforts to keep a record of their appearance, lives and work.

All of which is respectfully submitted.

H. L. ESTEN,
Chairman.

REPORT OF COMMITTEE ON EXPLORATION.

MR. PRESIDENT,—Your Committee on Exploration beg to emphasize much of what was expressed in last year's report on the advisability of greater attention being bestowed by our Government on the exploration and examination of our new territory.

The early history of Canada is replete with the adventures and discoveries of the early French settlers, so much so that even now our wilderness region to the north bears in the names of its lakes and rivers the reminder that they have shown an enterprise in this regard which we have been exceedingly slow in emulating.

We would respectfully urge on the Government the great gain that would accrue to the public if there was any authoritative source from which they could obtain reliable information as to the character of that vast region which extends from the settled fringe on our southern border up to James Bay on the north. It is only necessary to look into the newspapers of the day to see the difference of opinion which exists with respect to that region.

What we would suggest is that a thorough system of inspection should be undertaken, not to supersede, but to precede, the regular work of the surveyor—some such work as was done by Mr. Ogilvie along the Yukon and Mackenzie rivers. Each exploring party should have, in addition to the surveyor and his assistants, a practical mineralogist and a man capable of examining the timber and soil of the region passed over. A few parties thus employed would in a very few years supply us with a general knowledge of the country and its resources and capabilities that would be of great value to the Government in determining what districts should be subdivided and opened for settlement, which should be reserved for timber, and which would be valuable for minerals.

This information could annually be condensed in the Department, and on a large map, kept for the purpose, each year's work could be laid down so that at a glance the character of any particular region could be ascertained.

All of which is respectfully submitted.

E. STEWART,
Chairman.

DISCUSSION.

Mr. Stewart—I have thought for a good many years that we were working very much in the dark. For instance, a surveyor goes out to survey a township before the character of the country is really

known. Then again, as I have mentioned in the report, the public are at a loss to know what districts would be suitable for agriculture, what districts would be worth building a railway through; in fact, you find the greatest ignorance on the part of the public regarding the northern country. There are no authentic records anywhere to which they could refer to give them such information as is necessary. I hope that this will lead to some discussion; I think it is worthy of it. I believe it would be greatly in the interest of the Government if such explorations were undertaken not only for their own purposes, but for the benefit of the public generally.

PAPERS.

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

FIELD EQUIPMENT FOR PROSPECTORS.

By W. HAMILTON MERRITT, M.E.

Toronto.

Mr. Chairman and gentlemen, it is very good of you to allow me to appear before you to-day.

My reasons for so doing are, in the first instance, because it happens that the first time I tried to get together a little field-testing outfit was for a meeting of this Association; and another reason, my principal reason, is because I feel that of any body of men in this Province the Ontario Land Surveyors par excellence are the body that can use any species of field-testing outfit to the best advantage, and can most effectually assist the prospector. I thought you might, therefore, be interested to see a somewhat more complete outfit than the one which I endeavored to get together for a meeting of this Association a couple of years ago. I have been working at prospectors' classes occasionally for the last three years, and I have found by taking into the field an outfit such as I now show you that the ordinary tests, especially for the precious metals, can be made with a degree of accuracy which is not short of surprising.

You know that gold, and, indeed, silver, occurs in what we call the free milling and the refractory states. To extract it from the first you can use mercury, and to get it from ore belonging to the second class we must resort to smelting or some other process, such as cyanide or chlorination. You can always work out your gold or silver by smelting. For our testing the smelting process is carried out with the assistance of the blowpipe, the free milling is done by quicksilver. I shall merely show you the outfit which will do both of these things, without taking up any more of your time.

In the first place, the most important thing of all is getting a fair sample. You have read, no doubt, many of those prospectuses giving magnificent assays and that sort of thing, but, especially in

gold, you can get almost any assay you like, as all of you well know.

If a man has got such a rubber cloth as this and has this wide brush in the field, besides his mortar and pestle to hammer up and break the material, with his sieve, he can get a fair average sample, either to treat himself on the spot or to take afterwards to an assayer. He can thereby bring in his pockets the average of half a ton or more. Without this he would have difficulty in getting a fair average. As you can see, these are very cheap, simple little things.

Then, of course, for making the panning test, one requires a pan. Such a pan as this one is not quite so liable to rust as some are, being made of Russian iron sheet. All of these things are made very cheap, so that prospectors can afford to buy them.

That is the simplest sort of an outfit that a prospector should take into the field for panning, namely, the sampling cloth and brush, the mortar and pestle, sieve and pan.

This panning is rather uncertain. If gold ore runs 50c. a ton, it will "pan." When you go through all the trouble of pulverizing rock (first of all supposing you do get a fair sample), you might as well get a definite result as to find that it "pans." Of course, some prospectors, perhaps, do not want to get a definite result. If you wish to obtain definite results, it is advisable to have a couple of other pans, or one other pan and a bottle in which you can shake up the pulp and mercury. Many prospectors have bottles, but sometimes they break them, and the three pans are, on the whole, better for the field, as they nest together and the extra weight is not serious.

Then we have some nitric acid, which is the only liquid necessary to carry. It is carried in this "lightest weight mailing case," which only costs a trifle.

The mercury is also better carried in the same sort of case.

We have a little sodium in a similar case. These mailing cases have corrugated paper or cork paper inside as a lining, so that they can be thrown about with impunity, and the bottle in them will not break.

Here is a little hand scale that will weigh from 1-4 oz. up to 12 oz. It only costs about 50 cents.

Then we have a mercury retort. There are several sorts. A very cheap sort, made out of Russian iron, something like this, is put on a sheet of iron, and you can build a little bonfire under it. Here is another form, which has been made by a prospector. Its cover has been ground down to fit tight and it does not need heating. The tube from it is made of iron and it collects the mercury. This clamp holds on the cover. The sheet of iron that holds the mercury retort is very convenient for doing the work of quartering on the sheet of rubber cloth.

A little porcelain dish can be provided, or you can use a granite-ware cup and saucer for all purposes, and they are not so liable to break.

In case you get fine gold, there is a sieve 60 mesh, besides the one of 40 mesh.

Here is a wooden pestle, which anyone can make for himself at a moment's notice.

Then a little sheet lead is necessary (two ounces), and some sheet silver (25 cents' worth) is very convenient sometimes.

Finally, there are different ingredients, such as borax-glass, bone-ash, a little sodium-carbonate, a paraffine blow-pipe lamp (candles will do), and clay pipes for cupelling; a little pair of pincers, corrugated on the inside to hold things; a little steel anvil can be made readily by cutting off a piece of steel bar; a small hammer; asbestos paper to keep the mercury from spurting when you are retorting; a horseshoe magnet; a smooth iron bolt for cupel-making in a clay pipe; and with these things you have got all that is necessary for free milling determination, together with the scales, which I omitted to show you. These scales are remarkably accurate. They weigh from 5 grains to a tenth of a grain, and if you treat 2 lbs. of rock you can readily distinguish between an ore that would vary 80 cents in gold, and establish with the greatest of ease if it carries even as small an amount as $1.50 per ton.

With that portion of the outfit just exhibited, you see that the free milling properties can be determined, and at the same time you determine the proportionate yield of concentrates by weighing out the concentrates you have panned out in the process, and then weighing them with the little scales first exhibited, so that you can tell whether your ore is one, two, three or four per cent. concentrates; that is to say, whether it takes 100 tons of ore to make a ton of concentrates or whether it will take 50 or 20 tons; and then all you can do with this section of the outfit, just described, is to see whether these concentrates contain gold or whether they do not. That is almost all most people want to know.

Mr. Lyman, of Montreal, who sent up this outfit to be shown, charges $13 for everything you have seen so far, complete.

If you want to determine the value of the concentrates per ton, or if you want to estimate a refractory ore such as the one from Rossland, B.C., or to concentrate any ore and determine its value, without taking out the free milling parts, you proceed as follows: Pan it down until you get, say one ounce, without taking out the free gold. Of course you do not need all the pan amalgamation outfit for making this assay, but you require a little furnace. One sort of furnace is called Fletcher's furnace, and you will find the procedure in "Fletcher's Blowpipe," an excellent little manual, one recommendation being that it is cheap. Here is the

little furnace, and you use small crucibles of this size. Or you can use this larger furnace, which one of my pupils of a few years ago made for himself. He also made this little crucible, too. With them you can use a larger amount of ore, up to 25 grains, instead of the very small quantity Fletcher uses. You can, therefore, get a more satisfactory result. This larger furnace needs a good deal of blowing, therefore you should have a little blowpipe bulb like this, which does not weigh anything, and which is very cheap. You see by working it with your hand you can keep up a steady blast all the time, so that you have a blast furnace with you as well as a smelter, and for field work it is a great convenience. You will see the advantage in being able to make an assay of concentrated ore, refractory ore, or of concentrates with an outfit such as this, and the whole thing won't cost more than $25. With it you can really get results which are better than an assayer ordinarily gives you with a $200 plant, because in assaying he does not usually discriminate between the free milling part and the smelting or refractory portion. And of course the value of an ore may vary tremendously, whether it is of a free milling or smelting quality.

For this latter outfit Mr. Lyman charges $6 more. In it there is a platinum ivory scale, on which you measure the beads instead of weighing them. You note two divergent lines run up the scale. At stated distances there are numbers, and opposite each it shows in decimals of a milligramme the weight of the button. If it is silver it means so much to the ton and, if gold, another amount to the ton. There are a number of these little crucibles, some little capsules, one of these little furnaces (that costs 45 cents), a small amount of flour in these little tin boxes, methylated spirits if desirable (although you can do it with grease), a little camel's hair brush, some nitre and a tin spirit lamp, which costs $6, as above mentioned, or $19 for complete outfits of both sorts.

This box I have here is more compact, made for the quantitative set.

Very good and accurate results can be obtained from this outfit with a small amount of practice. In a few hours any intelligent man can learn to do the whole business.

DISCUSSION.

Mr. Gibson—What does the whole outfit weigh ?

Mr. Merritt—A great deal depends on the mortar and pestle, but one has to have that. I think it is 27 pounds for the qualitative and quantitative sets. The quantitative part is only a few ounces.

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

ACETYLENE GAS AND ITS USES.

By V. M. ROBERTS, O.L.S.
St. Catharines.

Acetylene is a colorless gas, having a pungent and very unpleasant odor, it burns in the open air with a luminous and smoky flame, and is formed by the contact of water with sodium, potassium, magnesium or calcium carbide, which are unions of a base with carbon, made in an electrical furnace.

The first reference to this group of carbides was observed by Davy in 1822. Jacob Johan Berzelius being the first to discover Acetylene, experiments were afterwards made by Frederick Wohler, a pupil of Berzelius, in 1862, and by Pierre Eugene Marcellin Berthelot, a noted French chemist, in 1866, and by several others, until Mr. Thomas L. Willson, in 1888, experimenting with his electric furnace with some of the compounds of calcium, accidentally discovered his present process of manufacturing calcium carbide. A mixture of lime and powdered anthracite was subjected to the heat of the electric furnace, and reduced to a heavy, semi-metallic mass. Upon examination it was found not to be the substance sought for, and thrown into a bucket of water which stood close by, on which a violent effervescing immediately took place in the water, and fumes were thrown off that it was impossible to ignore the presence of a gas proclaiming itself in such a marked manner. A match was applied, and the result was a luminous and smoky flame, accompanied by several sharp reports, as the bubbles burst and the gas contained in them was ignited.

The calcium carbide of commerce is manufactured by mixing nearly equal weights of coke and lime, ground to a fine powder, and subjecting to a heat of 3,000 deg. F. in an electrical furnace for about six hours. The intense heat separates the atoms of lime which enter into union with the carbon, and the whole is fused into a semi-metallic mass, or pig, which weighs from two hundred to three hundred pounds. When this is removed from the furnace, it is allowed about twelve hours to cool and is then broken or crushed into small pieces and packed in air-tight cases ready for shipment.

Calcium carbide is a very heavy, dark semi-metallic mass, having a crystalline metallic fracture of almost black or dark brown

appearance, very pungent in odor and susceptible to the moisture of the atmosphere, which causes it to slack like common lime.

In order to obtain Acetylene Gas from the calcium carbide of commerce, and to overcome the smoky flame of the gas when burnt in the open, it is necessary to confine the gas in a chamber under a small or large pressure. For this purpose generators have been made, in which water is brought into contact with the calcium carbide in a sealed chamber, from which it passes into a gas holder, which is weighted to regulate the pressure, and is conveyed from there through the pipes to the burners.

These generators are of two kinds: (a) Wet generators. (b) Dry generators.

In the wet generator the carbide is placed in a pan or deep tray in the generator chamber. In the top of the chamber is a spray through which the water is discharged on to the carbide, the flow or discharge being regulated by the rise and fall of the gas holder, the carbide, or rather residue, becoming saturated and remaining in the pan in the form of a stiff mud.

In the dry generator the carbide chamber is divided into an upper and lower half by means of a grating having a slight shaking motion, and on which the carbide is placed. The water supply is so regulated that when the gas holder is down a limited amount of water only, from four ounces upwards, according to the capacity of the generator, is discharged on the carbide. The heat caused by the slacking process dries the slacked lime, which coats the carbide, and it drops into the lower half of the generator chamber and is removed from there in the form of a very fine dry powder, which is perfectly odorless. One of the greatest difficulties which has had to be contended with and has in reality kept Acetylene Gas in the background has been the want of a burner which will not smoke or throw fine grains of soot—in other words, a burner with perfect combustion, or nearly so.

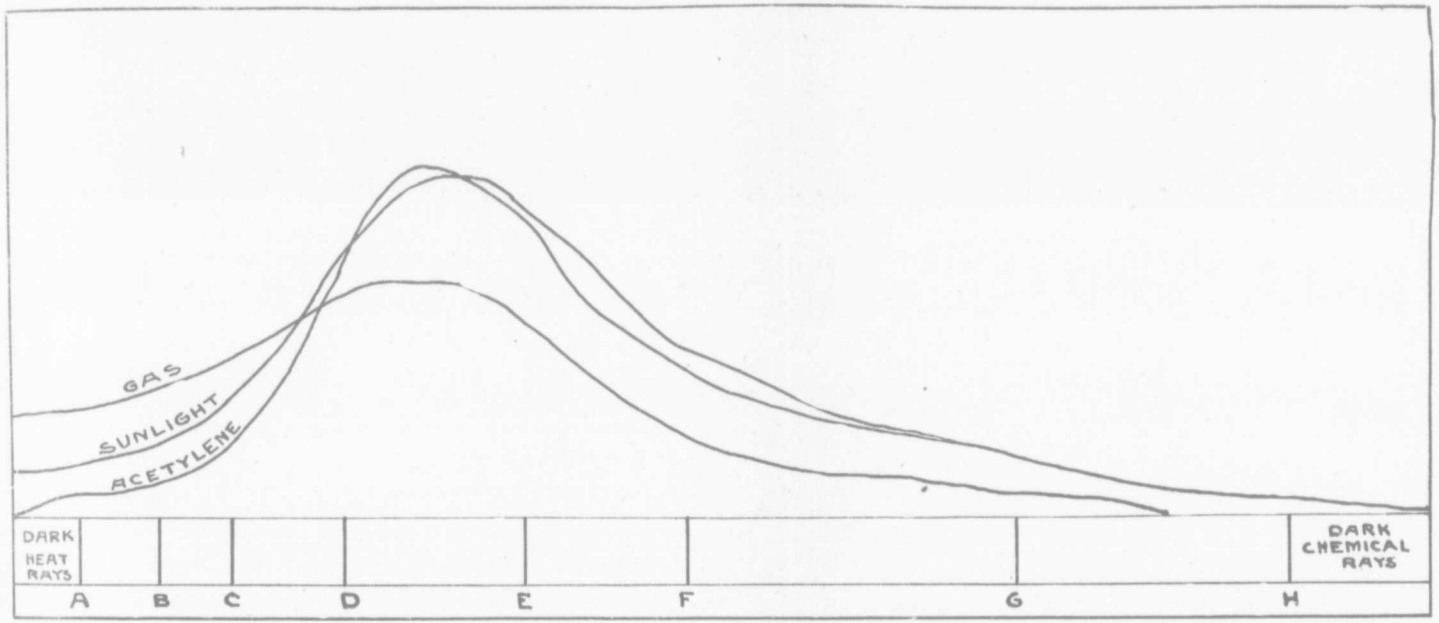
The burners on the market up to the present time are the Bray, the Milne, the Naphey and the Star or Chattanooga.

The Bray burner, I should judge, gives the best light, but although rated as a half foot and foot burner, it burns considerably more gas, as do all burners. It has a lava tip, which, after being burnt for a short time fills with soot and smokes horribly. This nuisance can be to a certain extent overcome by brushing the tip before lighting each day. There is a good demand for this burner on account of its cheapness and the light it gives, and it is well suited for factories or places where the smoke and soot will do no damage.

The Milne burner was made of iron, and was soon rusted by the moisture of the gas and rendered unfit for use.

The Naphey burner has two lava tips opposite one another.

kind air, water and gas are equally dangerous, if the necessary conditions for safety are not complied with and if the gas is impro-



CURVES OF LIGHT VALUES OF SUNLIGHT, ACETYLENE, AND COMMON GAS IN VARIOUS PARTS OF THE SPECTRUM

the moisture of the gas and rendered unfit for use.

The Naphey burner has two lava tips opposite one another.

Through each of these, from the outside to the gas passage in the centre, four holes are drilled to admit the air. These burners when lit throw their flame at right angles to and midway between the tips, and burn without smoking.

The Star or Chattanooga burners are made on the same principle as the Naphey burner, differing somewhat in form, and may be considered with the Naphey burner as being the most satisfactory burners which have so far been placed upon the market.

In 1895 the light of Acetylene Gas was studied with a spectrum photometer, the curve of which may be seen in the accompanying diagram, and which shows it has the spectrum nearest to that of the sun, with the exception perhaps of the arc light. In the matter of cost, candle power for candle power, it is far cheaper than any other illuminant. As an illustration, one pound of calcium carbide will produce five cubic feet of Acetylene Gas. This, burnt through a burner rated as a half foot burner, but which under tests has been found to burn from 5-8 cubic foot to 3-4 cubic foot per hour, according to the pressure. Assuming, therefore, 3-4 cubic foot per hour, one pound will last approximately 7 hours, and will give 175 candle power hours, at a cost of 3 1-2 cents.

The following table gives a very fair comparison of the different illuminants:—

Acetylene Gas is estimated at	$7 00 per 1000 cubic feet.
Coal and Water Gas is estimated at	1 00 per 1000 cubic feet.
Electricity is estimated at	20 per 1000 watts.
Coal Oil (American)	25 per gallon.

ILLUMINANT.	C.P.	Consumption per hour.	C.P.H. for $1.00	C.P. per 1000 c. ft.	Cost per 1000 c. ft.
Acetylene Gas, without Chimney	25	¾ c. ft.	5,000	35,000	$7 00
Coal or Water Gas, using Argand burner	16	5 c. ft.	3,200	3,200	1 00
Gasolene Gas, using Argand burner	12	5 c. ft.	3,200	2,400	75
Incandescent Electric Light	16	50 watts	1,600	1,600	20
Coal Oil, using circular burner	25	5 oz.	2,550	5,100	2 00

In Canada Acetylene Gas is still unknown to the majority of people, and is looked upon as being very dangerous and highly explosive, whereas it is really no more explosive or dangerous than any other illuminating gas. Experimental attempts to liquify this gas in order to get it into the smallest possible state have been the cause of the most serious accidents, where the parties experimenting have used a crude apparatus. To liquify the gas it is necessary to bring it under a very heavy pressure, and under conditions of this kind air, water and gas are equally dangerous, if the necessary conditions for safety are not complied with and if the gas is impro-

perly or carelessly handled. The accidents which have occurred, it is my firm belief, can one and all be traced to carelessness and ignorance on the part of the parties experimenting.

The gas is now used extensively in the States for lighting towns and villages. In addition to isolated dwellings, lamps of all kinds are in use, from the student's lamp to the bicycle lamp. It is fast taking the place of lime light in stereopticon views, and has a future before it the possibilities of which are hard to foretell.

For draughtsmen I should say it would be of inestimable value.

I have now been using it in my office for about eight or nine months. With its light the most delicate shades of color can be distinguished, and, although a most intense light, it is very soft and steady, and is not so trying to the eyes as coal oil, coal gas or electric light. I am now getting a cluster and reflector made, in order to attempt blue printing, being induced to do this by the great success of the St. Catharines Camera Club in photographing by Acetylene.

The superiority of Acetylene Gas in point of purity of light and its hygienic advantages (viz., it consumes less oxygen than any other gas, gives off less carbonic acid and no carbonic oxide, the temperature is about 35 per cent. less than ordinary gas, the flame is perfectly regular and steady), demands that it should have a first place among all gaseous illuminants.

DISCUSSION.

The President—I went through the Riordan Paper Works in St. Catharines, which is illuminated by this gas. They have been using the gas for quite a long time and they seem to be perfectly satisfied with it. Of course a paper mill is a very bright place, and although you can see very distinctly, it did not seem to impress one that the place was very well lighted. That is the impression it gave me while going through it; the light did not strike me as being very bright, although you can see very well.

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

PROGRESS ON LAKE OF THE WOODS.

By HENRY DeQ. SEWELL, Asso. M. Inst. C.E., O.L.S., D.L.S.
Rat Portage.

When in 1894 I had the pleasure of reading a paper before this Association on the subject of "The Lake of the Woods as a Mining Camp," there was nothing there beyond a few promising prospects. The deepest proposition at that time was the Pine Portage. A shaft had been sunk on it to a depth of 120 feet with very promising results, assays made by the Geological Department at Ottawa running as high as 20 oz. of gold. Dissensions, however, occurred amongst the owners, resulting in the closing down of this promising property, but I am pleased to note that work on it has lately been resumed.

The Sultana, situated on the same vein, or reef, was then working at a depth of 105 feet, and had just get three air drills and a compressor plant, the work having so far been done by hand power.

There were then some other promising properties on the lake, but on none of them had shafts been sunk to as great a depth.

I shall endeavor to lay before you a brief outline of the progress that has since taken place in gold mining within the past four years, and to point out what I believe will be the ultimate destiny of that interesting mining camp.

Referring to the gold statistics for the past year, the world's output shows that the United States contributed 25 per cent. of the entire production, Australia 24 per cent., Transvaal 23 per cent., Russia 14 per cent., and the rest of the world, including Canada, contributed only 14 per cent. It is thus self-evident that it is useless to look for any large influx of capital from the United States, as they have more gold in their own country than they can extract without the assistance of foreign capital. It is, therefore, gratifying to read in an article in the English London Mining Journal of a recent date "that the tendency of English capital will hereafter be more and more towards investments in mining enterpises in preference to stocks and other securities." The Journal winds up by speaking with favor of mining enterprises in British Columbia and the Northwest Territories of Canada, where the exploitation of gold mining properties seems about to bring about splendid results.

At the present time there are only three properties on the Lake of the Woods that can fairly be classified as dividend paying mines, viz., the Sultana, the Regina and the Mikado, but there are others that will probably become dividend payers in the near future, which mining men will recognize as a splendid showing for so short a time.

The Sultana belongs to private parties (Canadians), the other two are owned by Englishmen and are working under English charters, distributing their dividends in England. We have plenty of Americans on the Lake of the Woods who own some properties of undoubted merit, but none of them have, or are likely to have, sufficient pluck or energy to develop a property into a dividend paying mine, their sole aim being to develop and sell their properties at an advance, and thus it is to English capital, and to English capital alone, that we should look for the practical development of the Lake of the Woods. Thus we should endeavor by all the means in our power to develop our mining properties and put them into a practical shape, to attract the investment of English capital, and thus secure for ourselves large profits, and greater profits for the capitalists who can develop them into dividend payers.

The principal advantages the Lake of the Woods possesses over all other parts of the Rainy River District, to say nothing of other parts of Canada, is the easy means of access to all parts of the lake by steamer from the station on the C. P. R. at Rat Portage, thus reducing the cost of transportation to a minimum, also the free milling nature of the ore, and the continuity and depth of the veins, to which may be added that there never has been a single case of failure where a depth of 300 feet has been reached to get plenty of good paying ore. It will thus be observed that the Lake of the Woods possesses advantages and attractions peculiar to itself, which will always enable the miner to carry on his operations at much less expense than in any other part of Canada.

There are many other mining camps in Ontario; these are chiefly in the Rainy River District, such as the Lower Seine, the Sawbill, the Manitou, the New Klondike and Minnitonka, whilst in other districts are Hastings, Wahnapitae, Michipicoten, Jack Fish Bay, Shebandowan, etc., but the greatest progress and development will undoubtedly fall to the lot of the Lake of the Woods, as its special advantages, everything else being equal, will always give it the preference over other mining camps, even in the same district where the cost of transporting provisions, stamp mills, etc., is necessarily much more expensive.

The three dividend paying mines before mentioned are situated as follows: The Sultana, on the north shore of the lake, about 8 miles east from Rat Portage; the Regina, in Whitefish

Bay, about 50 miles south-east of Rat Portage; and the Mikado, in Shoal Lake, about 35 miles west of Rat Portage. These properties, it will be thus seen, are fairly scattered over the northern half of the Lake of the Woods, affording a considerable mineral area, which is more than likely to increase with future discoveries as it has in the past.

It is somewhat difficult to find out the amount of work done on these mines, as the owners keep these matters very much to themselves, and the Government reports are always carefully published about a year old, so that when issued they are somewhat stale. It is, however, known that the Sultana is down over 400 feet, with a 30-stamp mill; the Regina over 370 feet down, with a 20-stamp mill; and the Mikado over 300 feet, with a 20-stamp mill. and they have all plenty of pay ore in sight. The Sultana and Regina ores are claimed to average about 15 dwt. of gold and the Mikado 1 oz. to 1 oz. 10 dwt. of gold per ton of 2,000 lbs. The ore is all free milling, with some concentrates from which the gold can be easily extracted by the clorination or cyanide processes. Comparing this with the ore of the Le Roi mine at Rossland ,B.C., which averages 1 oz. of gold per ton, and smelting ore at that, the assured future of the Lake of the Woods becomes intelligible. There is a peculiar feature about these three mines, viz., that they are all contact veins, lying alongside of intrusive granite bosses. So far as my experience goes in Western Ontario, veins at or near the contact of any change of formation are generally preferable.

Besides these mines, there are many prospects more or less developed, on some of which considerable work has been done. Commencing from the north of the Lake of the Woods, in Jaffray township, there are a number of highly mineralized diorite dykes (locally called Fahlbands). They have great widths, but no well-defined walls. They appear to be similar to the diorite dykes which are being mined at Rossland, B.C. Probably, if these dykes are sunk on deep enough, large bodies of low-grade ore will be found, and, if so, it would be a bonanza, for a constant ore body from 15 to 30 feet wide carrying 6 dwt. of gold per ton of 2,000 lbs. would present considerable attraction for British capital.

The Scramble has been sunk on these dykes 75 feet, the Black Sturgeon 35 feet, the Princess 50 feet, and the Grey Eagle 50 feet. These dykes are all more or less gold-bearing, but whether they succeed or not in producing dividend payers, they present an exceedingly interesting geological problem.

In Haycock township, near the Pine Portage mine, there are some good prospects with considerable development work done, viz., the Royal, the Triumph (sold last fall for $30,000), the Treasurer and the Bad mine. These are all good gold quartz propositions of considerable promise.

South-east of the Pine Portage mine on the mainland are the Master Jack, the Black Jack and the Golden Gate; the latter was sold for $20,000 cash last summer. On Hay Island, near by, are situated two very promising gold propositions, viz., the Keewatin and the George Heenan. Some development work has been done on all these properties. A little further south, in Bottle, Witch and Andrew Bays, to which may be added Gibi Lake, there are a large number of very promising gold locations; they have had but little development work done, owing to their being comparatively recent discoveries. Still further south is Bath Island, an interesting proposition in the clay slates and mica schists, with some fine-grained gneiss, a formation in which no previous mining for gold has been done. There are a number of strong parallel veins on it, and should gold be found in paying quantities, it will be a desirable proposition. We next come to the vicinity of the Regina mine, which so far may be considered the south-eastern limit of the Lake of the Woods gold belt; this consists of Crow Lake and Whitefish Bay. Here we have the Bully Boy and the Trojan, both reported sold, the latter for $40,000 cash. There are other promising properties in this vicinity, and some of them that have had considerable development work done are under option at good prices.

Last, but not least, is the west side of the Lake of the Woods, in the immediate vicinity of the Mikado mine on Shoal Lake. Here we have a number of promising properties, such as the Gold Coin, the Li-Hung-Chang, the Cornucopia, the Yen-ti-hi, the Yum-Yum, the Nan-ki-poo, and Cameron's Island, that sold last fall for $10,000. Close by, in Echo Bay, is the Golden group (four properties), of which the Golden Horn was recently sold for $35,000. Lying east of the Mikado mine and adjoining it is a large tract of mineral lands, about 6,500 acres, that I surveyed for a Buffalo syndicate. It extends northward to Echo Bay and contains some valuable claims. Little or no development work has been done on it, owing, I believe, to a lack of funds on the part of the promoters. The lower part of Shoal Lake, from Ash Rapids south and westwards, contains a number of promising properties, on which but little development work has been done. This takes us to Carl Bay, or Dead Man's Portage, the commencement of the Ontario Government Gold Concessions Co., that covers a large tract of land on the western peninsular down to Monument Bay on the Lake of the Woods. This company is credited with having discovered some valuable claims, and should it result in a large investment of English capital, it will materially assist in advertising the Lake of the Woods in the only market from which any financial investments of any magnitude can come.

The Keewatin Power Co., which for years has been nothing but a valuable franchise, now proposes reaping a rich harvest out of the mining companies by transmitting electricity to the mines on Shoal Lake, which will enable those companies to work their properties to a greater advantage than heretofore.

In conclusion, what is most needed at the present time in the interests of Canada is the adoption of such measures as may be calculated to demonstrate to the world at large the possibilities of this country becoming one of the chief producers of gold in the near future, and it behoves everyone who is trying to interest English or foreign capital in the purchase and development of our mines to keep well within the mark when making any representations, to adhere closely to the truth, so that we may merit the confidence of investors and ultimately secure an abundance of capital from England and other countries to develop the latent, but rich, resources of this great country. The Government can, if so disposed, aid and assist by the establishment of a mint in Canada, and by requiring that all gold taken from our mines shall bear the imprint of Canada, either as coin or bars of bullion, instead of as at present allowing a large portion of our gold to pass through the United States mints, thereby giving credit to that country as the producer of a large amount of gold which rightfully belongs to Canada. Thus each coin bearing the imprint of a Canadian mint would be a bona-fide advertisement of the gold resources of this country. Australia adopted this principal many years ago, with the result that it is now the second greatest gold producer in the world.

DISCUSSION.

Mr. Gibson—Are any of these minerals found in the Laurentian formation in any quantities ?

Mr. Sewell—Yes, it is one of the best formations; but generally on the Lake of the Woods you have to look for the contacts of the different formations.

Following any of these formation lines, it may be seen there has been some lateral impression and the result has been more breakage in the rocks through the deposits of the different formations lying one on top of the other, and consequently, in the cavities, the veins have been deposited, and they appear to be far more lasting under those circumstances than under any other.

Mr. Gibson—It is not really in the Laurentian formation; it is in some of the dikes or veins in this formation ?

Mr. Sewell—Yes, the Laurentian is as much a producer as any of the others, but it has to leach out of the formations in the shape of water—mineral water—and come in a deposit.

Mr. Gibson—I am not a practical miner, but the idea has come to me that these minerals have all come up from the lower regions of the earth and have been scattered over the surface of it, and during the glacial period the surface rock has been scoured off and thus left these veins below.

Mr. Sewell—I do not think so. The formations have been broken up by strong volcanic or other action, and the cavities are leached out of the surrounding rock; quartz containing gold has leached out.

Mr. James—As one having some little experience in mining, I may say a few words on that score with reference to that line Mr. Sewell speaks of, that it is very wide as a matter of fact, because the broken up part of the two formations will naturally leave room for veins, a good deal on either side.

Mr. Sewell—Yes.

Mr. James—Has Mr. Sewell, in his experience, met with placer mines ?

Mr. Sewell—No, nothing in the nature of placer mines at all; but I do not see any reason why they should not be found if you went north of the Lake of the Woods, but scarcely in the Lake of the Woods district. It is all lake—very few rivers.

Mr. James—Has there been any great attempt to find placer mines ?

Mr. Sewell—No; some think they found placer mines, but they really were the tops of the other mines.

Mr. James—In gullies where there have been creeks running did they attempt to sink down ?

Mr. Sewell—There are hardly any creeks there. It is all lakes and wherever there is a connection between lakes it is generally a muddy, still channel. It has been pulled down a great deal by glacial action and levelled considerably. There is nothing sedimentary. I think if you went further north you would find a great deal of change in the Laurentian formation.

Mr. James—They will find placer mines more in the rapidly running creeks.

Mr. Gaviller—You say there are no signs of placer mines but you see no reason why they should not be found extensively; but how do you account for the disposal of the material which was caused by this glacial action ?

Mr. Sewell—I think it is probably down at the bottom of the Lake of the Woods.

Mr. Stewart—You do not mean to say it is common to find good quartz veins away a distance for the contact, that is, in the Laurentian the same as in the Huronian ?

Mr. Sewell—I do not see why there should not be. Very little of any value has ever been found, except that which is near contact. There are numerous contacts of different changes of formation all over the lake, and it is almost invariably in connection with these contacts that anything of any value has been found, otherwise you generally find a bedded vein which may be of an uncertain depth.

Mr. Stewart—I understand the question was whether quartz carrying gold was frequently found in the Laurentian formation.

Mr. Sewell—If I were looking and came upon the Huronian and there was no change of formation, I should pass over it until I came to a change of formation. I should not look in any peculiar formation; I should just look for a contact, and if I did not find it, I should pass on until I did.

Mr. Gaviller—Is it your experience that the quartz veins in the Laurentian formation are vitreous quartz, not milky quartz ? Do you find any really good milky looking quartz in the Laurentian formation at all ? I do not mean the junction.

Mr. Sewell—Well, the junctions are where the veins are found, and you do not find them anywhere else.

Mr. James—I think the experienced authorities say that you can.

Mr. Sewell—You can within the area of filtration.

Mr. James—But the instant you go too far from that line you would not be likely to find anything ?

Mr. Sewell—I think the Laurentian and Huronian and the Clay Slates all contain more or less gold. The problem is, in Nature's laboratory how and where one is most likely to find it has been leached out or dissolved out of those rocks. You must have a cavity in order to deposit mineral water or water of any sort. If you have not got any general breaking up of a formation or some cause or other, you cannot have a large cavity, and where you have

a large cavity there the leaching process takes place, and the subterranean water flowing through the cavities of the rocks runs into these cavities or veins and constitutes the vein. In fact, you might call it, properly speaking, a stone creek. That is what a vein is; it is a quartz creek. It has been water, and the water, owing to the excess of mineral, has deposited through the rise and fall of temperature.

Mr. Tyrrell—I think Mr. Sewell missed one point in his valuable paper. When I was at Rat Portage during the past summer, I always understood, and I believe it is generally understood in Rat Portage, that the richest gold mine on the Lake of the Woods is the Hilliard House. I did not hear him say anything about that.

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WATER POWER FROM THE NIAGARA RIVER.

By VAUGHAN M. ROBERTS, O.L.S.
St. Catharines.

At a meeting of the American Association for the Advancement of Science held in 1894, Prof. Spencer, in describing the evolution of Niagara Falls, stated that their age was 28,000 years, for the first 11,000 years of which the fall was only 200 feet, draining the Erie Basin by the present route, the waters of Lake Huron, Lake Michigan and Lake Superior then emptying through the Huron Basin by way of the Ottawa River. The second stage came in with the increase of height from 200 feet to 400 feet and the final drainage of the upper lakes through the Erie Basin, the present conditions being brought about in 17,000 years more. The age of the Falls was estimated at 55,000 years by Andrew Ellicott in 1790, and at about 35,000 years by Lyall in 1841.

For thousands of years the immense power of Niagara Falls, estimated by some to be upwards of 6,000,000 horse-power, has been lying idle and practically going to waste, firstly, for lack of the need for power, and secondly, for lack of enterprise and capital. In or about 1891 the Niagara Falls Power Co. of Niagara Falls, N.Y., was formed, and a charter was procured for developing a large portion of this power, and a few years later the great Niagara Falls Electric Power Plant was completed and electric power successfully transmitted to Buffalo, a distance of 26 miles. This project and its successful issue acted as a stimulant on men's minds, and fresh projects were in consequence being continually brought before the public.

The development of a power at Queenston, Ont., taking water from the Montrose Creek, a tributary of the Welland River, and conveying it to the escarpment at Queenston by means of a tunnel four miles long, with an open canal of one and one-half miles long at each end of it.

The Mather bridge scheme consisted of the building of a bridge across the Niagara River where it leaves Lake Erie; below the spans where the current was strongest immense wheels, forty feet in diameter and about 200 feet long, were to be placed, sub-

merged about 20 feet; these wheels were to be connected with the power house on the shore by a system of shafting.

Love's Model City scheme involved the building of a canal and the erection of power houses, to be supplied with machinery. "Free power for forty years and free factory sites" was Mr. Love's lever, the revenue being derived from the sale of land to the persons who would flock to the city in the wake of manufacturing concerns.

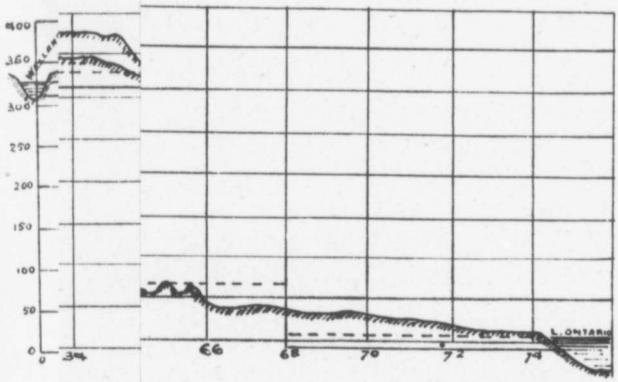
These and several other schemes have been projected for the development of the enormous power of the Niagara River, the majority of which are for the most part so wild and visionary that few of them will ever get beyond the chrysalis state and can be passed over for a Canadian project, viz., that of the Welland Power and Supply Canal Company to construct a power canal from the Welland River to Lake Ontario. This project is the more interesting as it originated with Canadians, is in Canadian territory, and the company now holding the charter is formed of Canadians, and lastly, our American neighbors consider it a steal of the Niagara River, mention of which will be made later on.

Clause 2 of the company's Act of Incorporation defines their proposed work as follows :

"The Company may construct, equip, maintain and operate a canal and hydraulic raceway from some point in the Welland River, within five miles from its junction with the Niagara River, to a point or points on or under the Niagara escarpment at or near the township line between the Townships of Stamford and Thorold, in the County of Welland, or in the Township of Grantham, in the County of Lincoln, with such raceways or extensions of the said canal and hydraulic raceway through the said Township of Grantham or the Township of Niagara as are necessary to carry off the surplus water from the said canal and hydraulic raceway to Lake Ontario, with all such works, dams and wing dams, docks, sluices, conduits, accessories and buildings as are necessary to give full effect to the intent of this Act; with power to dredge, widen or deepen the Welland River from its mouth to the point of intersection of the said canal with the Welland River, if so found expedient for the purpose of the Company."

The canal will be 15 feet deep, 100 feet wide on the bottom, and 160 feet wide on the water line, and the slope of its sides and banks 2 to 1, having its intake on the Welland River near the Village of Montrose, and will flow through the Townships of Stamford, Niagara and Grantham to Lake Ontario, being fed by the Niagara and Welland Rivers.

The Welland River rises in the County of Wentworth a few miles south of the city of Hamilton, and flowing through a comparatively level country, empties into the Niagara River about two



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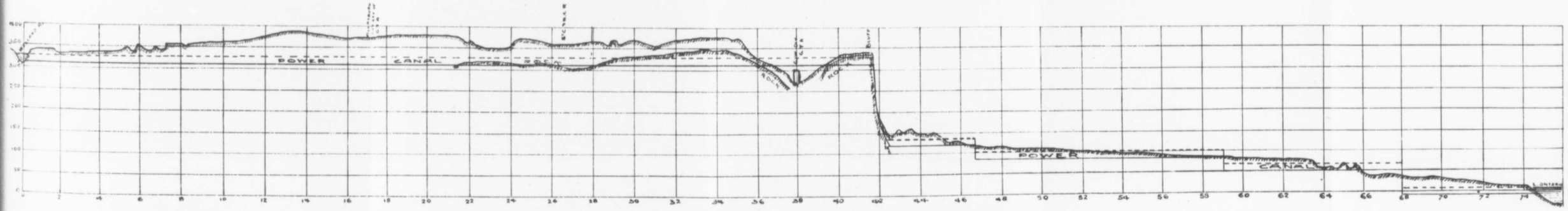
of the power canal.

In the spring of the year, when the disruption of the ice which has formed in the Welland River during the winter months takes place, the extremely swift current of the Niagara River above the Falls keeps the mouth of the Welland River open and carries the



PROFILE OF PROPOSED POWER CANAL

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Niagara and Welland Rivers.

The Welland River rises in the County of Wentworth a few miles south of the city of Hamilton, and flowing through a comparatively level country, empties into the Niagara River about two

miles above the Falls, and is navigable for some thirty miles above its mouth. A canal or cut was made some years ago by the Dominion Government from Chippewa, a small village at the mouth of the Welland River, southerly across the north-east corner of the Township of Willoughby into the Niagara River, to allow vessels bound for Welland to enter the river without risk, connecting with the Welland Canal at Port Robinson. The current of the Niagara River forces its waters through this cut, and its influence is felt some twelve miles up the Welland River.

Seven miles north of the Welland River the canal reaches what may be termed the "Bluff" to distinguish it from the Niagara escarpment, of which it forms a prominent and isolated portion; seven miles north of this point is Lake Ontario.

Between the point of intake and Lake Ontario there is a difference in elevation of 316 feet, of which 184 feet is available at the Bluff, 66 feet in the vicinity of the Queenston and Grimsby stone road, 33 feet in the vicinity of the Niagara stone road, and 33 feet at or near the mouth of the Eight Mile Creek, every foot of which can easily and with advantage be utilized for the development of power.

In applying for and securing their charter, the Welland Power and Supply Canal Company had the following objects in view :

(a) The construction of a power canal between the Welland River and Lake Ontario, with the ultimate development of 300,000 horse-powers or more.

(b) The construction of a shipping basin at or near the development of the power at the Bluff, upon permission being obtained from the Dominion Government to connect such basin with the New Welland Canal by means of a guard lock or such other construction as the Government might require.

(c) The construction of a good and safe harbor at the mouth of the Eight Mile Creek, together with a branch railway connecting it with the Great Western Division of the Grand Trunk Railway.

(d) The irrigation of the country through which the canal passes.

The engineering features in connection with this immense undertaking are, for the most part, of an extremely simple nature; difficulties similar in all respects to those which will have to be surmounted, having already been successfully overcome in the construction and maintenance of the New Welland Canal, which lies about two miles to the west and is a standing proof of the feasibility of the power canal.

In the spring of the year, when the disruption of the ice which has formed in the Welland River during the winter months takes place, the extremely swift current of the Niagara River above the Falls keeps the mouth of the Welland River open and carries the

ice away immediately, preventing ice-jams. The intake of the canal will leave the Welland River about three-quarters of a mile above Montrose bridge, at such an angle with the River as will afford protection from ice coming down stream, and crossing a small knoll, enters the bed of a creek flowing into the Welland River about half a mile lower down, and follows its course for about one mile and a quarter, thence almost due north across the height of land to the Bluff, crossing under the Allanburg cut off of the Grand Trunk Railway and the St. Catharines and Niagara Central Railway, and over the Great Western Division of the Grand Trunk Railway; thence following the general course of the Eight Mile Creek to Lake Ontario.

The deep cut on the canal will be about 65 feet; the slope of sides of cut and canal will be two to one in earth, and have a batter of one in twelve in rock. A short distance south of the crossing, or aqueduct, over the Great Western Division of the Grand Trunk Railway, a regulating weir will be constructed of first-class masonry. The aqueduct will be similar in all respects to that on the New Welland Canal where it crosses the same railway about one mile to the west, being composed of a masonry tunnel, covered with puddle clay properly tamped and rammed to form the bed and banks of the canal. A storage basin or reservoir and head race will be constructed at the bluff, which presents about six thousand feet of almost perpendicular sides, in the form of a semicircle, down which the water will be conveyed through steel tubes to the turbines. From the bluff to Lake Ontario the cutting will not be heavy, the canal being formed alternately in cut and fill, masonry, dams and sluiceways being built at the points of power development.

The general formation and topographical features of this section are well adapted for successful irrigation.

During the last ten or fifteen years the development of power from the fall of water, and especially in large quantities, has received a great deal of thought and attention. Manufacturing has increased to such an enormous extent that large powers, which can only be obtained economically by the use of water, are in constant demand. The development of powers on the numerous rivers in Canada possessing waterfalls have certain drawbacks which become a nuisance and a constant source of annoyance. Heavy rainfalls on the drainage area are closely followed by the volume of flow, causing a great variation in the flow of streams. Such streams lack the principal requirement of effective water-power, viz., regularity of flow to the maximum amount needed for the machinery.

The Niagara River carries the overflow from the upper lakes, which act as storage basins or reservoirs, and regulate the flow, keeping it even throughout the year. This water backing up the Welland River will naturally have its outlet through the proposed

canal, which will practically divert part of the waters of the Niagara River. This is a fact which is, or at least appears to be, fully recognized by our American neighbours, if we may judge from the following newspaper articles:—

The Niagara Falls (N.Y.) Journal, 30th June, 1894:—"For the consideration of those who are trying to make a corner on Niagara River water, it will be well to inform them that neither the State of New York or any of its chartered companies are masters of the situation, but that a company recently formed in Canada can dry up the Niagara River and make the great cataract and Niagara gorge a dry and dreary waste any time they see fit. A water company has been chartered in Canada to build a power canal from Lake Erie to Lake Ontario. Through this route all the water that now flows through the Niagara River channel can be diverted if this company sees fit, and much easier than enough water to interfere with the beauty of Niagara Falls can be diverted, by all the projects now under way or talk of in this State."

The Buffalo Courier, under heading "Stealing the Niagara River," says:—"Certain newspapers in the States are exercised over what they term a scheme to 'steal the Niagara River,' by which reference is made to the project of one of the Canadian companies that have been organized for the purpose of utilizing the Niagara water power, namely, The Welland Power and Supply Canal Company, which was incorporated at the last session of the Dominion Parliament, and whose aim is not only the utilization of power, but also to supply water to irrigate the peninsular fruit belt. The charter of the company, The Philadelphia Record observes, permits it to draw unlimited water from the Niagara River. The company is empowered to deepen or widen the Chippawa Creek (Welland River) from its mouth to the point of intersection of the proposed canal, four and one-half miles west, and it is said there is nothing in the charter to prevent the company from diverting the course of the Niagara River to Thorold, Ontario."

These criticisms are satisfactory, in that they practically acknowledge the feasibility and superiority of the project of the Welland Power and Supply Canal Company over any of the other projected schemes for the development of the power of the Niagara River. That steam cannot compete with water power in the development of cheap electrical power is a well known fact, which makes the development of cheap power of the greatest importance to the manufacturing industries of this country, and one of the greatest factors in the growth of cities and towns. To use the words of Mr. Ferris, engineer of the Ferris wheel, "The condition which will determine the relative expansion of towns and cities in the next decade is the presence of water power. The whole problem of electricity is one of cheap generation."

The total cost of this work would be in the neighbourhood of $5,000,000. This does not include the harbor or shipping basin, but is merely for the power canal and necessary machinery for developing 300,000 horse-powers in water, 100,000 horse of which are developed electrically.

DISCUSSION.

Mr. Butler—What are you going to do with all the power ? is the question. Some few years ago, when Niagara projects were first started, it was contemplated in the future to send electric power to New York and all the large cities between Niagara and New York. As far as I am able to learn up to the present date, a very small fraction, indeed, has been sent even to Buffalo, and at what cost no one could find out. I know that in Canada one of the largest schemes that has been worked out, so far as I know, in the world, has been by the Royal Electric Company at ——— Lake, about fourteen miles from Montreal, and some time ago I received figures from them to supply 125 horse-power per 24 hours, and I found I could do better by putting in compound engines and water tube boilers in competition with electricity there. From investigation at Chambly (I do not know the distance from this point to any city in Canada), it seems to me they are going to build up an immense water power without requiring to use it. There is another scheme on the St. Lawrence River, known as the Messina Springs, part of the St. Lawrence River taken by a cross canal, with a head of about 80 feet, power to the extent of some 100,000 horse-power, I think, they are figuring on. So that all these tremendous schemes for utilizing of water powers seem to me to be largely speculative for the reason that the power is not wanted. I do not believe 100,000 horse-power would be used by the City of Toronto. They have 28 feet head at Chambly.

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

LAND SURVEYORS AND THE FORESTRY PROBLEM.

By THOMAS SOUTHWORTH, CLERK OF FORESTRY FOR ONTARIO.

Toronto.

I am deeply grateful for the opportunity afforded me to address the members of this Association, for various reasons. In the first place, I only escaped becoming an ornament to your profession through an overdose of study of the diary of the very methodical surveyor to whom I was once apprenticed. The multiplicity of detail, the incidents of daily life, domestic and otherwise, with which that diary was filled, convinced me that my lack of method and extreme modesty would militate against my success in a similar production, and I went back to the farm. Since then, however, I have learned that all surveyors are not so particular as to their daily journals; in fact, I have known of incidents in the lives of some surveyors to go utterly unrecorded, at least so far as their own private journals were concerned.

Aside from my abortive attempt to become a surveyor, I have been interested in the success of your Association for, having had the honor to be the friend of Mr. Willis Chipman and his printer as well, when he successfully attempted its organization, I was in at the birth, as it were, and have always followed your proceedings with much pleasure.

I believe I am expected to say something regarding the relation of land surveyors to the forestry problem. now receiving so much attention in Ontario. In extending your curriculum of studies to include "Botany and the Forest Flora of Canada," a very wide scope was given in the terms used, and I do not know what ground the author or authors of it intended to cover. In what I have to say on this subject I desire to be understood as speaking, not as the Provincial Clerk of Forestry, but simply as an individual interested in the welfare of our common country and of your Association, and will briefly outline my ideas of the proper relation of land surveyors to the Crown Lands Department and to their other clients in the Province in connection with Forestry.

POLICY OF THE DEPARTMENT.

We have not an autocratic government in this country, and it is difficult to forecast what the policy of the Administration may be ten or twenty years hence. With us the people rule. Sometimes the will of the people is changed and with it the government. A change of government may mean a change of policy, and I have heard of a change of government entailing a change of officials—but that was in the United States. For these reasons there can be no absolute certainty as to the system of exploiting our present and future forest reserves that may be adopted by other generations than ours, or by other administrations than the present one.

I think we may be reasonably certain, however, that public opinion is now sufficiently awake to the vastness of the interests involved and the wastefulness of past methods to prevent any retrograde step from the forward movement now begun in forestry development.

EVOLUTION OF THE SYSTEM.

As you all know, the pioneers in this tree-covered province found it necessary to clear the ground of its tree crop in order to raise crops of another kind, but just as essential for their existence. The trees were felled, rolled into log heaps and burned, a laborious and expensive business. When we think of the endless toil of the early settlers in getting the ground ready for crops of grain and for pasture amid the dense forest that once covered this part of Ontario, with no market for any forest product, we are filled with wonder at the courage of the men and the women who undertook it.

It was not long, however, before the lumberman began to prepare the way for the pioneer farmer. A market was found in England for much of our most valuable timber, and the labor of the farmer was lessened by the work of the lumberman.

The method of exploiting our great coniferous forests adopted by us in the past has been, in some respects, the wisest available Nature has provided us with a splendid crop of valuable timber trees, and it was the duty of the government to see that in preparing the land for grain and pasture this crop should be harvested with as much revenue to the state as possible. The timber had to be removed to make way for grain crops where clearings had to be made; what the lumberman left the farmer burned, and it did not matter, so far as the provincial revenue was concerned, if the timber was cut faster or of a smaller size than was advisable for the most profitable working. From time to time areas of timber have been sold at the highest price obtainable in open competition. So long as it was designed that the lumberman should act as the precursor

of the farmer in clearing the land for grain growing, and at the same time contribute to the revenues of the state, I doubt if a much better plan could have been adopted. The lumberman only bought the standing timber, the fee simple of the land remained in the Crown to be disposed of to the actual settler, and the manner in which the lumber was cut, or, as some would say, was slaughtered, was of more concern to the lumberman himself than to anyone else.

It so happened, however, that as settlement which, begun on the shores of the St. Lawrence and the Great Lakes, extended northward, considerable areas of timber land were found which were not at all suitable for general agriculture. The soil on these areas, although frequently bearing a heavy crop of trees, would not grow anything else with profit. When the trees were removed by the lumberman and the forest fires which generally followed him, it was discovered that the land was unfit for settlement, and as it had been taken from the only purpose for which it was suitable, it became valueless and waste. The young forest growth that sprang up only furnished food for the next fire that swept over it.

Thus it will be seen that the system followed, while all right for the tillable areas, was not suitable for these tracts of thin, rocky or sandy soil. Forest fires were of such common occurrence it was for a long time thought impossible to prevent them; and, besides, it was generally believed that when the original white pine forest was cut away it was succeeded by Banksian pine, poplar, or other less valuable trees. Erroneous as this view was, it was firmly held by most woodmen. At the suggestion of Mr. Aubrey White, now Assistant Commissioner of Crown Lands, a system of fire ranging was adopted in 1886, much in the way of experiment. It was found to be quite possible to check or prevent forest fires, and the question of the reclamation of these waste areas became a live issue.

NATURAL REPRODUCTION.

Planting young trees on these lands was out of the question because of the great expense. A more correct knowledge of the laws of natural regeneration of forests after forest fires, in the past few years, has led to the discovery that wherever fire has been kept out for any length of time, and where the trees of the original forest, old enough to bear seed, have not been completely exterminated, which rarely happens, a new crop of the valuable varieties, such as pine, spruce and others, is found to be growing in large quantities. It is found that, in the case of white pine particularly, the quick growth of poplar or other trees is necessary for the propagation of the pines that need the shade thus afforded during their early life. With the knowledge of actual conditions, the problem of reclaiming these waste lands became less difficult of solution. It was seen that

time and protection from fire was, in most cases, all that was needed to secure another crop of timber where nothing else would grow. For this purpose the Act of last session of the Legislature for the establishment of forest reserves was introduced by the Commissioner of Crown Lands and passed. The Bill is very brief. It gives the Lieutenant Governor-in-Council power "to set apart from time to time such portions of the public domain as may be deemed advisable for the purposes of future timber supplies." It further provides that "no lands within the boundaries of such reserves shall be sold, leased or otherwise disposed of, and no person shall locate, settle upon, use or occupy any such lands." It is also provided that "the Lieutenant Governor-in-Council shall have power to frame regulations for the protection, care and management of the said Crown Forest Reserves."

FORESTERS AND LAND SURVEYORS.

It is designed that these reserves shall be created out of areas that have been lumbered over and found to be unfit for settlement, and also from tracts that investigation prior to the removal of the timber shall prove to possess the same character of soil. None of these reserves have yet been created, unless we except our million-acre Algonquin Park, and in establishing their boundaries it is more than likely the services of the gentlemen of this Association will be required.

It is impossible at this time to state what the regulations for the care and management of these reserves will include. It is the intention to have them managed and protected with some approach to modern scientific forestry methods, such as will be suitable to the conditions existing here. In any systematic attempt to manage theses reserves for future profit, working plans for each reserve will have to be prepared, and for such working plans some sort of topographic survey and timber plan will be required. In countries where scientific forestry has been practiced for a long time a forester is necessarily a land surveyor; surveying is part of his studies in his four years' course.

As we have no trained foresters in Ontario, much of the technical work of the future treatment of the forest reserves will need to be performed by surveyors until such time as we have a trained staff of foresters

FORESTS AND CLIMATE.

It would be presumptive on my part, before this audience, to go into the question of the effect of forests on climate and water supply. The necessity of forest growth to the health, nay, the existence of humanity, is well known. The absorption by the leaves of trees

of the carbonic acid gas expired by animals purifies the atmosphere, that otherwise would become so foul that we could not live in it.

As to the effect of forests on rainfall, a great deal has been said and written that was perhaps not warranted. I believe that, though forests may have little or no effect on the total rainfall, they exercise a great deal of influence on the local distribution of that rainfall. I give this as my firm opinion, but must confess frankly that I cannot prove it as yet. Experiments are now being conducted in Germany, France and Switzerland to determine this point, but as yet it is a case of " not proven.'

There can be less question, however, as to the effect of forests on stream flow and the subterranean drainage of the water gradually filtered from the forest floor.

The effect of forests in checking evaporation from the soil by breaking the force of the drying winds is well known to you all, and there are few of you who have not personally observed the failure of streams that were once perennial owing, apparently, to the removal of the forests from their sources and banks.

THE CROWN LANDS.

Much territory has been opened for settlement in Ontario that should have been held exempt from location if the character of the soil and the timber growth had been fully known. I am far from placing the blame for this entirely upon the surveyors who laid out and reported on these areas. They no doubt carried out their instructions, but in examining many of these reports I have been disappointed in the information they contained. So far as the timber was concerned, there seems to have been a disposition to regard the white pine as the only tree worth reporting upon. While this is undoubtedly the most valuable tree in our, or perhaps any other, forests, there are others of great and increasing value.

I think a surveyor should be able to distinguish and report upon all our commercial timber trees, and to state the proportions in which they are found in the township surveyed. It is not unusual to find in a surveyor's report, " No timber of any value, mostly spruce." If spruce is not now as valuable as pine, it will be in the near future, for no business in this country is advancing with such rapid strides as that of paper-making, for which spruce is mainly used. There are few trees growing in our forests that may be considered as of no value. The cheapening of steel has caused its substitution for wood in many ways, but, on the other hand, new uses are found for wood, and the changes in this direction are so rapid that a tree having little, if any, value this year may be eagerly sought after next. Even the despised Banksian, or jack pine, makes very

good paper, and the white or canoe birch is being extensively used in the manufacture of spools. The common aspen poplar is being made into flour barrels at Keewatin, and a very good barrel it makes. I have slept this winter under a blanket made entirely from wood, and the same vegetable fibre is spun into silk threads that, when woven into cloth, cannot be distinguished from the product of the silk worm.

In estimating the value of our various timber trees, regard must be had not altogether to the value of the wood alone, but to its occurrence in our forests. For instance, the wood of the black walnut, juglans nigra, is very valuable, but as its habitat was confined to a very limited section of the province, and as it is now practically all gone, it need not be considered. It would also be well in reporting on forest trees to give the botanical names as well as the common ones. The same tree goes under various names in different localities, and this is sometimes very confusing. In looking over some reports I found the term cypress used quite often, and was for some time unable to make out what tree was meant until one of your members informed me it was the pinus Banksiana, or jack pine.

Another point that I think should be borne in mind by the surveyor in new territory is the general age of the forest, which may be easily determined by cutting down a few trees of average diameter and counting the annual rings of growth.

Aside from the surveyor's usefulness to the Department of Crown Lands in connection with forestry, he may be equally useful to the individual members of the farming community who may be his clients. Rightly or wrongly, the land surveyor is regarded in most communities as a general all-round, well-posted individual, whose advice on a great many matters is eagerly sought for. There are few farms in the more densely settled parts of the province that have not some hilly, unproductive acres that could be profitably planted with trees, and I know of few men who would have more influence in restoring a proper proportion of woodland where overclearance has been detrimental to the general well-being of the community than surveyors.

Subject to correction, I submit a list of what I consider to be our most important timber trees, arranged in the order of their importance, with their common and botanical names.

Among the coniferous trees the pinus strobus, or white pine, is easily first, and has no equal on this continent. Next are picea alba and picea nigra, the white and black spruce. These two trees are so much alike it is not easy to distinguish them, but when growing in masses the foliage of one is much darker than the other. The cone of the white spruce is thicker and shorter than that of the other, while the cones fall off before next flowering time, and the cones of

the black spruce are still on the tree at next flowering time in the spring. The spruce is the tree most used for paper-making, and the largest spruce forest in the world is probably in Ontario and Quebec.

Next in order is probably Tsuga canadensis, or hemlock, with pinus resinosa, or red pine, and larix Americana, or tamarac, in the same class. The market value of these three trees varies considerably.

Next to these I would place thuya occidentalis, or arbor vitae, which we generally, but some say erroneously, call white cedar. This tree, where found in quantities, is more valuable than the three last mentioned. In addition we have abies balsamea, or balsam fir; juniperus virginiana, or red cedar, a scarce, but very valuable tree, and pinus Banksiana, or jack pine, sometimes called pitch pine and cypress.

Among the deciduous trees that are found in our northern forests are quercus macrocarpa, or bur oak; quercus rubra, or red oak; betula lenta, or black birch, or sweet birch; betula lutea, or yellow birch; acer saccharinum, or sugar maple; tilia Americana, basswood or linden; ulmus Americana, or white elm; fraxinus viridis, or green ash; fraxinus sambucifolia, or black ash; betula papyrifera, or canoe birch, white birch, or paper birch; fagus ferrugina, or beech; juglans cinerea, or butternut; carya amara, or bitter hickory; populus balsamifera, or balsam poplar, or balm of gilead. Other trees valuable, but less important because of their scarcity, such as fraxinus Americana, or white ash, might be mentioned, but these I regard as the most important from a commercial point of view.

DISCUSSION.

Mr. Southworth—I have tried in the very brief time at my disposal to give an idea of the development that has taken place in the protection of our Crown Lands in regard to forestry, and to direct the attention of this Association to it.

Mr. Gaviller—I think we all ought to be glad that this most interesting paper has been written and we have had the pleasure of hearing it, and that the gentleman overcame his bashfulness, and I hope on a future occasion we shall hear from him again; because in my own experience and the experience of young men I have had out with me at work—and I think it is the general experience of surveyors who have been at work a few years—there is much ignorance on the subject of the timber in the country. In fact, you find a great many persons do not know the names of the trees, and most

of us in our youth were under the impression a pine tree was the only tree worth looking at; and I daresay numbers of us are old enough to remember the first thing considered necessary to be done on the farm was to girdle the pine tree, get the bark off, and sell the miserable remains that happened to be standing in the fall after the hardwood was gone, to some sawmill to stoke up where they could not get water power to supply the power to run the mill.

I have not read my report on the Committee of Land Surveying yet, but I think when we do read it you will see I have emphasized as strongly as possible the great necessity there is for carrying on this work now as much as possible, and there is no doubt in a case like this, where the ignorance has been so great, that the remedy should be applied in a manner that will make it most effectual.

Mr. Niven—I will just say, Mr. Chairman, that I was very much interested in the paper that Mr. Southworth has just read.

It is not very long since people believed that we would never have a second crop of pine. Now, I am not an awfully old man yet, but it is nearly thirty years since I went to Haliburton, and I remember about the first thing I noticed up there was a nice little grove of white pine some distance out of the village, along the road that I was building, and they were just nice little trees, such as you see when driving about, about four or five inches in diameter, and perhaps twenty feet high, growing nicely. Now those trees form a very fine grove of valuable pine. Unfortunately, a few years ago fire got in and destroyed the greater part of them, but not longer ago than the day before the election I drove through that place again, and I had a practical lumberman alongside of me in the cutter, and he said that he had made an offer to the company for that grove of pine. There is some very good timber there to-day, some excellent little saw-logs, and it is really surprising how quickly it has grown.

Regarding the Cypress, I was not aware before now that Banksian pine, or pitch pine, was ever called cypress. I remember, when I was an apprentice, the field notes of P. L. S. Willmot, who, I think, surveyed the Gore of Toronto. He planted his tamarac posts in a swamp. Those posts were sixty years old, and his field notes state they were planted in a cypress swamp; well, that swamp was a tamarac swamp. Whether Brother Willmot was astray in his timber or not I do not know. But I have always considered cypress meant tamarac. Of course I have always called tamarac, tamarac.

I am very much pleased with Mr. Southworth's paper, and I think it will be very useful to us, and I hope we shall hear from him again.

Mr. Gaviller—I don't think that Jack pine has any possible resemblance to cypress.

Mr. Southworth—We have no cypress in Ontario at all, but in some of the reports, I think principally along the Ottawa, as someone remarked, the Banksian pine is generally called cypress, and I did not know for a long time what it was; but I would just like to say in regard to the remarks that have been made by Mr. Niven and Mr. Gaviller, that I shall be extremely delighted if I am privileged to give a paper to this Association at your Convention next year, and I will endeavor in it to give the results of the latest scientific forestry up to date so far as I can, something that is of practical use to the members of the Association. This paper has been prepared hastily and was intended simply to direct attention to the subject as it exists in our own Province.

Mr. Chipman—Mr. Chairman, I think the Association has lost a valuable member in not having Mr. Southworth. If he had continued his studies, we would have had a surveyor acting as Clerk of Forestry. It was very fortunate, no doubt, for himself that he changed his mind, but it is our misfortune. However, he is with us and has promised to be with us again, and no doubt he will keep his promise.

As to that term cypress, I had quite a different impression as to its meaning. I also have seen it in surveyors' notes and made enquiries as to what it meant. I was told it meant white cedar; that is quite a different tree from either Banksian pine or tamarac.

Now to come to Mr. Southworth's work, which he has been at for the last few years in the Department of Crown Lands, to make his work of value to the surveyors and to the country at large, I think that the Association should secure two or three hundred copies of his report and distribute one to each member of the Association with our own Annual Reports. That would give his work a practical value to the members of the Association.

Mr. Ross—I like this paper of Mr. Southworth's very much. I think it is a very timely one. What he says with regard to the ignorance as to the names of certain woods and trees is quite true with regard to the general public, and I am afraid it is true with regard to quite a few of our own members, too. I think it would be a good idea to have botany put in our subjects for examination.

Mr. Chipman.—I might state, Mr. Ross, that has been added to the list of subjects for examination, and I think I was the one who suggested it last year.

Mr. Butler—Mr. President, I am partly responsible for telling Mr. Southworth that the word cypress was used in lieu of Jack pine. A French-Canadian halfbreed, north of Lake Nipissing, named the Jack pine to me the first time I saw it as "cypree," which was the nearest he could get to cypress in English,

and all the men in the vicinity called it cypress without any mistake. I think I told Mr. Southworth of that fact, and I put it down in my notes as cypress until I found it was Jack pine.

As I was out with Mr. Southworth on the Forestry Commission some time last summer. I might tell you something in addition to what he said as to what happens in the growth of the reforestration of the pine forests.

After the lumbermen have cut over the forest, or the fire has destroyed it, as a rule the poplar springs up first. There seems to be an absolute necessity for the poplar or some other quick-growing deciduous tree, for unless that shelter is afforded by the deciduous trees, the young pine saplings will die from the heat of the sun.

Now, the poplar grows rapidly for from 15 to 20 years, shading the pine by making a dense covering overhead. The pines strike up higher for sunlight and you get a limbless tree, which crowds the poplar; the poplar keeps ahead of it, and the evergreen keeps shooting up; and I thing if you examine any tree that grows in a dense forest, it grows without any limbs at all near its base.

Then the next thing was that, after about 25 to 30 years, the poplar began to be of somewhat slower growth, up to 50 or 60 years. At that time, looking at a forest, the deciduous and evergreen trees are almost on a line, and it would be difficult at a distance to tell which it was, whether an evergreen or deciduous forest.

At 75 years there is no mistake about it at all; the pine tree is over the top and the poplars are beginning to fall. They rot quickly and form some nourishment for the pine tree. After that it is a case of the survival of the fittest among the pines themselves.

Among other things, we found that state of affairs occurring up in the Collins Inlet District, and to show you how little the men who are all their lives in the woods see of what is going on under their very noses and eyes, I was describing to Mr. Mickle, of the firm of Mickle, Dyment & Son, lumbermen, a forest owned by Mr. John Bertram, in which I told him that it came on from 5 years up to 50 years, and 75 years and 125 years. He said he wished he had a forest like that and he would take such great care of it, it would never get cut out. That is the principle. Just cut the annual growth and keep a perpetual forest there. It has been done in other parts of the world and can be done here. All we have to do is to educate our lumbermen up to act on it, and the firm with which I have been connected have been acting on it for 10 or 15 years. We have cut only our annual growth. Now, when passing along with Mr. Mickle, travelling through Hollow Lake, in the first old burn we came to, which he thought was nothing but poplar, we found a splendid young pine forest coming along beautifully. He was astonished. He said, "I did not think there was anything in that

but poplar, cherry trees and sumach." He realizes now he has there an asset which is rapidly increasing in value and is better than money in the bank at compound interest at 3 per cent. There is no question about it, a pine forest like that is worth 4 per cent. compound interest as an investment.

Now, another point we noticed was the conditions of crowded growth. If a tree is crowded in its environment, that is to say, if it has not sufficient room around it for air and light, that tree will take perhaps 15 years to add an inch in diameter; it may grow two feet in height.

Now, if it has normal forest surroundings and the soil good, it will add an inch in diameter in seven or eight years; but in favorable conditions, if weeded out as it should be, then the inch will be added on in about four years.

Mr. Southworth—I think that is a very moderate estimate.

Mr. Butler—And of course it will grow in height proportionately.

On twelve-inch trees that add on an inch in four years a man is making money hand over fist, and all he has got to do is to protect them and weed out the forest.

Now, the question in Canada here is, what are we going to do to weed out those forest trees to give the healthy trees a chance to grow? Those of you who take The Engineering News, look into the issue two weeks ago, and see what they are doing in Sweden in connection with the Charcoal and Smelting and Steel Works. There you will see the question solved. They have 730,000 acres of land all told owned by the Charcoal Iron Smelting Company, of Sweden. They also run a pulp mill in connection with it. They found that true economy consists in cutting down all trees that make pulp—the limbs, the shrubs, the leaves, every particle of the trees is gathered up. What will not make charcoal will make gas in refining the steel, but everything that will make charcoal is used in refining the iron, and if they can do it there surely we can do it here. That is all I have to say on forestry.

I think we owe a debt of gratitude to Mr. Southworth for preparing this paper. I can tell you that the action which the Government has taken in connection with forestry is largely due to the suggestions of Mr. Southworth.

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

ECONOMIC RECOURCES OF THE HUDSON BAY DISTRICT.

By J. W. TYRRELL.
Hamilton.

Where is this district and what is its extent ?

The following may be taken as a simple but fair description of it, i.e., of Hudson Bay and the surrounding country which may be considered as tributary to it:—

All and singular that certain parcel of land and water (without the premises) situate, lying and being in the Dominion of Canada, in the Continent of North America. Being composed of that great undeveloped region, long monopolized as the most fruitful field of the Hudson Bay Company, and more particularly described as follows, that is to say: the entire area within a radius of seven hundred miles from a point situate in latitude 59 deg. north and longitude 85 deg. west, and containing by admeasurement nine hundred and eighty-five million six hundred thousand acres, be the same more or less.

Briefly, the circumference of the circle above described would be situate as follows: Commencing at its southern extremity, the line crosses the height of land north of the Canadian Pacific Railway, near Missonabie, thence proceeding westerly it takes in the north-eastern part of Manitoba, passing through Lake Winnipeg, thence just touching the eastern extremity of Lake Athabasca, thence would cut through the centre of the divide between the waters of Great Slave Lake and Chesterfield Inlet, thence crossing the Arctic Circle, and for its extreme northern boundary passing the north end of Melville Peninsula, and thence through Cumberland Sound, Cape Chidley, at the eastern extremity of Hudson Straits, and thence southerly and south-easterly through the Labrador Peninsula, following the border of the western water-shed to the place of beginning.

The area contained within this circumference, already given in acres, amounts to one million five hundred and forty thousand square miles, which represents almost one-half of the land area of the whole Dominion of Canada, which is commonly placed at three million two hundred thousand square miles. Now, astonishing though the statement may seem, it is, nevertheless, true,

that for the whole of this vast area we have absolutely no direct access, excepting by means of small boat or canoe navigation.

Of course there is for ships one most indirect route to the Bay by way of the St. Lawrence River, the Atlantic Ocean, and Hudson Straits, but this necessitates a voyage of from three to four thousand miles of difficult navigation.

We now come to the question—which is, by the way, one of the most burning now before the Canadian public, and particularly the citizens of Toronto—i.e., Is this part of the Dominion worth opening up by means of railway or improved shipping facilities, and if so what return may we count upon from its development in consideration of the public monies spent upon it.

If these million and a half square miles are worthless, let us not squander our none too abundant public funds upon them, but if it can be shown that there is very reasonable ground for expecting handsome returns from the opening and developing of the Hudson Bay District, surely it is time that a strong movement should be made in that direction.

From my personal knowledge and after a careful perusal of the reports of Dr. R. Bell, A. P. Low and J. B. Tyrrell, members of the Geological Survey, who have at various times carried on exploratory work in the district, I will endeavor to present a list of the various economic resources of the Bay, together with some notes as to their localities, qualities and abundance.

Commencing with the Animal, or highest of the three great kingdoms of Nature, let us see what resources the Hudson Bay District has to offer us.

MAMMALS.

Moose.—Not found to the east of Hudson Bay, but south and south-west they are commonly met with as far north as about latitude 57 degrees, valuable for flesh and hide.

Woodland Cariboo.—Common throughout the districts south and south-west of Hudson Bay. Reported to be about exterminated in Labrador. Valuable for flesh and hide.

Barren Ground Cariboo.—Very abundant in the barrens both east and west of Hudson Bay. The chief source of both food and clothing for the native population, and the great local source of food for future explorers and prospectors.

Musk Oxen.—Common north of Chesterfield Inlet, and along the valley of the Great Fish River. Flesh may be used as food, and hides form valuable robes.

Fox (red, cross, silver and black).—Common throughout the district. Furs of silver and black varieties very valuable.

Arctic Fox.—This species is abundant throughout the barren grounds. Furs not so valuable as other varieties.

Grey Wolf.—Becoming scarce in southern districts. More common in the semi-barrens.

Artic Wolf.—Common, though not very numerous, throughout the barrens.

Wolverine or Carcajou.—Very common throughout the barrens. Skins are valuable as furs.

Canadian Lynx.—Abundant in some places in wooded country. Fur very fine and warm for rugs or clothing.

Sable or Pine Marten.—Common below north limit of semi-barrens. Fur valuable.

Fisher.—Abundant in some of more southern districts.

Mink.—Very common in southern portions.

Weasel.—Common throughout the wooded country.

Ermine.—Common in wooded as well as in barren lands.

Otter.—Common in more southern districts. Very abundant in parts of Labrador.

Beaver.—Common in more remote wooded districts. Very abundant along some of the rivers emptying into the east coast of James Bay.

Musk Rat.—Very common everywhere throughout southern wooded region.

Black Bear.—Not uncommon throughout wooded districts.

Barren Ground Bear.—Rare, but met with occasionally in the barrens. Skin valuable.

Polar Bear.—Abundant about the shores of Hudson Bay in some localities, and found for a considerable distance inland.

Walruses.—Very abundant in several localities in Hudson Bay and also found in James Bay. Valuable for hides and ivory tusks.

Bearded or Square-Flipper Seal.—A large species common in Hudson Straights and Bay. Valuable for hide and oil.

Gray Seal.—Not common.

Hooded Seal.—Not very abundant.

Harp Seal.—Common along the whole Labrador Coast. Valuable for oil and hide.

Ringed Seal.—Most common species in Hudson Bay and Straights, and quite numerous. Valuable for oil and hide.

Harbour or Fresh Water Seal.—Common about the coast of Bay and in some lakes, both in Labrador and the western barrens. The skin of the thoetis of this species, contrary to the usual rule, is black and glossy, and makes a beautiful soft, rich fur.

White Whale.—Very abundant in both Hudson and James Bay, and especially about the mouths of large rivers where they resort to feed upon the small fish. Valuable chiefly for oil.

Narwhale or Sea Unicorn.—Found in Hudson Straights and other waters to the west and north-west. This peculiar creature,

whose body is only 18 or 20 feet in length, possesses a single spiral ivory horn not uncommonly 8 feet in length and of great weight.

This horn, or tusk, which extends from the end of the nose in line with the body of the animal, is composed of a very fine grade of ivory, and is therefore very valuable.

Right Whale or Bow-Head.—This is the most valuable and one of the largest of the several species of whales, and furthermore is nowhere so common as in the water of the northern part of the Hudson Bay District. Although the value of an average Right Whale is in the neighborhood of fifteen thousand dollars ($15,000,-000), it is a most regretable fact that, to the best of my knowledge, there has never been a Canadian whaler in the Bay, whilst our neighbors to the south have habitually for years had at least five or six vessels hunting and carrying away these prizes to the ports of New England.

Indeed, this foreign wholesale destruction has been carried on for so many years and to such an extent that the whales have become comparatively scarce to what they once were, and it is high time that our Canadian Government should step in and put a stop to the poaching practice entirely, and see that these most valuable of all animals are not ruthlessly exterminated, as without such intervention they certainly will be.

FISHES.

Sturgeon.—Common throughout southern portions of district. A small species, plentiful in many of the rivers of Labrador.

Salmon (common sea).—Found in abundance in Ungava Bay.

Cod.—Found in Ungava Bay.

Hearne's Salmon.—Common along coast of Hudson Bay.

Great Lake Trout.—Abundant throughout lakes and rivers. Twenty-five pounds is not an uncommon weight for this fish.

Brook Trout.—Abundant in many streams.

White Fish.—Very abundant in lakes and rivers. Ordinary size from six to ten pounds; fourteen pound whitefish caught in Lake Mistassini.

Herring White Fish.—Abundant about the mouths of most of the rivers flowing into Hudson Bay.

Halibut.—Reported to occur in Hudson Bay.

Pike or Jack Fish.—Very abundant throughout district in lakes and more sluggish streams.

Pickerel.—Reported common. Many other less important species may also be found, but the above list will be sufficient.

Without attempting to present a full list of the birds of the Hudson Bay District, I will merely call attention to the existence of great numbers of water and land fowls, such as geese, ducks, grouse and ptarmigan.

TIMBER.

The Hudson Bay District is not, as a whole, a great timber country. Indeed, the northern half of the district is entirely devoid of timber of any description, but the land of the southern half is covered by forests of more or less value, some of the river valleys and more favored localities being well wooded by valuable trees of good size.

The following is a list of the forest trees of the Hudson Bay District, arranged in the ascending order of their northern limits :

1st. White Elm.—Found only in the most southern parts of district, its extreme north limit, east of Lake Winnipeg, being about latitude 51 deg.; not very abundant.

2nd. White Pine.—Found only as far north as latitude 52 in the neighborhood of Lonely Lake. Common and of fair size, about the head waters of the branches of the Moose River.

3rd. Red Pine.—About same as white.

4th. Black Ash.—Found as far north as latitude 53 toward Lake Winnipeg, but only 50 deg. towards James Bay. Common on the various branches of the Moose River, but of small size.

5th. Cedar.—Found as far north as the mouth of the Rupert River on James Bay, along the Moose and Albany Rivers, around Lake St. Joseph, and Cedar Lake on the Saskatchewan River, being in about latitude 53 deg. 40 min. Many trees are of large size, though not very abundant.

6th. Banksian Pine or Jack Pine.—Extends as far north to the east of James Bay as latitude 55 deg., and trees of good size are abundant throughout this western part of the Labrador Peninsula. To the west of Hudson Bay the range of this tree extends much further to the north, having been discovered by me at the north end of Selvyn Lake in latitude about 60 deg. 30 min. Dr. Bell reports it as being abundant and of large size in the valley of the Albany River.

7th. Balsam Fir.—Northern limit on east side of James Bay at Great Whale River. To the west it crosses the Nelson River at about latitude 55 deg., and thence turns in a north-westerly direction towards the mouth of the Athabasca River. The tree is common below this limit, though not very abundant.

8th. Canoe Birch.—One of the most common and valuable forest trees of Northern Canada. In the Labrador Peninsula it extends as far north as Great Whale River, is very common south of this, but not of large size, commonly not over six inches in diameter.

West of the Bay the limit extends in a north-westerly direction, passing out of our district a little north of Selvyn Lake. When, in 1893, I passed through, a party of Chippewyan Indians were engaged in the manufacture of bark canoes from it.

9th. Aspen or Common Poplar.—Has about the same northern limit as the Birch, and is the most widely diffused tree of North America. It is very abundant within its range throughout the Hudson Bay District, and is one of the most valuable of the forest trees, being commonly as much as 10 or 12 inches in diameter. It is now much sought after for the manufacture of pulp, etc.

10th. Balsam Poplar or Balm of Gilhead.—Extends considerably further north than the white poplar, but is much less common.

East of Hudson Bay this tree is found as far north as Richmond Gulf. West of the Bay it disappears near Fort Churchill, and thence its limit extends in a north-westerly direction, about parallel with those of the other northern trees, although in latitude 64 deg. 41 min. at the forks of the Telzoa River, my brother and I found driftwood branches of this tree which had come from some place to the westward.

11th. American Larch or Tamarac.—This tree is the rival of the Spruce in the range to the northward, and, as regards abundance, it stands second only to the Black Spruce. It is usually the largest tree of its neighborhood.

It attains a fine growth throughout many parts of the country south and west of James Bay.

12th. Black Spruce.—Is by far the most abundant tree in the Hudson Bay District, forming, I should judge, 75 per cent. of the whole forest. It is much to be regretted that this tree does not attain a larger size, being, as a rule, too small for the manufacture of lumber.

13th. White Spruce.—Though much less abundant than black, is very common everywhere throughout the forests of the Hudson Bay District.

Its northern limit, which is about the same as the Black Spruce is, on the east side of James Bay, in about latitude 57 deg., a few miles north of Richmond Gulf.

On the west coast of the Bay the limit extends to latitude 59 deg. at the mouth of the Seal River; thence it extends in a north-westerly direction, passing close to the mouth of the Copper Mine River, and on to the mouth of the Mackenzie River.

In latitude 62 deg. 15 min. north, on the shore of Cary Lake, I have seen White Spruce trees the largest of which measured twenty-nine inches in diameter, two feet above the ground. This was, of course, very exceptional. Mr. Low reports 18 inches as no

uncommon size for the species in Labrador, and 20 inches at one locality near Lake Mistassini.

Dr. Bell reports cut Spruce logs on Lake St. Joseph 18 and 20 inches in diameter.

In connection with the forest resources of the District, it is very much to be regretted that disastrous bush fires are of such frequent occurrence, entirely destroying large areas of valuable timber from year to year, which may have been a century or more in attaining its growth.

MINERALS.

From the third and last great division of natural resources we may expect, in course of time, the greatest results.

There is every reason to believe that many parts of this great District will prove to be rich in the possession of minerals. As yet neither the prospector nor the miner has operated to any appreciable extent within the circumference of our vast district, but from what preliminary exploratory work has been carried on, it is abundantly proven that many large mineral areas exist, and only await means of access for development. The following is at least a partial list of those already reported :

1st. Iron(haematit and magnatit).—Extensive deposits in various localities in Labrador, on the Albany River, and near the east end of Lake Athabasca.

2nd. Copper.—Extensive deposits on west coast of Hudson Bay, also south-west of Lake Mistassini, on East Main River, and elsewhere.

3rd. Silver.—Found associated with lead in the limestone of Cambrian areas of east coast of Hudson Bay, where it occurs in quantities sufficient to be of economic value. It has been traced for a distance of twelve miles, and has given assays of from 5.104 to 12.3 ounces silver in the ton.

4th. Gold.—Discoveries of this most coveted metal have been reported from the Lonely Lake region, the west coast of Hudson Bay, and the shores of Repulse Bay.

5th. Mica.—Large specimens have been obtained from the north shore of Hudson Straits, also from near Lake Manouan in Labrador. From the Ison-Glass River, where a quarry was opened as long ago as 1685, from Lake Winokapaw, and elsewhere.

6th. Graphite.—Found on north shores of Hudson Straits, etc., etc.

7th. Asbestos.—Found on J. Gordon Island on east coast of Hudson Bay.

8th. Coal.—Lignite coal reported to exist on Coal River, a tributory joining the Moose River at about 114 miles from tide water.

9th. Anthraxolite.—This mineral has been found at Lake Mistassini, at Pet-it-sik-apaw and Men-i-hek Lakes in Labrador, and on Long Island in Hudson Bay, from which latter locality an analysis of some samples gave 94.91 per cent. of carbon.

10th. Jasper.—Is found in large masses in several places in Labrador, whence it is easily obtainable.

On the Koksoak River there is a thick band of apple-green jasper, brecciated with small angular fragments of the red variety, which might be used for pannels, etc.

11th. Agates.—Found on east coast of Hudson Bay.

12th. Labradorite.—Large and beautiful crystals of this mineral are found in great abundance on the north-east side of Lake Michikamau for a distance of ten miles or more, besides other places in Labrador.

The above lists might be greatly extended, but I think that I have already shown that the Hudson Bay District, vast in its extent of territory, is not likely to prove less vast in its natural resources, and I am convinced that the sooner we provide ourselves with some adequate means of access and egress to this great realm of isolation, the better it will be for the trade and commerce of our country, and for the thousands of those who may go up and possess themselves of "Our Great Northern Heritage."

DISCUSSION.

Mr. Southworth—You refer in your paper to the very serious losses in that district from fires. To what do you attribute the fact that so much of that territory has been burned over—the causes of the fires? I notice Dr. Bell attributes it nearly altogether to lightning. Do you think that is the cause, or is it due rather to the carelessness of the Indians and traders in that country?

Mr. Tyrrell—I think it is to a very great extent due to the carelessness of the Indians, but where prospectors have entered the field they are perhaps as bad or worse than the Indians, often being anxious to get rid of the growth, of whatever nature it may be, in order to lay bare the rocks. But where the country is not occupied by the prospectors, such as the great Barren of Labrador, I think that it is almost entirely due to the carelessness of Indians. They have a practice amongst them of signalling each other, such as

notifying an inland tribe of the crossing of the deer at a certain place in a river where they may be expecting them. In order to notify these neighboring tribes they will kindle a great fire, and that often results in the destruction of large quantities of timber. I think it is almost entirely due to the carelessness and wilful destruction of the Indian.

Mr. Southworth—I am glad to have your opinion about that, because I noticed Dr. Bell has given that as a natural phenomenon—forest fires—and he takes it as a sort of rotation of crops on the part of Mother Nature, and gives the Jack pine as a tree that will not shed its seeds under any other circumstances as an evidence of the fact that the tree has been provided for such a contingency. That is, of course, incorrect, because Jack pine will reproduce itself by its seeds in the same way as any other tree. But last summer in the north we put out a fire that was occasioned by an Indian who left his camp fire burning on the ground, and I have only heard of one or two authenticated instances where fires had been caused by lightning, and it seemed strange that that whole country should be entirely burned over by lightning, which is generally accompanied by rain to put out the fire.

Mr. Tyrrell—I know that last season, when I was travelling through the Lonely Lake District and the district around Lake Minnitakie, the whole country was burning. That was largely due to the work of prospectors. There had been a recent influx of prospectors, and almost everywhere where their camps had been they left a fire trail behind them.

Mr. Stewart—Are there any blueberries up there ?

Mr. Tyrrell—No, it was a wooded country; next year the blueberries may have a chance.

Mr. Stewart—Indians sometimes fire a country that berries may come up.

Mr. Niven—I have been in the bush more or less for thirty years, and I never knew an instance of lightning causing a fire yet. Most of the fires of recent years I think have been started by prospectors. I know that in the Rainy River District some five years ago we were almost smoked out and driven out, in fact had to run through the flames very often, as it was a dry season, and I am quite certain there were thousands and thousands of dollars' worth of pine destroyed that summer by prospectors simply burning the ground so that they might see the rock.

So far as my experience of the Indians goes, I do not think that in the parts of the country where I have been that very many fires could be attributed to them. They hunt, and they know that

the fire destroys the fur, and I have found them very careful, although in the tract of country Mr. Tyrrell mentions—Minnitakie Lake and from that to Lac Seul—the country has all been burned some few years ago. I don't know how that fire originated, but it was a very serious one.

Mr. Stewart—I would like to ask Mr. Tyrrell, in speaking of the whale fisheries, whether our Government should take some means to protect them. I am not clear whether Hudson Bay is regarded as an inland sea—whether the Canadian Government have power to prevent foreigners coming in. There is some talk now about a railway to James' Bay. But so far I have been unable to see how a railway from there to Toronto would be of use in bringing any of the fishery products here. Certainly the whales would not be brought to Toronto and then sent down to Montreal and shipped on a vessel for England.

And again, the other fisheries there are not of very great value at present, and as for carrying grain we would scarcely send the grain from here to James' Bay and thence to England. As I said before, there is a great amount of ignorance shown by those who write regarding the country between here and Hudson Bay. If preliminary explorations were made we would know whether the railway would be of any use to Toronto or not. It seems to me that at present, at least, such a railway would not have enough to do—I cannot see what it would do. I would be very glad if anyone here can give any reason to make me think otherwise.

Mr. Tyrrell—In replying to Mr. Stewart's remarks, I may say I have not undertaken to look at the question from a Torontonian standpoint at all; I have not undertaken to show whether it will be of any benefit to the city of Toronto, or whether it will not. I have merely made an effort to show what the resources of the district are, and then if financiers and business men think those resources are going to be of any benefit to Toronto, why let them act on their opinions.

I think that some such project as Mr. Stewart has called attention to on several occasions—that is, the making of preliminary explorations in advance of surveys, would be a decided step in the right direction.

The information which I have endeavored to present in this paper has been gleaned as best I could get it from official reports and from some personal knowledge, but the amount of information available is very meagre.

If the Government were to take the matter up and send out some of our intelligent surveyors to look into this matter and determine what we may count on getting, and what the district really is like, it would be, I think, a benefit to the country.

Mr. Stewart—What about the closed sea ?

Mr. Tyrrell—As to that, there is no doubt it is purely Canadian water. There was away back in 1670 something of a struggle maintained for some years between the British and the French for the supremacy of those waters, and it concluded by the Treaty of Utrecht, by means of which the French ceded all rights in Hudson Bay to the British.

Mr. Stewart—That might be, but that would be simply the French occupation there—they had some rights of occupation—but I mean as to whether it is really a closed sea.

Mr. Tyrrell—I think it is admitted to be such by the best information which I have been able to obtain; it is considered, I know, by members of the Senate who have spoken on the matter in Ottawa to be a Canadian sea exclusively.

Mr. Stewart—It is pretty well closed.

Chairman—Has not the City Council of Toronto appointed a Commission—three Commissioners—to enquire into this question as to the economic resources and the best route for a railway, and as to whether, from a financial standpoint, it would be a safe undertaking ?

Mr. Tyrrell—Yes, I believe they have appointed a Commission to do some work; I don't know what the programme is.

Chairman—I believe they have power to expend a certain sum of money ?

Mr. Tyrrell—There is an appropriation of $5,000.

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

SOME CAUSES OF LOSS IN GOLD MINING IN ONTARIO.

By CAPT. J. F. WILLIAMS.
Toronto.

The contention is that we have mines standing idle, which would yield more gold per ton than some that are working and paying dividends on lower grade ore, and if these mines can do it, why not others ? It seems to me that since the conception of gold mining in Ontario it all has been uphill work and great loss of capital in some places. No doubt, ore that is very refractory and difficult to treat will account for some of the failures in the past, but, on the other hand, there are mines with free milling ores which at the present day ought to be working. There has been a large amount of work done on some of them, machinery erected, everything put up for the extraction of the precious metal, gold veins carrying gold in paying quantities, everything that is needed for the successful working of the mine, yet they have been failures in many instances when the mill has been put in operation on the ore. It has been found that it did not carry as much gold per ton, as the mill test showed that a reliable firm made for them, before the erection of their own mill; yet they cannot find the gold in the tailings. It is evident that a great loss is taking place, and unless the evil is cured the enterprise must be a failure. The mill man says he is attending to his duties, and catching all the gold possible, which shows by the tailings. Therefore, it is evident the loss is not in the mill.

It seems to be a chronic case when a mine shuts down; the cause is generally attributed to some fault or other with the mill; while, if the cause were found out, it would show it to be due to some other defects outside of the mill. Therefore, I will try and show where great loss occurs outside the mill. I will not go into the cause of losses to a great extent, but will try and show where losses do occur. In a mine just opened up and the mining is near the surface, say in starting to sink a shaft, or open work. In most of the mines there is generally a large amount of prospecting done. First, to show that there are veins on the property. Second, to determine what kind of mineral they bear. Third, to see if they

carry ore in a paying quantity. We will say the vein found contains gold; we notify the parties that we represent that we have found this vein. I am notified to send so many tons of ore to a certain firm for a mill test; the wish of the parties carried out, the ore is mined carefully for fear any gold might be wasted, carefully put in barrels and sent on. While that is in transit and being tested, the vein is being stripped on its course; after a while the returns are sent back showing good results, and gold in paying quantities and not refractory.

Suppose that the quartz is of a honey-comb nature; the cells carry a large amount of gold in the leaf form, which needs careful handling and mining near the surface; this has been strictly attended to so far. The parties come to the conclusion that they will erect a milling plant, for the circumstances warrant it. Now, word is sent to start mining operations on the lode and get out all the ore I can for the mill, which will be erected at once, so as to have a supply on hand. As you have noticed above, the ore that was sent away for a test was got very carefully so there should be no loss. But now mining has got to start; men are engaged; everything ready for the mining of the ore, but no provision made for the ore to be carefully put away till wanted. No thought of the loose gold in the cells. What was going to come of that while waiting till the mill was ready? No floor of any kind made to put the ore on, but simply to take it from the lode and throw it to one side on a pile of loose rock and underbrush. Ultimately the fine gold that was loose found its way into the crevices of the rock and other debris lying around, which, when wanted, could not be recovered and was lost.

Another way of loss in gold has come to my notice, namely, blasting. I have noticed men at work on a gold reef drilling; it was known that it carried gold in paying quantities, but after it was mined it would scarcely pay for milling. This might look strange, but nevertheless it's true; the loss occurs in this way. In the blasting operation the hole would be overcharged, and when the explosion occurred the ore could be seen cutting off the limbs of the trees. The hole that ought to be charged with judgment sufficient to break the ore and keep it in the workings was overcharged, the ore all blown away, and what gold there was in it was lost. From time to time an average sample would be taken from these workings in a very careful manner, sent to the assayer, the returns would be satisfactory, still carrying gold in paying quantities; that was all right, but when everything was ready at the mill the prospects for the company looked bright. The mill started on ore that ought to realize so much per ton, but when the clean-up came it was far short of that figure, then some one says this cannot be the right mill for this ore. The

mill is condemned when the fault is in the mining, and the loss occurred before it ever reached the mill.

It is a great drawback to any company either with a large or small capital which has spent a large amount of money to have its ore tested before putting in machinery to make sure, to find that the best part of their lode has been lost. It was on that pile of ore its hopes were centred. Other men were watching what the result would be; if satisfactory, they would take stock. There were so many tons put through, so much gold was recovered, the thing was not satisfactory, therefore they would not have anything to do with it. The lode had been worked deeper, it would cost more per ton now to mine it; in other words, it would cost twice as much to mine it now as what it did above, therefore the company's money has run out, making it impossible to carry on the work any longer. After a large, expensive operation the mine is shut down, being, in the opinion of some, no good, played out, when at the same time here is gold in the mine in paying quantities, but through mismanagement at the start the company was handicapped. If gold is worth mining at all, it is worth mining properly, and I firmly believe that if our mines were carried on with the proper mining system, and everything was done to the best interests of the company, and some things left undone that are being done till the mine gets on a good footing, and expenses kept down, and things only erected and put up when needed, and the demand called for it, there would be better times in mining. It is a very bad policy in mining to think a thing is needed. It is no use to work a mine on a thinking system, to think a thing is required, and when it is there and costs a large amount to get it there, and then see it is no use. The thing is to be sure it is needed, and not to spend your employer's money on a thing that is not required. Another thing is to make a success. If you have some piece of work to do, know what you are going to do before you start. Be certain on that point, carefully weigh the matter over in all its details. Is it feasible? Will it answer the purpose it is intended for? Will it meet all the requirements which it will be called on to do? But do not have a half-a-dozen men working at a thing for three or four days, then find out that it is wrong, and that some other method would have to be introduced in place of the one that has been worked on. But be sure that you have it down right before starting it, in all its minute details, and when completed that it will be not merely an ornament, but a useful factor in the working of a mine. Mining as a rule does not call for frills and tassels in its different branches: it's these kinds of things cost money to get. What is wanted most in the erection of things pertaining to the working of the mine is strength and durability to stand all pressure that is brought to bear on it from

all points, for the safety of the miners and the successful working of the mine.

In starting a mine, if these things were considered at first, and a little less hewing and planning done, not so much of a surface showing made. That is not what makes a mine. It is a poor policy to make a little town on the surface first, and then look around to find the mine, after all the available cash has been spent in building up the town. That is not what the company wanted, or what it intended the money for. It was to open up the veins and prove them, first develop them in depth, open them out on their strike, prove their value, and ascertain first if it will make a paying investment. This to be done at a cost which the company will be able to meet.

But the company meets with a drawback. It finds that the money it had is gone. The shareholders visit the mine to see what the prospects are, to find that the mine is having a building boom on the surface. But down in the mine things are very quiet, as it was necessary to get some of the miners up on the surface to help to get things in shape, as it would not be wise to have anything out of order at the surface. This I maintain is wrong both to the Company and to the mine, for they are handicapped in this way. Money has been spent too freely on the wrong part of the mine, and instead of having their mine opened up with about two years' supply in sight, the company finds itself with about enough to make a mill run with. At the clean-up it finds it has a vein producing gold in paying quantities, but it cannot work the mine, for the simple reason that it has no money to pay the expenses to get out ore and enlarge the underground workings, and to get out ore enough to meet the capacity of the mill. Therefore, after spending a large amount of money, it is compelled to close down the mine. Then comes the question: Why did not such and such a mine pay? They could not have found anything there, and the mine gets a reputation as being no good, played out, when such is not the case, and this makes it uphill work for any company to fight against. Therefore, if a mine shows a good vein as far as it has been worked, and in a mill test produced gold in paying quantities, the fault cannot be in the mine. When things like this occur with a mine, it not only injures the reputation of that mine, but the district which it is in suffers to a certain extent with it. I know of one mine in particular that is closed down to-day, that in the mill run that was made on the mine produced gold in paying quantities, as I put through the run for the company in its mill erected on the mine. So that is conclusive proof that there are mines that would pay to work that the to-day lying idle on account of the way that work was done on them, in an unbusi-

ness-like manner in the start. But if the mines had been worked according to the means of the company, and only things erected that were absolutely necessary to put them on a working and paying footing, some of them could have been put there with the capital the company had in hand. But when so much unnecessary work is done, causing an expenditure which in most cases is an unredeemable loss, it puts a company with a small working capital to the wall. Practical mining involves more than some may think; it is not merely to drill a hole and then launch out as a practical miner and take on in some mine as one who knows all, but in fact would not know when the brass holes in the wind bore were choked, or the pumps going in fork, or a goose neck shackle from a squatter. A practical miner, from his boyhood to manhood, has to learn a lot to be a success in life, or a success to those that employ him. These are some of the different things he learns practically: Tramming, filling, mining in all its different methods, shaft man, pit man, timber man, to understand the working of a mine in all its details, to know what is required for the different workings, to be able when in charge of a mine to be not only able to give an order for a piece of work to be done, but to have an experience that if there is no one else in the mine can do it, to be able to turn in and do it himself, and when there is a dangerous piece of work to be done, to be there and take your place with the rest, and to never ask a man to go where you are afraid to go yourself. It looks bad when there is danger ahead, when the mining captain is waiting with his miners for his superior officer to come to help to carry it through, to have word sent saying that he has had a bad night or has a headache, but to go on with the work, it's all right. A practical miner in charge of a mine will stand by his men and share danger with them.

DISCUSSION.

Mr. James, Jun.—I don't understand how there can be a loss in blasting?

Captain Williams—My meaning is this, suppose you work an open cut, and you drill a hole in a certain place in the vein, and you overcharge that hole, when the explosion occurs the ore is driven about, and when you get back to the workings there is a vacant space and the ore is all gone. I have seen them going round with a basket picking it up afterwards.

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THE SEWAGE PURIFICATION WORKS OF WORCESTER, MASS.

By CAPT. W. F. VAN BUSKIRK, O.L.S., A.M. Can. Soc. C.E.
City Engineer, Stratford, Ont.

Engineers, as a rule, have little time or money to expend in travelling and making examinations of works such as those at Worcester, and it is difficult to get descriptions of engineering works, as the college professor and the mechanic fill the pages of the various Canadian engineering publications with mathematical problems and trade advertisements.

It occurs to the writer, therefore, that a short description of the works and of the experience of the city of Worcester in dealing with what is recognized to be one of the most difficult problems with which towns have to deal, may prove of interest, and may possibly be of some value to members of the association in considering problems of like character.

The plant at Worcester, Mass., for the chemical treatment of sewage has been for many years the largest and most interesting purification works in America. The plant was well built and has been well managed, so that we may take it for granted that no better results can be obtained by any similar plant operated under similar conditions.

The city of Worcester is situated upon the Blackstone River, has a population of about 98,000, and has in the neighborhood of 80 miles of sewers, which receive large quantities of manufacturing wastes, as well as the ordinary domestic sewage and surface water. The quantity of sewage was largely augmented by the flow of a small masonry enclosed stream. This water is now being separated from the sewage proper, and all additions to the sewerage system are being made on the separate plan, as it is not possible to properly treat the very large quantity of sewage now flowing into the river.

The Blackstone River is not used as a source of public water supply, but has, below Worcester, many dams for the storage of water for power, etc., for the numerous mills situated on its banks. Large quantities of organic matter from the sewage were formerly deposited in these ponds and in the bed of the river,and became exposed to the atmosphere during periods of low water. The

foul odors given off by these deposits were considered dangerous to health and were declared a nuisance; so that in the year 1886 the State Board of Health ordered the city to purify its sewage in some manner before discharging it into the river. Mr. Charles A. Allan, M.A., Soc. C. E., City Engineer, was sent to Europe to examine the most important sewage purification works, and upon his return reported that the sewage of Worcester could be most economically purified by chemical treatment, and that the effluent would be sufficiently pure to prevent the serious pollution of the river.

Acting upon Mr. Allan's recommendation, the city, in 1889, constructed six precipitation tanks, each being 66 2-3 x 100 feet x 7 feet deep, and these were put in operation as soon as completed.

Since that time there have been added ten new tanks, each 40 feet by 166 2-3 by 7 feet.

The capacity of the works is now upwards of 15,000,000 gallons per day, providing for the entire dry weather flow of the sewers.

The lime used for precipitation is slaked and mixed with water in two tanks, 8 x 6 feet each, the mixture being agitated by compressed air delivered by perforated wrought iron pipes placed in the bottom of the tanks.

The milk of lime is delivered to the main outfall sewer by an iron pipe entering at a point about 100 feet above the screen chamber. Sulphate of alumina was formerly used with the lime, but was discontinued. The quantity of lime used is about 900 lbs. per million gallons of sewage, or 40 tons per week, at a cost of $6 per ton. This quantity is much less than is generally used, owing to the fact that the sewage of Worcester contains at times large quantities of iron salt from wire works, which is run into separate tanks and used gradually in connection with the lime.

After receiving its charge of lime, the sewage passes through a screen chamber, where all large substances are removed; thence flows down a mixing channel, with rather a rapid fall, to the channels between the settling tanks, whence it is directed, along with a small amount of the sewage containing the iron salts, into the various tanks, by means of movable flash boards. The sewage passes slowly from one tank to another, the solids in suspension gradually sinking to the bottom, until it reaches the last one in operation, whence it flows out over a weir to a channel which conducts it to the river. The effluent looks bright and transparent, but appears to contain a considerable quantity of lime in solution at times, as the stones with which the outlet channel is paved were coated with lime.

From one to three tanks are "cut out" each day, and after

being allowed to stand quiet for a short time, the clear liquid is drawn off by means of hinged floating arms from pipes provided with valves passing through the walls of tanks.

The sludge deposited in the bottom of tank is then run off to the sludge well through masonry channels located under the sewage channels between the tanks.

It is then pumped from the well by a Shone ejector, the air for which is compressed by power from a water wheel driven by the effluent from the tanks at the main outlet. After leaving the well the sludge is deposited on beds where the water is gradually drained off. The sludge has not been utilized to any great extent, but it is reported to be growing in favor, and presses are being put in which will leave the material in a form that will permit of economical handling or disposal.

The force of men generally employed on the works consists of four day men and two night men, occupied in cleaning tanks, etc., and one day man and one night man employed in making tests of sewage, in order to ascertain the quantity of lime to be applied.

An idea of the efficiency of the process may be gathered from the fact that 54 per cent. of all the organic matter and about 92 per cent. of the suspended matter contained in the sewage is being removed.

Notwithstanding the fact that nearly all of the suspended matter is removed, the town of Millbury entered action a short time ago to compel the city of Worcester to further purify its sewage, and in consequence of such action the city employed Mr. Samuel M. Gray and Dr. Drown to make a report on the plant. They have recommended that the effluent from the works be further purified before being discharged into the river, and for this purpose an area of ten acres is being prepared for sand filtration. There is a little doubt, however, whether this will abate the nuisance or not, as the river bed and mill ponds are still covered with the organic matter deposited before the works were put in operation and during heavy storms since that time when the whole of the sewage was not passed through the tanks.

The report above mentioned affords further evidence of the fact that purification by chemicals is an incomplete process, and the lime and organic matter remaining in the effluent may give trouble when discharged into streams and small bodies of water.

The experience of Worcester is particularly interesting, as being in all respects similar to the experience of England, where it is found that notwithstanding the many improvements in settling tanks and in the methods of applying chemicals, it is not possible to produce effluents of sufficient purity to be discharged into the smaller rivers without causing complaints, and, as a

consequence, the effluents are generally subjected to further treatment by rapid filtration through gravel, coke, or some such material.

Chemical precipitation, it is true, may in some cases give a degree of purification sufficient for the conditions which obtain, but the writer is of opinion that it will in most cases prove less expensive to treat sewage by rapid filtration through gravel, aided by a current of air; and when the conditions demand complete purification, the effluents can be filtered in the ordinary way at a very high rate per acre.

It has been shown by experiments conducted by Board of Health of the State of Massachusetts that Rapid Filtration through gravel or coke gives an effluent comparable in all respects with that obtained by Chemical Precipitation under the most favorable circumstances and has the advantage that the sludge is disposed of, as it is consumed in the pores of the filter.

Recent experiments in England confirm the conclusions of the Massachusetts Board of Health, and we may expect in the near future to find many of the chemical plants supplanted by more scientific and less costly methods.

DISCUSSION.

Chairman—Did you mention, Mr. VanBuskirk, what the total discharge of the river itself was into which the effluent was emptying ?

Mr. VanBuskirk—No, I did not.

Chairman—Have you estimated the cost per head of population that this process involves ?

Mr. VanBuskirk—About three cents, I think.

Mr. Butler—Per day ?

Mr. VanBuskirk—For a year.

I might say, Mr. Chairman, I have been there four or five times, but I thought I would make a short description of it, and if anybody would like to find anything more about it they can find it in the files of The New York Engineering News. There was a complete technical description of it about a year ago. I don't know that it gives the cost anywhere, but the cost of running that works is somewhere about $25,000 a year.

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"THE PRINCIPLES OF EVIDENCE."

By M. J. BUTLER.

Napanee.

The subject matter of this paper is prescribed for the examination of candidates for admission as Ontario Land Surveyors. Hitherto, fortunately for the most of us, a very mild interpretation has been given to the phrase by the Board of Examiners. An interpretation more in keeping with the intention of the Act will likely be adopted for the future. Let us seek to analyze the phrase "The Principles of Evidence," in the hope that we may clearly apprehend what is intended. By the word "Principles" we understand the elemental fundamental truths of a science. By the word "Evidence" "That which tends to prove or disprove any matter in question, or to influence the belief respecting it. Belief is produced by the consideration of something presented to the mind. The matter thus presented, in whatever shape it may come, and through whatever material organ it is derived, is evidence."—Prof. Parker, Lectures on Medical Jurisprudence in Dartmouth College, N.H.

Greenleaf, vol. 1, chap. 1, defines Evidence as "That which in legal acceptation includes all the means by which any alleged matter of fact, the truth of which is submitted to investigation, is established or disproved."

Evidence may be considered with reference to its *instruments*, its *nature*, its *legal character*, its *effects*, its *objects* and the *modes of its introduction*.

The instruments of evidence, in the legal acceptation of the term, are:—

(1) Judicial notice or recognition. (2) Public records. (3) Judicial writings. (4) Public documents. (5) Private writings, as deeds, writings, contracts, wills. (6) Testimony of witnesses. (7) Personal inspection by the jury or tribunal.

In its nature evidence is direct or presumptive, or circumstantial. Direct evidence is that means of proof which tends to show the existence of a fact in issue, and does not arise from any presumption. Evidence is direct and positive when the very facts in dispute are communicated by those who have the actual knowledge of them by means of their senses. In one sense, there is but

little direct or positive proof, or such proof as is acquired by means of one's own senses; all other evidence is presumptive, but in common acceptation direct and positive evidence is that which is communicated by one who has actual knowledge of the fact.

Presumptive evidence is that which shows the existence of one fact by proof of the existence of another or others, from which the first may be inferred, because the fact or facts shown have a legitimate tendency to lead the mind to the conclusion that the fact exists which is sought to be proved.

Circumstantial evidence is sometimes used as synonymous with presumptive evidence; but presumptive evidence is not necessarily and in all cases what is usually understood by circumstantial evidence. The latter is that evidence which tends to prove a disputed fact by proof of other facts which have a legitimate tendency, from the laws of nature, the usual connection of things, the ordinary transactions of business, etc., to lead the mind to a conclusion that the fact exists which is sought to be established. (See 1 Starke's Ev., 478.)

In its legal character, evidence is primary or secondary and prima facie or conclusive.

Primary Evidence: The best evidence, or that proof which most certainly exhibits the true state of facts to which it relates. The law requires this, and rejects secondary or inferior evidence when it is attempted to be substituted for evidence of a higher or superior nature. For example, when a written contract has been entered into, and the object is to prove what it was, it is requisite to produce the original writing, if it is to be had; and in that case no copy or other inferior evidence will be received. So, too, when the question is as to whether a post is an original one—the evidence of one who knows it to be such must be had if obtainable.

This is a rule of public policy, grounded upon a reasonable suspicion that the substitution of inferior for better evidence arises from sinister motives and an apprehension that the best evidence, if produced, would alter the case to the prejudice of the party. This rule relates to the quality of evidence, not to the quantity of it.

Secondary Evidence: That species of proof which is admissible when the primary evidence cannot be produced, and which becomes by that event the best evidence.

But before such evidence can be allowed it must be clearly made to appear that the superior evidence is not to be had. The rule requires that the party or person who possesses it be applied to whether he be a stranger or the opposite party; in the case of a stranger he must be served with a subpoena duces tecum, if the opposite party it is sufficient to serve him with a formal notice demanding the documents or thing, and in all cases proof must

me made of the facts of such service. There is a difficulty when a stranger, after having been served with a subpoena duces tecum, refuses to supply the evidence. No secondary evidence can be given, but he is liable for contempt of Court, and may be made to respond in damages for such refusal. A party to the cause after service of the notice to produce, who refuses to obey the demand, cannot afterwards contradict the secondary evidence, even though it be inaccurate.

It has been decided, at least in England, that there are no degrees in secondary evidence; and when a party has laid the foundation for such evidence he may prove the contents of a deed by parol, although it appear that an attested copy is in existence.

Prima Facie Evidence is that which appears to be sufficient proof respecting the matter in question, until something appears to controvert it, but which may be contradicted or controlled.

Conclusive Evidence is that which establishes the fact: as in the instance of conclusive presumptions, etc.

Admissibility of Evidence: In considering the legal character of evidence, we are naturally led to the rules which regulate its competency and admissibility, although it is not precisely accurate to say that evidence is in its legal character competent or incompetent; because what is incompetent for the consideration of the tribunal which is to pronounce the decision, is not, strictly speaking, evidence. But the terms incompetent evidence and inadmissible evidence are often used to designate what is not to be heard as evidence, as witnesses are spoken of as competent or incompetent.

As the common law excludes certain classes of persons from giving testimony in particular cases, because it deems their exclusion conducive in general to the discovery of the truth, so it excludes certain materials and statements from being introduced as testimony in a cause, for a similar reason. Thus, as a general rule, it requires witnesses to speak to facts within their own knowledge, and excludes hearsay evidence.

Hearsay is the evidence, not of what the witness knows himself, but of what he has heard from others. Such mere recitals or assertions cannot be received in evidence, for many reasons, but principally for the following—first, that the party making such declaration is not on oath; and, secondly, because the party against whom it operates has no opportunity of cross-examination. 1 Phillips Ev., 185. The general rule excluding hearsay evidence does not apply to those declarations to which the party is privy, or to admissions which he himself has made.

Admissions are the declarations which a party by himself, or those who act under his authority, make of the existence of certain facts. A statement of all the distinctions between what is to be regarded as hearsay and what is to be deemed original evidence

would lead us too far on this occasion. The general principle is that the mere declaration, oral or written, of a third person, as to a fact, standing alone is inadmissible.

Res Gestae. But when evidence of an act done by a party is admissible, his declarations, made at the time, having a tendency to elucidate or give a character to the Act, and which may derive a degree of credit from the Act itself, are also admissible, as part of the res gestae.

The Effect of Evidence: As a general rule a judgment rendered by a Court of competent jurisdiction directly upon a point in issue is a bar between the same parties and their privies in blood or in law.

The object of evidence is to ascertain the truth between the parties to the cause.

Necessarily in preparing a legal paper there is no room for originality of matter. All one can do is to consult the legal authorities and quote verbatim, the difficulty being to know where to stop, hence in what precedes little more has been done than to abstract the excellent article in Bouvier's Law Dictionary. The writer is well aware of the imperfect and fragmentary character of this paper, and can only advise those desirous of pursuing the subject to read Reynold's edition of Stephen's Digest of the Law of Evidence. The recent work by Mr. R. E. Kingsford, Barrister, of Osgoode Hall, will probably be more in conformity with the Evidence Act of Ontario, but as the writer has not had an opportunity of reading it he is unable to judge its merits.

DISCUSSION.

Mr. Gaviller—I suppose Mr. Butler's object, especially as he is a member of the Board of Examiners, would be to frighten all future candidates into the idea they had to get several very large and expensive volumes and read up this subject, but I think it is an excellent thing having a paper upon it, and especially the paper we have just heard; because, as far as the examinations have gone at the present, if any candidate was to simply get hold of our next year's report and read this paper when printed, it would go a very long way to help him to get through his examination.

But, as Mr. Butler suggested, and it no doubt will be done in the future, the subject of Evidence will be paid a great deal more attention to as a subject of examination in the finals, and the more experience we have as examiners and have had, we find it the more necessary from the very extraordinary answers we get to the very

simple papers that have been given, and the candidates are not to blame for this, because all of us know how difficult it is in a great many cases to take an affidavit of the very extraordinary evidence that we have submitted to us, which makes the subject still more important, knowing, as long as human nature is human nature, that the tendency of all parties, especially out in the country, will be—the tendency, I say, I don't say the deliberate intention—to make their evidence coincide with what will most benefit their own property.

That is pretty well understood by all surveyors who have taken evidence as to lines and points, and the more we are safeguarded as to what real proper evidence is, and what the witness should know, and that he should give his knowledge in his evidence, the better able we shall be to draw up a decent affidavit and to get evidence upon the subject, and reject what is not evidence.

Because, as Judge Hagarty once remarked on a case in Court, in speaking to a celebrated Q.C., who was examining a witness, "Mr. So-and-so, you must remember that a surveyor is sent out in a semi-official manner. He holds a position in which he has to take the evidence before he can make up his mind what the result will be."

The question asked the surveyor on that occasion was, "What is your opinion on this case from what you heard?"

Well, now, the answer that he got was, "I knew that the case was coming into Court, I knew that the parties who were those who understood the case the best, would be examined in Court. There was a great deal of hurry in making the survey, consequently the evidence was not taken from those parties. They are here about to be examined in the Court. I have not heard their evidence, so I simply have not made up my mind what opinion to form on it."

Then, when he was constantly pressed to give an answer as to his opinion, the foregoing remark was made by Justice Hagarty.

I think we are very much obliged to Mr. Butler for the paper he has read, and I hope it is only the commencement of much information on this subject.

Chairman—When the surveyor takes evidence in the field in reference to a corner stake from a farmer who points out the stake as one which had been pointed out to him by his father as being kept up under the original survey, would that come under the definition of hearsay evidence?

Mr. Butler—I think it is hearsay evidence, and I think it is a weak point very often in the surveyor who takes it down, and I know I have done it myself, but it is not primary evidence, but it may be the best evidence obtainable under all the circumstances.

Mr. Campbell—Mr. Chairman, I think we have dealt with a

very important point this morning in this matter of taking evidence, and how to take evidence. I know something about taking evidence, and there is a heap I don't know about it, and I do not think I ever will become posted on what evidence should be admitted in trying to establish a lost point, and what evidence should be ruled out, and judging from the paper read by Mr. Butler this morning it looks to me as if volumes might be written on this subject, and Mr. Butler is the very man who could write these volumes.

It is an unfortunate thing for us as an Association that we should confine ourselves to meeting once a year, or if meeting only once a year that we should confine our meetings to two or three days, because our papers are of the greatest importance as educators, and I think many subjects have been very ably dealt with.

Now, the question of sewage purification, dealt with by Mr. VanBuskirk this morning, is a question of very great importance in this country. Nearly every city and town to-day is interested in the question of disposal of sewage and information on this subject is very much needed.

Mr. VanBuskirk is well acquainted with the system of sewage disposal dealt with in his paper, and he comes here to-day giving us personal information, or information from personal experience.

Mr. Butler has had experience in connection with the taking of evidence, and he comes here also prepared to give us the result of personal experience, and for that reason I think that these papers should be taken up and discussed more fully than they have been; or, better still, if this cannot be done, we should try to induce these gentlemen to write text-books on these different subjects for those of us who have not, owing to our multifarious and arduous duties, sufficient time to devote to a consideration of these problems.

I do think it would be of great benefit to the Association if Mr. Butler should take up the question of evidence and write a text-book, not for the use of students only, that is, those who intend entering the profession, but for all the members of the profession. I am very much pleased with this paper on Evidence.

Chairman—I think Mr. Campbell's remarks are very pertinent. I think one reason why a fuller discussion does not take place is the fact that there are a great number of papers written and the time is limited.

Another reason is, too, that in a discussion of a paper, particularly a technical paper, the paper not having been printed before the meeting, the members are not sufficiently conversant with the subject and are not in a proper position to discuss the subject.

Now, I know for two years at least the papers were printed before the meetings. I don't know whether they were printed at such an early date that they were distributed among the members,

but if the members could be induced to have all their papers sent in long enough before the annual meeting to have them printed and distributed to each member of the Association, as is done in other societies, then a better discussion would take place upon the papers, and in the case of absent members they could send in their written opinions on the papers.

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SUDBURY WATERWORKS.

By L. V. RORKE.

Sudbury.

So many papers have been read by different members of the profession on this available subject, "Waterworks," the writer feels that it may be only trespassing on your time to attempt another, but when we consider that no two systems are identical and that each plant will have one or more particular points of interest in its construction or maintenance peculiar to itself, I am encouraged to proceed. In view, however, of this, I shall only give a general outline of the system, going into details of construction only, where I may hope to attract your interest.

Sudbury assumed the dignity of a town some five years ago, and at present has a population of about 2,000. Mining, lumbering and railway operations are what engage the attention of its people, commercially or otherwise, situated as it is at the junction of the main line of the Canadian Pacific Railway with what is known as the "Soo Branch," and in the centre of the great nickel mining belt of the Province, and also being the chief distributing point for supplies to the lumbering camps of Northern Nipissing and Eastern Algoma.

In 1894 the question of a Waterworks and Sewerage System was discussed, and a By-law to raise the necessary funds was submitted to the ratepayers and carried, only a very small vote to the contrary, and the writer, together with J. R. Gordon, Civil and Mining Engineer, were engaged as Designing and Constructing Engineers by the Corporation.

That the passing of By-law met with little or no opposition (which is not generally the case) was due to the following reasons :

1st. Wells were scarce, it being necessary, to obtain good water, to bore through from 60 to 80 feet of "running sand" into the rock below, in the central part of town, and the cost of this was too great.

2nd. The water in the small river flowing through the town was totally unfit for drinking purposes.

3rd. Those who had not wells were obliged to buy water procured from a small spring within the limits of the Corporation, from water carts, at 25c. per barrel, and the poorer classes did not obtain a fresh supply as often as health demanded.

4th. The cost of water so obtained was greater than the water rates which the Corporation could supply householders for.

5th. In the business portion of the town people were compelled to water the streets by a volunteer tax during the summer months, which would be much reduced when water was more easily obtained.

6th. The hope that insurance rates, which are exceptionally high in those northern places, would be greatly reduced.

In designing the system we were handicapped in one particular. It was necessary to keep the expenditure down to the lowest possible notch and give the ratepayers water. The Corporation was enterprising, but not wealthy, and the engineers, being residents, were fully aware that the "town fathers" were compelled to finance carefully, as well as supply necessary demands, and were willing to co-operate with them and keep down expense; but not, however, with a "penny wise-pound foolish" motto, but only in such cases where the town would not materially suffer and where changes and extensions can be made in future with little additional expense. The principal clippings were all ornamental designing, extension of mains to outlying portions, extension of conduit, and filtration.

While, therefore, not being able to present to the engineering profession a perfect system, we do at least present the foundation for such, as well as fulfilling the requirements, and meeting the wishes of even an enterprising and ambitious town.

While reading the paper on "Waterworks" by T. H. Wiggins, C.E., as published in last year's proceedings of the Association, wherein he cites cases of the earlier development of water power, I was reminded of an instance which occurred here previous to the construction of the system.

There was keen competition amongst a few men for the contract of street watering, and those who had the matter in hand were surprised to receive a tender for the work much below the other figures. They, however, accepted the lowest tender, and were curious to know how he would be able to do the work for the price. The ingenuity of the man came to his help, and being aware that the filling of his water tank was where his time and labor were lost, he constructed a large paddle-wheel about 12 feet in diameter, with an open tin-can attached to the edge of each paddle. These buckets were of different sizes and shapes, however, as old oyster cans, camp tea pails, tobacco caddies, etc., were used. The wheel was placed over a small creek in town and propelled by the force of the stream; as the laden bucket passed the apex of the wheel the water was spilled on its downward course into a wooden trough which conveyed it to his tank, standing on a low bridge some 25 feet away. True, a considerable portion of the water never reached

the tank, but he saved time and made his contract pay, much to the surprise of his rival competitors.

The only available source of supply was Lake Ramsey, which is situated about three-quarters of a mile from the central part of town and is 25 feet below the level of same, rendering a pumping system necessary. Lake Ramsey, which is so named after the late W. A. Ramsey, Chief Engineer of the C. P. R. construction, is five miles long and from one-half to one mile wide, and is fed by small streams and springs from its immediate vicinity. Its position on the height of land separating the watershed of the Walmapitae River from that of the Whitefish River excludes it from being the receiver of any great extent of surface drainage, and while the water is not rated as first-class, there is nothing injurious or obnoxious in its constituents.

The pumping station is built upon the shore of the lake and consists of pump and boiler room 26 x 30 feet, electric light room 26 x 34 feet, with a one a half storey commodious dwelling above electric light part for the electrician and engineer. Just outside of station is built a well, into which the water from lake gravitates by means of 500 feet of steel conduit 11 inches in diameter. The walls of well are built from 18-inch brickwork at bottom to 9-inch at top, laid and lined with cement. The intake at end of conduit is a steel funnel placed upright to pipe, with a perforated lid 30 inches in diameter.

About one-third of a mile from the lake, and towards the town, a rocky hill stands out as though nature had placed it there purposely, on which to erect the water tank. The top of hill is 100 feet above the lake surface, or 75 feet above the town; upon this is built a steel tower 80 feet high and supporting the steel water tank, 24 feet in diameter and 24 feet high.

The tower, built by the Canadian Bridge and Iron Co. of Montreal, consists of six columns of 6-inch T iron set on bases 3 feet square, of cut stone from the Longford quarries, set in cement and bolted to the solid rock below. These columns are braced by three sets of horizontal girders of same dimensions and with wrought iron inch tie rods. The columns are placed with 50-foot spread at base and converge to 25 feet at top.

Water is pumped into this elevated tank through a 10-inch main, and from thence gravitates through 10, 8, 6 and 4-inch mains throughout the system.

The pumping plant consists of two direct-acting duplex Northey pumps, each guaranteed to pump at a safe and reliable fire speed 30,000 gallons per hour, with steam pressure of 80 lbs. per square inch. These are connected to delivery main with proper valves, to allow single or double action. The surface of water in well at low water mark is 9 feet below the pump valves.

The system comprises, approximately, 500 feet steel conduit, 11 inches diameter; 1,800 feet 10-inch main, 3,500 feet 8-inch main, 7,000 feet 6-inch main, 4,000 4-inch main, 26 fire hydrants with double hose connection, and 14 valves.

The principal portion of mains in the town are connected in circuit, there being only two dead ends upon the entire system. The distributing main to town branches from the main leading to tower is about 400 feet from the latter, at foot of hill, thus enabling the tank to be shut off at any time by means of a gate valve, and allowing direct pressure from pumps over the system in case of repairs at any time to tank, or in case of large fires, but owing to the high pressure obtained from the tower, the latter may never be required. Indeed, some householders grumbled that the pressure at tap was too great (a good fault); but to insure sufficient pressure at higher points within the town, it was necessary to give 80 lbs. in the lowest portion. The water mains throughout are laid to give a 5-foot covering.

The upright pipe to tank was protected from frost as follows: A boxing of 2-inch plank, 24 inches square, was built over the 10-inch main, and the interior space around pipe thoroughly packed with mineral wool. A second boxing of 2-inch plank, 36 inches square, was placed over all, thus leaving an air space. The outer box was covered on all sides with a coating of hot coal tar.

Water tank was enclosed, both roof and sides, with inch lumber, tar paper and shingles, coated with mineral paint outside of studding, and dressed and matched lumber on inside. A space of two feet was allowed between tank and covering, and a 3-foot walk outside, with iron railing.

The connection of delivery pipe with tank is made with a special cast-iron slip-joint, to relieve the strain caused by expansion or contraction due to the temperature.

SEWERS.

A system of separate sewers was included in the work for the thickly populated portion of the town.

Junction Creek, a stream 20 to 30 feet wide, flowing as it does around the eastern and southern border of town, is the outlet for the disposal of sewage matter, and for the present population meets with the requirements, though in time the main sewer may need extending further down the stream before discharging.

This stream empties into Kelley Lake some two miles to the south-west of the town and situated further down the watershed than Lake Ramsey, the source of water supply.

The main sewer, which extends along Lisgar street in a southerly direction to Junction Creek, is of 18-inch extra hard salt-glazed

sewer-pipe. The laterals extending east and west along the several cross streets are of 12, 10 and 9-inch pipe, as the case demands. The house laterals are of 6 and 4-inch pipe.

In laying the mains junctions were placed every 50 feet (the width of lots), and these, where present connection was not needed, were plugged by means of a circular wooden cap sawn to fit and cemented in. Extra precaution in all sewer joints was necessary, owing to the nature of the soil, which was at that depth a "running sand," and, if at all wet, would find its way through joints like water.

The greatest depth on main sewer was 20 feet, and this trench had to be timbered throughout to prevent caving in. The lower 4 feet of excavating had to be bucketed, shovelling being impracticable. All sewer trenching had to be tightly cribbed to enable safe and sure, as well as speedy, work. As a support or foundation for the pipe in main sewer, two layers of 2-inch planking, sawn in 3-foot lengths, were laid angling across the bottom of trench, the upper layer angling in an opposite direction to that of the lower.

The depth at which this "running sand" is found varies according to the amount of rainfall; in a very wet season three and a half feet is the maximum depth, while in a dry season one can dig five feet at the same place without fear of caving. When exposed to the drying elements this sand becomes quite hard and compact in a short time, but powders very finely.

Manholes were built of brick and cement, with cast-iron covers, over main sewer at all junctions with street laterals, and also at upper ends of street laterals and bends. Through these the sewers are flushed by means of hose attached to hydrants.

On all house laterals a cesspool trap is placed at street line for the protection of mains, which has served as a good check and shown in a few cases where inferior plumbing and careless occupants would ruin a sewer system if not protected by supervision or check as above.

In most cases a uniform grade of 3 inches per 100 foot was adhered to. The smallest grade which I had to resort to was .7 inch per 100 foot.

At outlet of main sewer there is quite a steep grade for 100 feet down the bank of creek, and the discharge is affected below the surface of the water. A solid retaining wall of brick and cement on face and rubble work behind is built around outlet for protection.

A stranger coming into Sudbury certainly fails to see any beauty in his surroundings. But he will be surprised on visiting the small and unpretentious homes of citizens to find all the modern conveniences and comforts afforded by the Waterworks, Sewerage and Electric Light Systems owned and operated by the Corporation of the town.

DISCUSSION.

Mr. Morris—Mr. President, with regard to the trouble they had with their sewerage, I can well understand it, because in 1881, while at Sudbury, it was found impossible, no matter to what expense we went, to dig wells of any kind. I was over a year and a half at Sudbury, and I don't know of a single well ever being dug, and while the work was going on at Sudbury I was always prepared to hear that the putting in of their sewerage system was found to be impracticable owing to quicksand, and the fact that it was found practicable is of some interest, and it is one of those cases where, no matter what the expense is, it is of great moment that the people should have water, for their own supply was merely from springs called Nolan's Creek, and another creek. In this case they went to a great expense in a small town, and the system that they put in was supposed to be foolhardy, but it was practically a necessity, and I don't know of any other case where a sewerage system was put in under such severe circumstances, that is in the way of excavation.

Chairman—There seems to be a tendency in the present days for cities to own their water-works and electric light systems. I know a short time ago I was looking over the report of the City Engineer of Toronto, together with some other reports on the electric lighting of Toronto; he reported on it last year and two or three years ago, and I compiled a table. I know of cities having a population of from ten to twenty-five thousand, including some thirty cities, principally in the United States, one only in Canada, and I found that the cost of operating the electric light was just about 50 per cent., I think, of the amount paid the companies on the average in places of that population.

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SPECIFICATIONS.

By JAMES HUTCHEON.

Guelph.

Land Surveyors in Ontario do nearly all the engineering work in the towns, villages and country districts of the Province, and consequently are frequently called upon to prepare plans and specifications for works of various descriptions about to be undertaken in their respective territories.

If in letting contracts the bidding could be restricted to contractors who have a reputation at stake, plans and specifications might be much less complete, but this cannot be done, and as some of those tendering will be honest, straightforward men, ready to carry out the spirit of their contract to the utmost, while others will be the very reverse, the engineer should do his part in a way that will insure the carrying out of the work contemplated in a regular and proper manner, and not place the honest contractor at a disadvantage with one of less honest intentions. In order to accomplish this, the engineer himself must of necessity have a clear and well-defined knowledge of the work which he wishes to have done, and should, whenever the nature of the undertaking admits of it, supplement his written specifications with both general and detail drawings. In the preparation of both drawings and specifications he must realize that they contain the completed work, and that in preparing them he is really constructing on paper that which he wishes to have carried out in other form. He should not fail to take advantage of every source of information that may be open to him nor to avail himself of the experience and knowledge of those who may have a part in carrying out the work. This is especially important in matters of which he may not have any expert knowledge or to which he has previously given but little attention, as useful hints may often be obtained by submitting a draft of the specification to a manufacturer or mechanic in that particular line of work and adopting such suggestions as commend themselves.

Every surveyor, in the practice of the profession, will gather specifications pertaining to the particular works with which he has to do, and these he should amend or revise from time to time, as experience points out where they can be improved. Standard

specifications prepared by engineers of recognized ability are usually obtainable for the principal engineering works and should be adopted wherever applicable, making such additions or alterations as may be necessary to meet the requirements of the case in hand. New cases, however, occasionally arise to which such specifications will not apply and, with a view to meeting those, the following suggestions are offered:

Let the language of your specifications be clear, concise and easily understood, and so definite that those tendering will know exactly what will be required of them. Make the arrangement such that the essential requirements will stand out prominently and not be buried among the general conditions or clauses of less importance.

The opening clauses should give a general description of the nature and extent of the work as a whole, and where plans accompany the specifications reference should be made to them. The succeeding clauses should define or describe the work in detail, following as nearly as practicable the order in which it will be taken up in construction.

The length of this description will be governed by the complexity of the work and the nature of the plans. In preparing drawings make them as complete as possible; the specifications will then deal chiefly with the quality of the materials, the nature of the workmanship and the final results to be attained. Following this, we should have the general conditions, referring, among other things, to the time and manner of payment, the payment for extra work and what shall constitute an extra, the appliances to be used, the protection of life and property, etc.

As already stated, the chief aim should be to give a clear knowledge of what will be demanded of the contractor. If the work consists of excavation, state the extent of it, tell how it will be classified and measured, how and where it is to be disposed of. If test pits have been sunk or borings made, give the results of those trials, but in general do not guarantee the accuracy of them. Require the contractor to do all pumping and shoring, if such are needed.

If you are building masonry, describe the quality of the stone, give the thickness of the courses, the dimensions of the stones, the manner in which they are to be dressed, the proportion of headers and the nature of the backing, i.e., whether it is to be of stones the same thickness as the face stones, or of stones of various thicknesses or of rubble. If heavy stones are to be used, require them to be handled with a derrick, otherwise you may meet a contractor who will attempt to roll them into place. It is not enough to say that the pointing shall be neatly done, for the contractor's idea of neatness may differ from yours.

It is a hard matter to get ordinary mechanics to change their usual style of work, hence in places where appearance is a secondary consideration don't attempt it, but instead, adapt your specifications to the situation, as nothing but vexation will result from trying to get masons accustomed to building rubble, work to 3-8 inch joints; better in such cases use a higher grade of cement or a richer mortar, with good flat-bedded stones well bonded, and dispense with fine dressing. For mortar, give the proportions of cement and sand, how they are to be measured and the quality of each. The usual proportions are 1 of cement to 2 of sand or 1 of cement to 3 of sand. The measuring can be very easily done in bottomless boxes on the mixing board; a 350-pound barrel of cement measured loose contains about four cubic feet. In small works, where the cement will not be tested, name the brand or brands that may be used. If a quantity will be required, specify the quality by naming the strength it must give in a seven-day test, the specific gravity, the fineness of grinding and soundness in the hot test. If water gives trouble, use a quick-setting cement, otherwise a moderately slow one.

In excavating or trenching in streets, let the surface metal be kept separate to be used in finishing, have the street left in the same condition that it was before beginning the work, and let the contractor maintain the part trenched in such condition for three or six months.

If you have painting to do state the kind and number of colors to be used, as that affects the labor required. If lead is to form the body of the paint, decide on which brands you will accept and require it to be brought on the work in the original unbroken package. Ask for pure linseed oil and forbid the use of benzoine and such adulterants. If the honesty of your contractor is not above suspicion, employ an inspector who understands the business.

In undertakings where unforseen conditions are apt to arise, reserve the right to make such changes in the plans as may be deemed advisable.

Changes will affect the amount of labor and material required, therefore provide for the extra payment to be made in case of increase, and for the reduction, if the work is lessened.

Make the decision of the engineer final as to the interpretation of the specifications and whether the work is in compliance with them. Remembering that the engineer is only human; do not leave questions to be settled by his opinion where such can be previously provided for.

These suggestions might be extended, but if enough has been said to indicate the line along which the work of preparing specifications should proceed, the object of this paper will have been

attained, and for further guidance in the work I would refer you to Johnson's "Engineering Contracts and Specifications."

DISCUSSION.

Chairman—I might say Mr. Hutcheon has furnished a well thought out paper, full of practical suggestions, and one which covers and makes provision for a great variety of contracts. The paper is now open for discussion.

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THE YORK STREET BRIDGE, TORONTO.

By A. P. WALKER, O.L.S.

Toronto.

This structure stands near the foot of York street, Toronto, and affords access from the city to the water front for vehicles and foot passengers over the intervening railway tracks.

It was built under the provisions of the agreement known as the "Esplanade Agreement, 1892," the parties thereto being the Canadian Pacific and Grand Trunk Railway Companies and the City of Toronto. This agreement was one of the results of the endeavours of the Canadian Pacific to establish a freight yard in the central part of the city, and under it that Company were to construct the bridge, and the cost was to be borne in equal parts by that Company and the City, unless the Courts should decide that the Grand Trunk were liable for a share.

Plans of the proposed structure were prepared in Montreal, under the direction of Mr. P. A. Peterson, the Chief Engineer of the Canadian Pacific, and were approved by the City Engineer, Toronto. Work on the ground was commenced 1st May, 1896, and the bridge was opened for traffic about the beginning of August, 1897. The erection took much longer than anticipated, caused, in the first place, by the contractors for the ironwork being unable to obtain their raw material fast enough; in the second place, by a shipload of timber for the deck being wrecked en route; and, in the third place, by differences arising between the Company and the City regarding the finishing up of the roadway.

The general design of the bridge is a steel trestle, composed of about 32 spans, deck plate girders, ranging from 30 to 70 feet span, with wooden stringers and decks. There are also, in addition, two spans of less than 20 feet, rolled steel I beams. These girders and I beams rest on iron columns standing on stone pedestals, except at the three ends of the bridge, where there are stone abutments. The width of the roadway, except on the southerly ramps, is 37 feet 6 inches, with sidewalks on each side 7 feet 6 inches wide. On the southerly ramps the width of roadway is 32 feet 6 inches, with one 7 feet 6 inch sidewalk.

The ground plan of the bridge is "T-shaped," with the base resting on the south side of Front street, and it extends southerly therefrom across the deviation of York street and the railway tracks to Lake street, a distance of about 906 feet. Here the ramps of the bridge turn, one to the right and the other to the left, and descend to the level of the street. The length of these ramps are each about 316 feet, making a total length of bridge of 1,538 feet.

From Front street the roadway of the bridge rises with a grade of 1 foot in 20 for about 298 feet, and at the Lake street ends there are similar falling grades of one in twenty about 500 feet in length. Heavy loads to the railway freight sheds are taken over these grades every day, and no special difficulty seems to be experienced.

There are in all, three abutments and sixty-eight pedestal blocks. The foundations of the two Lake street abutments and all the pedestal blocks, except fourteen north of the south line of the old Esplanade, are on piles driven to the ledge rock. This was necessary, as this land was formerly part of Toronto Harbour, and had only been filled in the year previously with miscellaneous rubbish, earth, brick-bats, tin-cans, as well as more objectionable refuse.

When piles were to be driven, an excavation was carried down to one foot below zero level of the water of Toronto Harbour, and soundings were then taken down to the rock. The piles were then cut off the correct length and driven home with a "follower." Under the specifications the piles were to be cut off one foot below zero level, and the above method was found less expensive than actually cutting them under water, and it was very seldom that a pile had to be cut when once driven home. Only a very blunt point was made on the pile before driving. Four piles were driven for the small pedestals, 8 for the medium, and 9 for the large pedestals. Under the abutments the piles were 4 feet centres longitudinally and 2 feet 6 inches transversely.

The excavation was then carried down six inches below the top of the pile and two feet in depth of concrete put in. In some cases where the underlying material was very soft, short lengths of two-inch plank were laid flat under the concrete between the piles, in order to keep the concrete from settling in the soft material before it was set. The concrete foundation is 7 feet square under ten of the pedestals carrying the longer spans, 6 feet square under nine of the pedestals, 5 feet 6 inches square under five pedestals, and 4 feet 6 inches square under the remaining 44, and is generally 2 feet deep. The concrete was composed as follows: except when laid under water: Cement 1 part, clean sharp sand 3 parts, broken stone 5 parts, all by measure. Under water the

concrete was composed: Cement 1 part, sand 2 parts, broken stone 5 parts. The cement used was the "Star" brand, made by the Rathbun Company, of Deseronto.

Below ground the stonework is what is known as "rubble masonry;" above ground it is "rock-faced ashlar," and was built under the Canadian Pacific standard masonry specifications. The stone was brought partly from the contractor's quarries at Owen Sound and partly from the Orangeville quarry. The contractor for concrete and masonry work was David Chalmers, of Owen Sound. The piling was done by the Railway Company's own men and their track pile driver. The two top courses of the pedestals had to be drilled before being placed in position to receive the 1 1-4 inch iron rods which secured the iron columns to the masonry, and some little difficulty was experienced in drilling completely through these stones without breaking them. This drilling was done with a steam drill, half from each side of the stone.

The iron work was erected during the winter 1806-7. It was supplied and erected by the Central Bridge and Engineering Co. of Peterborough, Ont., and was paid for at so much per pound in the finished work. The bridge was designed to carry, in addition to its own weight, the following live loads, either singly or in any combination: (a) 100 lbs. per square foot of roadway and sidewalk; (b) one 32,000 lb. road roller having a wheel base of 11 feet 2 inches in length and 7 feet 4 inches transversely; (c) a string of electric cars 26 feet long, each weighing 30,000 lbs., fully loaded, on each track.

All parts of the structure were proportioned so that maximum loads should produce no greater tensile strain upon the net section than 12,000 lbs. per square inch. A wind strain of 400 lbs. for each longitudinal lineal foot, and 150 lbs. for each vertical lineal foot of the trestle bents was allowed for. All steel had to come up to the following requirements: Ultimate strength, 58,000 to 65,000 lbs.; elastic limit, 33,000 lbs.; elongation in 8 inches, 20 per cent.; reduction of area, 40 per cent., and was made by the open hearth process. Before leaving the shop it was thoroughly cleaned of all loose scales and rust with steel scrapers and brushes, and was then giving a good coating of red lead mixed with linseed oil, well worked into all joints and surfaces, and after erection the ironwork was given two more coats of paint.

All the timber in the deck of the bridge, with the exception of the sidewalk planks and paving blocks, is southern yellow pine, creosoted with 10 lbs. of dead oil of coal tar per cubic foot. On top of the joists and 4-inch plank was laid two thicknesses of best tarred paper, thoroughly sealed with roofing pitch to the planking and each other. On top of this was laid the paving

blocks, consisting of square-cut white pine blocks 8 inches x 4 inches x 4 1-2 inches deep, grain upwards. These blocks were held apart at the cross-joints by three specially made nails driven into each block up to the collar, leaving the blocks 3-16 of an inch apart. All joints and vacancies were then filled in with best paving pitch, and the roadway covered one-half inch deep with gravel. A double track girder rail for electric cars was laid across the bridge by the Street Railway Company before the paving was done for possible use in the future. The sidewalk planks are of tamarack, 7 feet 6 inches long, 2 inches thick, laid with 1 1-2 inches fall towards the kerb. The cost of the structure was approximately :

Foundation and earthwork, including piling	$4,200 00
Stone and concrete work	15,900 00
Ironwork	43,000 00
Damages to St. James Hotel property	4,900 00
Deck and roadways	28,000 00
Engineering	2,000 00
	$98,000 00

DISCUSSION.

Mr. Morris—I would like to ask Mr. Walker if there is any record of the construction of this work anywhere except what he has given in his paper.

Mr. Walker—I know of no other record.

Mr. Morris—I consider a paper of this kind to be exceedingly valuable not only to this society, but to the city of Toronto, and all those interested in large works in large municipalities.

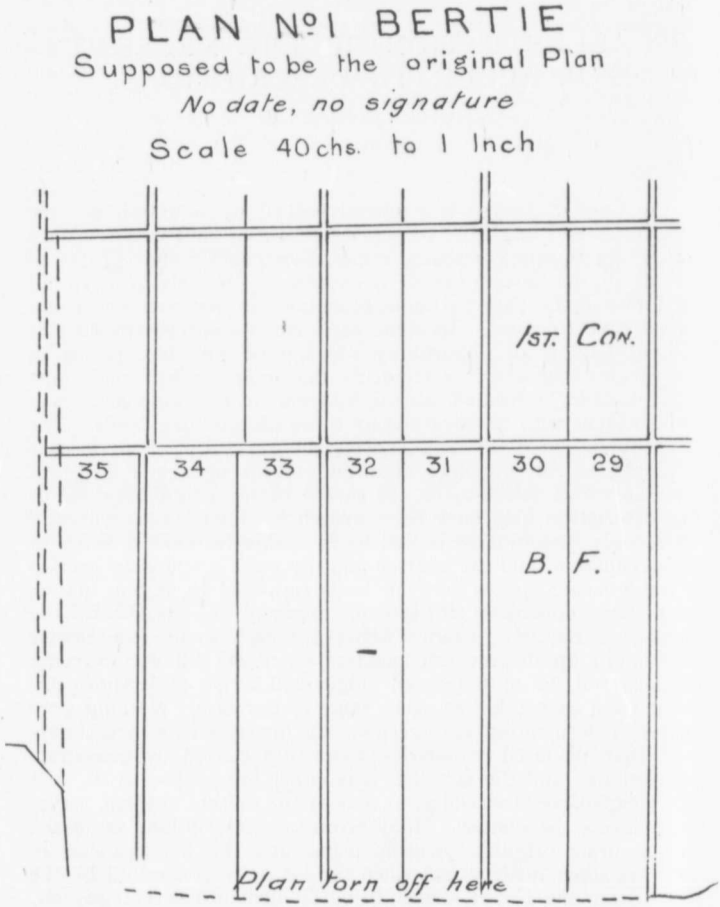
[*This Association is not responsible as a body for any opinions expressed in its Papers by Members.*]

AN ILLUSTRATION OF THE NECESSITY FOR ACCURATE DESCRIPTIONS.

By GEO. ROSS, O.L.S.
Welland.

A Land Surveyor is frequently called upon to run out the boundaries and mark the corners of a tract of land in accordance with a description containing many discrepancies and capable of several interpretations, but he is expected to be able to locate all the limits of the parcel without hesitation, so that they will stand for all time to come. In some cases he is expected to do this without having an opportunity to examine the descriptions in the various registered instruments that might affect the limits of the land to be located, although several of the boundaries may be coincident with or governed by those of adjoining lands. The owner of a parcel of land expects the surveyor whom he has employed to run the lines according to his deed and does not want any time taken up in the survey of his neighbours' lands. The description may have been written by some "conveyancer" whose only qualification is that he is unable to make a living at any occupation, and the courses and distances given may overlap or leave vacant spaces between lands supposed to adjoin. However, the unfortunate surveyor is expected to "establish" the boundaries required without delay, although should the matter be brought up in court the acutest solicitors will give varying opinions and the most learned judges will arrive at decisions differing from each other at every stage of the case. Nothing goes further in fermenting and keeping up quarrels in a neighbourhood than disputed boundaries, frequently caused by inaccurate descriptions; and the fact that it is either impossible, or at least a very expensive proceeding, to remedy the defects in them, serves to aggravate the matter. Many erroneous descriptions are based on inaccurate original township plans, and the discrepancies in them are often made worse when the lot or tract covered by the patent from the Crown comes to be divided into several parcels, especially, as is frequently the case, when the descriptions are drawn out by a self-styled "conveyancer," without a special survey being made. The interpretation of a description may appear quite evident to one individual, but as various matters may ulti-

mately be shown to affect the case, it is often difficult to anticipate the final result where a discrepancy exists. The value of correct descriptions is not even appreciated by the legal fraternity,



as few of them hesitate to draw up the descriptions for the various parcels into which a block of land may be divided under a will, in accordance with any rough data that may be submitted to them.

However, they are gradually becoming alive to the necessity for accurate descriptions, based on actual survey.

The drafting of proper descriptions is one of the most important matters that can engage the attention of the student in surveying, and I would call to his special notice the papers on this subject already published in our Annual Reports. In this paper I wish to give some account of a case in which the patents from the Crown were founded on inaccurate plans, and caused a dispute as to the ownership of a tract of land, that was only settled after the lapse of a century.

On the 10th of February, 1797, the Crown granted to Timothy Skinner a certain parcel or tract of land, situate in the Township of Bertie, containing 100 acres, more or less, being composed of part of lot number 32, in front, near Point Abino, and situate, lying and being in the Township of Bertie aforesaid, in the County of Lincoln and Home District in the Province of Upper Canada, which said 100 acres of land are butted and bounded or may be otherwise known as follows, that is to say: beginning at a post on Lake Erie marked number 31-32, thence north 50 chains, thence westerly parallel with Lake Erie 20 chains, more or less, thence south to Lake Erie, and thence easterly along the bank to the place of beginning.

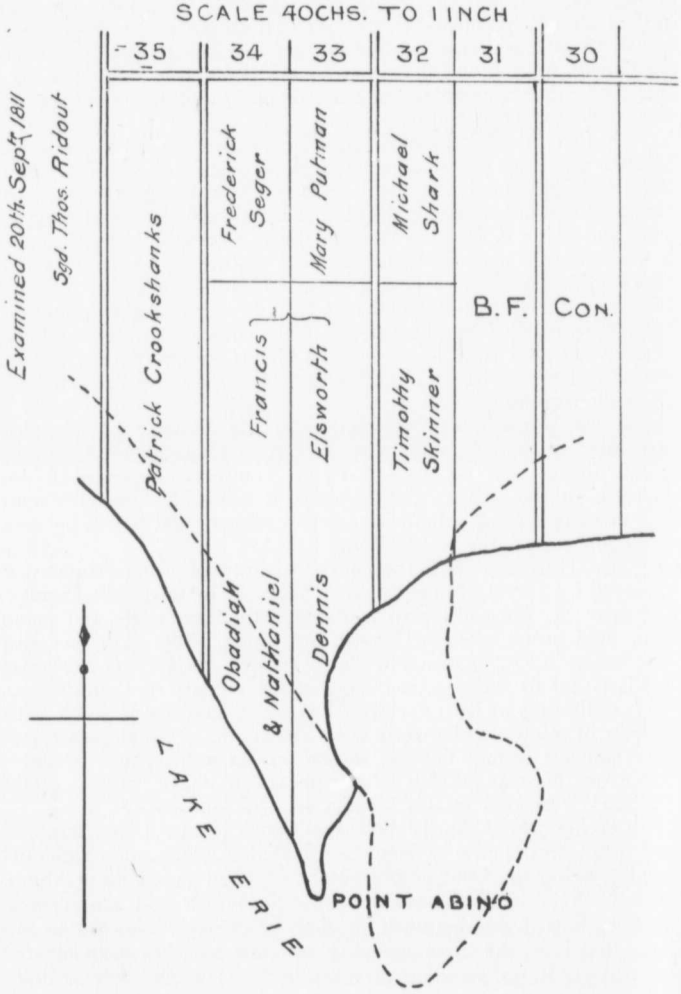
If we compare the description in the Skinner patent with plan A 1 of record in the Crown Lands Department, Toronto, it will appear that no part of Point Abino was intended to be included in this grant; but compare it with M. Burwell's plan B 7, on which Point Abino is correctly shown, and it will be seen to include nearly the whole Point.

The Township of Bertie in the vicinity of Point Abino was surveyed by Deputy-Surveyor Wm. Hambly in 1894, and Deputy-Surveyor M. Burwell's plan is dated 28th May, 1828, and made from field notes taken in March and April, 1825. On the 20th December, 1793, instructions were issued to Deputy-Surveyor Lewis Grant to survey certain lots in the vicinity of Point Abino, "by continuing to lay off eleven lots of twenty chains front, with a chain of allowance between every other lot." Grant appears to have run out certain lines as shown on Burwell's plan. Deputy-Surveyor Thomas Welch also appears to have made certain "original" surveys in this vicinity in 1794 and 1795.

On the 7th of April, 1808, the Crown granted two hundred and fifty acres, more or less, to Obadiah Dennis and Nathaniel Dennis, being the front of lots numbers 33 and 34, on Point Abino, on Lake Erie, in the Township of Bertie, which said 250 acres of land are butted and bounded, or may be otherwise known as follows, that is to say: Commencing where a post has been planted marked 33, R, 32, standing on a marked line, in the rear of Point

PLAN Al. Tp OF BERTIE

Note: Broken line shows true position of Pt Abino, Not shewn on Plan Al.



Abino, known by the name of Grant's line, at the south-east angle of lands granted to Francis Ellsworth, and being at the north-east angle of the now granted tract, thence south 21 chains, more or less, to Lake Erie, then southerly along the water's edge on the east side of Point Abino to the southernmost extremity of that Point, then northerly along the water's edge on the western side of that Point to the allowance for road between lots numbers 34 and 35, then north 36 chains, more or less, to the lands granted to the said Francis Ellsworth, then east along the southern boundary of said lands 40 chains, more or less, to the place of beginning.

From this description it would appear to be the intention to grant the whole of the Point to the Dennises, on the supposition that it lay in front of lots 33 and 34, but as it was mainly in front of lot 32.

In 1819 John Burch, P.L.S., made a survey and plan of Point Abino for Nathaniel Dennis and Thomas Otway Page, who then had possession of the land included in the Skinner patent. I attach a copy of Burch's plan, which is reduced from a scale of ten chains to forty chains. To Burch's plan is attached the following: Description of the south half of lot No. 32, in the Township of Bertie and the part of Point Abino in front thereof. Commencing at the north-east corner of the south half of said lot, at an original post marked 31-32, thence south 51 chains to Grant's line, then east one chain to the lake, thence southerly along the lake on the east side of Point Abino to the extremity of that Point, thence northerly along the lake on the west side of the Point to the allowance for road between lots numbers 32 and 33, thence north 57 chains to Grant's line, thence north 51 chains, thence east 20 chains to the place of beginning, containing 380 acres, more or less.

Description of land in front of lots 33 and 34: Commencing at the south-east angle of lot number 33, thence south 57 chains to the lake, thence northerly along the lake to the allowance for road between lots number 34 and 35, thence north 6 chains and 50 links to Grant's line, thence east 40 chains to the place of beginning, containing 127 acres, more or less.

Mr. Burch also took several affidavits, all going to show that the Dennises never claimed any part of Point Abino in lot 32. The following declaration of Nathaniel Dennis will serve as a type:—

"In the matter of the original posts in the broken front on Lake Erie, on the south half on Point Abino, in the Township of Bertie, in the District of Niagara.

"Nathaniel Dennis, of the said Township of Bertie, in the above district, yeoman, declares and affirms:

"That he resides on the south end of lot 32, on Point Abino, which was granted to one Timothy Skinner in the year 1797. That he has lived on the said lot 32 on Point Abino under the said Timothy Skinner and his successors since 1800 to the present day. That his brother, Obadiah Dennis, in the year 1798 moved on Point Abino from the Grand River at the request of the said Timothy Skinner, when he applied to the Crown for a patent to the south half of lots 33 and 34. That the said patent issued finally in the year 1808. That he has always since the year 1800 been acquainted with the only recognized posts marking the northern boundary of the said grant to Timothy Skinner of the south half of lot 32, on Point Abino. That the said post stands at the north-east angle of the south half of the said lot 32, broken front, on Lake Erie, 50 chains north from the lake bank, between the said lots 32 and 31 in the limits between the north half and south half of the said broken front on Lake Erie. That he never in any way claimed any part of the said south half of the said lot 32, by right of precedence, excepting that he had hoped to buy the equal undivided half interest of one Michael Sherk, who had acquired a title thereto. That by a mistake in the grant for lots 33 and 34 the said patent was unsatisfactory to both grantees of the south parts of lots 33 and 34, and which was issued in 1808. That until 1808 he never heard of a Grant's line marked merely to show the length of one hundred acres. That he does not now claim any of the south part of said lot 32 because of his residence thereon on Point Abino. That he never heard of any other post in the said broken front excepting one at the north-east angle of the grant to Obadiah and Nathaniel Dennis, standing on the allowance for road between lots 32 and 33, fifty chains south from the northern limits of the south half of the said lots 33 and 34.

"Declared before me, at Point Abino, on Monday, the 18th of October, 1819.

"NATHANIEL DENNIS.

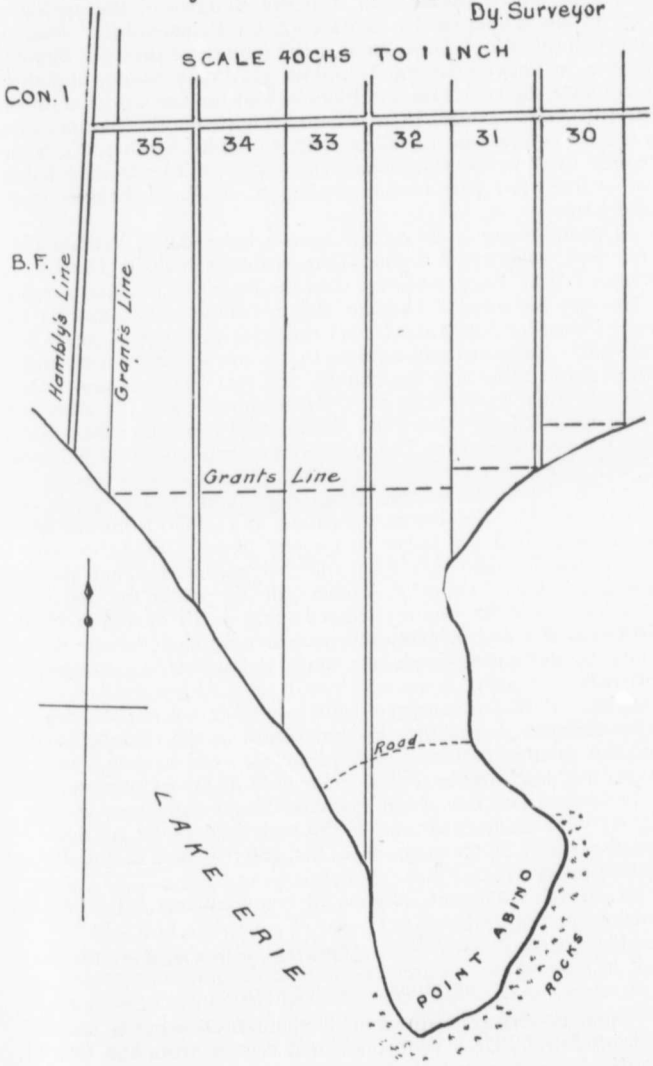
"JOHN BURCH, P. L. Surveyor."

Obadiah Dennis, in his declaration before Mr. Burch, states in part as follows: That he was born in the year 1754, and in the 40th year of his age he did personally assist in fixing the boundaries of lot 32 of broken front Lake Erie, which said lot had been entered by Timothy Skinner in 1789 or 1790 on Point Abino. That the said survey was completed by one Welch for the said Timothy Skinner. . . . That the said Timothy Skinner, before the above survey, had built a good log house, which is standing at the east end of the second sand hill, and had cleared up all

BERTIE PLAN B.7

28th. May 1828 Sgd. M. Burwell

Dy. Surveyor



the available land on Point Abino between the first two hills. That the patent issued to the said Timothy Skinner in the spring of 1797 for the whole of the said lot 32, on Point Abino. That on Saturday, the 5th of May, 1798, at the request of the said Timothy Skinner, he moved his family on lot 32, Point Abino, and there lived under the said Timothy Skinner and his successors until the year 1812, when he left Point Abino. That Timothy Skinner built a second log house in the fall of 1787, which his brother, Nathaniel Dennis, lives in till this day. That none of the Dennis family ever claimed any part of the south part of lot 32, broken front, Lake Erie.

The following is an extract from a letter dated Pelham Corners, Saturday, 12th, 6 mo., 1819, from Obadiah Dennis to Thomas Otway Page, who was then the owner of the land granted to Timothy Skinner: "Thomas, thou art mine friend, and by the hand of Brother Nathaniel I send thee this greeting of peace and good-will. Nathaniel came down to see me to glean some information about thine and his troubles at Point Ebineau, and I have felt it my duty to tell thee all I know about the matter, because no one living knows what I do. As far as I can remember, it was about the year 1789 that Timothy Skinner entered Point Ebineau. . . . . He expected at first to take up the whole of lots 32, 33 and 34, in the south halves, comprising about 700 acres, in the whole three lots. But before his patent was issued from old King George he invited my father to go and live on lot 32, or Point Ebineau, in about the year 1793, and then applied for their patents at the same time. Timothy Skinner got his patent for the south part of lot 32 in 1797, and my father having died I moved on Point Ebineau, at the wish of Timothy, and then applied for our patent for lots 33 and 34, again in my name, but which was not issued until 1808."

With all this information before him, it seems Mr. Burch had no difficulty in making the description in the Skinner patent cover the greater part of Point Abino, as well as one hundred acres to the north of the Point. However, it seems unreasonable that he should run one chain east on Grant's line from the east limit of lot 32 to the lake, as, if the east limit of lot 32 did not strike the shore of the lake, then the eastern part of the Point would be in lot 31.

Mr. Burch's account may be of some interest. It runs as follows:—

"BERTIE, 30th October, 1819.

"RE SURVEY POINT ABINO.

"Thomas Otway Page and Nathaniel Dennis, in account with John Burch, Dr. To professional service from the 18th to the 29th of October inclusively:—

	£	S.	D.
To eight days at one pound.....	8	0	0
To eight days assistant at 4s.....	1	12	0
To day's loss of time by rain.....	1	0	0
To two maps and diagrams, field notes, one copy for each.....	3	4	0
To work of assistant copying three affidavits in duplicate.....	0	8	0
To taking affidavit of Obadiah Dennis, since dead	1	0	0
Total	15	4	0
To three quarters cost to Thomas Otway Page	11	8	0
To one quarter cost to Nathaniel Dennis...	3	16	0
Total	15	4	0

"Received from Thomas Otway Page and Nathaniel Dennis cash in full of amount standing opposite each name as proportional share.

"JOHN BURCH, Land Surveyor.

"Bertie, 30th October, 1819."

On the 5th of November, presumably in the year 1819, Nathaniel Dennis signed a document from which the following extracts are taken:—

"Three years after the date hereof I promise to pay Thomas Otway Page the sum of three pounds sixteen shillings for cash advanced for me to John Burch, the same being my proportional share of our joint survey of lots 32, 33 and 34, B. F. L. E., in the Township of Bertie, in the district of Niagara, on Point Abino, and completed by the said John Burch, a legally qualified surveyor, in October, 1819, and whereby we have irrevocably established the allowance for roads dividing the lands of the said Thomas Otway Page, comprising lot 32, B. F. L. E., and granted by the Crown to Timothy Skinner, in the year 1797, and the lands of Nathaniel Dennis, and granted by the Crown to Obadiah and Nathaniel Dennis, in the year 1808.

"The said allowance for road between lots 32 and 33 runs out on the west side of Point Abino, and only south as far as the rocks on the west, leaving all my lands in lots 33 and 34 west of the said road allowance and on the west side of the Point; wherefore, for mutual protection and convenience I hereby become the voluntary tenant and caretaker of the said lands of Thomas Otway Page,

pending the erection of a suitable tenement or residence upon my own lands."

After matters were thus "irrevocably" and amicably settled one might reasonably suppose there would be no further dispute as to the interpretation of the description in the Skinner and Dennis patents. However, it was nearly eighty years after the date of Burch's survey before the boundaries were finally adjusted by the decision of the Supreme Court of Canada.

The will of Ezekiel Dennis, the father of Obadiah and Nathaniel Dennis, is dated the 26th day of February, 1797, and lodged in the Surrogate Court on the 12th of August, 1803. The following are extracts from it:—

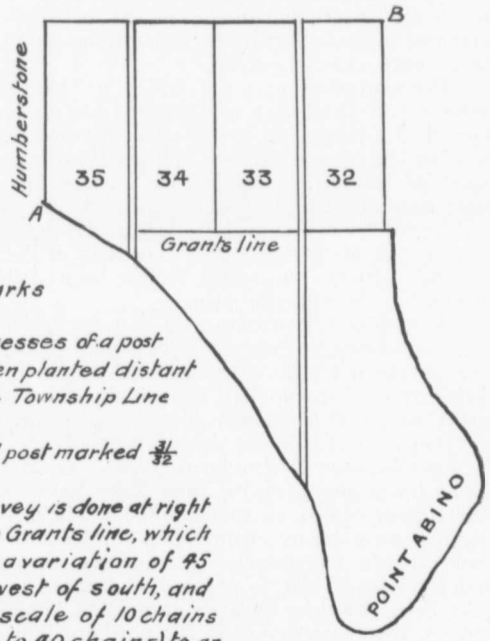
"In the name of God, amen, I Ezekiel Dennis . . . being in perfect mind and memory . . . I recommend my Sol into the hands of Almighty God that gave it . . . and as touching such worly estate wherewith it hath pleased God to bless me in this life, I give, demise and dispose of the sam in the following manner and form:—First, I giv and bequeath to my oldest son, Obadiah Dennis, and Nathaniel Dennis, my third son, my rites and possessions on Point Ebino, beginning below where Obadiah Dennis' house oppossit the road at the lak, and running along the road to the west sid of the point, let ther be more or less land in the survey to be divided between the two Obadiah is to have the aforesaid lin to the hill where between my house and Obadiah runing through to the west sid of the point North of this trackt of land the remainder from the aforesaid hill to Nathl. Dennis South of the aforesaid land, with my house and Improvements, to the aforesaid Nathaniel Dennis . . . I do giv and bequeath to the aforesaid Obadiah Dennis and Nathl. Dennis . . . to hold and hav forever, the premises, messuages and tenements by them to be possed and enjoyed, and if so be that Government has has refused the aforesaid land the are to hav each of them the right of One hundred accres a peeic to tak and lay wher the shall chus themselves, to them, their heirs, Executors and administrators for ever, to hold the aforesaid Nathl. Dennis is to hold the place by virtue of a former article, the lifetime of his mother. Secondly, I do give and bequeath to William, Julia, Sarah, Rachel, Elen, Hannah, Catharin, My Son and Daughters, the Remainder of my land . . . for ever . . . to be equally divided between the Seven after the decess of my loving wife—Nathaniel is to giv her one half of the profit of the place during her lifetime . . . according to an article entered into the year 1792."

The houses and improvements referred to in the will of Ezekiel Dennis were on the eastern part of Point Abino and have remained in possession of Obadiah and Nathaniel Dennis, their heirs and

Plan of Point Abino, in the Tp. of Bertie, in the District of Niagara, and Province of Upper Canada

SCALE 40CHS. TO 1 INCH

Sgd. John Burch
Land Surveyor



Remarks

A. Plain witnesses of a post having been planted distant west of the Township Line 80 links.

B. An original post marked $\frac{31}{32}$

Note: The survey is done at right angles to Grants line, which required a variation of 45 minutes west of south, and laid on a scale of 10 chains (reduced to 40 chains) to an inch.

sgd. John Burch
Land Surveyor

successors, to the present time, the successors claiming the whole of Point Abino as far north as Grant's line. The successors of Timothy Skinner claimed all that part of Point Abino lying east of the west limit of lot 32, but it appears they occupied only that part of lot 32 lying between the south limit of the north 50 chains patented to Sherk and Grant's line, which ran east and west at the distance of about 100 chains south of the north limit of the said lot. This would leave the Skinner tract the depth of about fifty chains, as called for in the patent. At the time of Provincial Land Surveyor Burch's survey the Dennises apparently consented to the claims of Thomas Otway Page, the successor of Timothy Skinner. However, as they continued to reside on the eastern part of the Point and conveyed their lands in Point Abino according to the description in the patent of 1808, their successors remained in possession of the whole Point, and the labours of Mr. Burch were soon forgotten.

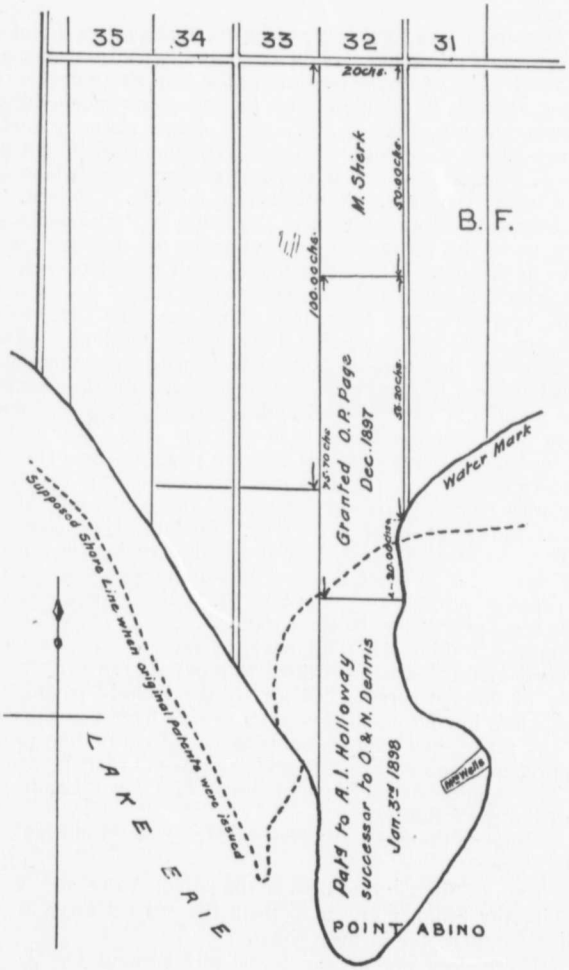
The road allowances, too, which he "irrevocably" established between lots 32 and 33 and between lots 34 and 35, were never opened out there, but are located between lots 31 nd 32, and between lots 33 and 34, as it appears from evidence that Deputy-Surveyor Hambly, in the original survey, ran them out in the latter position instead of where they are shown on his map and were supposed to be, by Mr. Burch. Evidently Mr. Hambly, in running out this portion of the Township of Bertie, either laid out his roads between the wrong lots or showed them in the wrong position on the township plan.

According to township plan A 1, lot 32 in question is more than 100 chains in length. This would leave a parcel of land between the north 50 chains granted to Sherk and the south 50 chains granted to Skinner, and on the 22nd of June, 1840, this parcel, supposed to contain 36 acres, more or less, was patented to Samuel Street. It was described as follows: "Commencing in the limit between lots numbers 31 and 32, at the distance of 50 chains (on a course north) from Lake Erie, then north fourteen chains, more or less, to lands granted to Michael Sherk, in the said lot, then west twenty chains, more or less, to the allowance for road between lots numbers 32 and 33, then south twenty-five chains, more or less, to within the distance of fifty chains from Lake Erie, otherwise to lands granted to Timothy Skinner in the said lot, then easterly (along the northern limit of the said lands of Timothy Skinner), at the distance of fifty chains from and always parallel to the shore of Lake Erie, to the place of beginning."

The east limit of lot 32 is about 107 chains instead of 114 chains, and the lake shore being so different to what is shown on map A 1, on which the description is founded, it would be a very difficult matter to define on the ground the land granted to Street.

PLAN SHEWING
Result of Litigation

SCALE 40CHS. TO 1 INCH



However, the Sherk and Skinner tracts were always supposed by their owners to abut and no vacant land from the first was left between them. It seems rather peculiar that the descriptions in the patents for this portion of the township were still drawn out according to plan A 1, after M. Burwell's plan showed it to be so inaccurate.

The dispute as to the ownership of that part of Point Abino which the Skinner patent might cover never died out, but became very much alive when the land along the lake shore in this vicinity became valuable as building sites for summer residences, and on the 20th January, 1893, A. E. Otway Page, claiming under the Skinner patent, commenced an action in the High Court against Allan I. Holloway, who was in possession of Point Abino as successor to the Dennises. Shortly before this Mr. A. Niven, O.L.S., was instructed to proceed to the Township of Bertie and take evidence as to the possession or occupation of that part of Point Abino in dispute. Mr. Niven made a full report on this matter, from which I quote the following extracts: "As to improvements, very little was done until about the year 1870, when the Point came into the possession of Wells and Holloway. The only improvements that appear to have been made up to that date were on that portion of the Point east of lot 32, with the exception of a few acres that were cleared and cultivated . . . and consisted of four or five houses and a barn and lime kiln. The rest of the land in dispute, being unfit for farming purposes, was simply used for pasturage . . . It does not appear from the evidence that Page was ever in possession of any of the land south of Grant's line, as shown on Ross' plan, which line seems to have been by common consent recognized as the boundary between Page and the Point . . . . There is now a board and wire fence on Grant's line running across lots 32, 33 and 34. The Point has come into use as a summer resort to some extent . . . . Under all the circumstances, I think that Holloway, as successor to the Dennises, can fairly claim that he is entitled to purchase the 191 1-2 acres in excess of the 250 acres called for by the Dennis' patent, and, in my opinion, he and his predecessors in title have had such possession and made such improvements as would entitle him to become the purchaser, and at the same price as was paid for the 250 acres."

The opinion of the Commissioner of Crown Lands may be seen from the following:

Ruling re Point Abino claim of Mr. A. I. Holloway and Mr. O. P. Page:

"I am of opinion that neither the patents to O. and N. Dennis nor Timothy Skinner grants to them the 191 1-2 acres in dispute, but the fee thereof is in the Crown.

"There does not appear to be any ground for Mr. Page's

claim to Point Abino as distinct from the 100 acres granted to T. Skinner by patent granted 10th February, 1797. Nothing is shown which entitles him, in my view, either to be looked upon as the owner in fee or as entitled to become the purchaser at the price charged at the time of the issue of the patent to Skinner. His claim is disallowed."

"The whole parcel is claimed under the original patents by Allan I. Holloway. By plan of survey by Geo. Ross, P.L.S., of 16th March, 1892, the total area of the Point is given as 445 1-2 acres, of which a small parcel of 4 acres shown on the plan is occupied by Mrs. C. J. Wells, leaving 441 1-2 acres claimed by Mr. Holloway, and lying south of Grant's line, as run by De Cew, P.L.S., shown on the plan. There appears to be enough land on lot 32, north of Grant's line, to cover what the patents to T. Skinner and Mr. Sherk call for, but there is apparently no land to fill the patent granted to S. Street 22nd January, 1840, viz., 36 acres. Holloway claims, and the abstract seems to verify it, that Street quitted claim to Page of his right to any land under said patent. Deducting from 441 1-2 acres the area of 250 acres covered by the original Dennis patents, there would appear to be 191 1-2 acres more than the original patent called for, which may be sold to Mr. Holloway at —— per acre. A special patent for the whole area, as shown by P. L. S. Ross' plan, may be prepared and issued.

As the additional area now claimed may be viewed as constituting what was intended to be covered under the original location and patent, it would appear to come within the meaning of the O. C. 5th March, 1857, authorizing the Commissioner of Crown Lands to dispose of such lands at $2 an acre, but under all circumstances the alternative price of $1 per acre has been charged."

Before a patent was issued to Holloway, the Pages brought suit, as already stated. Holloway's solicitors then applied for a fiat to bring an action in the name of the Attorney-General for Ontario for the cancellation of the Skinner patent. As the description in the patent was based on erroneous maps, was wrong and should be corrected, the action in the name of the Attorney-General was tried at Welland in April, 1894, before Mr. Justice Rose, who held that at the time of the issue of the Skinner patent the Crown was in error as to the true position of Point Abino, and gave judgment vacating the patent, and leaving the Crown to do what was just and right under all the circumstances. Costs against the Pages.

The will of Ezekiel Dennis was not put in evidence before Judge Rose, but when the matter came up before the Divisional Court it was suggested that an effort be made to secure a copy. This was obtained and admitted before a decision was given confirming Judge Rose's judgment, Meredith, J., dissenting and being of opinion that the patent should not be avoided, but that the

rights under it should be declared. No costs of action or appeal to either party.

This decision was sustained by the Court of Appeal for Ontario, and then the case came before the Supreme Court of Canada. The suggestion came from the judges here that an agreement should be reached between the parties on the basis of the Skinner patent being set aside, and a new patent issued to Mr. Page for an area of land equal to that granted to Skinner and Street, and having a frontage of 20 chains on Lake Erie. An agreement was arrived at and judgment given as follows :

" It is ordered that the judgment of the Divisional Court varying the judgment at the trial be varied by adding the following paragraphs thereto:—

" 1. And by consent of Her Majesty's Attorney-General and the defendants by their counsel, it is ordered that a patent do issue to the defendant Otway P. Page of the lands following, that is to say : Commencing at the south-east angle of the lands in lot 32 granted by the Crown to Michael Sherk, thence southerly following the line of the easterly limit of said lot 32 until it strikes the water's edge at high water mark of Lake Erie, thence from that point southerly following the line of the shore for a distance of twenty chains, thence in a westerly direction to the line between lots 32 and 33 at right angles thereto, thence in a northerly direction along said line between lots 32 and 33 to the southerly limits of the said land in lot 32 granted to Michael Sherk, thence easterly along the southerly bounds of the said land granted to Sherk to the place of beginning.

" 2. And by the like consent this Court doth order that there be no costs of this action or any of the appeals to any of the parties."

Reference to the annexed plans will show that at about six chains south of Grant's line the east limit of lot 32 will either intersect the shore line of Lake Erie or run very close to and nearly parallel with it for a considerable distance, and a slight variation in the bearing of the line, together with the difficulty of determining high water mark, might carry the line to the south end of the Point without touching the lake shore, and thus open up the whole matter again. This difficulty was apprehended by the counsel on each side, and after consultation, E. Gardiner, O. L. S., was appointed by counsel for one of the parties and the writer by counsel for the other party to proceed to Point Abino and " lay out upon the ground the description contained in the Minutes of Settlement in the case of Attorney-General vs. Page." The survey was " to be without prejudice to the rights of either party and to obtain information for a final delineation of the boundaries of the parties if possible."

We proceeded to the locality and succeeded in agreeing on the boundaries, which made the east limit of the land to be granted to Mr. Page 56 chains and 20 links on the east limit of lot 32 before striking the high water mark, and on the west limit a distance of 75 chains and 70 links, containing in all nearly 154 acres. Our survey was adopted, but there was another kick because no provision was made for the extension of the side road along the east side of lot 32, through the portion to be granted to Mr. Page, south of the point where the east limit of the lot intersected the high water mark. However, this could not be remedied except by an agreement between the parties to whom the land was to be patented. On the 17th December, 1897, the Crown issued a free grant to O. P. Page as described in the judgment of the Supreme Court, with the exception that the 20 chains along the shore of Lake Erie was given as 20 chains more or less to a post planted by E. Gardiner and G. Ross, O. L. Surveyors, and marked "P." and "Atty. G.," instead of the net distance of 20 chains mentioned in the judgment. A patent was issued to Mr. Holloway on the 3rd of January, 1898, for the remaining 225 acres in lot 32 in Point Abino (excepting four acres occupied by Mrs. Wells), the price charged for the said area being three hundred dollars.

Thus the dispute as to the ownership of this tract of land was finally brought to a close, but as a portion of it had previously been laid out into buiding lots, a number of which had been sold, it will be seen there still remain some minor difficulties as to the title of the parcels so conveyed. As an error in the description in a registered instrument may have far-reaching consequences, and often can only be corrected, if at all, by a most expensive and annoying lawsuit, the greatest care should be taken to have all descriptions definite and accurate.

DISCUSSION.

Chairman—Gentlemen, I think Mr. Ross has certainly made out his case—that is, that the necessity for accurate descriptions exists.

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

ASSESSMENT PLANS.

By P. S. GIBSON, O.L.S.
Willowdale.

It is a well understood principle that when land is assessed that a good and sufficient description should be given of the same in the tax bill. If not, and the tax is not paid, and the land be put up for sale for the taxes and sold and a tax deed be given that the owner holding paper title before the tax deed can compel the municipality to redeem the land and remove the flaw in his title caused by the tax deed.

To avoid such difficulties, assessors should be Ontario Land Surveyors, but as this would cause too much expense the next best thing is to have the surveyors prepare Assessment Plans, by which the ordinary assessor can make proper assessments. These plans must include all registered plans and amendments of same, all lands not shown on registered plans, all land properties exempt from taxes, as church, school, cemetery lots, and all public and private roads.

For these purposes the lands to be taxed must be divided up so each plan, if more than one,will show a special division, as a block or section, or a certain number of township lots. On a scale of 200 feet to the inch, the ordinary block or section 100 chains square can be shown on a plan about 3 1-2 feet square, which forms a convenient size for handling and answers well for township assessment plans, as lots of 20 feet frontage and lanes can be shown.

At first sight such plans may be considered very simple and to be easily prepared, whereas it will be found they are the most difficult plans to make.

An ordinary plan of town lots for registration by an owner is straight work, as is also an amendment of the same.

A complete or compiled plan of a village is considered by some to include only a compilation of registered plans and by others the addition of all lands, whether held by paper title as deeds, and is required to be put in the registry office, and by some registrars is entered up as a registered plan and by others simply filed and no index opened.

An assessment plan or plans are not to be registered and must show all the lands to be assessed in each division in such manner

that a proper description can be made by the assessor, which includes finding areas of each parcel which is to be assessed by the area.

For an ordinary "compiled" plan of a village, if we are to enter all properties held by deed or otherwise and not shown on a registered plan, we are entitled to take the proper title as it reads, whether correct or not, but for assessment plans it is necessary that the description on the plan shall be such as to cover the land in actual possession, or, as sometimes said, take the dirt title, which can only be obtained from an actual survey on the ground. Again, should we go to the registry office for the paper titles to lands not shown on registered plans, we find difficulties not only from defective descriptions, but from not registering deeds and remnants.

Under the above circumstances we find it much easier sometimes to make surveys of the properties, taking the names of the owners and occupants in each case. This is particularly necessary when taxes are levied for local improvements on the frontage or areas, even when the lots may be shown on registered plans as the actual frontage in possession may not, and often is not, the same as shown on the registered plan. So often is this the case, we find it advisable for all local improvement assessments to make a special survey and plan of the frontages liable to be attached to the by-law.

Another important matter is to show clearly the lines between different municipalities, and when these lines cut through lands owned by the same person or persons to show clearly the assessable part in each.

Again, after the plans are completed and in the hands of the assessors, care must be taken to see that any amending plans, such as where the smaller lots are put in blocks, that these plans shall also be in the possession of the assessors.

It is found necessary to furnish blue prints of the plans to the assessors, as the clerk and treasurer require the original plans, and on account of the cost it would not do to have the plans carried about and liable to be lost.

In the year 1897 the Council of the Township of York, in the County of York, ordered the amending of the assessment plans made some years before, and to have three blue prints of each. These plans are 21 in number, and about 3 1-2 feet square.

Another very important matter to be shown on the plans are certain topographical features of the country, as the forests, rivers, hills, in order to assist Assessment Commissioners to revise or understand the assessor rolls. Also as in the future it is expected that more attention will be paid to preserving our forests and replanting, plans of this kind would be of great use, as in some foreign countries.

In this short paper the design has been to merely suggest some matters for the consideration of the Ontario Land Surveyors of our Province, so they may see their way to inducing more municipalities to have such plans prepared as it would give them work and would pay the municipalities to have such plans, as it is well known that where there is negligence in assessing lots according to registered plans that land companies and individuals often neglect to pay their taxes until the returns are made to the county treasurer, when they apply for a certificate as to taxes due on their lots, according to certain numbers of registered plans, and as the assessors have not had plans to assess by the land has been assessed in bulk, and in some cases not assessed so the applicants receive certificates that there are no taxes due on such lots.

DISCUSSION.

Mr. Ross—You made some remarks about compiled plans that I think are very appropriate. I know in Welland County our Registrar insists on having every parcel designated by letter or number, and opens up every lot.

I was pleased with your remark that surveyors were well paid for these Corporation plans. I find there is a great deal of work in making Corporation plans and a great deal of care to be taken to prevent error, and I find it is very hard to make it pay even if you get a fair price for it.

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

SILICA PORTLAND CEMENT.

By M. J. BUTLER, O.L.S., M. Inst. C.E., M. Am Soc. C.E., M. Can. Soc. C.E.

Napanee, Ont.

If it be true that the man who makes two blades of grass grow where one formerly grew is a public benefactor, then in that case F. L. Smidth & Co. should be considered public benefactors, for they have discovered a means by which it is possible to take one barrel of cement and make two of it, with increased strength at the same time.

The first thing to bear in mind is this, that in the grinding of ordinary Portland cement it is practically impossible to reduce it to such a degree that less than 10 per cent. residue will be left on a sieve of 10,000 holes to a square inch; that when tested on the 40,000 mesh sieve not more than 75 per cent. of it will pass that sieve, leaving 25 per cent. residue; that the residuum on any sieve, however fine, has no cementitious property whatever. This is the fundamental principle which underlies sand cement. That is to say, the unground portion of Portland cement is sand to all intents and purposes.

Now, taking advantage of this fact, F. L. Smidth & Co., of Copenhagen, Denmark, who are the inventors and discoverers of the process, substitute for that unground portion of the Portland cement, pure sand; it must be silicious sand, free from mica or earthy matter and feldspar and other soft or friable substances.

It is important that the cement itself be of the very highest grade—extremely important. It is as important that the cement be good, as in the Mannesman tube rolling process, that the steel be of the highest class to make a success of the actual working of the plant.

So, too, the sand should be clean. It must be pure Silica. Taking all the known methods of grinding up to the time of Smidth & Co.'s discovery, it was impossible to grind to such a degree as is requisite for the successful making of sand cement.

They invented the tube mill and in order to give a proper idea of it I will just briefly describe same. It is a cylin-

der 25 feet long, 48 inches to 50 inches in diameter, lined with cast iron plates, revolving at the rate of about 60 revolutions a minute. The tube itself is filled half full of flint pebbles. The pebbles are brought from Norway and delivered in Canada and in all parts of the world where they are working under these patents.

The clinker is fed in at a uniform rate into the tube mill. As it passes through the length of the mill revolving, it hammers itself together, the clinker and the balls revolving and pounding it, until they are ground to such a degree that the Portland cement ground in this way will leave not more than 10 per cent. residue on the 10,000 sieve and not more than 20 to 25 per cent. on the 40,000 sieve. Now, that is about the practice required to grind Portland cement. When we mix sand and cement in equal proportions, we can now grind all of the cement to an impalpable degree of fineness, so you cannot find it on any known sieve, and the sand itself will be reduced to such a degree that not more than 4 per cent. residue will be left on a 10,000 sieve, and not more than 8 to 10 per cent. residue will be left on a 40,000 sieve. Consequently we now have every particle of active cement material in the cement acting upon a sharp, finely ground portion of Silica.

In itself that minute particle of Silica is stronger than any corresponding minute particle of Portland cement. The cement flour rubs around that particle of Silica and has something to grip to, a sharp, fine particle of Silica. That is, perhaps, the explanation of the action of sand cement, and why it is that when you make a mortar composed say of Portland cement and ordinary commercial sand, in the proportion of 3 to 1, that if you take that same Portland cement and grind one part sand with it and mix this sand cement in the proportion of 3 to 1, and test it in the testing machine, the sand cement will beat the original cement from which it was made, and with corresponding economy to the consumer.

Of course, as engineers, in order that our clients may get the benefit of sand cement, we should satisfy ourselves by standard tests that the material is suitable for the work in hand and then specify that sand cement will be accepted. Thus the client will get the benefit, otherwise the contractor will get the benefit of it, and he generally does, because he will bring his cement and place it before the engineer, who will test it and get the best results, and of course that is all he has to do with it and the contractor is pocketing the profit.

On this continent probably the largest consumption of sand cement has been by the firm controlled by General William Sooysmith, on one contract 10,000 barrels in the great Cathedral of St. John the Divine, in the city of New York, was used.

I will read a test made by Prof. H. T. Bovey, at McGill College, Montreal.

McGill University, Montreal, Testing Laboratories. Report of tests of "Ensign" Silica Portland Cement, for the Rathbun Company, Deseronto, Ont.

I. "ENSIGN" Silica Portland, composed of Rathbun "STAR" Portland and Sand, ground together in the proportion of 1 to 1.

This Silica Cement was mixed with standard sand, in the proportion of 1 to 3.

(a) With rammed briquettes and the addition of 10 per cent. by weight of water, the tensile strength after six days, 189 lbs. per square inch; the tensile strength after thirteen days, 201 lbs. per square inch.

(b) With rammed briquettes and the addition of 12 per cent. by weight of water, the tensile strength after six days, 178 lbs. per square inch; the tensile strength after thirteen days, 183 lbs. per square inch.

II. Blowing test: The pats were mixed in the ratio of 16 of cement to 4 of water, by weight. The pats were subjected to hot vapor at 120 deg. F. for 24 hours, and were then submerged in boiling water for about the same time. The results were most satisfactory, showing no trace of free lime.

III. Fineness: Residue on No. 120 sieve, 0.7 per cent. 7-10 of 1 per cent.; residue on No. 100 sieve, 0.6 per cent. 6-10 of 1 per cent.; residue on No. 80 sieve, 0.0 per cent.; 0 per cent.; residue on No. 50 sieve, 0.0 per cent. 0 per cent.

(Signed) HENRY T. BOVEY.

May 27th, 1897.

To satisfy himself about this matter, Mr. Henry C. Bamber, F.I.C., of London, England, selected a sample of English Portland cement, without revealing its identity, and packed it in barrels, sealed and sent to the Sand Cement Works at Denmark, of Homan Smith & Co. The seals were then broken in the presence of Mr. Bamber.

ABSTRACT QUOTED NEARLY VERBATIM FROM BAMBER'S REPORT.

The English Cement was sifted in 200 sieve, 40,000 square inch, residue 39 per cent.; 76 sieve, 5,776 square inch, residue 8.7 per cent.

Sand was sifted through 20 sieve, 400 per square inch; remaining on 30 sieve, 900 per square inch for Comparative Standard tests—using only what remained on the 30 sieve.

The Sand Cement was made from usual Clean Sea Sand. All the Sand Cement left about 3 per cent. residue on 200 sieve, 40,000 square inch. The proportions of Sand Cement and Water were taken by weight. The water used was chilled rain water.

Experiment	Mixture by weight			The mixture Contains		Tensile strain lbs Per.sq. in.			Guaged with p.c. of water
	Cement Sand	Sand Cement	Sand not ground	Cem't	Sand	7 dys	28 dys	3 mos.	
No. 1	1		3	1	3	113	178	255	11
" 2	1	2	2	1	8	164	248	332	9
" 3*	1	3	2	1	11	111	197	280	9
" 4	1	3	3	1	15	84.5	135	182	7
" 5	1	12	2	1	38	35	75	124	8
" 6	1		11	1	11		57	90	4
" 7	1		15	1	15		35	66	3.5

We use this way of indicating the mixture of mortar as e. g. 1 : 3 : 2, meaning one part Sand Cement, 1 : 3 with 2 parts coarse sand; as Sand Cement 1 : 3 contains one part Cement and 3 of Sand, ground together, 1 : 3 : 2 mortar, will to each part Cement have 3 of ground Sand and 8 of Coarse Sand, or 11 parts of Sand altogether.

*With reference to this experiment No. 3 it is of interest to note that the countless experiments made with Sand Cement 1 : 3 : 2 and 1 : 2 : 3, which both contain 11 parts of Sand to one of Cement, have proved that they are almost identical in respect of strength. Accordingly the Sand Cement 1 : 2 when used for mortar with 3 parts sand is superior to "Neat Cement used with the same amount of Sand."

This shows the investigation of an eminent English chemist and is associated with the firm known as K. B. & S., English Portland Cement.

There is also a record taken at the School of Practical Science, Toronto, which shows as follows:—

SCHOOL OF PRACTICAL SCIENCE,
TORONTO, April 17th, 1897.

Partial record of test of a sample of "Ensign Brand" Cement:—

NEAT CEMENT

Briquettes were guaged with 20 % of Water } Cement rammed into moulds..... }

2 DAYS IN WATER—1 DAY IN AIR:

No. 1	—375	
" 2	—335	
" 3	—340	
" 4	—355	
" 5	—365	Average—354

Briquettes were guaged with 20 % of water } rammed into moulds..... }

6 DAYS IN WATER:—1 DAY IN AIR

No. 1	—475	
" 2	—540	
" 3	—460	
" 4	—480	
" 5	—455	Average—482

Sand Test { 1 part Cement 3 parts Standard Sand.....,

1 DAY IN AIR—6 DAYS IN WATER:

No. 1	—137	
" 2	—177	
" 3	—165	
" 4	—176	
" 5	—176	Average—166

Hot Test—Pats of the Neat Cement placed in Hot Water, for 48 hours, (2 days) turned out perfectly sound. C. H. C. WRIGHT.

DISCUSSION.

Mr. Walker—I would like to ask what the price of it is ?

Mr. Butler—I think it is about 10c. to 15c. per barrel less than that of Portland cement. The cost of grinding is just in the ratio of 5 to 12, so that the other items were reduced practically in nearly the same proportion. You see, adding on the cost of grinding, this comes on in the proportion which the cost of sand would bear to cement clinker.

Mr. Walker—The grinding costs less ?

Mr. Butler—The grinding costs more, in the ratio of 5 to 12. Sand is worth 60 cents a cubic yard, and cement worth a good many dollars a cubic yard, but the grinding being slightly more expensive it reduces the cost about 10 to 15 cents per barrel.

Chairman—What facility does this give for adulterating cement ? Does it give a better chance ?

Mr. Butler—No.

Mr. Van Buskirk—What portion of sand is in the cement in Canada ?

Mr. Butler—One and one by weight—that is to say, the sand cement itself is made up of 100 lbs. of Portland cement and 100 lbs. of dried sand.

Mr. Van Buskirk—I had some sand cement tenders the other day, but I would not accept any because the amount of sand was not given.

Mr. Butler—We are putting the cement in such shape that you get more use out of what cement there is, and when you realize that every barrel is practically 25 per cent. of sand, that question does not arise.

Chairman—I suppose the strength consists in this, instead of having the real Portland cement in your sand, you have Silica cement and the real Portland cement itself is ground to an impalpable powder.

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THE KILBURN SWAMP DRAIN.

By F. W. FARNCOMB.
London.

The Kinburn Swamp, the drainage of which this paper is the subject, lies in the heart of Hullett, and has long been an eyesore in this, one of the most prosperous, if not the banner township of the Country of Huron. The land in the surrounding country being high and rolling and intersected by numerous rapid flowing springs and rivulets, offering ample outlet for the well-drained farms emptying into them, has required few large ditches; in fact, this is the first work of the kind, and probably the only one, which has been necessary for the municipality to undertake.

It is, therefore, likely that the apparent indifference of the owners of the swamp lands, as well as the Township Council, to the state of affairs and their want of enterprise was mainly due to the fact that improvements of a similar nature had never been attempted; the gospel of the "Drainage Acts" had never shed its rays upon these fortunate people or revealed to them the responsibility of their brethren on the hills in the enigmatic forms of "outlet" and "injuring liability," and the ever increasing floods were taken as a matter of course. But finally a well-known character, who had already had several lawsuits with the Township, "mired" his team in a vain attempt to get along the apology for a road during the close season to a few acres of land which he had cleared in the swamp. He brought an action against the municipality, and the outcome was the employment of the writer to see what could be done towards draining and opening up at least a portion of the concession road. It was then found that this meant the drainage of the whole swamp, for the Council were advised that any work done would be thrown away without the deepening of the south branch of the Maitland River. Levels were taken down the river, which supported this theory, and finally a petition of a majority of the owners was obtained, mainly through the instrumentality and foresight of an enterprising citizen of Clinton, who owns several hundred acres of this swamp land and who, though at first opposed to the scheme, on the ground of damage to timber, on examination of the plans, became its firmest supporter, predicting that if

the plans were carried out he would have the finest land, when cleared, in the township, and his prophecy has certainly been fulfilled.

Referring to the accompanying sketch, it will be seen that the swamp in the main extends from side roads 6 and 7 to side roads 15 and 16 and across concessions 4, 5 and 6, with a total area of about 2,500 acres. It is bounded on the northerly side by high-rolling land and on the southerly side by a peculiar ridge of drift sand and gravel, averaging less than half a mile in width and from 60 to 80 feet in height above the river, which it follows to a point about three miles below the swamp proper, where it crosses to the northward and meets the higher land.

Before this ridge, popularly known as the "Hog's Back," had been thus worn through at this point by the waters penned back, many thousand acres must have been submerged.

The Maitland River enters the swamp, as shown, on the easterly side, following along near the south and westerly sides and below follows closely along the ridge dscribed until it breaks across and gains rapid fall.

The portion of river in the swamp was extremely crooked and in some places disappearing from view in masses of rubbish and drift, the accumulation of years.

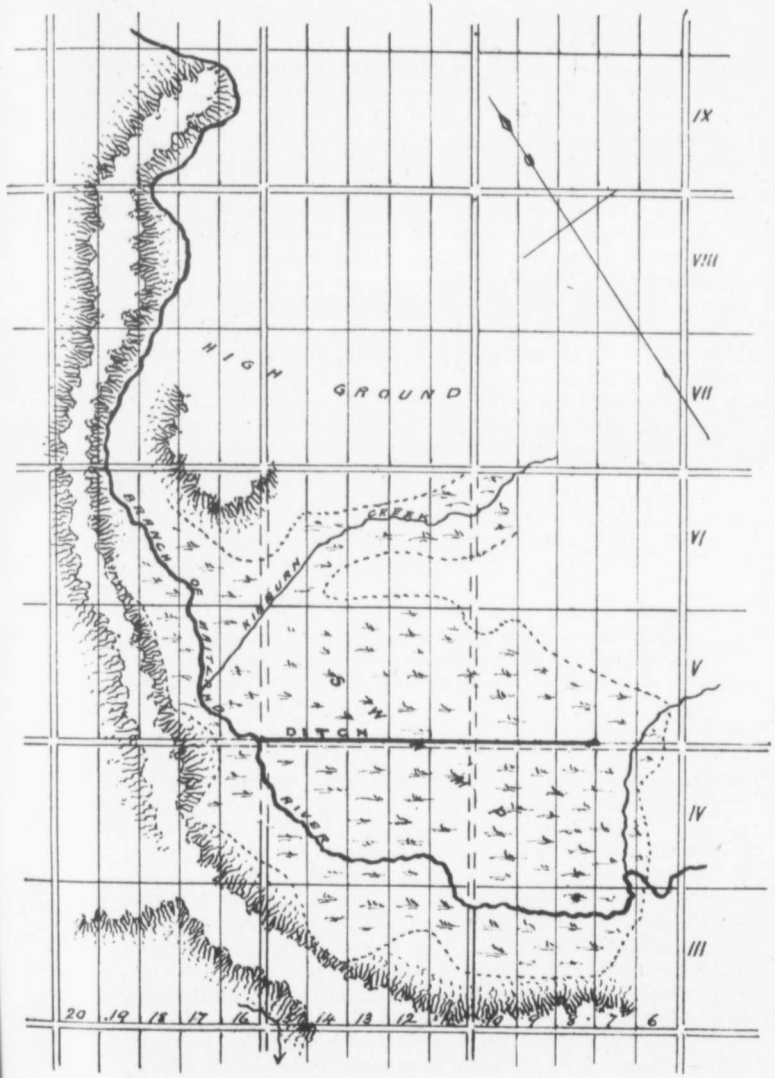
The total fall in the river from the middle of the swamp to a point just above the present outlet, a distance of over five miles, was less than four feet. The first two miles being practically "dead," the channel narrow, shallow and crooked.

The lower portion of the river is wide (six or eight rods) and confined by high banks, so that the adjoining lands derived little or no benefit from the work.

The survey plans and reports were completed and filed in December, 1894, and the contract let to Messrs. Chalmers and Hill, of Toronto, the following spring for about $150 less than the estimated cost, or about $9,000.

This contract included the construction of an open ditch along the north side of the concession road about two miles in length, about one-half through stump and burnt land and the remainder standing timber (mostly black ash), as well as the improvement of the Kinburn Creek and the dredging of the river. The contract required the excavation in the river of a channel twenty feet wide in the bottom, with foot to foot slope, the earth deposited five feet clear of the edges and sloped back two feet horizontal to one vertical.

The grade given the bottom was two feet per mile the first three miles, and the remainder 17-10 feet per mile. This gave a depth in swamp of about six feet below ground and an average cut in the bed of river at lower end of work of about five feet.


IX
VIII
VII
VI
V
IV
III
HIGH GROUND
BRANCH OF KINKAID
KINKAID CREEK
DITCH
RIVER
20 19 18 17 16 15 14 13 12 11 10 9 8 7 6

This work was done with an old "Beattie" dredge, floating on a scow 18 feet by 30 feet and 5 feet deep, and run by a 30-horse power engine; capacity of dipper about three-quarters of a yard.

Towards the lower end very hard digging was encountered, necessitating the use of steel teeth on the dipper throughout. Large boulders imbedded in this "hard pen" added to the difficulty, and in one place dynamite was effectively used to "loosen up."

Even at a depth of six feet this deposit seemed to be none the less hard, and marks of the steel teeth were plainly visibly in places on sides of cut even after the spring and fall freshets had passed through the channel.

However, this mixture of clay and boulders, which was deposited wet on the sides, seems to have baked equally hard in that position, and at the present time does not appear to be filling in in the slightest.

In the swamp an immense amount of the "black muck" which formerly filled the river has washed away down stream, leaving the channel deeper in places than when first dredged.

The total amount of earth excavated in the river was 54,154 cubic yards, and the estimated cost was 12 cents per cubic yard.

By making the ditch along the concession road deeper at the outlet, and as it follows the natural inclination of the swamp, a fair fall of about three and a half feet per mile was obtained.

The road, through another contract, was closed, chopped and cleared at the same time, and the earth excavated used to grade up.

This ditch was made two and a half and three feet bottom, sides sloped one to one, no water outside of that in swamp north of the road having to be dealt with after the top was off; most of the work was done with a plough and scraper, the rich bluish clay under the mould cutting like cheese; no quicksand was encountered.

The work on the Kinburn Creek ditch, which enters the swamp and river near the north side, was light, excepting a portion near the river, it having been dug recently.

Prior to this work being done, the water in spring and fall freshets of late years rose to a height of over eight feet in low ground, and fully 2,000 acres were flooded.

The swamp remained full of water all winter and disappeared, as a rule, in July, but in some seasons has remained all summer. The area drained by the river at this point is about 60,000 acres. The flood height is now about five feet, and the spring and fall freshets are confined to the river in six or seven days. The spring flood is passed of within one week after thaw is complete.

A considerable area of the land reclaimed has been cleared and logged, and it has already been demonstrated that excellent crops will be obtained, while hundreds of cattle have been pastured

where formerly a beast could not enter, excepting in the mid-summer months.

A bridge has been thrown across the river on a concession road, and an excellent road has been made through the swamp, as well as the opening up of side roads 10 and 11 and 15 and 16.

In view of the results obtained with so small an expenditure, there is already some talk of further enlarging the channel in the river in the near future, though when first advocated there was vigorous opposition to the scheme because of the cost.

The land, which before was sold for the timber at $12 and $15 an acre, has trebled in value.

In conclusion, it may be said that the object of this letter is not to uphold this scheme as complete in any respect, but in the hope that the results obtained may be of some use to any members of this association who, like the writer, may not have had sufficient experience in dealing with the flow of large bodies of water, to be able to say with confidence exactly what the result would be.

DISCUSSION.

Chairman—This very interesting and practical paper is now open for discussion by the members.

Mr. VanNostrand—I am sorry Mr. Farncomb is not here to further enlarge on some particulars, but I think we have sufficient here to be of great service to the members when put in the report.

The complaint is sometimes made that, although we are an Association of Land Surveyors, we read papers on a number of matters that appear to be foreign to our profession, but I think that we are quite justified in doing so. It is only in an occasional instance that the land surveyor meets with a piece of work which will profitably turn out a good paper, whereas in engineering nearly every kind of work will form a paper in itself, and the benefit to be derived from it both by the members of the Association and by the public at large is very great.

No doubt there are a number of places in the Province similar to the one described by Mr. Farncomb that have lain for a great many years surrounded by well tilled farms, and these have been worse than waste lands. In this instance the waste lands have been reclaimed, and the profit on the investment is at least three or four hundred per cent., besides the convenience resulting from the opening up of the various roads. I think if our members keep this case in view some of them will be able to find swamps, each ore in his own district, that may be treated similarly.

Mr. Code—It would be a good idea to get together as many of these cases as we could and write a separate paper on each about the cost, the difficulties of the work, and the area drained.

We could get the systems of assessment used on different drains, and I think if we got some general average assessment, it would be useful.

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"ARBITRATORS AND WITNESSES."

By HERBERT J. BOWMAN, O.L.S., M. Can. Soc. C.E.
Berlin.

In the year 1894 the town of Berlin, pursuant to the Municipal Act, and with the assent of the ratepayers, passed a By-law enacting as follows:—"That from and after passage of this By-law all future expediture in the town of Berlin for the opening, widening, prolonging or altering, macadamizing, grading, levelling, paving or planking any street, lane, alley or public way or place, or for constructing any sidewalk, bridge, culvert or embankment, forming part of a highway therein, or of curbing, sodding or planking any street, lane, alley, square or other public place, or either of them, shall be by special assessment on the property benefitted and not exempted by law from assessment."

In short, all street opening and construction may be done only as Local Improvements and cannot be paid for out of the general funds of the municipality.

Considerable work has been done upon existing streets since this By-law was passed, and some new streets have been opened. As a town grows in population, and land near the business centre becomes too valuable for gardening purposes, new streets will be required, and there is no doubt they should be paid for by special assessment on the property benefitted, and they should not be paid for by the municipality at large. Where the property owners accept the amounts mentioned in the By-law as to be tendered for the lands required for the opening of the new street, the lands are deeded at once to the corporation. However, in case of non-acceptance of the amount tendered an arbitration must follow. If the amount claimed for compensation does not exceed $1,000, the Municipal Act, consolidated in the Revised Statutes 1897, directs that the claim shall be settled by award of the County Judge, sitting as sole arbitrator, or by such other sole arbitrator as the Judge, on applicaeion of either party, may appoint. This is a step in the right direction, reducing the cost, delay and uncertainty under the old method of three arbitrators in every case. However, where the claim is for a larger amount than $1,000, and in all cases in townships and villages, the old method must be followed, one arbitrator being

appointed by the Corporation, another by the property owner, and these two meet and appoint a third arbitrator. If they fail within seven days to do this, the County Judge nominates as an arbitrator a fit person, resident without the limits of the municipality in which the property in question is situated.

When a lawyer is appointed as an arbitrator, he usually understands the duties he is supposed to perform and, of course, would not plead ignorance of the law. Other arbitrators, however, often proceed on a wrong basis. They suppose that they ought to act, in a measure, as counsel for the parties appointing them, and they do not appreciate the importance of the oath taken before proceeding to try the matter of the arbitration, viz.:

"I (A. B.), do swear (or affirm) that I will well and truly try the matters referred to me by the parties, and a true and impartial award make in the premises, according to the evidence and my skill and knowledge. So help me God."

From the wording of this oath it will be seen that when once sworn in, the board of arbitrators becomes a court, in which all the members have like duties, and no greater consideration should be shown by any arbitrator to one side of a case than to the other in order that an impartial award may be made.

A similar misapprehension exists as to what is expected of a witness in giving evidence in a court of law. Nearly every member of this association is frequently served with subpoenas commanding him to attend some court or arbitration to give evidence on behalf of one or other of the parties, but does this mean that he is to place himself entirely in the hands of one side and shut his eyes to everything else? The answer to this question will again be found in the oath administered to the witness, viz.:

"The evidence you shall give touching the matter in question, between the parties in this action, shall be the truth, the whole truth, and nothing but the truth."

It will be seen from this that a surveyor or engineer going into the witness box should give his evidence in a straightforward manner and never become a partisan. As remarked by the judge in a recent trial in Toronto, "A witness has no counsel," and the questions of counsel on both sides should be answered with equal frankness. It is easily seen that often a witness does not understand the nature of the oath and is trying to present only one side of the case, but it is hard to see how a professional witness who is familiar with the oath could act in this manner.

From the foregoing it will be seen that the assumption is unsound, that a civil engineer or land surveyor may aid or oppose either party to an action when he goes into the box. If this assumption were correct, how could a corporation engineer or surveyor give evidence in an action taken by a property owner

against the municipality? Were he to champion the cause of the municipality alone, would not the property owner feel that his course was indefensible, and as a contributor to his salary, be apt to maintain that he should have the engineer's aid rather than his opposition? The engineer, however, should never be an advocate, but place the facts impartially before the Court regardless of which side has had the subpoena issued commanding him to attend.

DISCUSSION.

Mr. Morris—With regard to the civil engineer and land surveyor as a witness, the paper refers to their not being partizans as witnesses, but giving their evidence truthfully. Well, we would expect that in a land surveyor, but in the case of a land surveyor who is trying to act as it were as arbitrator on a law suit, acting on both sides, as some poor land surveyors have been led to do at times, he finds he has got both lawyers on to his back; and, as far as I am concerned, I made up my mind that I would, if necessary, rather take a strong stand on one side, you might say as a partizan, than ever attempt to give evidence so as to endeavor to have both sides of the case. You are always misunderstood, and they look upon you as if you were trying to give evidence to save yourself; I think that the surveyor puts himself in a better position in a court of law where he does take the position of a partizan that is in the endeavor to secure truthful evidence as to the side in which he is interested. He is better understood by the Court, better understood by the opposing side, and then he is in no doubtful position.

Mr. Code—It is curious how men see it in different lights. Now, I had a case some time ago, and one of the engineers took a very decided stand; in fact, he rather overdid the thing, and as he was acting against a township, the result is he does no work for that township now, because he was so bitter a partizan.

Mr. Butler—I am sorry to say I did not hear the whole of this paper. There is one little point Mr. Bowman mentioned with reference to hearing the truth, the whole truth and nothing but the truth. Now, it must not be forgotten as a rule of law and evidence that answers must be responsive to the questions asked, and that the witness has no right whatever to volunteer testimony.

On the other hand, it seems to me the surveyor particularly, or the engineer, is a sort of free lance—the surveyor is bound by oath of office, he should approach the question from a judicial standpoint. Beyond question he should seek to inform himself of all the facts without any bias whatever. He should be sure he is right, but

once satisfied that he is right he should take high and strong ground.

In that sense he should be a partizan, and a strong partizan, but up to that stage he has no right whatever to take a partizan stand.

Mr. Niven—I agree with Mr. Butler there. I think when a surveyor is called in on a question his first duty is to satisfy himself of the merits of the case, the right and the wrong of it, and then as regards being a witness he should answer the questions that are put to him truthfully. I think if he does that he is doing all that is necessary in the case.

Mr. Morris—That would be suggesting that the surveyor become a kind of adviser to the solicitor on one side. You see the surveyor or engineer does, in most cases, become an adviser to the solicitor.

Mr. Butler—I don't consider he becomes a partizan, though, unless from the beginning he is employed to prove a certain state of things, and that is a wrong position. He has a right to stand independent until he has satisfied himself; but having satisfied himself, he should take the strongest stand possible.

Chairman—The custom is, I think, for the surveyor or engineer called in on a question of this kind, after he has examined into the matter and has made up his mind, to report to the lawyer who employed him.

Now, I have two cases in my mind in which I was called in, when my contention would have strengthened the other side rather than the side who employed me, and I was not called as a witness at all. But I think, especially in engineering questions, an engineer can often work up a case for a lawyer in a way in which he could not do it, and it is right he should devote his time to it and make as strong a case as possible consistent with the truth.

Mr. Morris—I have been misunderstood. I don't mean to say from the start we should become active partizans, but that we should take an interest, and advise, as we often do advise the lawyer, if it is in his interest to make a settlement, but at the same time that we should have at heart the interests of that side on which we are employed.

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THE USE OF FIELD TILE FOR LARGE DRAINS.

By MAJOR W. MAHLON DAVIS.

Woodstock.

The reduction in the price of field tile and their construction in large sizes has the effect of closing many large open drains, and causing tile to be adopted in many locations where it would otherwise be impracticable.

Putting aside aesthetic considerations, leaving out of the question the depreciation in value caused by an unsightly open drain meandering through a farm, there are sufficient practical reasons to warrant the use of tile wherever they can be procured of adequate capacity.

In comparing the cost of open drains with that of tile drains, the following are the most important questions to be considered:

(1) Cost of construction.

(2) Annual cost of maintenance. This, in the case of tile drains, is practically nothing, and in open drains can only be determined by experience. Cleaning out will certainly be required once in three or four years, but cost of the work and its frequency will depend on the locality; this amount should be capitalized and added to the first cost.

(3) Value of the land occupied by the drain, which in the case of the tile drain is nil, but for the open drain is very considerable, and is made up as follows:—

(a) Value of the land, taken as a fractional part of the entire farm.

(b) Add to the above the enhanced value of a narrow strip, the tillage of which costs nothing (that is, the land occupied by the open drain would be cultivated in connection with the contiguous land without any extra expenditure of labor.

(c) To the above must be added such sum as will make compensation for the inconvenience of tilling fields of irregular shape.

The following table gives approximately the comparative cost of open and tile drains of various depths:—

COST PER ROD.

DEPTH	OPEN DRAIN	FIELD TILE.					
		6 in.	8 in.	10 in.	12 in.	14 in.	18 in.
3 FT	$ 1.08	0.90	1.20				
4 "	1.80	0.96	1.26	1.86	2.19	3.00	
5 "	2.52	1.27	1.60	2.00	2.40	3.60	5.00

It would appear from the above that for depths up to 5 feet and for sizes of tile up to 12 inch, that the tile drain has the advantage, considering only first cost, and taking all things into account field tile of any size capable of carrying off the water, and for any depth, are cheaper than an open drain.

In deciding on the size of tile it is not necessary to provide a capacity that would be ample for a culvert, neither is it safe to calculate on a drain having twelve months in which to dispose of the annual rainfall.

In this latitude a rainfall exceeding one inch in twenty-four hours is exceptional, so that this quantity may reasonably be taken as a basis for our calculations. Not more than one half the rainfall can be depended on to reach the trunk drain, a proportion which decreases as the area of the watershed increases. If the water can be removed within forty-eight hours, as a rule no damage to the crops will result, therefore a trunk drain that will convey about 900 cubic feet of water per acre in twenty-four hours will be ample for ordinary drainage; lateral drains will require a greater capacity depending on the facility with which the rainfall reaches the tile.

Cases frequently occur where the largest size of tile obtainable is insufficient, but where a depression can be left over the tile for freshets, the depression should be slight and the slopes very gradual, so that farm implements cancross without trouble.

DETAILS OF CONSTRUCTION.

Tile over twelve inches in diameter should not be less than two feet in length, as they can be laid more evenly. They should be particularly well burned and moulded from the toughest clay. Many qualities of clay which make fair tile of small size are totally unfit for those of large diameter. The thickness should increase from one inch for 12 inch tile to 1 3-4 inch for 18 inch tile.

Two factors of vital importance in drainage are perfect alignment and grade the curves should not have a less radius than 60

feet. An accurate grade can best be obtained by means of "boning rods," that is, by placing two bridges across the trench, about 300 feet apart, the tops being adjusted so that a line joining the top of one with the top of the other will be parallel with the grade line. A rod equal in length to the distance of this line from the grade line is then used to obtain the exact elevation of each tile; this method is especially advantageous when working in quicksand. Difficulty is sometimes experienced in obtaining a safe foundation for the tile, the importance of the work not justifying the adoption of the expensive methods customary in sewer work. An inch board, 8 or 10 inches in width, has been placed under tile, and proved satisfactory. The writer once overcame a very bad place by excavating below the grade and refilling with gravel. The pipe was laid to the exact grade and when tested a week later had not stirred.

In backfilling, particularly in deep cuttings, care should be taken to pack the earth firmly about the haunches of the tile, and in running sand the joints should be covered with a sod, or, if this is not obtainable, use clay loam.

Catch basins, or manholes, should be placed about 1,000 feet apart, to admit of easy inspection of the drain. They should have a pit 18 inches below the grade line for the purpose of intercepting sand. They also provide a convenient means of connecting lateral drains. Wherever possible these catchbasins should be placed at crossings of fences.

A tile drain when properly constructed is a permanent work, requiring little or no expenditure for maintenance. The best soil which is being carried off by open ditches is retained. In the winter and spring, when the open ditches are dammed by the accumulation of ice and snow, the tile drain is quietly at work carrying off the water which would otherwise lie stagnant in the earth, and the heat of the sun in spring time, instead of being expended in the evaporation of the water, exercises its genial influence in warming the soil and promoting the growth of plants.

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

LAKE ERIE SURVEY.

By OTTO J. KLOTZ ASTRONOMER FOR THE DEPARTMENT OF THE INTERIOR, CANADA.

Ottawa.

During the season of 1896 a survey of the north shore of Lake Erie was made under my direction. The immediate object of the survey was to obtain the exact geographical position of that part of the shore, the original township surveys being inadequate and lacking accuracy for that purpose, and Bayfield's chart, although very good in its day, did not meet the present requirements. Besides, the position of the shore line to-day is in many places materially different from that of the original surveys of townships bordering the lake.

The survey was divided into three parts—the survey of the shore line; the survey of the road nearest the lake, with connections with the shore survey every few miles; and the determination of the fathom line in the lake.

A word about the road survey. As is well known, the United States have completed a survey of the Great Lakes. A monumental work, occupying 41 years and costing over three million dollars. High-class work is expensive in the first instance, but cheap in the end, for it requires to be done but once. The U. S. survey was begun at Duluth, the westernmost point of Lake Superior, and a chain of triangles carried thence along Lakes Superior, Michigan, Erie, Ontario and the River St. Lawrence to near the international boundary of the 45th parallel of latitude. Base lines in the primary chain of triangles were measured—Minnesota (Duluth), Keweenaw, Fond du Lac, Chicago, Sandusky, Buffalo, and Sandy Creek (Oswego), while a base at Mackinaw was put into the chain thrown across the northern end of Lake Michigan, and one at Olney for the chain south from Chicago. Wherever the width of the lakes and the topography of the country permitted, geodetic points were established also on the Canadian side. We have thus a number of well determined points at the western end of Lake Superior, at the east and west ends of Lake Erie, and at the east end of Lake Ontario, to which we can tie hereafter surveys of precision. Two of such geodetic points, "Grand River" and "Kingsville," were utilized in the survey of 1896, the former being the initial point and the latter the closing point thereof.

It was desirable that the survey of the north shore be made with a precision equal to that of the south shore, and for two reasons, in the first place, for the sake of precision itself, and in the second place, for the more important reason for the opportunity offered of inaugurating a Geodetic Survey in Canada, which in years should extend and grow, and eventually cross our wide domain from ocean to ocean. I have written and spoken so much on this subject of a Geodetic Survey for the past twenty years that I will not here, and before you who are conversant with the matter, dilate thereon. The attention of the Government was drawn to the position of the matter in connection with the Lake Erie survey. However, in consideration of the immediate requirements—the position of the boundary line in Lake Erie—and the unfavorable topographic configuration of the country there, for triangulation purposes, especially the western part of the peninsula, it was determined to base the shore survey on an accurate survey of the road running near the lake. This road is mostly straight and comparatively level, so that a considerable degree of accuracy was obtainable by direct linear measurement thereon. Every two or three miles, on a side road or otherwise, a line was run from the road to connect the two surveys and keep the work under proper control.

For both the road and shore surveys, 6-inch D. L. transits—Troughton & Simms—graduated to °.004, aperture 1 1-4 inches, one horizontal plate only, inverting eye-piece, were used. The linear measurements were made with 100-foot Chesterman's steel tapes, whose lengths were determined by means of the comparison or standard tape tested and issued under statutory authority. It is scarcely necessary to state that these tapes have the zero marks on the tape and not at the end of the handles, as obtained with the old link chain. For establishing the fathom line a light, trussed sounding rod, about 13 feet long, was used; on one end the six feet were marked by a transverse painted line, the other end carried, six feet apart, two disks, and these latter were used for micrometer readings thereon, or the determination of the distance from a shore survey station to the point on the fathom line where the boatman held the rod vertically. The micrometer used was of the Lugeol type, with divided objective. This form of micrometer we have found the best, and is used on all the exploratory surveys made for our Department. Experience has shown its error to be about 1 in 800. The value of a division of the micrometer was determined at the beginning of the survey, during the survey, and at the end thereof, for the fixed length between the disks on the sounding rod, and at distances from 200 to 3,000 feet at 100 feet intervals, and no material change in the thread of the screw found. The angular measures were controlled by azimuth observations on Polaris daily, or as often as the weather permitted. The observa-

tions were always made in daylight and generally shortly before sunset. A striding level was used. As the azimuth observations were dependent on the exact hour angle of Polaris, observations for time were always made at the same time, for which purpose sidereal pocket chronometers were carried. The want of such a chronometer should, however, not debar anyone from making similar observations, as an ordinary good watch will, with time corrections that readily suggest themselves, answer the purpose quite well. The angles on the road and shore surveys were read in both positions of the instrument—circle right and circle left—and the three verniers were read each time. This gave two independent determinations of the angle between back sight and fore sight. Every day, circumstances permitting, the road survey was brought down to the lake and there a common point made with the shore survey, and thereby a check on the latter obtained. This check was in the first instance in azimuth by account, and in the second place in latitude and departure. Theoretically, the quantities spoken of should be identical for the two surveys. There was seldom any marked disparity between the two azimuths, but the linear measures on the lake required at times remeasurement to ensure greater accuracy. From the physical character of the lake shore and adjoining precipitous banks and ravines, the difficulty of carrying on linear measures becomes apparent. The location of the position of the sounding rod when held on the fathom line was determined by an azimuth shot from one of the shore stations and by micrometer readings—forward and reversed motion of micrometer head.

The survey was begun at the United States Lake Survey Geodetic Station, " Grand River,"

Latitude 42 deg. 50 minutes 49.96 seconds,

Longitude 79 deg. 37 minutes, 23.82 seconds,

and ended at a similar station, " Kingsville,"

Latitude 42 deg. 01 minute 36.1 seconds,

Longitude 82 deg. 44 minutes 21.4 seconds,

passing around Pointe Pelee, the most southerly part of continental Canada. The former station is a " primary " one, about two and a half miles west of he mouth of the Grand River, and the latter a " secondary " one, in the village of the same name. The United States geodetic stations are marked on the ground by a stone monument placed beneath the surface for greater security from disturbance, and by three stone reference posts placed at some convenient distance and favorable spot. Both " Grand River " and " Kingsville " were readily found by means of these reference posts, which are still in position after twenty years. About ten miles west of Long Point there was another geodetic station, " Houghton," but being, or having been, on one of the large drifting sand hills,

no monument whatever could be found. From the nature of the hill and the sand and the prevailing wind it would appear that the hill travels. In fact from other evidence—fences, etc.—we know that it does.

The greater part of the lake front surveyed is bordered by high, precipitous, cut banks, attaining their maximum height, about 120 feet, in the vicinity of Port Stanley. The cut banks often descend directly into the water, i.e., there is no beach whatever. This necessitated taking the survey to the top of the banks; there, often meeting woods and many deep ravines filled with brush, much retarding the progress and increasing the difficulty of attaining accuracy of the survey. The extensive marshes of Turkey Point and Long Point gave an opportunity for testing the imperviousness of the epidermis. To one accustomed to the wilds of the North-West and British Columbia, the mosquitoes of Lake Erie were a pleasure. In the County of Haldimand, on the lake shore, we find rock (highly fossiliferous limestone) exposure, showing beautiful parallel glacial groovings. By means of a prismatic compass I determined the direction of the groovings and found it to be N. 40 deg. 30 minutes E. on lot No. 12, in the Township of Rainham, and on lot No. 1, nearly five miles west, N. 48 deg. 30 minutes E. magnetic. Beyond, no rock exposure was encountered, and boulders were scarce until we reached the western end of the survey. The most of the so-called ports along the shore of Lake Erie are but a memory of the past. A few piles of a former wharf speak of shipping of by-gone days. Deforestation and the advent of railways are the principal causes of this change.

The history of Talbot road, now one of the best roads in Canada, has an interest from physiographic reasons. Originally it was a colonization road reserved along the strip five rods wide in front of the lake. As the prevailing winds on the lake are southwesterly, the north shore is especially subject to erosion, and the banks have in consequence been slowly and continuously receding, necessitating from time to time the shifting of fences to make room for the lake road, besides the renewal of bridges near the lake over creeks and ravines. When the trouble arising therefrom became so acute the various Township Councils concluded to shift the Talbot road to a safe distance from the lake, and we have the present, in many respects, model road. Much information of the wasting away of the banks was gathered from old farmers who have spent their lives on farms abutting the lake. The evidence was, of course, always of a circumstantial kind, but none the less conclusive. An illustration will, perhaps, explain the fact. In the Crown patents one finds: "Reserving Talbot road and one chain in front thereof." This was along the lake front. A farmer would say to me when interrogated about the former and present positions of the bank:

" Do you see that hickory tree out there on the edge of the bank ? Well, when I was a boy, the Talbot road used to run on the south side of that tree." Now, this is pretty good evidence that about eight rods of land have disappeared into the lake. It may be stated that this erosion has not increased the beach at all, but undoubtedly tends to shoal the lake in general, and especially along the shore, so that where formerly small craft could land, it is now inaccessible. Erosion along the north shore has been general, and, westward of Port Stanley, has averaged within the past fifty years from four to eight rods. There has been some accretion on the west side of Pointe Pelee. This is explained by its position in the lake, and the prevailing winds. Being situate near the western end of the lake, the westerly winds lower the water at that end so that while accretions take place on the westerly side of the point, decretion obtains on the opposite or easterly side. This effect is well illustrated, too, at Port Stanley through the artificial obstruction, the pier. To the west of the pier several hundred feet of beach have been added and materially help to make Port Stanley a favorite summer resort. Along the eastern part of the lake, where we have rock exposure underlying the alluvium, there has been less wasting away of the banks.

The low stage of the water for some years has exposed the rim of the bottom to the action of the wind, and in consequence, where the banks are low, as they are a little west of Morpeth, sand hills have grown and partially cover trees standing near the lake shore.

That Lake Erie is very shallow is well known, and an ocean liner would, if sunk almost anywhere in the lake, show its masts above water, but what calls one's attention to the fact very forcibly are the pound-net fishing arrangements. For the row of tamarack piles which extend into the lake for about a mile are only about 40 feet long, of which five feet are in the ground and seven feet above water. These piles are removed every fall to prevent damage from ice and also to prevent fouling of the fishing ground by debris gathering around the poles.

The two deep bays shown on the township plans of Romney as " The Two Rivers " are now but a memory, for one walks dryshod over their former mouth. A number of the streams discharging into the lake do so by filtration.

At several points east of Pointe Pelee coarse gold has been found on the beach.

In the Townships of Romney, East Tilbury and Raleigh we have the peculiarity of the land immediately adjoining the lake having its natural drainage northward into the Thames basin, so that the artificial drainage of the long, narrow farms, which is made into Lake Erie, becomes rather expensive on account of the

depth to which the drains must be carried. By erosion one of these drains was found to be a narrow V-shaped channel over fifty feet in depth, threatening calamity to the buildings near by.

A few miles east of Wheatley, in the County of Kent, some engineer's stakes were encountered, having been placed in connection with a proposed canal across the peninsula from Lake St. Clair into Lake Erie, for shortening the distance.

In view of the possible future triangulation of the country north of the lake it may be mentioned that on the ridge in the Township of Orford a suitable primary station might be found. From the level character of the country in the extreme western part of Ontario, suitable ground for such stations is difficult to find. Another one that came under my notice is a little west of Woodstock, which, with one near Port Stanley and the Houghton sand hill, would form nearly an equilateral triangle of about 35 miles to a side.

THE REDUCTION OF THE WORK.

I shall treat the matter in the order in which the work was done; this pertains to the road survey alone, as the shore survey was adjusted for each block of two or three miles between points common to the two surveys. Azimuths were reckoned from north through east to north, paying attention to the quadrants for giving the proper sign to the functions sine and cosine. There are 580 stations in the road survey, and of the observation stations 24 were adopted as initial meridians for carrying forward the azimuth between the latter. The latitudes and departures were computed from one initial meridian to another. Their algebraic sum gave the difference in latitude and longitude between the initial and terminal points. Converting the difference of longitude into arc along the middle parallel (using the very useful tables of the Dominion Lands Manual) and multiplying by the sine of the middle latitude, we obtain the convergence between the two meridians, and by applying this to our terminal azimuth obtain the computed true azimuth thereof, which, compared with the observed azimuth (at the terminal meridian) gives us the accumulated angle error between these two meridians. On the assumption that the angles of the traverse have all been equally well read, which is a matter solely of personal knowledge, the angle error was equally distributed amongst the angles read. It may be stated that the average correction per angle was 3.33″, the maximum correction was 5.80″ and the minimum .09″. Furthermore, all the corrections, with the exception of two were positive, showing, I think, unmistakably that the angle error was markedly due to torsion, making the angles too small. The instrument was always turned in the same way—to the right—whether for circle right or circle left.

Applying the angle correction a new azimuth results for each course, and hence corrected latitude and departures. These latter were deduced from the already computed ones by the use of deflection tables, specially computed for each second of arc. From the corrected latitude and departures the true differences of latitude and longitude of the initial and terminal points of a "block" are found, after applying to the former the necessary reduction to the parallel of latitude at the terminal point. This reduction is of the form $-d\lambda \sin (1/2\, d\lambda'' \sin \phi)$ converted into arc of latitude, $d\lambda$ representing the difference of longitude for the middle latitude ϕ.

The quantity within the brackets represents the deflection from the prime vertical at an initial point and the deflecting great circle cutting the parallel of latitude of such initial point at the distance $d\lambda$ therefrom.

Carrying the work thus forward from block to block, we ultimately reach the final station, the geodetic point U. S. Lake Survey, "Kingsville." In doing work carefully we have an a priori confidence in the ultimate result, and are justified in expecting the closing error to be either within certain limits or of a particular nature. In the present instance it is seen that the azimuth of the traverse was continually kept under control, and in the computation and reduction of the traverse the small angle errors applied so that there was no reason that a sensible error in closing at the final station, whose geographic co-ordinates are known, due to azimuth of the traverse should occur. But with the linear measure the case stood differently. To begin with, the steel tape had a correction to standard length—as every tape has, although the correction may be very small—then we have the personal equation of chaining, and thirdly the correction for inclination of ground, either when tape is laid thereon, or when through too much of an incline the tape is elevated at one end. The correction to the horizontal is invariably negative, i.e., the recorded chainage is too great. The signs of the other two corrections may be either positive or negative.

When a traverse extends over a considerable distance, and closes on a geodetic point, we have a further correction to the former for reducing the linear measure, or rather the derivatives—latitude and departure—to sea level. In the present instance, taking the mean level above the sea of the traverse line at 650 feet, the correction in longitude equals a third of a second of arc. This correction is always negative. The road survey is 265 miles in length, including the lines running to the lake. From the manner in which the work was done and the reduction of the traverse made, it was natural to expect the closing error to be one due almost wholly to linear measure. Carrying the computation uncorrected for length of chain and elevation above sea, forward as

above indicated, the geographical co-ordinates of the U. S. stone monument "Kingsville" are found to be ϕ=42° 01′ 34″.58, λ=82° 44′ 27.″41. The U.S. Lake Survey gives ϕ=42° 01′ 36″.1, λ=82° 44′ 21″.4, giving a difference in ϕ of 1″.52, and in λ of 6″.0. Now as the ratio of the difference of latitude and longitude of the initial and terminal stations is 100-380 and the ratio of the closing errors in ϕ and λ is 100-389, we see that the *a priori* conclusion was well founded, i.e., that the closing error is due to linear measurement. Hence no change in the adopted azimuths of the traverse was made. In the adjusted and final computation the latitudes and departures were all decreased respectively in the ratio of the closing error in latitude and departure to the total distance of latitude and longitude, which is equivalent to multiplying all the lengths by a constant. To apply more mathematics—method of least squares—to this survey would be like cracking nuts with a sledge hammer. The result of the work has now been plotted on five large sheets on a scale of half a mile to the inch; a large scale, yet so small that the plotting of a refined geodetic survey of the same work on that scale would coincide with the former. From these sheets a reduced chart has been made on a scale of 1-400,000, the south shore and extremities of the lake being taken from the U. S. Lake Survey sheet of that scale. It may be mentioned that for the purpose of transfer of the latter a "dry" print had to be obtained from Washington, as ordinarily the sheets when printed are moist, and in consequence afterwards even the best of maps and charts suffer seriously from distortion. A suitable non-distorting material for map printing has yet to be discovered.

After the completion of the traverse an astronomical station was established at Port Stanley, which was tied to the traverse. A substantial stone pier was erected for the transit and zenith telescope and a small observatory built over the pier. For longitude the observatory was connected with Ottawa, which is now well established in longitude, and a successful series of transits obtained, although bad weather—October and November—retarded the work.

The observers, Mr. W. F. King and myself, exchanged stations. The final reductions for longitude are not yet quite complete. For latitude I obtained 54 observations, and from which the position of the pier (observatory) is found to be ϕ=42° 39′ 52″.73 λ ″.09. The final traverse reduction, above indicated, gives for the same point ϕ=42° 39′ 53″.24, a difference of half a second of arc, a satisfactory agreement.

The Lake Erie survey cannot be called a geodetic survey, but simply a careful traverse, in the reduction of which, however, geodetic considerations have been applied throughout.

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

DOCUMENTARY HISTORY OF THE FIRST SURVEYS IN THE PROVINCE OF ONTARIO.

By J. J. MURPHY, DEPARTMENT OF CROWN LANDS.

Toronto.

The Treaty of Peace, signed at Paris on the 7th February, 1763, completed the conquest of Canada, and added to the territory of Great Britain fully half a continent. On the 7th of October of the same year a royal proclamation was issued, erecting the government of the Province of Quebec, defining its limits and providing for liberal grants of the lands of the Crown to the inhabitants and other persons who should decide to settle in the province. Special provision was made for rewarding the conduct and bravery of the officers and men of the army and navy who had taken part in the late war, and the quantities of land which they were to receive, according to rank, and without fee or reward, were particularly set out. This proclamation was received in Canada in August, 1764, but notwithstanding the liberal grants offered to induce settlement, nearly twenty years were to elapse before any movement was made to colonize that part of the newly acquired territory, now known as Ontario. Up to 1783 the settlements extended very little beyond the city of Montreal in a westerly direction. Various reasons may be given for this state of affairs; in the first place, the members of the disbanded British regiments who decided to remain in Canada preferred settling in the inhabited portions of the province to braving the dangers of the *wild Indian regions;* in fact settlement in the Indian territory was discouraged until the claims of the Indian tribes were arranged for and ceded. Then there was no immigration from abroad. The popular prejudice which prevailed in the Old Country at the time, and which apparently has not even to this day been fully dispelled, was that the Canadian climate was "nine months of snow and ice and three months of cold weather."

But the chief obstacle was, no doubt, the troubles connected with the revolt of the American colonies, which, unfortunately, began shortly after the conquest and continued up to 1783. During this time the whole attention of the colonial administration

was fully occupied in preventing the new province from following their example.

With the cessation of hostilities in 1783 and the recognition of the independence of the United States, a change took place. There were many of the American colonists who had adhered to the royal cause, and when it became apparent that this cause was lost their hopes were ended. Their homes and property had been confiscated; they were subject to continuous persecution from the victorious party, and were destitute and dependent. A large number of them, therefore, decided to seek a refuge on Canadian soil. Sir Guy Carleton was then in command of the British forces in New York, and General Frederick Haldimand Governor-General at Quebec. They took prompt and active measures to provide for the removal of these Loyalists to Canada, and for their settlement on suitable lands of the Crown. In anticipation of their arrival, and without waiting for definite instructions from the home authorities, Haldimand sent exploring parties to examine the country along the St. Lawrence west of Montreal and in the neighborhood of the old French fort at Cataraqui. He also gave instructions for the survey of the lands at the last-named place. This letter of instructions from Governor Haldimand to the Surveyor-General, Major Holland, was dated on the 26th of May, 1783, and, so far as known, this was the first survey ordered in the Province of Ontario. Major Holland proceeded at once to the locality, began to lay out a town plot, and having examined the surrounding country and formed his plans for future operations, he returned to Quebec and reported to Governor Haldimand.

The Deputy Surveyor-General, John Collins, with two assistants, was sent up and proceeded vigorously with the surveys. During the fall of 1783 and the following year they surveyed the outlines of five townships and partly subdivided them. These townships, which extended westward from Cataraqui around the Bay of Quinte, were numbered consecutively, 1, 2, 3, 4 and 5. They were afterwards called Kingston, Ernestown, Fredericksburgh, Adolphustown and Marysburgh, but were generally known for many years by their numerals.

Early in the January of 1784 the first band of United Empire Loyalists, under the leadership of Captain Michael Grass, arrived from New York and, the following May, they ascended the St. Lawrence in batteaux, to take possession of the lands which had been surveyed for them. Sir John Johnston and Deputy Surveyor-General Collins were instructed to proceed with the party and settle them on the lands, which were to be drawn for, in order to prevent partiality. Mr. Collins was also appointed to administer the oath of allegiance. Provisions, seeds and implements were supplied, and energetic efforts were made to have these refugees settled comfort-

ably. The greater part of Captain Grass' party were settled in township No. 1, and this was the first effective settlement made within the boundaries of what is now the Province of Ontario, and may be justly considered as the foundation of the province.

Major Samuel Holland was the first Surveyor-General of the Province of Quebec. He was appointed on the 10th of February, 1764, by His Majesty in Council, and appears to have been engaged on surveys in various parts of the American colonies; but he resumed his duties in Quebec when the Revolutionary War broke out. He died there on the 28th January, 1802. Maj. Holland was a British officer who distinguished himself at Louisburg, and had also fought bravely under Wolfe on the Plains of Abraham. He was a great favorite of Wolfe, was with him during his last moments at the close of the battle, and was also one of his legatees.

Major Holland contributed some scientific papers to the proceedings of the London Philosophical Society in 1768, '69 and '74, and he compiled several maps of the Province of Quebec. The most important of these, "A New Topographical Map of the Province of Lower Canada," was published in London the year after his death.

On the 8th September, 1764, Major Holland appointed John Collins Deputy Surveyor-General, and he directed the surveys in the upper part of the province until its division into two distinct provinces of Upper and Lower Canada by the Constitutional Act of 1791. From an account rendered by Mr. Collins, it appears that when engaged on the surveys at Cataraqui and the Bay of Quinte, he was paid for his services as Deputy Surveyor-General at the rate of fifteen shillings a day, besides expenses, and that the other surveyors employed at that time were paid at the rate of 7 shillings and 6 pence a day, with 1 shilling and 3 pence additional for provisions. The following is an extract from a report, in which he sets out the instruments which he had in his office: "There are no instruments in the Surveyor-General's office which belong to the Government. The following list are instruments belonging to Mr. Collins :—A theodolite by Rowley, F.D.; an acromatic telecope, 3-8 in length, the magnifying powers with eyeglasses for land objects about 50 times, and with those for astronomical uses 80 times; one Hadley's quadrant; one Mason's level; one English chain; one French chain. The Deputy Surveyor and the Assistant Surveyors furnish their own instruments for the ordinary business of surveying lands.

JOHN COLLINS,
Deputy Surveyor-General.

The following documents containing the instructions and correspondence connected with these first surveys have been collected

partly from the records of the Crown Lands Department, but chiefly from the Haldimand Papers in the Archives office in Ottawa. They are, as far as possible, arranged in chronological order.

LETTER FROM GOVERNOR HALDIMAND TO SURVEYOR-GENERAL HOLLAND.

HEADQUARTERS, QUEBEC, 26th May, 1783.

Major Holland, Surveyor-General :

SIR,—As it is necessary that I should be informed of the nature of the country from the last concessions to Cataraqui, and thence to Niagara, on the north side of Lake Ontario, you are hereby directed to set off immediately for Montreal, and to proceed to Cataraqui, where you will minutely examine into the situation and state of the post formerly occupied by the French, and the land and country adjacent; considering the facility of establishing settlement there, and the advantages and disadvantages that might attend that measure, all of which you will report to me as soon as possible; and in the meantime, if you find the fort in such a state as is correspondent with the views and instructions I have communicated to you, you will, without loss of time, make application to Major Harris, commanding at Carleton Island, for workmen and all other assistance in his power to afford, and also to Major Ross, commanding at Oswego, who has orders, upon your application, to send Lieut. Tinling, acting engineer, and with him such artificers, tools and materials as you shall require, to join you immediately. You will dismiss the Canadian Batteaumen at Carleton Island and procure soldiers or seamen, as you shall think best, to proceed to Cataraqui.

Having made your observations at Cataraqui and given such directions as you shall think necessary at that place, you will send forward the gentlemen who accompany you for the purpose of continuing the examination of the country to Niagara, and return yourself to Quebec without loss of time.

I am, etc.,

F. HALDIMAND.

FROM MAJOR HOLLAND TO GENERAL HALDIMAND.

QUEBEC, 26th June, 1783.

SIR,—Agreeably to the commands contained in your Excellency's letter to me dated the 26th of last month, I immediately set off for Montreal, with the two Mohawks, Captain Brant and Johan; there I left them, Captain Brant being unable to proceed from sickness. On the 3rd of June Captain LaForce joined me at LeChine,

and we proceeded, with two batteaux, for Carleton Island. As the time limited by your Excellency for my return would not permit me to make an actual survey of the ungranted lands on the north side of the River St. Lawrence, I examined them with attention, and collected all the information I could as to the facility of establishing settlements there, and I found that from the supposed bounds of the Seigneurie of Soulange the property of Monsieur de Longueille on the Lake St. Francis the lands are low towards the water side and fit for meadows, but at the same distance the soil is exceedingly good tillage. From the upper part of Lake St. Francis to the Long Sault no land can be more promising, covered with fine timber fit for building vessels, and in some places pineries fit for masts. The shore along the Long Sault has not an inviting aspect, but the soil, 'tis said, at no great distance back is equal to that on Lake St. Francis.

There are fine pineries two or three miles from the water's edge where large masts may be procured.

From the head of the Long Sault to the top of the uppermost rapid, where the navigation begins, the country has a most favorable appearance. From hence to Cataraqui the shore is high and rocky, but opening here and there into beautiful coves and bays, where the view extends a great way into fine natural meadows, and though the shore appears rough and uninviting the soil is rich at some distance—fit for all purposes of agriculture, as I have been informed.

I arrived at Carleton Island on the 10th, late at night, and applied to Major Harris to despatch your orders for Major Ross and Mr. Tinling, the assistant engineer. On the 12th I reached Cataraqui, and began the survey of the Fort and entrenchments made there by the French troops. On the following day my assistant proceeded to survey the harbor and Captain La Force to take the soundings. Lieut. Tingling joined me on the 17th, when I examined the fort, and made arrangements for the re-establishment of this important post, which in every part surpassed the favorable idea I had formed of it. Your Excellency will perceive its advantageous situation by the plans and drawings which accompany this letter.

The vaults still remain entire, with part of the walls of the fort, barracks, etc., etc., and are in such a state as will contribute to lessen the expense of its re-establishment. The works or lines began by the French on the commanding grounds near the fort will cover a sufficient space for a town. The harbor is in every respect good, and most conveniently situated to command Lake Ontario. The battetaux men prefer keeping over on this side, as they can follow the shore without crossing to the islands in their course.

Captain Joseph Brant, with several Indians of the Six Nations, went up to Cataraqui Falls and made excursions into the woods. They seemed to be well satisfied with the country. At their return they declined saying anything concerning the lands; but told me that as soon as they have examined the north side of the lake they will inform your Excellency of the spot where they'll choose to fix their abode. For this purpose they have sent Captain Isaac with six men of their number to accompany the surveying party.

On the 19th we returned to Carleton Island, where I arranged matters with Major Harris, and wrote to Major Ross for fifty men from each post, and to transport materials to Cataraqui to prosecute the works carrying on there under Mr. Tinling, with whom I left Lieut. Holland as an assistant, who was despatched to forward materials from Oswego.

Captain La Force, Mr. Cotte, and Mr. Peachy proceeded to survey the north shore of the Lake Ontario all the way to Niagara, having received my instructions for that purpose. On the 20th I set out from Carleton Island for Quebec, where I arrived yesterday.

I have the honor to be, etc.,

SAMUEL HOLLAND.

FROM MAJOR HOLLAND TO GENERAL HALDIMAND.

NEAR QUEBEC, 10th July, 1783.

MY DEAR GENERAL,—I should not have been wanting in sending your excellency those volumes of Pre Charlevoix which make mention about Cataraqui before now; if the second volume had not been lent out in town, which was only returned last night.

The first mentionings made by this author is in volume the second, page 244 and 245, when the first project was made in the year 1672, to take post there by Monsieur de Courcelles and his successor, Count Frontenac, built the fort. Page 372 in the same volume it is metnioned that in the year 1688 the Iroquois formed a blockade. Page 406 to 409, the same volume, it was proposed to be abandoned, but opposed by Count Frontenac, though it was evacuated in 1689. In the third volume, page 222 to 227, the fort is retained by Count Frontenac against the advice of everybody, and well executed by Monsieur Cryan; thus in the year 1695, in the fifth volume, page 281 to 288, some reflections on the fort, its situation, and road to it. Page 301 in the same volume P. Charlevoix mentions his arrival and leaving Cataracouy. I have only sent those three volumes, which have any relation to Cataracouy, and marked those pages mentioned above.

Your Excellency will perceive through the whole the importance of this post, which by this present Revolution is become nearly of the same consequence as it was in the times of Count Frontenac, or rather to the time of Monseiur de Montcalm (before he took Oswego), which induced him to take possession of the commanding ground near it, by which he would have covered the fort and would have taken in a sufficient space for a town. Your Excellency will be convinced by the plan which I had the honor of transmitting to you that if those lines are judiciously disposed of it must perpetuate Fort Haldimand, at Cataracouy, to all posterity, to which none shall be more happy to contribute to than,

My dear General,
Your Excellency's most obedient and most obliged humble servant,

SAMUEL HOLLAND.

His Excellency the Commander-in-Chief.

FROM CAPT. MATHEWS TO MAJOR ROSS. (OSWEGO.

HEADQUARTERS, QUEBEC, 28th July, 1783.

MAJOR ROSS:

SIR,—By order of His Excellency the Commander-in-Chief I transmit to you the enclosed sketch and explanatory letters for a township His Excellency has in contemplation for Cataraqui. The hurry of business in which the General is involved by the departure of the German troops prevents his entering fully into this matter at present, but that no time may be lost in taking every preparatory measure, His Excellency desires you will have the survey mentioned in Major Holland's letter immediately taken, and that you will transmit it to him with every additional remark that shall strike you as useful information on this occasion.

His Excellency is further pleased to direct that all buildings and materials that can be with propriety removed from Carleton Island for the use of the new post and to put the stores, etc., under cover in case of evacuation this fall, be particularly attended to, which His Excellency desires you will communicate his wishes on this subject to Major Harris, for his mutual assistance in this as well as all other circumstances that can facilitate the speedy establishment of the post at Cataraqui.

I am, etc.,

R. MATHEWS.

P. S.—His Excellency not having yet received the least information or instructions concerning the settlement of Loyalists in

this Province, and having it only in view to place them in such situations as appears to him most eligible, desires you will not mention anything of the present scheme to any person whosoever.

R. M.

FROM MAJOR HOLLAND TO GENERAL HALDIMAND.

NEAR QUEBEC, 23rd July, 1783.

SIR,—As your Excellency was pleased to desire my thoughts on the situation for a town on the harbor of Cataraqui, I have made a sketch of its environs, which I have the honor to join, and for the illustration of this subject I have been obliged to take the liberty to adopt names to the several places which must come in question. The peninsula on the east side of the entrance of Cataraqui harbor seems to me a most advantageous place for the purpose, as vessels (sufficient for the navigation in those parts) may lay in safety most all around it, with the help of some small wharfs, may lay to load and unload with great conveniency. At Point Frederick a proper space, A, for a fort, with a convenient distance for an esplanade, B, should be reserved, which may serve as well for military use as for a market place. The principal streets should run through the middle from the fort to the neck; a convenient space for a street or landing must be reserved on both sides the town along the waterside. At Point C a proper space should be reserved for batteries and naval purposes, with sufficient space on the neck D, where in time fortifications for the security of the town may be constructed. At the same time I must recommend to your Excellency's consideration that a common for the feeding of the cattle belonging to a town is of the greatest benefit to its inhabitants, and if a N. W. line is drawn from the head of Hamilton Cove to Cataraqui Harbor I think a sufficient tract will remain for that purpose; if not, Cedar Island may be included for that purpose. If your Excellency is pleased to approve of what I have the honor to represent, it will be necessary that an exact survey be made and laid down by a scale of fifty or sixty feet to an inch, and to ascertain the exact breadth of the ground. Avenues should be cut through as marked on the sketched plan E F, where some of the principal cross streets must fall; and on the neck marked G H it will be also necessary to have cuts through for the same reasons, as the ground intended for the town is only wanting on a large scale. The commons may be laid down by a scale of 100 feet to an inch.

I beg leave to submit the whole to your Excellency's consideration, and have the honor to be, etc.,

SAMUEL HOLLAND.

FROM MAJOR ROSS TO CAPTAIN MATHEWS.

CATARAQUI, 31st July, 1783.

SIR,—The contrary winds made it impracticable to remove the troops from Oswego until the 28th instant, as the vessels did not arrive sooner, but everything being in readiness no time was lost, and we arrived here the 30th, in the morning.

I have perused with attention the instructions given to Lieutenant Tingling by Major Holland, which shall be strictly adhered to, and were it not for a scarcity of masons I should hope in a very short time to have the honor to inform His Excellency of everything being finished accordingly.

There is a very advantageous place for building mills about five miles from this fort, but nothing more can be done than to collect and prepare materials until a millwright arrives. Please present the enclosed sketch to the General.

The iron-work, etc., arrived yesterday.

I have the honor to be, etc.,

(Signed) JOHN ROSS.

FROM MAJOR ROSS TO GENERAL HALDIMAND.

CATARAQUI, 3rd September, 1783.

SIR,—Agreeable to your Excellency's orders of the 20th of July, I have the honor to transmit the survey directed; exclusive of the survey I have taken every necessary height and distance, and with as much accuracy as possible have endeavored to examine every part that comes within the scale of useful information.

Your Excellency did me the honor to require my remarks on this occasion. With due submission I shall endeavor to explain matters to the best of my humble judgment. If I have presumed to differ from the plan laid down by Major Holland, it is from this circumstance that both the engineer and myself are of opinion that the old works or the ground contiguous to them cannot be well fortified, being commanded from a rising ground at the distance of point blank cannon shot.

The next object which strikes me is the high land above Cape Henry at A, elevated above the surface of the water upwards of one hundred and twenty feet. This place I take the liberty to say is eligible ground to fortify, and place my ideas accordingly.

I have sounded the harbor in Haldimand Bay, where there is water sufficient. Point Frederick, being subjected to an advantageous cannonade from the west side of Cataraqui Harbor, may I then take the liberty to say (although no town can be placed here

secure from bombardment) that the land on east side of Haldimand Cove is preferable for a town, where, I think, there is sufficient space under the guns of the supposed fort at A. At B the naval purposes may be executed, where wharfs can conveniently be erected. I take the liberty to propose this place being the safest side of the bay for anchorage, and as it is the additional breadth of the point distant from the land on the west side of Cataraqui harbor, may be judged a proper place for store-houses.

The town common, as before described, the land is not arable, being a rocky surface, but may do for pasture. Cedar Island is perfectly barren. These are all the remarks which I shall take the liberty to present to your Excellency at present, and will conclude with this observation, that the high ground at A is most respectable—it commands Hamilton Cove, Cedar Island, Point Henry, Haldimand Cove, Point Frederick, Cataraqui Harbor, and even the old fort is not secure from thence.

I would have caused the survey of the fort and this side of Cataraqui Harbor to be added to the plan sent, but as it would have occasioned a delay and Mr. Tinling informs me that your Excellency is already furnished with one, thought it best not to wait.

I have the honor to be, etc.,

JOHN ROSS.

GENERAL HALDIMAND TO MAJOR ROSS.

HEADQUARTERS, QUEBEC,
7th September, 1783.

MAJOR ROSS:

SIR,—This will be delivered to you by Mr. Collins, whom I send, with proper assistance, to Cataraqui, in order to survey and mark out the settlement intended at that place for the refugee Loyalists. I enclose for your information a copy of my instructions to Mr. Collins, by which you will perceive that it is my intention to have the lands distributed in townships containing lots of 120 acres, which will be useful to you as a general answer to applications which may probably be made for particular spots or quantities of land.

Capt. Laforce, Capt. Sherwood and others skilled in land, and the principles of colonization accompany Mr. Collins. They have also a number of men in order to cut down and square timber to make a beginning; and it is very probable that some of them may choose to winter there. Should that be the case, I wish them to set down upon the ground intended for the town, and small lots to be given to them on the common, in order to clear it as

soon as possible. Any persons so settling may obtain leases for thirty years (as expressed in the instructions), but if they should not choose to take leases upon those terms, and notwithstanding to hut themselves for the winter, they must sign agreements to relinquish their lots whenever they shall be required so to do.

You will give the necessary directions for victualling the Loyalists that accompany Mr. Collins, and as they are chiefly artificers, such of them as shall not be wanted on the survey, you will employ as you shall see necessary in forwarding the establishment of the post. Any tools, nails, etc., that they may want you will supply, if you have them, or otherwise by requisition to Carleton Island, from any department where they are to be found.

I am, sir, etc.,

F. HALDIMAND.

FROM GENERAL HALDIMAND TO JOHN COLLINS.

HEADQUARTERS, QUEBEC,
11th September, 1783.

JOHN COLLINS, Esq.:

SIR,—It being my intention to establish settlements for the provision of part of the distressed Loyalists resorting to this Province at and in the neighborhood of Cataraqui, upon Lake Ontario, you are hereby directed to proceed to that place without loss of time for the purpose of surveying and laying out the several lands in townships and lots agreeably to the following instructions :—

1. You will make an exact survey of the neck intended for the town lot, describing and expressing the nature of the ground and soil, and if Point Frederick is not commanded from Point Henry, on both which places sufficient spaces for fortifications must be reserved.

2. At the west side of Cataraqui Harbor the ground near the fort and within the lines (as marked in the plan A, B, C) must remain to the Crown, for the use of the garrison, and as a place of resort for the Indians, where some of the most noted might be allowed to build, reserving sufficient spaces round the slips (where vessels were formerly constructed) unincumbered with buildings.

3. Though a common, containing about 400 acres, must be reserved for the use of the town, leases may be given for a term of years, not exceeding thirty years, to settle there, as the people for the present will be glad to be as near the town as possible, and the common will be cleared by the time the town will be in want of it.

4. The method of laying out townships of six miles square I consider as the best to be followed, as the people to be settled there are most used to it, and will best answer the proportion of lands I propose to grant to each family, viz.: 120 acres, of which six are to be in front, which will make 19 chains in front and 63 chains 25 links in depth, so that every township will have 25 lots in front and four chains 75 links will remain for roads, with 7 concessions in depth. Fifty-eight links will remain for a road, by which distribution each township will contain 175 lots of 120 acres.

For your assistance in the execution of this business you will be joined at Montreal by Capt. Sherwood and Lieut. Cotte and also by Mr. Grass, captain of one of the companies of militia intended for that settlement, and these gentlemen will be attended with axemen, etc., proper for that occasion.

You will begin your survey by a township on each side of the bay, and transmit it to me, together with your remarks, reporting to me in the like manner from time to time the progress you shall make.

As it is not improbable that in exploring these lands some of the persons employed may make choice of particular situations, and make preparations accordingly, to prevent which you are to signify to them that my intentions are to distribute the lots impartially by drawing for them, and that all timber cut down this fall, or any log houses they may choose to make and reside in until the settlements shall be regularly granted, will not be considered as any right of such persons, but entered as a temporary beginning, and should any of them prefer remaining there this winter to returning to Sorel, may have lots of four acres marked out for them in the common, which they will enjoy for thirty years, as before mentioned, by which means whatever work is done will forward the clearing of the common and be for the public good. The officers commanding at Carleton Island, Cataraqui, or any post you shall have occasion to call at are hereby directed to afford you every assistance in their power, whether in provisions or otherwise, for the speedy and effectual execution of these instructions.

Wishing you success, etc.,

F. HALDIMAND.

FROM GENERAL HALDIMAND TO JOHN COLLINS.

HEADQUARTERS, QUEBEC,
JOHN COLLINS, Esq.: 15th September, 1783.

SIR,—Since your departure from Quebec I have received letters from Major Ross which induce me to change the situa-

tion of the proposed township near Cataraqui, and to desire it may be placed on Point Henry, to explain which I enclose you a sketch of that point, copied from that Major Ross sent me, and I desire you will begin by opening a large avenue from Point Henry in a direct line towards the high ground marked 122 feet above the water, and near D, and on the line I would cut several other avenues, all at right angles therewith, as the line in pencil shows; but in doing this and every other service, you must conform yourself to such orders as Major Ross may think proper to give you.

I am, sir, etc.,

F. HALDIMAND.

FROM GENERAL HALDIMAND TO MAJOR ROSS.

QUEBEC, September 15th, 1783.

SIR,—I have received your letter of the 3rd instant, with the sketch of Point Henry, etc., and am very much obliged to you for the trouble you have taken to examine the ground near Cataraqui. I entirely approve of your idea of changing the situation of the town to Point Henry, and have given my orders to Mr. Collins accordingly, subject, however, to any alteration which you may think necessary, and, in case of any future discovery, of situation, proper to be fortified you will preserve such an extent of ground round them as you judge proper, and communicate to me your ideas concerning them.

In a few days Lieut. French, of Major Jessup's Corps, will leave Montreal with a party of Loyalists, to examine the great River Ottawa, and when at a proper distance to endeavor from thence to fall upon Cataraqui. When they arrive you will supply them with everything they may want and provide them with the means of returning to Montreal as soon as possible. . . . and in order more fully to accomplish my intentions on this point, I could wish you would send some small party with savages somewhere near the same road, but they should be accompanied by an intelligent person, who would keep a journal of the distances and the course they steer, with every other necessary remark. Our plans of this country are very imperfect. According to them I should conjecture that due north from your post the great river lies about 150 miles distant. I mention this, but have no doubt that the savages are much better acquainted with the distance than we are.

From the report of Sir John Johnson I have reason to expect that the Mohawks and some other tribes of savages will establish themselves near the Bay of Kintie, and I understand it is their

wish to have the Loyalists in their neighborhood. All which, I think, will be an advantage by rendering the settlement respectable, and consequently secure. The only difficulty seems to be, giving uneasiness to the Missisagues, as they claim the northern part of Lake Ontario, to avoid which I have directed Sir J. Johnson to treat with them on this matter, and if necessary to make such purchases as the King's service may require, which he tells me will easily be accomplished.

I am, sir,
Your most humble and most obedient servant,

F. HALDIMAND.

FROM MAJOR ROSS TO CAPTAIN MATHEWS.

CATARAQUI, 2nd October, 1783.

SIR,—Mr. Collins arrived here last night with Capt. Sherwood, by whom I had the honor to receive His Excellency's directions. Accordingly I shall be extremely happy to contribute as much as in my power to expedite the business they are sent upon.

I am glad we have anticipated His Excellency's intentions in sending those gentlemen, from which view I have employed myself from time to time traversing the lands adjacent, and cutting almost all the paths and avenues about this fort which become necessary to render a proper and speedy information to His Excellency.

The Indians have not as yet been advised on this occasion. I am doubtful they will make more difficulty than Sir John Johnson imagines; but still I hope of no great moment or importance. I have had no rum to give them since my arrival to which they are absolutely devoted. Any little I have given them as yet has been my own, but it has been but trifling.

The troops will be in barracks in a few days, and I have informed the commissary that he may direct the transport of provisions to this place when he pleases. Storehouses are in great forwardness.

I have the honor to be, etc.,

JOHN ROSS.

FROM JOHN COLLINS TO GENERAL HALDIMAND.

CATARAQUI, October 2nd, 1783.

SIR,—I have the honor of your Excellency's favor of the 15th September, by which I observe the change your Excellency directs

to be made with respect to the situation of the township near Cataraqui, and my receiving orders from Major Ross. Your Excellency may rest assured I shall conform myself to them in every particular.

I arrived here yesterday evening in company with Captain Sherwood, etc., having had excessive bad weather almost every day since I left Quebec. I waited on Major Ross and showed him my instructions. He advised that as the lands proposed for townships were not yet purchased from the savages I should stop a few days till that was done, as a person was sent to bring them in for that purpose. In the meantime I shall employ myself in surveying that part fronting the lake, and the other business recommended by your Excellency.

I have the honor to be, etc.,

JOHN COLLINS.

FROM JOHN COLLINS TO GENERAL HALDIMAND.

CATARAQUI, 3rd November, 1783.

SIR,—Through Capt. Mathews I have had the honor of your Excellency's commands of the 13th ultimo, by which I find the weather with you has been similar to what we have had here. All the low lands on the small rivers which this country abounds with are covered with water in such a manner as greatly to retard our progress. All I have been able to do has been to complete the survey of one township, the plan and report of which I have the honor to transmit to your Excellency by this conveyance, with a plan of Point Henry, surveyed by Mr. Cotte, accompanied with such remarks as I hope will prove satisfactory. Mr. Cotte has been constantly employed on that business since his arrival here, but sets off to-morrow with Captain Sherwood and myself in order to lay out a second township, which will be a few miles above the first. The lands between the two are stoney and unfit for cultivation. Your Excellency will please to observe that the township I have laid out is on the west side the River Cataraqui. The lands on the east side, back of Point Henry, by Capt. Sherwood's report, are stoney and barren and not more than half a dozen good lots could be found for some miles back, which report, with the approbation of Major Ross, made me decline laying out a township on the east side the river.

Captain Sherwood and his officers have been constantly employed from their arrival here till the 24th ultimo in exploring the country on this side the lake, a report of which I have likewise the honor to enclose.

Mr. Holland, from indisposition, has not been able to attend me as yet, but will, I expect, in a few days. In the meantime, your Excellency may rest assured that I shall exert my best abilities in complying with your wishes and in expediting this business as fast as possible. At the same time am very much afraid that it will be greatly retarded from the badness of the weather.

I have the honor to be, etc.,

JOHN COLLINS.

FROM MAJOR ROSS TO CAPTAIN MATHEWS.

CATARAQUI, 3rd November, 1783.

SIR,—I had the honor to receive your letter of the 13th ultimo. The lands have been purchased from the Missisagoes, which bargain was much facilitated by an old chief of them whose usual residence is in Canada, but happened to be here at the time. His name is Mynass, has been in Europe, is now an old man, and expects, as he really deserves, that his services on the occasion will be considered by Sir John Johnson, to whom he is recommended.

As soon as the purchase was made, which (up the lake) extends about forty-five miles, I sent some officers of the garrison to explore the country. They report that the lands in general are of a most excellent quality, easily cleared and intersected with rivers on which are several falls where mills can conveniently be erected.

I am much obliged to His Excellency for the order on Carleton Island for rum. Such is the nature of the Indians here that if their services are wanted they are exceedingly covetous, but if they are not employed seldom ask for anything. As the latter is mostly the case at present, a very small quantity of rum or provisions will satisfy them, both of which shall be managed with the greatest economy. Indeed of late I have greatly weaned them from both, and without any discontent. This nation in peaceable times will be very little expense to Government.

The party which went to meet Lieut. French returned some days after his arrival here. They travelled about sixty miles, nearly a northern course. The lands in general are of a better quality than those reported by Lieut. French on the banks of the River Ganenencui, which he has described as very barren. They did not touch upon that river—the Indians would go no further.

The weather has been exceedingly bad here lately—very unfavorable for carrying on the works, and in particular for Mr. Collins' operations.

I was in hopes the saw-mills would have been finished this fall, which the badness of the weather has in some measure prevented. Lieut. Brass not being materially wanted after the arrival of the men sent by Captain Twiss, I have not taken the liberty to write for him, especially as there are so many people employed here at present.

I have the honor to enclose the necessary obligations from such as had permission to build here.

I have the honor to be, etc.,

JOHN ROSS.

CAPT. J. SHERWOOD'S JOURNAL OF EXPLORATION FROM THE WEST END OF LAKE ST. FRANCIS TO THE BAY OF QUINTE.

Sept. 19th, 1783.—Left Montreal with Lieut. Johns and two men of the King's Rangers, Ensign Bothem and seven men of the Loyal Rangers; proceeded up the River St. Lawrence in a boat. 23rd. Arrived at the west end of Lake St. Francis, which is about sixty-five miles from Montreal. 24th. Sent out a party to go by land three miles back from the river and to proceed ten miles up the river and there wait for the boat. We encamped this evening at Mille Roche, eighteen miles up from the lake. Here the party joined us. They report that they went four miles back from the water, and that the land is all the way of the best quality they ever saw, it being a black deep mould, entirely free from stones, ledges or swamps. The timber is very thin, but grows exceedingly large and tall. It is a mixture of beech, maple, elm, basswood, butternut, white oak, hickory, and some pine. The land is exceedingly pleasant all along the shore, and there is a number of fine islands in the river, but there is a great scarcity of water back from the river. 25th. Sent out a party to go by land, and proceeded this day five leagues, which brought us two leagues above the rapid Long Sou. Here the party who went by land joined us. They report that they went two leagues back from the river, that the land is all the way exceeding good, the soil black and deep, mixed with clay loam, the timber the same in quality as described yesterday. Lieut. Johns, who was one of the party, says he never before saw so fine a country of land for all kind of cultivation. They crossed a large creek which emptys into the river just at the head of Long Sou; about two miles up this they saw a very convenient place, and falls for mills, surrounded by a fine grove of pine and white oak timber.

26th and 27th. Proceeded to the head of all the rapids, about twenty-eight miles. This place is called La Galloom, and is about three leagues below Oswegatchie. I sent out frequent parties all this way, as before, and their reports all agree in the excellent quality of the land which is in general as above described, and the river all the way interspersed with fine islands, the soil and timber exceedingly good.

28th. Proceeded five leagues. The land in this distance is not so good as above described, it being somewhat stony, but the soil is deep and rich and may be cultivated to great advantage. On the whole the land may all be said to be of the very best quality from the Lake St. Francis all the way up the river, twelve miles above Oswegatcha, and would admit of at least twelve townships on the river, each six miles square, but the six lower townships would be the best of the twelve. Indeed, I think there cannot be better land in America.

29th. I sent three men with six days provision to go by land from two leagues above Oswegatcha to Cataraqui.

30th. We arrived at Carleton Island. There is a vast number of islands between Oswegatcha and this place, but in general they appear to be barren rock, excepting one called Grenadier Island, which appears to be fine land.

Oct. 1st. Arrived at Cataraqui. I came from Carleton Island to this place in a bark canoe and crossed the island called Long Isle; this appears to be very good land, nearly equal to the Long Sou, and from every information I can get from my own people and others who are good judges of land, I am persuaded here may be two very valuable townships, one east and the other west of the Portage.

2nd, 3rd and 4th. Went to view the land from Cataraqui to Six Nation Bay, which is about seven miles west. This township will in general be stoney on the lake, but about a mile back the land is good. especially up Little Cataracqui, and between that and Six Nation Bay the land is very good.

6th. The party who came by land from two leagues above Oswegatcha joined us at Cataraqui, where they report that for the first six miles of their march the land would admit of a tolerable good settlement; that this township will be watered by three fine creeks, on one of which is a good place for a mill, about two miles from the lake; that all the rest of their march, within five miles of Cataraqui, the land was exceeding bad, being a constant succesion of stoney ledges and sunken swamps, altogether unfit for cultivation, for three miles at least back from the lake; that on the east five miles next to Cataraqui the land was broken, but in many places was improvable and would admit of scattering settlement. This day I went with the boat to view the land all the

way to the Bay Quinte. We found the land for three miles west of Six Nation Bay to be very broken and stoney for three miles back from the lake. We encamped this night at a bay nine miles west of Cataraqui. This place is called Muddy Bay.

7th. Proceeded up the lake, always keeping a party out by land, two or three miles distant from the water. At about three and a half miles from Muddy Bay we came to a very fine river, which the Indians call Mittabi Kitaga, or Stoney Creek. Between this bay and creek the land is very good except a small distance on the edge of the shore, which is stoney, but in general the stones do not extend more than 200 yards from the water, and then begins very good land. This river has two very fine falls, the uppermost not a quarter of a mile from the lake. From this we proceeded to the entrance of the Bay of Quinte, which is about seven and a half miles from Stoney Creek. The land all the way for three miles back, which was as far as we went, is extraordinary good for any kind of cultivation. The soil is deep and rich; the timber is beech, maple, elm, basswood, with some pine, and white oak. We went this afternoon up the bay on a course west by south, about eighteen miles. Here the bay turns north by east as far as we could see, which we judged to be fifteen miles. The bay in general as far as we went is about two miles wide. We encamped this night by a small creek the south side of the bay, on the tongue of land between it and the lake. The land on the north side of this bay thus far is very good.

8th. I sent Lieut. Johns and one man to explore the tongue of land from our encampment back to the mouth of the bay, and Ensign Bothem, with one man to find the distance due south across the tongue to the lake.

9th. This morning Ensign Bothem returned, and reports that it is about six miles on a south line from our camp to the lake. The first two miles the land is extraordinary good, as it is for two miles next the lake, but the two miles in the middle is generally cedar swamps. We returned this evening to the mouth of the bay, where we met Lieut. Johns on the point of the tongue. He reports that he thinks that this tongue of land is about fifteen miles long and about five miles wide in general, and that the land for about a mile and a half from the water on each side is very good, the soil being deep and black, very heavy timbered, generally maple, elm and basswood, with some large pines. The middle is almost one entire cedar and hemlock swamp (or rather grove), not too wet in general for pasture and meadow. The soil is very rich.

10th. Returned to Cataraqui.

11th. Went to look at the country east of Cataraqui. Proceeded fifteen miles to a large river, which the Indians call Cada-

nockui. Near the mouth of this river is a waterfall of about twenty feet perpendicular, which forms the most convenient place for mills I ever saw. The land from Cataraqui is for five miles down broken and stoney, but intermixed with grades of choice good land, and, considering its vicinity to the garrison it may be a valuable township, but then the lots must be picked out wherever the good land can be found, for if they are laid and drawn for in a regular form many men would get lots that would be worse than none. From this township to the River Cadanockui the land is altogether unfit for settlement, being one continued bed of rocks, with intervals of sunken spruce swamps two miles from the lake. There may be a good farm on the east side Cadanockui River. There is three delightful little islands near its mouth, but in general the land is very bad on each side this river.

13th. Returned to Catarockui, and on our way explored the island. This begins six miles below Cataracqui, is about seven miles long by two wide, and in general is very fine land, fit for any cultivation.

14th. I sent Ensign Bothem with the boat to land Lieut. Johns on the north side of the Bay of Quinte, at the western extremity of the late Indian purchase, from whence he is to proceed with two men one day's march north, then east until he falls in with the Cataraqui River, then down the river to the garrison. Ensign Bothem is to explore the land three miles back from the bay, from where he lands Lieut. Johns to the east and west angle.

15th. I went with two men in a bark canoe up Stoney Creek, with an intention to find its source. This stream is very pure water, and so rapid that we were many times obliged to wade to our knees and draw the canoe for an hour at a time. We proceeded up in this manner for a day and a half, which brought us about six miles north from the lake. For one mile from the mouth of this creek the land is broken and stoney, but then begins delightful land, and as far up as we went equally in quality to the Long Sou.

17th. The logs in the river prevented our proceeding any further by water. We took out the canoe and I went north by land for about three miles, which brought me in sight of a lake which appeared to be six or eight miles long and about half as wide, but a large sunken marsh prevented me from going to it. Here I began with my compass to take the angles of this serpentine river, guessing at the distance from angle to angle, and found it as follows:—From the great swamp next the small lake the creek runs west 4 deg. south two miles, then south-west one mile, then west three-quarters of a mile, then south twenty rods, then south-west ten rods, then south ten rods, then south-west eighteen rods, then south-east twenty-five rods, south-west twenty-seven

rods, west thirty rods, south-east seventeen rods, south-west eight rods, south-east eighty rods, south ten rods, south fifteen degrees west twenty rods, south twenty-five deg. east fifty rods, south-east forty-five rods, west fifteen deg. north 90 rods, fifteen deg. ten rods west, eighteen deg. north twenty-eight rods, south twenty-five rods, south-east eighty rods, north-east ninety rods, east thirty rods, north-east twenty-two rods, east thirty-three rods, north-east twelve rods, east twenty-nine deg. north ten rods, south-east fifteen rods, south thirty-two deg. east ninety rods, south twenty rods, south-east sixty rods, south 44 rods, south seven degrees east one hundred rods, south-east fifty-six rods. All this distance every angle in the river forms the most beautiful bows of proper intervals, land of the richest soil and the upland back for two miles on each side of the river is of the best kind. Here the river runs through bad stoney land south forty-five rods to a fall which is about seven feet perpendicular, then south-east eighteen rods, a very rapid current, then south seventeen degrees east thirty rods to another cataract which falls at least twelve feet, then south twelve degrees east twenty-four rods, then south twelve rods to the mouth of the river. This is a noble stream, and should be in the centre of the second township and the lots be laid east and west, bounded on each side of it. From this as far up the Bay of Quinte as I have been is good land, sufficient for four townships; the tongue between the bay and the lake, two townships; the Isle Tonte, one; the Long Island, two; so that from Cataraqui eighteen miles into Bay Quinte, a distance of about thirty-eight miles, we have ten townships (including two islands), the land in general nearly equal to that on the Long Sou, and the climate much preferable.

20th. I returned to Cataraqui.

23rd October. Ensign Bothem returned, and reports that after landing Lieut. Johns and party at DeMulek House, he proceeded to explore the country from said house on the east side of the Bay Quinte back to its mouth, and finds the land in general to be of the best quality. From the entrance of this bay it bears of south of west eighteen miles to a point which he calls oak point; here it turns to the east of north about three miles; then a bay about a mile wide puts in near three miles to the east; about three miles still north puts in a second bay to the east near four miles. From this bay, which is about one mile and a half wide, they proceeded still north about three and a half miles to a third bay, near two miles wide, which Mr. Bothem judged to be about ten miles long, bearing south-east from the mouth to the head. From the head of this third bay he marched due south about two miles, which brought him to the lake near one mile east of the entrance, or mouth, of Bay Quinte. There is a number of fine creeks put into the heads of the above mentioned small bays, which forms the most beautiful land he ever

saw, all the way from the mouth of the Quinte Bay to DeMulek House, an extent of thirty miles. From Messrs. Johns and Bothem's report, compared with my tour up Stoney Creek (which puts into the lake twelve miles west from Cataraqui), it appears that, between Bay Quinte and a north line drawn from the mouth of this creek lies a very extensive country of land equal in quality to the Long Sou, or any other part of North America.

J. SHERWOOD,
Captain Loyal Rangers.

To John Collins, Esq.,
Deputy Surveyor-General.

LIEUT. JOHN'S JOURNEY THROUGH THE WOOD FROM BAY QUINTE TO CATARAQUI.

DE MULAK HOUSE, 19th October, 1783.

Set out from said house and marched north two miles, and struck a large river that came from the north-east and ran to the south-west. We marched up the river two miles, and met with a pair of falls on the river. We judged them to be about eight feet high. From that we marched about four miles and encamped. Good land the day through.

October 20th. We continued our course four miles; then we altered our course and steered east. We marched eight miles and encamped. One cedar swamp about one mile; the rest good land.

21st. We continued our course east and marched about five miles, and struck a river that came from the north-west and ran to the south-east, on which is very good falls for mills. We judged the falls to be about six feet perpendicular, with rapids some way after. From that we marched two miles and struck a large river that came from the north-east and runs south-west. We marched up the river about one mile, in hopes to find a ford, but finding none we made a raft and crossed the river, and marched about one and a half miles and encamped. Good land the day through.

22nd. We continued our course and marched five miles, and came to a small creek that came from the north-east and ran to the south-west. From that we marched four miles and struck another small creek that came from the north and ran to the south. From that we marched about one and a half miles, and struck another small creek that came from the north-east and ran to the south-west. From that we marched one and a half miles and struck a small lake that lay north-east and south-west. We marched down the lake side to the south-west about one and a half miles, when a river ran out the same course west. Followed that for one and a half miles and encamped. Good land the day through.

23rd. It being a stormy day, lay still.

24th. We made a raft and crossed the creek. We judged the creek to be about 150 yards wide. We then continued our course east and marched four and a half miles, and struck a river that came from the north and ran to the south, on which there is good falls for mills. We judged the falls to be eight feet. From that we struck a large cedar swamp in about three and a half miles, which caused us to turn our course more to the north-east, which course we continued about three and a half miles and encamped. The land the day through very bad, being nothing but cedar swamps and stoney ridges, but a number of beautiful springs running from the feet of the ridges.

25th. We continued our course east and marched about four miles and struck a small creek that came from the north and ran south. From that we marched south by east two miles, and struck the road that leads from Cataraqui to the mills above

J. JOHNS,
Lieut. K. R.

DESCRIPTIONS OF THE TOWNSHIPS WEST OF CATARAQUI WHICH WERE OUTLINED BY THE DEPUTY SURVEYOR-GENERAL (COLLINS) DURING THE FALL OF 1783, AND SUB-DIVIDED DURING THE FOLLOWING YEAR.

TOWNSHIP NO. 1 (KINGSTON).

A township or tract of land six miles square, lying and being in the Province of Quebec, situate on the north side of Lake Ontario, near the ancient Fort Frontenac, beginning at a stone boundary standing south 49 degrees, west two hundred and twenty perches from the west angle of the said fort, and six perches from the bank of the lake, runs due west, crossing the mouth of the Little Cataraqui six miles to a stone boundary standing six perches from the bank of the Bay Tonegeyon; and from thence due north, crossing the head of the Bay Tonegeyon, and a small creek that discharges itself into the said bay, six miles to a stone boundary; and from thence a due east course, passing through a low country six miles to a stone boundary standing on a hill twenty-eight perches from the main branch of the little River Cataraqui; and from thence due south, crossing the main branch of the little River Cataraqui and two other branches that discharge into the said river, terminates on the north bank of Lake Ontario at the first station, including twenty-three thousand and forty superficial acres of land, the greater part of which appears to be of an excellent quality, fit for the production of wheat, oats, Indian corn, hemp,

flax, timothy and clover. The woods in general are maple, bass, hickory, ash, elm, pine and white oak, etc.—the two latter in many parts from two and a half to three feet diameter.

This township hath a great many advantages on account of its situation, having Lake Ontario on its front. All the small bays afford good harbor for boats, and the lake abounds with a great variety of fish and wild fowl. The little River Cataraqui is navigable for batteaux from its entrance into the lake to the upper boundary of the township, in which space are many proper places for erecting saw-mills.

J. COLLINS,
D S General.

TOWNSHIP NO. 2 (ERNESTTOWN, SO CALLED AFTER PRINCE ERNEST, EIGHTH CHILD OF GEORGE III).

Surveyed according to the above scheme or plot hereunto annexed, a township or tract of land of six miles square, situate on the north side of Lake Ontario, bounded in front by the said lake, and in depth by the ungranted lands belonging to the King; on the east by the ungranted lands as aforesaid, and on the west by a township marked on the plan No. 3, beginning at a stone boundary, and runs up the lake south 59 degrees west six miles, to a stone boundary; from thence along a line of marked trees, north thirty-one degrees west six miles, to a stone boundary; and from thence along a line of marked trees north fifty-nine degrees, east six miles, to a stone boundary; thence south thirty-one degrees east six miles to the first station, including twenty-three thousand and forty superficial acres of land, which appear to be equal in quality to the best lands in America. The woods the same as described in No. 1. Surveyed the 7th day of November, 1783."

TOWNSHIP NO. 3 (AFTERWARDS CALLED FREDERICKSBURGH, AFTER FREDERICK, DUKE OF SUSSEX, NINTH CHILD OF THE KING).

Surveyed according to the above scheme or plot hereunto annexed, a township or tract of land situate on the north side of Lake Ontario, bounded in front by the said lake, and in depth by the ungranted lands belonging to the King; on the east by No. 2, and on the west by No. 4, beginning at a stone boundary standing thirty perches from the bank of the lake, and runs up the same south fifty-nine degrees east six miles to a stone boundary standing on the north bank of the Bay of Quinte; from thence along a line of marked trees north thirty-one degrees west, crossing a large bay six miles and one hundred and forty-one perches to a stone boundary; and from thence along a line of marked trees north fifty-

nine degrees east six miles to a stone boundary standing on line No. 2; thence down the said line south thirty-one degrees east six miles and one hundred and forty perches to the first station. The quality of the land and woods the same as described in No. 1. Surveyed the 12th day of November, 1783.

J. COLLINS,
D. S. General.
Assisted by Capt. Sherwood and Lieut. Kotte.

TOWNSHIP NO. 4 (ADOLPHUSTOWN, CALLED AFTER THE DUKE OF CAMBRIDGE, TENTH SON OF GEORGE III., AND FREDERICKSBURGH, ADDITIONAL).

Surveyed according to the above scheme or plot hereunto annexed, a township or tract of land situate on the north side of the Bay of Quinte, bounded in front by the aforesaid bay, and in depth by the ungranted lands belonging to the King; on the west by the bay aforesaid, and on the east by the division line that divides this township from No. 3.

Beginning at a stone fixed on the north bank of the Bay of Quinte, the upper boundary of No. 3, and runs up the bay the several courses of the water to the west point or peninsula of land that lies between the said Bay of Quinte and Savannah Bay; thence crossing Savannah Bay north fifty-one degrees east seven hundred and fifty-nine perches to a stone boundary standing in the line of No. 3; thence down the said line south thirty-one degrees east five miles and two hundred and eighty perches to the first station. Surveyed the 15th day of November, 1783.

J. COLLINS,
D. S General.
Assisted by Capt. Sherwood and Lieut. Kotte.

MINUTE OF A MEETING OF THE COUNCIL HELD ON THE 14TH APRIL, 1784, IN THE CASTLE OF ST. LOUIS, QUEBEC, TO CONSIDER THE ALLOTMENTS OF LAND TO REDUCED OFFICERS, DISBANDED SOLDIERS AND LOYALISTS.

GOVERNOR HALDIMAND'S SPEECH.

"GENTLEMEN,—I have assembled you this day as the King's Council, in order to communicate to you two additional instructions which I have had the honor to receive concerning the allotments of lands within this Province to be made to reduced officers, disbanded soldiers and Loyalists.

"Previous to the receipt of these instructions I had ordered the unconceded lands above and below Quebec to be explored by proper persons, and I have had the satisfaction to receive from them such favorable reports as induce me to hope that his Majesty's gracious intentions towards the Loyalists will be fully answered. The measures taken for the settlement of the Loyalists in this Province are proof of His Majesty's determination to retain and defend it.

"The Surveyor-General, with his deputy and other persons, are employed in making out plans of Seigniories agreeable to the instructions. When they are finished I shall assemble you again.

"Upon this business, in the meantime, the instructions, with extracts of two letters from the Secretary of State relating to them, shall remain in the Council Office for the perusal and consideration of the members." Read His Majesty's instructions, dated St. James', the 16th of July, and another dated the 7th of August, 1783. Read also extracts from two letters from the Right Honorable Lord North, one of His Majesty's principal Secretaries of State, to His Excellency General Haldimand, dated Whitehall, 24th of July and 7th of August, 1783. Ordered that the instructions and extracts remain in the Council Office for the perusal and consideration of the members of the Council.

EXTRACT FROM HIS MAJESTY'S INSTRUCTIONS TO HIS EXCELLENCY GOVERNOR HALDIMAND, DATED ST. JAMES', THE 16TH DAY OF JULY, 1783.

Whereas, many loyal subjects, inhabitants of the Colonies and Provinces now the United States of America, are desirous of retaining their allegiance to us, and of living in our Dominions, and for this purpose are disposed to take up and improve lands in our Province of Quebec, and being desirous to encourage our said loyal subjects in such their intentions, and to testify our approbation of their loyalty to us, and obedience to our Government, by allotting lands for them in our said Province;

And whereas we are also desirous of testifying our approbation of the bravery and loyalty of our forces serving in our said Province, and who may be reduced there, by allowing a certain quantity of land to such non-commissioned officers and private men of our said forces who are inclined to become settlers thereon.

It is our will and pleasure that immediately after you shall receive this our insructions, you do direct your Surveyor-General of Lands for our said Province of Quebec to admeasure and lay out such a quantity of land as you, with the advice of your Council, shall deem necessary and convenient for the settlement of our said loyal subjects and the non-commissioned officers and private men

of our forces which may be reduced in our said Province who shall be desirous of becoming setlers therein, and you shall allot such parts of the same as shall be applied for by any of our said loyal subjects, non-commissioned officers and private men of our forces, reduced as aforesaid, in the following proportions, that is to say:

To every master of a family one hundred acres, and fifty acres for each person of which his family shall consist.

To every single man, fifty acres.

To every non-commission officer of our forces reduced in Quebec, two hundred acres.

To every private man, reduced as aforesaid, one hundred acres, and for every one of their family fifty acres.

A true extract,

H. Motz.

EXTRACT FROM HIS MAJESTY'S INSTRUCTIONS TO HIS EXCELLENCY GOVERNOR HALDIMAND, DATED ST. JAMES', THE 7TH AUGUST, 1783.

Whereas our additional instructions to you, bearing date 16th of July last, authorized and empowered you to allot certain portions of land, with the Seigniories, to be surveyed and laid out in the Province of Quebec, by virtue of the said instruction, and to remain vested in us, our heirs and successors, to such of the non-commissioned officers and privates of our forces who shall be reduced in our said Province.

And whereas we are desirous of testifying our entire approbation of the loyalty, suffering and services of the commissioned officers of our Provincial troops who may be so reduced;

It is, therefore, our will and pleasure that upon application of the said commissioned officers who shall be willing immediately to settle and improve lands in our said Province, you do allot such part of the Seigniories to be surveyed and laid out as aforesaid in the following proportion, that is to say:

To every field officer.....	1,000 acres.
To every captain.....	700 "
To every subaltern, staff and warrant officer.....	500 "

Exclusive of fifty acres for each person of which family of such officer shall consist;

And whereas many of our loyal and deserving subjects have taken arms, and associated themselves in the Provinces now the United States of America for the support of our Government and authority, under the name of Associated Loyalists, without being put upon any particular establishment, many of whom may take refuge in our Province of Quebec;

It is our will and pleasure that the commissioned and non-commissioned officers and privates of the said Associated Loyalists shall be in every respect entitled to the same allotments of land and every encouragement intended and given by our said recited additional instructions to the non-commissioned officers and privates of our forces, who shall be reduced in our said Province, and by this our instruction to the commissioned officers of our Provincial forces who shall be reduced.

A true extract,

H. Motz.

LETTER FROM GOVERNOR HALDIMAND TO SIR JOHN JOHNSON, APPOINTING HIM TO TAKE CHARGE OF SETTLING THE LOYALISTS ON THEIR LANDS.

Headquarters, Quebec,
17th May, 1784.

Sir,—From your approved zeal for the King's service, the interest which you have at all times taken in the happiness of his loyal subjects, who, owing to their attachment to His Majesty's Government, have been obliged to abandon their properties and take refuge in this Province, and from your knowledge in general of and influence with these people, I have thought fit to request that you will take upon you the management and direction of distributing to the said Loyalists and to the disbanded troops in the upper part of this Province, the Crown Lands which, in pursuance of His Majesty's instructions, I have allotted for their reception.

You will herewith receive particular instructions for your guidance in the execution of this important public service, in which the officers commanding posts and all others, civil and military, are hereby strictly required to afford you every aid and assistance in their power to give.

I am, etc.,

Sir John Johnson. F. Haldimand.

LETTER FROM GOVERNOR HALDIMAND TO DEPUTY SURVEYOR-GENERAL COLLINS, WITH INSTRUCTIONS REGARDING THE SETTLING OF THE LOYALISTS.

Quebec, 18th May, 1784.

Sir,—Having communicated to you His Majesty's instructions for granting lands in this Province to such of his disbanded troops and refugee Loyalists who are desirous of settling therein, and the mode I have adopted for execution thereof, and having fur-

nished you with copies of the same, with every instruction and power necessary for laying out the lands alloted for that purpose, you are hereby directed to proceed without loss of time to Sorel, where I have ordered that all persons of the above description in that district shall be assembled to declare ultimately their choice of situation. You will, therefore, make out particular returns, specifying their names, number of each family and places where they shall choose to settle, which you will communicate to Capt. Barnes, of the Quarter-master General's Department, who has my directions to forward them immediately on their different routes. From Sorel you will proceed to Montreal, where you will confer with Sir John Johnson, to whose direction I have thought fit to commit the settlement of the disbanded troops and Loyalists in the upper district of the Province, and to whom you will give every assistance in your power in the execution of that service. Sir John Johnson will communicate to you my instructions to him, upon this subject, and you will deliver to him the books containing the King's instructions, oaths and declarations to be made and subscribed, together with the certificates for the settlers, which are to be distributed throughout the settlements, as Sir John Johnson and you shall think best. The advanced season of the year requires the utmost despatch in this business. You will, of course, first proceed to settle the Royal Regiment of New York upon the ground allotted for them, which I hope is by this time nearly laid out from thence upwards to Cataraqui. His Majesty's instructions respecting the manner of laying out the land and the portions to be distributed are so full that it is unnecessary for me to add to them, further than to remind you of what I have verbally mentioned—that every partiality is to be avoided—for which purpose my instructions to Sir John Johnson direct that the townships and lots in each are to be indiscriminately drawn for, as well by the officers as the men. Your progress in this business will depend so much upon local circumstances and unforeseen contingencies that it would be in vain to offer any other than general instructions. On Sir John Johnson's and your zeal for the King's service and the happiness of the settlers, I therefore, rely on a successful execution of it.

You shall hear from me upon the subject of the settlement at Niagara, concerning which I shall send directions to Lieut.-Col. DePeyster and to Major Ross to send up Lieut. Tinling to lay out the ground lately purchased at that place, which, considering the quantity that must be reserved for the King, is by no means sufficient to settle all the Corps of Rangers, part of which will, consequently, come down to Cataraqui.

I am, etc.,

FRED. HALDIMAND.

N. B.—The instructions which were given to Lieut.-Governor Cox for settling the Loyalists in the Bay of Chaleurs are in every respect the same as those alluded to in the above letters, with this addition, that 100 acres of wood land should be reserved in the rear of the fishing beaches, that every person occupying a station here should have (immediately behind it) a sufficient quantity of the necessary timber for the construction of flakes and stages, indispensibly necessary in carrying on the fishery.

To Major Holland and Sir John Johnson.

COMMISSION TO THE DEPUTY SURVEYOR-GENERAL TO ADMINISTER THE OATH OF ALLEGIANCE, ETC., TO THE LOYALISTS.

George the Third, by the Grace of God King of Great Britain and of the Territories thereunto, Defender of the Faith, etc.

To our trusty and well-beloved the Hon. John Collins, of the District of Montreal, in the Province of Quebec—Greeting:

Know you that we have thought fit to empower you, and we do hereby give and grant unto you full power and authority to tender and administer unto all persons whom it may concern, the oaths directed by the law and the declaration following, that is to say: "I, ———, do promise and declare that I will maintain, and defend to the utmost of my power, the authority of the King in his Parliament as the supreme Legislature of this Province"; and to receive from such persons their subscriptions severally to the oath and declaration. And what you shall do herein, you are here to make return into the office of our Clerk of the Council for our said Province, together with this writ.

Witness, our trusty and our well-beloved Frederick Haldimand, our Captain-General and Governor-in-Chief of our said Province of Quebec, at our Castle of St. Louis, in our City of Quebec, the seventeenth day of May, in the year of our Lord, 1784.

FRED. HALDIMAND.

By His Excellency's command,

A. GRAY.

REPORT OF THE DEPUTY SURVEYOR-GENERAL TO GENERAL HALDIMAND.

CATARAQUI, 12th August, 1784.

SIR,—I had the honor to receive Your Excellency's letter of the 20th of July, enclosing the Dedimus Potestatem, authorizing me

to administer the several oaths therein mentioned to Major Ross and Mr. Neil McLean, which I have accordingly done, and enclose the same herewith, together with the Dedimus Potestatem.

I have likewise the honor to report to Your Excellency that I have completed the survey and settlement of the 5th township,* situate on the Peninsula between Lake Ontario and Bay of Quinte. The whole of the disbanded British troops and Germans have drawn their lots. Each man has taken the oaths, agreeable to the King's instructions, signed the books, received his certificate, and is now in possession of his land, with which I am persuaded they will be pleased, as the land in general appears to be of good quality.

I am sorry to acquaint Your Excellency that the business with respect to completing the survey and settlement of the townships laid out last autumn is not so forward as could be wished, or, from the length of time, Your Excellency has reason to expect. The poor people have set themselves down, half a dozen together, in different parts of the townships, not knowing where to find their lots, except those on the front; nor can it be expected, until the several lines between the different concessions be drawn and boundaries fixed, which has not yet been done. I should have set out on that business this day, but find myself too weak, having just got quit of a fever which I have had for some days past. However, I have employed Mr. Tuffe and Mr. Henry Holland, with each a good party, in drawing the lines of the second and third concessions of the first township. On their return I shall proceed up the lake and complete the survey of the second and third townships in the same manner. With respect to the fourth township, nothing can be done until Your Excellency determines to whom it belongs. No doubt the party who is obliged to quit their claims will expect their land in some other place. I shall, therefore, without loss of time, when the business above mentioned is completed, go in search of another township, and by the first conveyance send Your Excellency a plan of the settlement lately made, with an account of my success.

I find great difficulty to get men, and am obliged to pay high. I have taken the liberty to draw on Capt. Maurer for £100 currency to carry on this service, which I hope Your Excellency will approve of. Your Excellency may faithfully rely on my bringing this troublesome business to as speedy a conclusion as possible.

I have the honor to be,
Your Excellency's most obedient and humble servant,

JOHN COLLINS,
D. S General.

To His Excellency General Haldimand.

*Afterwards called Mary'sburgh, after the Duchess of Gloucester—eleventh child of the King.

LETTER FROM GENERAL HALDIMAND TO SIR JOHN JOHNSON, BARONET, DATED HEADQUARTERS, 16TH AUGUST, 1784.

SIR,—It is with concern that I learn from Major Holland the very unfavorable report which he made to you, upon his way to this place, of the settlers belonging to your second battalion at Cataraqui, particularly of some of the officers, who, instead of conciliating the minds of such as are disposed to be discontented, and reconciling any difficulties which, from local or other circumstances, cannot be obviated, are active in encouraging and supporting them in disregarding the instructions, which, it appears by Mr. Collins' certificate and others, you had left for execution with Major Holland. A slight indisposition has prevented me from enquiring into the particulars of the affair, but I have directed Major Holland to make a faithful report to me, in writing, of every circumstance relating to it, that proper notice may be taken of such persons, whose conduct has been so reprehensible. In the meantime, finding that it has not only impeded, but actually stopped the progress of the settlement, the purport of this letter is to desire that you will immediately despatch an express to Mr. Collins, with my positive orders that he shall proceed in alloting the fourth township as proposed by Major Holland, leaving the proportions of the officers of your second battalion, Major Rogers' detachment, and Major Vanalstine's party, that cannot be completed in three and four, to be laid out for them as soon as possible where they can most conveniently be had.

You will at the same time give such directions as you shall think proper to the refractory persons in question, to second Mr. Collins in the execution of this order, in which, if they do not immediately acquiesce, they are to come down from thence, and will assuredly be deprived of every bounty a proper conduct would entitle them to from Government.

FRED. HALDIMAND.

To Sir John Johnson, Baronet, etc., etc., etc.

LETTER FROM THE DEPUTY SURVEYOR-GENERAL TO GENERAL HALDIMAND.

CATARAQUI, the 16th day of September, 1784.

SIR,—The sudden departure of the batteaux by which I write this, leaves me only time to report to Your Excellency that I am this moment returned from Bay of Quinte, where I have completely settled all matters respecting land affairs with Sir John Johnson

and Major Rogers' corps, and Major Vanalstine's party, to the general satisfaction of all parties. The plan formerly promised Your Excellency shall go by the first conveyance.

I have the honor to be,
Your Excellency's most faithful and most obedient
humble servant,

J. COLLINS,
Deputy Surveyor-General.

His Excellency General Haldimand.

MEETING OF COUNCIL, AT WHICH HIS EXCELLENCY MAKES KNOWN THE PROGRESS MADE IN SETTLING THE DISBANDED SOLDIERS AND LOYALISTS WITHIN THE PROVINCE.

On Tuesday, the 16th of November, 1784. At the Council Chambers in the Castle of St. Louis. Present: His Excellency, Frederick Haldimand, Governor; the Honorable Henry Hamilton, Lieutenant-Governor; Hugh Finlay, Thomas Dunn, Francis Adam Mabane, George Pownall, Samuel Holland, J. G. C. DeLery, John Fraser, Henry Caldwell, Francis Baby, and George Davison, Esquires.

His Excellency had acquainted the Council that, agreeable to the intention which he had communicated to them on the 1st of May last, he had exerted his utmost efforts to form the settlement of the disbanded soldiers and Loyalists upon the Crown Lands within the Province. That with this view he had appointed Sir John Johnson, with Major Holland, the Surveyor-General of the Province, his deputy, and other assistants, to superintend the settlements from Point au Baudet upwards to Cataraqui and the Bay of Quinte, and Lieutenant-Governor Cox, with assistant surveyors, to superintend the allotments of lands at Bay of Chaleurs and Gaspe.

His Excellency the Governor laid before the Council plans and surveys of different seigniories from Point au Badet to about fifteen miles above Oswegatcha, upon which seigniories the numbers settled are as follows, viz.:—

		Children,			
Men.	Women.	Males.	Females.	Servants.	Total.
815	360	436	449	33	2,093

His Excellency likewise laid before the Council plans and surveys of seigniories above Cataraqui to the Bay of Quinte, upon which seigniories the number settled was as follows, viz.:—

		Children,			
Men.	Women.	Males.	Females.	Servants.	Total.
799	275	303	326	43	1,746

His Excellency acquainted the Council that the return of the disbanded soldiers and Loyalists at Gaspe and Perce had not been received, but the numbers settled at Paspabiac, in the Bay of Chaleur, were as follows, viz.:—194 men, 69 women, 172 children; total, 435.

His Excellency was further pleased to acquaint the Council that, besides provisions, spades, hoes, and other such implements of agriculture, clothing and camp equipage had been furnished to the settlers from the King's stores, and that precautions were taken to procure for their use wheat, Indian corn,potatoes and garden seeds for the ensuing spring.

His Excellency ordered the Surveyor-General to make copies of the plans and surveys, to be lodged in the Council office.

GENERAL ABSTRACT OF MEN, WOMEN AND CHILDREN SETTLED ON THE NEW TOWNSHIPS OF THE RIVER ST. LAWRENCE.

These begin at No. 1, Lake St. Francis, going upwards. Montreal, July, 1784.	Men.	Women.	Children.	Servants.	Total.
1st Battalion late King's Royal Regiment, New York, and those attached, settled on Townships Nos. 1, 2, 3, 4 and 5	549	257	631	25	1,462
Part of Major Jessup's Corps and those attached, settled on Townships Nos. 6, 7 and part of 8	187	85	211	12	495
2nd Battalion late King's Royal Regiment, New York, and those attached, settled on Townships Nos. 3 and 4, Cataraqui	199	32	69	10	310
Capt. Grass's party and those attached, on Township No. 1, Cataraqui	88	33	66	..	187
Part of Major Jessup's and those attached, settled on Township No. 2, Cataraqui	137	71	214	12	434
Major Roger's Corps and those attached, settled on Township No. 3, Cataraqui	120	47	118	14	299
Major Van Alstine's party of Loyalists, settled on Township No. 4, Cataraqui	92	46	103	17	258
Different detachments of disbanded Regular Regiments, settled on Township No. 5, Cataraqui	153	39	67	..	259
Detachment of Germans with Baron Reitzenstein, settled in Township No. 5, Cataraqui	30	8	6	..	44
Rangers of the Six Nation Department and Loyalists, settled with the Mohawk Indians at the Bay of Quinte	13	8	7	..	28
	1,568	626	1,492	90	3,776

John Johnson.

INSTRUCTIONS FROM LIEUT.-GOVERNOR HAMILTON TO THE DEPUTY SURVEYOR-GENERAL TO MAKE AN EXPLORATORY SURVEY OF THE COUNTRY LYING BETWEEN THE BAY OF QUINTE AND LAKE HURON.

QUEBEC, 22nd May, 1785.

SIR,—You will please immediately upon your arrival at Montreal to wait on the General and acquaint him with the time of your intended departure from thence, and receive his commands for any of the settlements on your route.

You will confer with Mr. Delancy before you leave Montreal, and should anything appear necessary to be communicated to me, either on account of the Loyalists or the intended survey, you will have no time to inform me of it. You will consult the heads of the townships and report to me briefly the state and progress of each, with their real wants, not their fancied ones.

Having settled with Mr. McLean about the management of the Loyalists at the upper townships, and directed how the mills are to be worked for the common benefit, having settled Captain Brant's lot, and distributed the garden seeds, having left your instructions with Mr. Kotte how he is to proceed, and arranged all for the best with Captain Potts, you will proceed upwards to take a survey of the communication between the Bay of Quinte and Lake Huron, by Lake La Clie.

You will particularly note the depth of water at every necessary place and mark the soundings in your plan or chart—the parts navigable for the different sorts of craft; the nature of the soil and its produce, particularly timber; the Indian tribes on the communication, their number, disposition, etc.; what tracts of land it may be necessary to purchase, and at what rate; calculate the time and expense of rendering the different portages, etc., practicable; consider and weigh well the disadvantages as well as the favorable points; the tracts which the transport of goods would require if the roads were in good condition; consult the merchants of Montreal upon the idea of erecting stores at the different convenient places, and if you find they are desirous of encouraging the project, write me immediately.

Your prudence will suggest other measures. I wish you all health and good weather, and am, sir,

Your most obedient and most humble servant,

HENRY HAMILTON.

John Collins, Esq.,
Deputy Surveyor-General.

APPENDIX.

ONTARIO LAND SURVEYORS.

Minimum Tariff of Charges Adopted at the General Annual Meeting of the Association, on February 26th, 27th and 28th, 1889.

Field and Office Work, per day of eight hours	$6 00
First Assistant, per day of eight hours	3 00
Second " " " "	1 50

Time taken going to and returning from the Survey, to be included in above eight hours. Not less than half a day to be charged.

Surveys of Single City Lots, not less than	$6 00
Unless previous Surveys have been made of adjoining lots in same plan, then	5 00
No description to be drawn for less than	1 00
Services at Registry Office and at Consultations, per hour, not less than	1 00
No charge to be less than	1 00

All expenses, such as Railway Fare, Hotel Expenses, Conveyance of any kind, Posts, Monuments, are to be charged for as extra.

H. J. Browne, Toronto,
C. F. Miles, Walkerton,
M. Gaviller, Barrie,
E. Stewart, Collingwood,
A. Niven, Haliburton,
T. B. Speight, Toronto,
J. P. B. Casgrain, Morrisburg.

} Special Committee on Tariff.

ARTICLED STUDENTS.

Resolution passed at the General Annual Meeting of March, 1888.

Resolved—" That, in the opinion of this Association, the bonus to be paid by any articled pupil, to the Surveyor to whom articled, shall not be less than $200." Carried.

Willis Chipman,
Secretary-Treasurer.

A. Niven,
President.

22nd April, 1889.

OBITUARY.

JOSEPH DeGURSE.

Joseph DeGurse was born in Moore Township, in the County of Lambton, Ont., on February 26th, 1857. He spent his youth on a farm, but on arriving at manhood he decided on entering the profession of surveying and engineering, and with this object in view he studied at Assumption College, Sandwich, and at the School of Practical Science, Toronto, and after his apprenticeship in the office of Mr. T. Byrne, who at that time was practising in Sarnia, but is now at Sault Ste. Marie, he passed his final examination and received his commission as P. L. Surveyor in April, A.D. 1883.

On October 28th, 1884, he married Miss Annie Mulligan, daughter of Thos. Mulligan, of Lambton County, and then settled in Windsor, where he has since been engaged in professional work.

During the first few years of his professional life he made many Government surveys in the Algoma and Nipissing Districts and in the North-West.

In November, 1887, he obtained the responsible position of Chief Engineer of the Lake Erie and Detroit River Railway, and in both his professional and private capacity he was highly esteemed by the Directorate of that road.

Under his superintendence the road was located and built from Walkerville to its present terminus at Ridgetown, and surveys and plans were prepared for its extension to St. Thomas. By him also the old wooden bridges on the London & Port Stanley Railroad were replaced by first-class steel bridges. Terminal buildings were erected at London and many improvements were made in the roadbed and at the terminus at Port Stanley.

During the summer of 1897 he prepared plans and specifications for a ferry slip dock at Port Stanley harbor.

In addition to his extensive railroad engagements he attended to a large and varied local practice in surveying and engineering.

The cost of the pavements and sewers alone constructed under him in Windsor and Walkerville exceeded $300.000.

Notwithstanding his busy professional life, he yet found time to discharge judiciously many social and other duties.

He served some years with ability on the Board of Education.

For several years he was Chairman of the North Essex Board

of License Commissioners, and at the time of his death was Chairman of the Windsor Board of License Commissioners.

He was President of St. Vincent de Paul Society, and took a very active part and interest in the welfare of the poor and unfortunate members of the community.

In politics he was an ardent Reformer, and whenever the occasion arose he considered no sacrifice in time or labor too great in order to further the interests of that party.

He was loved and honored by all who knew him, and he leaves a devoted wife to mourn his loss.

EDWARD C. CADDY.

Edward C. Caddy, O.L.S. and D.L.S., fifth son of the late Col. Caddy, B.A., was born at Quebec June 28th, 1815, where his father was then quartered. A short time after this the family returned to England. He came to Canada again in 1833, but soon returned to England for a few years. Finally he settled in Canada and studied surveying with the late John Reid, P.L.S., and passed his examination as surveyor in 1846, and made his home in Cobourg. For some time he was employed in resurveying Hamilton and the surrounding townships.

He was among the first surveyors sent out to the North-West. His first survey in 1872 was about eighteen miles from Fort Garry. Between that time and 1884 he made eight different trips to the North-West on surveyors' work. He finally returned to Ontario in July, 1884, and since then did very little professional work.

Most conscientious in all his dealings, he took a great interest in his profession.

In 1856 he married Miss S. Rogers, daughter of James G. Rogers, of Grafton. He died September 26th, 1897, leaving a wife and eight children.

JOHN CHISHOLM McNABB.

John Chisholm McNabb, O.L.S., C.E., was educated at the High School, Hamilton, Ontario, and commenced his professional studies with D. C. O'Keefe, in that city, about the year 1869. He found employment in the Public Works Department under the Hon Arch. McKellar, Commissioner of Public Works.

He served his apprenticeship with T. N. Molesworth, P.L.S., passed his examination, and was sworn in P.L.S. in 1880. He was

employed in the laying out of the Erie & Huron Railway, and was for some time occupied in railway work in the State of Arkansas. While residing in Chatham he was appointed engineer for that city.

Latterly he made his home in Hamilton, where he died on 16th October, 1897.

JOSEPH MILLER OLIVER CROMWELL.

Joseph Miller Oliver Cromwell, O.L.S., was born at Road, in Somersetshire, England, on January 1st, 1820, and came to this country at a very early age. About the year 1845 he commenced the study of surveying under Josias Richie, P.L.S., and when duly qualified he commenced professional work on his own account, and soon became prominent in his profession in the north-eastern portion of Ontario, being specially consulted on all questions regarding boundaries. After a successful career, age compelled him to retire from his profession after over 50 years of continuous work. He had many apprentices, who were afterwards well-known surveyors, and he survived them all but one. He passed away at his home in Perth, Ont., on October 19th, 1897.

In Memoriam.

NAME.	LATE RESIDENCE.	DATE OF P.L.S. CERTIFICATE.	DATE OF O.L.S. REGISTRATION.	DIED.
Bolger, Francis	Lindsay	10th October, 1863	1892	3rd November, 1895.
Bowman, Leander Meyer	Toronto	14th April, 1892	1892	20th September, 1895.
Burke, William Robert	Ingersoll	5th April, 1878	1892	10th June, 1875.
Caddy, Edward C.	Cobourg	18th December, 1846.	1892	26th September, 1897.
Coad, Richard	Glencoe	8th October, 1879	1892	17th May, 1897.
Creswicke, Henry	Barrie	8th July, 1864	1892	22nd January, 1898
Cromwell, Joseph M. O	Perth	1st October, 1846	1892	19th October, 1897.
Deane, Michael	Windsor	26th May, 1848	19th December, 1892.	3rd April, 1897.
DeGurse, Joseph	Windsor	5th April, 1883	1892	22nd March, 1898.
Fowlie, Albert	Orillia	13th January, 1863	1892	—— April, 1898.
Gibbs, Thomas Fraser	Adolphustown	31st May, 1841	1892	17th April, 1893.
Haskins, William	Hamilton	5th July, 1855	1892	5th July, 1896.
Hewson, Thomas Ringwood	Hamilton	6th July, 1877	1892	21st October, 1898.
Howitt, Alfred	Gourock	12th January, 1856	1892	6th May, 1896.
MacNabb, John Chisholm	Hamilton	8th January, 1880	1892	16th October, 1897.
Ogilvie, John Henry	Rat Portage	8th April, 1876	24th April, 1894	21st September, 1898.
Pedder, James Robert	Doon	10th November, 1891.	23rd December, 1892.	17th January, 1897.
Robinson, William	London	—— May, 1846	1892	11th October, 1894.
Thomson, Agustus Clifford	Chicago	14th January, 1861	1892	—— December, 1896.
Walsh, Thomas William	Simcoe	25th April, 1842	1892	14th March, 1895.
Wheelock, Charles John	Orangeville	—— ——, 1856	1892	4th July, 1897.

LIST OF OFFICERS OF THE 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 1898 (SINCE

OFFICERS.	1892-3.	1893-4.	1894-5.
President	E. Stewart	E. Stewart	M. J. Butler .....
Vice-President	M. J. Butler	M. J. Butler	M. Gaviller.....
Secretary-Treasurer.	A. J. Van Nostrand.	A. J. Van Nostrand.	A. J. Van Nostrand.
Members of Council.	Hon. A. S. Hardy..	Hon. A. S. Hardy..	Hon. A. S. Hardy..
	P. S. Gibson	Geo. B. Kirkpatrick.	Villiers Sankey* ...
	M. Gaviller.....	A. Niven	Herbert J. Bowman.
	John McAree	P. S. Gibson	Geo. B. Kirkpatrick.
	Villiers Sankey*....	M. Gaviller.....	A. Niven .....
	A. Niven	J. McAree.....	P. S. Gibson.....
	Geo. B. Kirkpatrick.	Villiers Sankey* ...	Willis Chipman....

TION FORMED IN 1886 BY THE LAND OF ONTARIO.

INCORPORATION).

1889-90.	1890-1.	1891-2.	1892 (to 1st July).
A. Niven	Villiers Sankey.....	Villiers Sankey	E. Stewart.
Villiers Sankey	E. Stewart	E. Stewart	M. J. Butler.
Willis Chipman	A. J. Van Nostrand.	A. J. Van Nostrand	A. J. Van Nostrand.
E. Stewart	H. B. Proudfoot....	M. J. Butler	John McAree.
John McAree	M. Gaviller.....	H. B. Proudfoot ...	M. Gaviller.
P. S. Gibson.....	T. H. Jones.....	M. Gaviller.....	P. S. Gibson.

INCORPORATION).

1895-6.	1896-7.	1897-8.	1898-9.
M. Gaviller.....	Willis Chipman	T. Harry Jones	P. S. Gibson.
Willis Chipman	T. Harry Jones	P. S. Gibson	H. J. Bowman.
A. J. VanNostrand..	A. J. Van Nostrand.	A. J. Van Nostrand.	A. J. Van Nostrand.
Hon. A. S. Hardy ..	Hon. A. S. Hardy ..	Hon. J. M. Gibson .	Hon. J. M. Gibson.
P. S. Gibson	Geo. B. Kirkpatrick.	Villiers Sankey* ...	J. L. Morris.
F. L. Foster	A. Niven	J. W. Tyrrell	F. L. Foster.
Villiers Sankey*....	P. S. Gibson.....	Geo. B. Kirkpatrick.	Villiers Sankey.*
Herbert J. Bowman.	F. L. Foster	A. Niven	J. W. Tyrrell.
Geo. B. Kirkpatrick.	Villiers Sankey*....	F. L. Foster	Geo. B. Kirkpatrick.
A. Niven	Herbert J. Bowman.	J. L. Morris ..... (vice P. S. Gibson)	A. Niven.

*Chairman of Counell.

LIST OF MEMBERS.

1st SEPTEMBER, 1898.

The names of those members granted exemption by By-laws ratified by the Association are marked*.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Abrey, George Brockitt, Sawbill, Dist. of Rainy River.....10th Jan., 1860
D.L.S.

Allan, John Richard, Renfrew.....6th Nov., 1894
Grad. S.P.S.

Anderson, John Drummond, Trail, B.C.....13th April, 1892

Aylsworth, Charles Fraser, Sr., Madoc.....2nd April, 1861
D.L.S.

Aylsworth, Charles Fraser, Jr., Madoc.....8th Jan., 1886

Aylsworth, John Sidney, Selby, P.O. Box 23...9th Jan., 1871
D.L.S.

Aylsworth, William Robert, Belleville, P.O. Box 2.....8th Nov., 1861
D.L.S.

Baird, Alexander, Leamington.....7th July, 1877
D.L.S., C.E.

Barrow, Ernest George, Hamilton.....4th Oct., 1877
D.L.S., Mem. Can. Soc. C.E., City Engineer.

Bazett, Edward, Burk's Falls.....8th July, 1881
D.L.S.

Beatty, David, Parry Sound.....12th July, 1869
D.L.S.

Beatty, Herbert John, Eganville.....8th Nov., 1893
Grad. S.P.S.

Beatty, Walter, Delta.....19th July, 1858
D.L.S., M.P.P.

Bell, Andrew, Almonte.....6th Oct., 1866
D.L.S.

Bell, James Anthony, St. Thomas.....11th Oct., 1875
D.L.S., Co. Engineer, Elgin; City Engineer, St. Thomas.

Bigger, Charles Albert, Ottawa, 68 Daly Ave..6th Jan., 1882

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,
Geological 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, Peterborough.....7th Nov., 1896
Grad. S P.S.

Bowman, Clemens Dersteine, West Montrose. 10th July, 1879

Bowman, Herbert Joseph, Berlin.....7th Jan., 1887
D.L.S., Grad. S.P.S., Town Engineer. Assoc. Mem. Can. Soc. C.E.

Bray, Edgar, Oakville.....6th Oct., 1866
D.L.S.

Bray, Harry Freeman, Oakville.....10th July, 1882

Bray, Samuel, Ottawa, Dept. of Indian Affairs..6th Jan., 1877
C.E., D.L.S.

Brown, David Rose, Cornwall.....10th Oct., 1850
D.L.S.

Brown, George Laing, Morrisburg.....19th Feb., 1898
Grad. S.P.S.

*Brown, John Smith, Kemptville.....8th July, 1852
D.L.S.

Browne, Harry John, Toronto, 17 Toronto st..6th July, 1872
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 Engineering News Pub. Co., 220 Broadway.

Butler, Matthew Joseph, Napanee,
P.O. Box 359.....11th Jan., 1878
M.I.C.E., Mem. Am. Soc. C.E., Mem. Can. Soc. 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.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

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,
Parliament Building .....10th April, 1885
C.E. Provincial Instructor in Road Making.

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
Mem. Can. Soc. C.E., D.L.S.

Casgrain, Joseph Philippe Baby, Morrisburg...5th Jan., 1887
D.L.S., P.L.S. (Que.), C.E., Assoc. Mem. Can. Soc., C.E., Chief Eng. M. & P. J. Ry.

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
B.A.Sc. (McGill), Mem. Am. Soc. C.E., Mem. Can. Soc. C.E.

Code, Abraham Silas, Alvinston.....14th April, 1896

Cozens, Joseph, Sault Ste. Marie.....7th July, 1875
D.L.S.

*Davidson, Alexander, Arkona.....11th Oct., 1858
D.L.S.

Davidson, Walter Stanley, Sarnia.....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., (Kingston), City Engineer.

Deacon, Thomas Russ, Rat Portage.....12th Nov., 1892
Grad. S.P.S., Town Engineer.

Deans, William James, Oshawa.....11th July, 1884

DeMorest, Richard Watson, Sudbury.....9th April, 1889
M.E.

Dickson, James, Fenelon Falls.....6th April, 1867
D.L.S., Ins. of Crown Land Surveys.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Dobbie, Thomas William, Tilsonburg.....11th July, 1856
D.L.S.

Dobie, James Samuel, Port Arthur.....21st Feb., 1898
B.A.Sc. (Toronto).

Doupe, Joseph, Winnipeg, Man.,
169 Edmonton st.....13th Jan., 1863
D.L.S., P.L.S. (Man.), C.E. (McGill).

Ducker, William A., Winnipeg, Man.,
334 Pacific ave.....6th April, 1882
D.L.S., P.L.S. (Man.)

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., Eng. for Weddell Bridge & Engine Works.

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, Fort William.....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, Petrolea.....9th April, 1888

Ford, William Butterton, Hamilton.....21st Feb., 1898

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.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Gamble, Killaly, Toronto, 88 Charles st.....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.

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., Mem. Can. Soc. C.E., Engineer Tp. of York.

Gibson, Wilbert Silas, Willowdale.....21st Feb., 1898

Gilliland, Thomas Brown, Eugenia.....11th July, 1868
D.L.S.

Gillon, Douglas John, Fort Frances.....9th Nov., 1895
Grad. R.I.E. Coll.

Graydon, Aquila Ormsby, London.....8th July, 1880
City Engineer.

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, Steelton, Penn...13th Nov., 1893
C.E. (R.P.I., Troy, N.Y.)

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.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

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), Assoc. Mem. Can. Soc. C.E., Chief Eng. I.R.R. Co.

Hutcheon, James, Guelph.....10th Nov., 1891
Grad. S.P.S., City Engineer.

Innes, William Livingstone, Peterborough,
Trent Navigation Office.....14th April, 1892
C.E. (Toronto University).

Irwin, James Moore, Rat Portage.....27th Dec., 1893
D.L.S.

James, Darrell Denman.....3rd Nov., 1891
B.A., B.A.Sc. (Toronto University).

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
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. (Toronto University), Mem. Can. Soc. C.E.

Kippax, Hargreaves, Huron, South Dakota...7th July, 1877
C.E. (Toronto University), 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.

Laird, James Stewart, 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., P.L.S. (Quebec), C.E.

Lougheed, Aaron, Port Arthur,.....12th Nov., 1888
D.L.S.

*Low, Nathaniel Edward, Wiarton.....11th July, 1856
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Lumsden, Hugh David, Toronto,
63 Homewood ave.....4th Jan., 1866
C.E., D.L.S., M.I.C.E., Mem. Can. Soc. C.E.

*Lynch-Staunton, Francis Hardwick,
Hamilton .....11th Oct., 1856
D.L.S.

Macdougall, Allan Hay, Port Arthur.....11th April, 1859
D.L.S., Town Engineer.

MacKenzie, William, Sarnia.....11th April, 1896
Grad. R.M.C. (Kingston).

MacKenzie, William Lyon, Kuskonook, B.C.,
via Nelson, B.C.....7th April, 1887
C E., Asst. Eng. Crow's Nest Pass Ry.

MacPherson, Duncan, Montreal.....9th Jan., 1884
Grad. R.M.C., M.I.C.E., Mem. Can. Soc. C.E., Div. Eng. Eastern Div. C.P. Ry.

McAree, John, Rat Portage.....6th April, 1867
Dominion Topographical Surveyor, B.A.Sc. (Toronto University).

*McCallum, James, Fort Frances.....30th Mar., 1849
D.L.S.

McCubbin, George Albert, St. Thomas,
Box 423.....9th Nov., 1895
Asst. City Engineer.

McCulloch, Andrew Lake, Galt.....10th Nov., 1888
Grad. S.P.S., Assoc. Mem. Can. Soc. C.E.

McDonell, Augustine, Chatham,
4 & 5 Ebert's Block.....11th July, 1863
D.L.S.

McDowall, Robert, Owen Sound.....11th Nov., 1890
Town Engineer, Grad. S.P.S.

McEvoy, Henry Robinson, St. Marys.....10th July, 1875
D.L.S.

McFadden, Moses, Neepawa, Man.....13th April, 1858
D.L.S., P.L.S. (Man.)

McFarlen, George Walter, Toronto,
Court House.....11th Nov., 1889
Grad. S.P.S.

McGeorge, William Graham, Chatham,
Box 225.....8th Jan., 1866
D.L.S.

McGrandle, Hugh, Huntsville.....5th Jan., 1883

McKay, Owen, Windsor, P.O. Box 167.....7th Jan., 1887
Grad. S.P.S., Chief Eng. D. & L. E. Ry.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

McKenna, John Joseph, Dublin.....9th July, 1860
D.L.S.

McLatchie, John, Nelson, B.C.....9th Jan., 1864
D.L.S., P.L.S. (Que., Man. and B.C.).

McLean, James Keachie, Elora.....8th April, 1876
D.L.S.

McLean, William Arthur, Toronto,
Parliament Buildings .....21st Feb., 1898

McLennan, Murdoch John, Williamstown...13th Nov., 1893
B.A.Sc. (McGill), D.L.S.

McLennan, Roderick, Toronto,
115 Avenue rd.....20th June, 1846
D.L.S.

McNab, John Duncan, Owen Sound.....9th Oct., 1879

McPherson, Archibald John, Galt.....10th April, 1897
B.A.Sc. (Toronto), City Engineer.

McPhillips, George, Windsor.....9th July, 1885
D.L.S., P.L.S. (Man.)

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.

Meadows, William Walter, St. Thomas.....21st Feb., 1898
Grad. S.P.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 University).

Mountain, George Alphonse, Ottawa.....9th Jan., 1884
Mem. Can. Soc. C.E., D.L.S., P.L.S. (Que.), Chief Eng. Can. Atlantic and O.A. & B. Rys.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Murdoch, William, Rat Portage.....10th Jan., 1860
D.L.S., C.E.

Murphy, Charles Joseph, Toronto, 157 Bay st..6th Oct., 1886

Newman, John James, Windsor.....21st Feb., 1898

Newman, William, Windsor,
57 Sandwich st. w.....12th Nov., 1892
Grad. S.P.S.

Niven, Alexander, Haliburton.....8th July, 1859
D.L.S.

Ogilvie, William, Dawson City, Yukon Dist..12th July, 1869
D.L.S., Commissioner for Yukon District.

O'Hara, Walter Francis, Chatham.....14th April, 1892
D.L.S.

Paterson, James Allison, Toronto,
23 Adelaide st. e.....5th April, 1878
C.E., Mem. Can. Soc. C.E.

Patten, Thaddeus James, Little Current.....5th Jan., 1883

Peterson, Peter Alexander, Montreal, P.Q...16th July, 1863
D.L.S., C.E., Mem. Can. Soc. C.E., Chief Engineer Can. Pac. Ry.

Pinhey, Charles Herbert, Ottawa,
630 Wellington ave.....12th Nov., 1888
D.L.S., Grad. S.P.S., Assoc. Mem. Can. Soc. C.E.

Proudfoot, Hume Blake, Bonheur.....6th Jan., 1882
D.L.S., C.E. (Toronto University).

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, Dryden.....9th Nov., 1888

Roberts, Vaughan Maurice, St. Catharines...5th April, 1887

Robertson, James, Glencoe.....11th July, 1885
Grad. S.P.S.

Robinson, Franklin Joseph, Barrie.....21st Feb., 1898
Grad. S.P.S.

Roger, John, Mitchell.....10th Nov., 1888
Grad. S.P.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

*Rombough, William R., Durham.....14th Nov., 1848
D.L.S.

Rorke, Louis Valentine, Sudbury.....14th April, 1899
D.L.S.

Ross, George, Welland.....10th July, 1879
B.A.Sc. (McGill), D.L.S.

*Rubidge, Tom S., Cornwall.....9th Feb., 1849
D.L.S., Asst. Eng. Dept. Rys. and Canals.

Russell, Alexander Lord, Port Arthur.....16th April, 1873
D.L.S.

Sankey, Villiers, Toronto, City Hall.....11th Jan., 1878
Grad. R.I.E. Coll., D.L.S., City Surveyor.

Saunders, Bryce Johnston, Fort William.....7th Jan., 1885
B.A.Sc. (McGill), D.L.S.

Scane, Thomas, Ridgetown.....7th Jan., 1865
D.L.S.

*Schofield, Milton C., Guelph.....28th Sept., 1843
D.L.S.

Schwitzer, John Edward, Rat Portage.....16th Nov., 1896
B.A.Sc. (McGill.)

Seager, Edmund, Rat Portage.....8th July, 1861
D.L.S.

Selby, Henry Walter, Dinorwic, C. P. Ry.....8th Jan., 1876
D.L.S.

Sewell, Henry DeQuincy, Rat Portage.....9th July, 1885
D.L.S., A.M.I.C.E.

Silvester, George Ernest, Sudbury.....12th Nov., 1892
Grad. S.P.S.

Sing, Josiah Gershom, Meaford.....9th Jan., 1879
D.L.S.

Smith, Angus, Ridgetown.....14th April, 1896
Grad. S.P.S.

Smith, George, Woodville, Box 77.....7th April, 1881
Engineer for Co. Victoria and four Townships.

Smith, Henry, Toronto, Crown Lands Dept...8th Nov., 1861
Supt. Colonization Roads, D.L.S., Mem. Can. Soc. C.E.

Speight, Thomas Bailey, Toronto,
Yonge St. Arcade.....6th Jan., 1882
D.L.S.

Squire, Richard Herbert, Brantford,
30 Arthur st.....14th April, 1896
B.A.Sc. (Toronto University).

Steele, Edward Charles, Port Arthur.....9th April, 1889

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Stewart, Elihu, Collingwood.....8th April, 1872
D.L.S.

*Stewart, George Alexander, Calgary, Alta....8th July, 1852
D.L.S.

Stewart, John, Montreal.....11th Nov., 1887
D.L.S.

Stewart, Walter Edgar, Aylmer.....12th April, 1892

*Strange, Henry, Rockwood.....30th Nov., 1838
D.L.S., C.E.

Taylor, William Verner, Gananoque.....7th Nov., 1896
Grad. S.P.S.

Tiernan, Joseph Martin, Tilbury Centre.....7th Jan., 1886

Traynor, Isaac, Dundalk.....16th April, 1873
D.L.S.

Turnbull, Thomas, Winnipeg, Man.,
C. P. R. Office.....6th July, 1878
D.L.S., C.E. (Toronto University).

Tyrrell, James Williams, Hamilton,
42 James st. n.....8th April, 1885
Co. Eng. for Wentworth, C.E. (Toronto University), D.L.S.

*Unwin, Charles, Toronto, 126 Seaton st....12th April, 1852
D.L.S.

Ure, Frederick John, Woodstock.....7th April, 1887
C.E.

Van Buskirk, William Fraser, Stratford.....7th April, 1888
Grad. R. M. Coll.

Van Nostrand, Arthur J., Toronto,
Yonge St. Arcade.....30th Oct., 1882
D.L.S.

Wadsworth, Vernon Bayley, Toronto,
103 Bay st.....9th April, 1864
D.L.S.

Wagner, William, Ossowo, Man.....13th April, 1858
D.L.S.

Walker, Alfred Paverley, Toronto, Room 508,
Union Station, C. P. Ry., Eng. Office.....6th Jan., 1882

Wallace, Charles Hugh, Hamilton.....9th Nov., 1889
D.T.S., C.E. (Trin. Coll., Dublin), Asst. City Engineer.

Wallace, James Nevin, Hamilton,
Spectator Building, James st. s.....21st Feb., 1898
B.A., B.E. (Trin. Coll., Dublin).

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Ward, Archeson Thomas, Toronto,
Yonge St. Arcade.....10th April, 1897

Warren, James, Walkerton, Box 190.....7th Oct., 1864
D.L.S., Assoc. Mem. Can. Soc. 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 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. 19 are marked*.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Apsey, John Fletcher, Cumberland,
Queen City Hotel, Md.....6th Jan., 1886
Grad. S.P.S.

Blake, Frank Lever, Toronto,
Meteorological Office .....13th April, 1875
D.L.S.

Bowman, Arthur Meyer, Mahan,
Beaver Co., Pa.....11th Nov., 1887
Grad. S.P.S., Staff of U.S. Engineers.

Bowman, Franklin Meyer, Bellevue,
Allegheny Co., Pa.....11th April, 1892
Grad. S.P.S., Engineer Structural Iron Works.

Brady, James, Victoria, B.C., Box 815.....15th July, 1862
M.E.

Burnet, Hugh, Victoria, B.C.....5th April, 1887
P.L.S. (B.C.).

Cambie, Henry John, Vancouver, B.C.....8th July, 1861
P.L.S. (B.C.).

Coleman, Richard Herbert, Toronto, Canada
Co. Offices, Imperial Bank Chambers....6th Oct., 1877

Drewry, William Stewart, Ottawa,
Dept. of Interior.....5th April, 1883
D.L.S.

Edwards, George, Thurso, Que.....6th Jan., 1866

*Ellis, Henry Disney, Kuching, Sarawak,
Borneo .....7th April, 1877
D.L.S., Commr. of Pub. Works and Surveys.

Galbraith, John, Toronto,
School of Prac. Science.....13th April, 1875
M.A., D.L.S., Prof. Engineering.

Gibson, George, St. Catharines.....10th April, 1860
D.L.S.

*Gilmore, Robert, Toronto, 294 Huron st....11th April, 1856
D.L.S., C.E

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Green, Thomas Daniel, Ottawa,
Dept. of Indian Affairs.....7th Jan., 1885
D.L.S.

*Harris, John Walter, Winnipeg,
Assm't Com. Dept.....6th Oct., 1866
P.L.S. (Man.), D.L.S.

Hermon, Ernest Bolton, Vancouver, B.C.....7th Oct., 1885
P.L.S. (B.C.), D.L.S.

Jephson, Richard Jermy, Calgary, Alta.....7th April, 1877
P.L.S. (B.C.), D.L.S.

Johnson, Sydney Munnings, Greenwood, B.C..9th Nov., 1895
B.A.Sc. (Toronto University), P.L.S. (B.C.).

Kains, Tom, Victoria, B.C.....11th July, 1873
D.L.S., P.L.S., (B.C.) Surveyor General B.C.

Klotz, Otto Julius, Ottawa, 437 Albert st.....6th Jan., 1876
C.E. (Mich. University), Dominion Topographical Surveyor.

Lane, Andrew, Sparrow's Point, Md.....4th April, 1895
Grad. S.P.S., Draftsman Maryland Steel Co.

Lendrum, Robert Watt,
South Edmonton, Alta.....8th Jan., 1874
D.L.S.

Livingstone, Thomas Chisholm,
Winnipeg, Man.....10th Jan., 1859
D.L.S.

MacLeod, Henry Augustus F., Ottawa,
340 Cooper st.....11th Oct., 1856
C.E., D.L.S.

MacMillan, James Alexander, Calgary, Alta...6th Jan., 1877
P.L.S. (B.C.).

*McMullen, William Ernest,, St. John, N.B..11th Nov., 1892
Asst. Eng. C. P. Ry.

Magrath, Charles Alexander, Lethbridge, Alta..1st Nov., 1881
B.A.Sc. (McGill), D.L.S., P.L.S. (B.C.).

Moore, Thos. Alexander, London South....12th Nov., 1892

Munro, John Vicar, New York, N.Y.,
359 West 31st st.....9th April, 1895

Pearce, William, Calgary, Alta.....12th Oct., 1872
D.L.S., P.L.S. (B.C.).

Ponton, Archibald William, Ottawa,
Dept. of Interior.....9th April, 1880
D.L.S.

Pope, Robert Tyndall, Ireland.....13th April, 1875
C.E., D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Reid, James Hales, Bowmanville, Box 35.....6th Oct., 1860
C.E., F.G.S.

Reid, John Lestock, Prince Albert, Sask.....8th April, 1870
D.L.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, Greenwood, B.C.....6th Oct., 1877
P.L.S. (B.C.).

Sherman, Ruyter Stinson, Vancouver, B.C..12th April, 1890
P.L.S. (B.C.).

Simpson, George Albert, Winnipeg Man.....7th Oct., 1864
C.E., D.L.S., M.P.

Spry, William, Toronto.....19th July, 1858
C.E., D.L.S.

*Stewart, Louis Beaufort, Toronto,
School of Prac. Science.....6th April, 1882
Dominion Topographical 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
D.L.S., P.L.S. (B.C.).

Weekes, Abel Seneca, Westaskiwin, 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, Can. Co. Offices,
Imperial Bank Chambers.....6th Oct., 1866
D.L.S., Commissioner Canada Company.

Wilkins, Frederick William, Ottawa,
Dept. of the Interior.....6th Jan., 1877
Dominion Topographical Surveyor.

SUMMARY.

Active members subject to dues	210
Active members exempted from dues	21
Withdrawn from practice (including Associates)	52
Dead	21
Total number enrolled since incorporation	304