THE

# Canadian Society of Civil Engineers.

112 MANSFIELD ST., MONTREAL.

*(Established Feb. 24, 1887; Incorporated by Dominion Act, June 23rd, 1887.)*

(50 Vic. Cap. 124.)

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# REPORT OF PROCEEDINGS

OF

## ANNUAL MEETING,

## January 14th and 15th,

## 1896.

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**Montreal:**

PRINTED FOR THE SOCIETY,

BY JOHN LOVELL & SON.

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# REPORT OF PROCEEDINGS.

## ANNUAL GENERAL MEETING.

Convened at 10 a.m., Tuesday, 14th January, 1896.

THOMAS MONRO, President, in the Chair.

The Secretary read the notice convening the meeting.

The minutes of the Annual General Meeting held on the 24th and 25th January, 1895, were read and approved.

The following gentlemen were appointed scrutineers of the ballot for the election of Officers and Members of Council :—

Messrs. J. L. Allison, J. H. Larmonth and J. W. M. Wallace.

The following gentlemen were appointed scrutineers of the ballot for the election of the Nominating Committee :—

Messrs. R. M. Hannaford, J. A. Duff and Theo. Denis.

The President announced that the Members' Dinner would be held that evening in the Queen's Hotel, at 7.30 p. m., and invited all members to attend.

Mr. Alan Macdougall, Chairman of the Committee on Professional Status, presented the report of the Committee, being a proposed draft of Amendment to the Dominion Act of Incorporation, and an Act of Incorporation for the provincial legislatures, together with notes and professional opinion in connection therewith by Mr. Creelman, Q.C., the same having already been circulated confidentially amongst the membership of the Society.

Mr. Macdougall also read the following resolution passed by the Toronto members at a meeting held in Toronto on the 1st of December : "That the draft bills, both for the Dominion and Provincial legislatures, with amendments as passed at this meeting, be approved, and a copy of the resolution sent to the Secretary of the Society for presentation at the Annual Meeting."

A letter from Mr. H. N. Ruttan, of Winnipeg, expressing his approval on behalf of the members in Winnipeg of the action of the Committee, was also read.

The Secretary read the following correspondence addressed to himself on the subject :—

42 QUEEN ST., HALIFAX, N.S., Jan. 7, 1895.

DEAR SIR,

I duly received from Mr. Macdougall the drafts of Acts prepared for Dominion and Provincial Legislatures, accompanied by memoranda, by Mr. Creelman, Q.C., of Toronto. As I am unable to attend the annual meeting of the Society on Tuesday next, I send you, very briefly, my opinion of these documents.

After serious consideration, I believe the wisest course for the Society to pursue would be to attempt to secure the passage of the *Act to amend "An Act to incorporate the Canadian Society of Civil Engineers"* in the Federal Parliament before attempting any Provincial legislation. In the first place, our success in this endeavour seems very much more probable than the passage of any Act through any Provincial Legislature; it would make subsequent Provincial legislation much more easy, and prove the thin edge of a very important and powerful wedge. Failure to pass the Federal Act of Amendment would, I believe, prove much less disastrous to our project than the more probable failure in Provincial legislation. Success in the former would be a great point gained even if subsequent failure awaited us in the latter.

If, therefore, the Society decides to attempt the passage of the Act of amendment as drawn by Mr. Creelman, I would suggest, subject to his approval, the striking out of the words "and the said Society has petitioned for the passage of the Act; And, whereas it is expedient to grant the prayer of the said petition;" and also the addition of a penal clause (without which, it seems to me, the Act would be practically worthless), setting forth that persons improperly calling themselves Civil Engineers, or practising as such, may be sued by the Can. Soc. C. E., and fined.

With regard to Mr. Creelman's draft of a Provincial Act, I cannot clearly understand whether its object is to constitute a Provincial Act of Incorporation of the Can. Soc. C. E. for each province, or whether it is intended to create and incorporate a branch, shadow, or ghost of the Can. Soc. C. E. in each province. At any rate, I believe the passage of such an Act in any Provincial Legislature is practically impossible, and that the attempt would be ill-judged; success would involve the Society in such a maze of machinery, to say nothing of expense, that the last state of that Society would be worse than the first.

I submit and enclose herewith a draft (crude and innocent of legal subtleties perhaps) of such an act as I believe would answer every purpose, and prove not impossible of passage in Provincial Legislatures.

Kindly submit it to Mr. Macdougall for his consideration and that of the other members of the Professional Status Committee.

I trust this important matter will receive at the Annual Meeting the earnest consideration that it deserves.

Civil Engineers are surely as useful members of society, and as essential to the material progress and prosperity of any country, as lawyers and doctors, and they are just as much entitled to legal protection and encouragement. Let the Canadian Society use every legitimate means within its power to secure them.

Yours very truly,

C. E. W. DODWELL,

*Member of Committee on Professional Status.*

## DRAFT OF ACT FOR PROVINCIAL LEGISLATURES SUGGESTED BY C. E. W. DODWELL.

### *An Act Respecting Civil Engineers.*

Whereas, it is deemed expedient for the better protection of the public interests, and for the general advancement of Mechanical Science, and more particularly for promoting the acquisition of that species of knowledge which has special reference to the profession of a Civil Engineer, and to encourage investigation in connection with all branches of knowledge connected with the profession, and in order to enable persons requiring professional aid in any work, to which such knowledge of Civil Engineering is applicable or necessary, to distinguish between qualified and unqualified Civil Engineers ;

And whereas, by the Act, Chapter 124 of the Statutes of Canada passed in the 50th and 51st year of Her Majesty's reign, the Canadian Society of Civil Engineers was incorporated for the purposes and objects therein expressed, chief among which purposes was the raising of the standard of the profession of Civil Engineering, and for distinguishing between qualified and unqualified practitioners.

And whereas, it is deemed advisable to provide that the public works of the Province of————and of public corporations under the control of or receiving subsidies or subventions from the Legislature of the Province of————should be constructed under the supervision of duly qualified Engineers.

Therefore, Her Majesty, by and with the consent and advice of the Legislative Assembly of the Province of————enacts as follows:

1. This Act may be cited as "The————Civil Engineers' Act."

2. No person other than a Member of the Canadian Society of Civil Engineers, or a member in good standing of some other British Society of Civil Engineers, or a person entitled by some statute of the Dominion of Canada or of the late Province of Canada to use the title "Civil Engineer," shall be employed as an Engineer in the surveying, designing or supervising of the construction of any engineering work whatever carried on by or under the authority of the Government of the Province of————or upon which public money of the Province of———— is being expended, or of any Engineering work carried on by any public corporation deriving its authority from the Legislature of the Province of————.

3. A book or register shall be kept (in the office of the Provincial Engineer, or if there be no such officer, in the office of the Attorney-General, or in some other suitable and proper office), containing a complete and correct list of Members of the Canadian Society of Civil Engineers, and any person whose name does not appear in such register, and who shall call and style himself a Civil Engineer, or who shall seek or obtain employment, or practise as a Civil Engineer, shall be liable to prosecution at law by the Canadian Society of Civil Engineers, and to a fine for a first offence of not more than fifty dollars, and for each subsequent offence of not more than one hundred dollars, which sums may be collected by the Canadian Society of Civil Engineers as civil debts in the ordinary course.

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CITY ENGINEER'S OFFICE,
OTTAWA, January 7, 1896.

SIR,

I enclose a copy of resolution passed at a meeting of the Members of the Canadian Society of Civil Engineers, residing in Ottawa, and held in the City Engineer's office on January 6, 1896.

Moved by H. A. F. McLeod, seconded by F. A. Hibbard :—

"That this meeting is of the opinion that the Canadian Society of Civil Engineers should apply to the Local Government of the Province of Ontario for a Close Corporation Act, and should also apply for an Act amending their Dominion Charter on the lines laid down by Mr. Creelman. Also, that in Clause 17 of the proposed Provincial Act, after the words "Passing of this Act," the following words be inserted, "*and has become a member of the Society.*"

I have the honour to be,
Yours very truly,
E. E. PERREAULT,
*Secretary.*

PORTAGE LA PRAIRIE, Man., Jan. 6, 1896.

DEAR SIR,

I am in receipt of the draft bills for Dominion and Ontario Legislature, and the memorandum by Council. I think this matter is in such shape now that the Society can discuss it intelligently, and I hope the draft bills will receive unanimous approval at the Annual Meeting.

The memorandum prepared by Council is a very fair and judicial exposition of the case, and although he points out clearly the difficulties to be overcome, I think he is to be congratulated in drawing up a bill which should meet with the approval of the Society, and disarm opposition in the various legislatures.

Yours truly,

GEO. H. WEBSTER.

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PORTAGE LA PRAIRIE, Man., Jan. 6, 1896.

SIR,

I have read with much interest the proposed Acts of Incorporation for the Dominion and Provincial Legislatures, drawn up by Mr. Creelman, Q.C., and think they are admirably suited to attain the object aimed at by the Society.

There is one alteration which I should like to see made in the Act for the Provincial Legislatures, viz. : In clause 17, lines 15, 16 and 17, strike out the words, "or unless he is a Civil Engineer who has been practising as such in this Province at the time of the passing of this Act."

Unless these words are struck out, I think much of the usefulness of the Act will be destroyed, as there are many men who style themselves "Civil Engineers" on the strength of having served for a season or two as chainmen or rodmen on an engineering party, and who, without further training, think themselves fully competent to undertake any professional work which may come in their way.

Again, nearly all the land surveyors call themselves "Civil Engineers," many of them, certainly, without the slightest professional training.

No doubt the Act thus amended would seem to be unjust to many Engineers outside of the Society, who are as fully qualified to perform their professional duties as the majority of the members; but they could easily obtain redress by becoming members themselves.

I should also like to see an effort made to pass the bills through the other Provincial Legislatures besides Ontario, this coming session. In

this Province (Manitoba) I do not think there would be any difficulty in getting such an Act as that drawn up by Mr. Creelman, passed ; and it would certainly be of great benefit to the local members of the Society, as well as to the Province.

I am, sir,

Yours faithfully,

CHAS. H. DANCER.

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*Memorandum Re Close Corporation.*

From F. J. LYNCH, M. CAN. SOC. C. E., Ottawa.

I am opposed to any steps being taken or expenditure incurred towards the formation of a Close Corporation of Civil Engineers.

Several reasons lead me to this opinion :—

1. I do not see that advantages of any great moment would accrue to the Profession from such action.

2. Attempts to obtain the necessary legislation may lead to serious disadvantages, by placing Civil Engineers on the same footing as members of some other Close Corporations, who can only practise their profession by Provinces.

3. I do not think legislation could be obtained binding private corporations or individuals, much less the Dominion or Provincial Governments, to employ only members of such a corporation in Engineering work.

4. It has not yet been defined what is a Civil Engineer.

5. Civil Engineering is so dovetailed into electrical, mechanical, mining, military and naval engineering, not to mention other kindred professions, that I fail to see how the boundaries covered by a Close Corporation could be defined.

6. I am not aware that any country has established or felt the necessity for such action as is proposed. Many countries have their own corps of Engineers especially trained for public works, but they in no way exclude or limit the general practice of Engineers.

7. Supposing such a Close Corporation formed, other countries might legislate in a similar manner, thus limiting the field for Engineers, whereas they now have the world open to them.

8. The financial position of the Society does not warrant the large expenditure which would certainly be necessary.

These few remarks, which I have purposely made as concise as

possible, not to trespass on the limited time of the meeting, are all I propose to offer. A very little thought on several of them will show that to enter into details would raise many questions which could not be dealt with at any reasonable length for present purposes.

I will only add that I have devoted much thought to the subject, but have failed to work out any satisfactory or practicable scheme tending to benefit the Profession.

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Mr. Macdougall said in presenting this report he would just go briefly over the various steps which had been taken to get the decision of the Society, and then after that he would say a few words regarding the report. The circular which was issued, asking the opinion of the members on this question, having been replied to in a satisfactory manner, the Council was applied to for assistance so that the Committee might get legal advice in framing these bills, and after consulting with the other members of the Committee it was determined to employ Messrs. McCarthy, Osler and Creelman, of Toronto, to frame the bills. The question was found to be bristling with difficult points, and Mr. Creelman told the speaker that he had never had such a difficult piece of work as the framing of these bills. Attention was first given to the bill for the Dominion House. It was deemed best that we should first get our charter from the Dominion, and after that make application to the provinces. The bill for the provinces was next considered, and has been framed about eight different times, until Mr. Creelman and Mr. B. B. Osler were at last satisfied with what is now presented to you. Although the bill does not appear on the face of it to ask very much, yet the speaker thought if it were carefully read we must come to the conclusion that it is a step in advance, and will give us the very power we are seeking, namely, that none but members of the Society shall be employed on the construction of any work carried on under the authority of the Dominion Government. It has been urged, and will be urged no doubt, that the difficulty will be to get the government to take such a position as that they will employ only the members of the Canadian Society of Civil Engineers; but the speaker thought if we looked into the position of the Society just now, we would see that every man who has any standing as an Engineer is now connected with our Society. It is not as if we were just beginning our existence, and the Society was without influence. It must be admitted that the influence of the Society has extended throughout the Dominion, and he was sure that in the Province of Ontario the Society is fully recognized and its members given their

Mr. Macdougall

proper position. There is one difficulty which faces us in this, and in any other legislation that we may undertake, that is the question of the title of "Civil Engineer," which seems to be a stumbling block to a great many men. The question has been asked how the Civil Engineer can be defined. When Mr. Mansergh, one of the vice-presidents of the "Institution," was in Toronto, the speaker asked him the question, and he replied, it was simply the line between the Military and the Civil Engineer. In our own Charter, the speaker thought, we have it sufficiently plainly defined, and he thought there should be no difficulty. He saw no reason at all why we should not each of us take up the special line of practice for which we feel we are most competent. This Society, under the powers obtained by this Act, would be able to lay down certain rules and regulations by which Engineers would practise. If we get a broad act to cover the practice, then the details can be gone into afterwards.

The Provincial Act was drafted with a view of being introduced first of all into the Ontario legislature. The idea we had was, that if the Act passed through the Ontario legislature it could readily be extended to the other provinces. In taking up this question, of course, there is a good deal of difficulty to be met with. The question of our relation to the Land Surveyors is a point which we went into very much in our Committee. The speaker was not well acquainted with the practice in the other provinces, but in the Province of Ontario the Land Surveyor has to know a certain amount of engineering, and if we look at the engineers who are in practice in Ontario just now, we find that most of them are Land Surveyors,—Land Surveyors first and Engineers afterwards. We might bring all these into our Society Now that condition does not exist in the other Provinces. In Manitoba there is a good deal of friction, and in the Northwest Engineers and Land Surveyors do not live on very good terms with each other. In the Province of Ontario there are no differences, and we are led naturally to consider whether we ought not to seek the co-operation and possibly affiliation of members of the corporate bodies of Land Surveyors.

Another important point in connection with the Provincial Act which has come to us through Mr. Shanly relates to the difficulty of having a number of different Acts in the several provinces. It is for this reason that this Act has been framed as the basis of an Act which would apply to all the provinces so that we might be under the same conditions everywhere.

Mr. Shanly said this is certainly the most important matter that has ever come before the Society. The getting of the Acts, in the first place, Mr. Creelman assures us is a very difficult matter, and one thing is perfectly certain, that in each province there must be a separate and distinct Civil Engineers Society. That will be the state of the case, and Mr. Creelman does not understate the difficulties. The speaker entirely agreed with Mr. Dodwell, that the difficulties will be extremely great, and it appeared to him that the only way will be to seek for separate legislation in each province. Mr. Shanly said he also observed what Mr. Lynch has said, and he confessed that he was entirely with him. He did not think it wise of us, we are still juveniles, to set to work to get legislation from seven different provinces, because he felt perfectly satisfied that it will be utterly and entirely impossible,—and Mr. Creelman says the same,— to obtain an Act uniform throughout the provinces. Then there is the difficulty of working the thing after obtaining it, even supposing we do succeed. Mr. W. Shanly.

The Civil Engineer, in order to qualify himself to practise in all parts of the Dominion, will have to become a member of seven distinct and separate societies, subject to the payment of the annual fee and to the Rules and By-Laws of each.

Where is the benefit to be derived from it? A question of this kind cannot be discussed and settled in a meeting like this. There must be further committees, there must be further application to counsel, and how is the expense to be met? The cost will probably be somewhere in the thousands, and he would like to know where it is to come from. Is it to be met by a special assessment? He could only suggest that they should endeavour to feel their way in each province before presenting any bill to the provincial governments. He did not see any very great difficulty in obtaining an Amended Act from the Dominion Parliament, but from the provinces he entirely despaired of ever getting from any of them a useful and workable Act.

Mr. Hannaford said Mr. Creelman on page 7 of this pamphlet brings forward, as he understood it, exactly what Mr. Shanly has said, and there is no doubt we shall have to go to the different legislatures of Canada; and supposing we do succeed in the end, what are we to do with the result? If we could get the legislations in all the provinces the same, it might be possible for us to go before the Dominion Parliament and have one bill passed. But in the local bills some clauses will have to be expunged and others put in so that we shall have a mixed quantity. He was not opposed to it himself if it could be carried out success- Mr. Hannaford

fully, but he quite agreed with Mr. Shanly in thinking that it would be better to defer immediate action and appoint a committee to look further into it. If we could only get a very modest act that would apply to the different provinces, and so make a beginning, but he thought we would have to proceed very modestly at first. If, as Mr. Macdougall says, we could get the Land Surveyors to unite with us with a view of getting joint acts passed, it would be wise to do so.

Mr. Wallis. Mr. Wallis entirely agreed with Mr. Shanly. He looked upon the expenditure incurred as nothing lost, for we have obtained valuable information as to procedure, which can be turned to good account at any time. Owing, however, to the intricacies of the position, he counselled delay, and suggested a continuance of the present committee, or the appointment of a new one, as should be in accord with the views of Mr. Macdougall, with the object of obtaining further information.

Mr. W. Shanly. Mr. Shanly said the document that we have got from Mr. Creelman is certainly worth all that it has cost. He might also add that the whole of this work had been done by Mr. Macdougall. The members of the Committee live so far apart that it was impossible for them to meet. This was the one great difficulty. The whole of his knowledge of what was going on from time to time was obtained from correspondence with Mr. Macdougall.

Mr. Sproule. Mr. Sproule said he would like to make a few remarks on the points which have been brought up. There is one thing which has been mentioned, and is considered to be one of the most serious difficulties to be overcome,—that is, how persons could be forced to employ members of the close corporation of Civil Engineers. It seems this question can be answered by asking another : How is it possible to force people to employ surgeons ? There is no difference between the recognition of the rights of a Civil Engineer and those of a doctor. Is the country better or worse for supporting a close corporation in medicine ? It must be admitted that it is an advantage to have a close corporation in medicine. The next difficulty that has been mentioned is the greatest, viz., how the incorporation could be managed throughout the seven provinces of the Dominion. He thought that difficulty might be overcome by having reciprocity between the corporations of the several provinces, as in the case of Land Surveyors, without their requirement of six months' service before being admitted to practice. He would also advise that in the Provincial Acts we should endeavour to incorporate the Land Surveyors in the Society,—of course, with their co-operation. In Ontario there are over 200 surveyors, a great part of whom are already mem-

bers of the Society. He maintained that they are probably better qualified to become Civil Engineers than half of the members we have in our Society. It will be more difficult for us to get legislation as each year passes by, and in a few years it will be impossible, as it is now in the United States. He would advise that the Committee be continued, that we should endeavour to get as many members as possible before coming before the legislatures, and that the Committee should get all the further information necessary. Every year that passes makes the difficulties greater. The architects are applying and are getting powers, and it has been well said that the Land Surveyors will soon be the Civil Engineers of Ontario. If we are satisfied that a close corporation would be beneficial to us and to the public, let us face difficulties as true Britons have always done, and overcome them.

Mr. Blackwell said he would like to point out that the Engineer is constantly moving from place to place. He is not like a doctor or a lawyer who builds up a practice in one place and stays there. An Engineer is continually moving about, and his position cannot be compared with that of a doctor or a lawyer. Mr. Blackwell.

Mr. Shanly said that proved the difficulty of making it work as a close corporation. Mr. W. Shanly.

Mr. Butler said he was in favour of the Draft of the proposed Dominion Bill, and thought it should be submitted to the Government at once. With reference to the proposed bill before the local legislature, he did not think such a bill would pass the Ontario Legislature at this time. He would beg to suggest that a committee in each province be appointed to interview the Attorney-General, and ascertain from him if the Government would be willing to take the question up. He held that all such Acts should be Public Bills. Mr M.J. Butler

Mr. Walbank said he was in accord with the remarks of Mr. Shanly. He did not see how the Society was to derive any benefit from close corporation powers unless one bill could be secured to cover all the provinces. Mr. W. McLea Walbank.

Mr. Mountain said that at a meeting held in Ottawa, of which Mr. Surtees was chairman, there was a very large number present, the majority of the resident members of the Society, a resolution was passed favouring the adoption of both of these bills, an exception being made in clause 17, which reads that unless such a person is a member of the Canadian Society of Civil Engineers, he shall not be entitled to call himself a Civil Engineer, etc. At this meeting a resolution was adopted, asking that an amendment be made in clause 17 as per the resolution which has already been read. In Ontario, the Land Surveyors Mr. Mountain.

are a close corporation. They practise their profession, and no Engineer who is not also a Land Surveyor need attempt to practise, although, on the other hand, a Land Surveyor can practise as a Civil Engineer. He thought if a bill could be passed by the Dominion Government covering the whole of the provinces, it would be a good thing, and he was confident that if a vote were taken the majority would favour close corporation if it could be got in that way.

Prof. Bovey. Prof. Bovey asked would the Ontario Act include Quebec Engineers, and would the Quebec Act include Ontario Engineers?

Mr. Sproule. Mr. Sproule said this is practically done. A Land Surveyor from Quebec can practise in Ontario after serving six months there. It is practicable, because the Land Surveyors have done it. The six months' service is required on account of differences in the Surveyors' Acts respecting divisions of land in the different provinces. This would not be necessary in Engineering.

Prof. Bovey. Prof. Bovey asked, can a Land Surveyor in the Province of Quebec practise in the Province of Ontario?

Mr. Sproule. Mr. Sproule said they have to pass an examination in the law relating to lands in the other provinces, and serve for so many months before being allowed to practise. Manitoba reciprocates with the Dominion respecting the Dominion Land Surveyors, and no time of service is required.

Mr. Wallis. Mr. Wallis said we have heard about the Provinces of Ontario and Quebec, but how does the proposition affect the other Provinces, such as Nova Scotia, New Brunswick and Manitoba?

Mr. Sproule. Mr. Sproule said that the Provincial Act reads that a Land Surveyor from any other province may practise, if the province from which he comes reciprocates in privileges with the province to which he goes.

Mr. Macdougall Mr. Macdougall said he did not see why, in the case of Civil Engineers, it would be necessary to have any service. It is necessary for the Land Surveyors because the laws are different in the different provinces. The Land Surveyors are all incorporated.

Mr. W. Shanly. Mr. Shanly said he thought it was a mistake to try to draw a comparison between the two professions. The Land Surveyor was a licensed man. He must be so. The laying down of the boundary lines and the other work which a Land Surveyor is called upon to do necessitates this. Land Surveyors in all the provinces are, in fact, sworn officers of the Crown.

Mr. Sproule. Mr. Sproule said he would like to call the attention of the meeting to the fact that years ago the Land Surveyors were commissioned straight from the Government. They were examined by the Government and

they were licensed by the Government. Now this power has been transferred to a close corporation, and he had no scruple in saying that the present conditions are an enormous improvement on the old ones, and that the men now admitted are much better qualified for their work than those licensed when the examinations were carried on by the Government.

Mr. St. George said that one of the arguments brought against the necessity of forming ourselves into a close corporation in Canada is that the Engineers in England do not see the necessity of getting such legislation. They have practically got it. He had lived in England, and when he applied for work to several large firms in London the first question put to him was: "Are you a member of the Institution? If you are not you cannot get any work." In England the work is controlled by the big firms of Engineers who have the whole of the work. A man who belongs to the Institution of Civil Engineers practically belongs to a close corporation. Mr. Shanly says we must proceed cautiously; but McGill College is now turning out qualified Engineers, and it is going to be a difficult thing for them to get work, especially any Government work. The Government gets one or two good men, and their assistants are gathered from the friends of members of Parliament. Now, if there is a close corporation, none but competent men could be appointed to Government positions. He agreed with Mr. Shanly that there are going to be great difficutlies in the way of obtaining the Acts of Incorporation which we seek. He approved the suggestion that a committee in each province be appointed by the Council to confer with the several Provincial Governments. Mr. St. George

Mr. Shanly said he quite concurred in the propo-al to appoint provincial committees, and hoped Mr. St. George would move a resolution to that effect. Mr. St. George speaks as if he (Mr. Shanly) were greatly opposed to a close corporation. On the contrary, he thought it would be an excellent thing if it could be obtained. But he had just mentioned difficulties in the way of obtaining it, which Mr. Creelman also informs us he does not see the way to overcome. He would advise that further discussion be postponed to next year, that a committee be appointed in each province to discuss these matters and report to the Council. Mr. W. Shanly.

After some further discussion it was moved by Mr. Macdougall, seconded by Mr. Walter Shanly, and carried:

"That the report of the Committee on Close Corporation be received and the Committee dissolved."

The President then read a letter which had been sent to him by Mr. The President.

R. Adams Davy on the condition of Civil Engineers and the small recognition which was given to their services.

The President said another point that he was requested to bring forward, in the name of Mr. B. T. A. Bell, Secretary of the Mining Association of Quebec, was the question of affiliating all Engineering societies in the Dominion. In that way their transactions would be much more valuable. He simply brought this before the notice of the meeting as he had been requested.

After some further discussion on the formation of committees to carry on the work of close corporation, it was moved by Mr. Walter Shanly, seconded by Mr. E. P. Hannaford :

" That this meeting authorizes the Council to take such action as it may deem best in respect of applying to the Dominion Parliament for the amendment to the charter as presented by the Committee."

After some discussion the motion was put and carried.

Mr. Sproule. Mr. Sproule said he would like to know if this resolution is intended to be mandatory to the Council, or if the Council has the privilege of dropping the matter altogether. He thought that if the thing was to be carried on, the meeting should state that the Council is desired to take immediate action, because the soul of the Council is not in this work to the same extent as the soul of the Society.

It was then moved by Prof. Bovey, seconded by Mr. Sproule, and carried :

" That the Council be requested to take immediate action in the matter submitted by the foregoing resolution."

It was moved by Mr. P. W. St. George, seconded by Mr. G. A. Mountain, and resolved :

" That a committee of three members in each province be appointed by the Council, to see if the Government of said province would pass the said proposed bill for Civil Engineers, and to report to a central committee of five members, which shall also be appointed by the Council, and said Committee to report to the Council before first day of October, 1896."

The meeting was then adjourned to Wednesday, the 15th January at 10 o'clock a.m.

## ADJOURNED ANNUAL MEETING.

THOMAS MONRO, President, in the Chair.

The meeting was called to order at 10 o'clock a.m. Wednesday, January 15th, 1896.

The Secretary read the following report :

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## REPORT OF COUNCIL.

ANNUAL MEETING, JANUARY 14TH, 1896.

The Council begs to present the following report on the work of the Society during the past year.

### ROLL OF THE SOCIETY.

The elections comprised *one* honorary member, *three* members, *six* associate members, *two* associates and *fifteen* students. *Five* associate members have been transferred to the class of members, and *ten* students to the class of associate members. *One* associate member has been replaced on the roll on application.

Resignations have been received from *three* members, *one* associate member, *one* associate, and *six* students, while *eighteen* members, *twelve* associate members, *seven* associates and *eighteen* students have been removed from the roll for non-payment of dues.

The deaths have been :—

*Members*:—Charles Sproatt, Patrick Kennedy Hyndman, John Fraser Torrance and Arthur M. Wellington.

At the present date the membership stands as follows :—

| | Non Res. | Res. | Total |
|---|---|---|---|
| Honorary Members..... ..... | 6 | 2 | 8 |
| Members..... ..... | 217 | 52 | 269 |
| Associate Members..... | 111 | 29 | 140 |
| Associates..... | 26 | 18 | 44 |
| Students ..... ..... | 90 | 55 | 145 |
| | | | 606 |

At the same date last year the membership was as follows:—

| | Non Res. | Res. | Total |
|---|---|---|---|
| Honorary Members..... ..... | 6 | 1 | 7 |
| Members..... ..... ..... | 233 | 53 | 286 |
| Associate Members..... ..... | 111 | 30 | 141 |
| Associates..... ..... | 30 | 19 | 50 |
| Students..... ..... ..... | 101 | 63 | 164 |
| | | | 648 |

There is therefore a falling off in the total membership of forty-two, the decrease having taken place chiefly in the classes of Members and Students. The decrease is, however, more than accounted for by the large number removed from the roll early in the present year for non-payment of dues. Taking this fact into consideration, the effective membership of the Society remains practically unchanged.

The membership of the Society has now, in the opinion of the Council, reached as large a number as should be expected from the population of the country, and no material increase in its numbers should be looked for in the near future.

At the time of the last Annual General Meeting there were five new applications, and at the present time there are three applications for admission into the Society.

## ANNUAL MEETING.

The Ninth Annual General Meeting was called to order at 10.30 a.m. on Tuesday, January 24th, 1895, Mr. P. Alex. Peterson, president, in the Chair, and after the appointment of the scrutineers was adjourned to Wednesday, January 25th, at 10 o'clock a.m. The meeting re-assembled at 2.30 p.m., when the business of the meeting was concluded, and the Address of the retiring President, being a "review of the re-construction work on the Canadian Pacific Railway since 1886," delivered.

On Tuesday evening, a Members' Dinner was held in the Windsor Hotel, and on Wednesday evening an ordinary meeting of the Society was held in the Engineering building, McGill University. At this meeting His Excellency the Governor-General and the Countess of Aberdeen were present. An address of welcome and the diploma of Honorary Membership in the Society was presented to His Excellency. Afterwards Prof. Bovey's paper on the Strength of Canadian Timbers was read, and light refreshments were partaken of.

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### ORDINARY MEETINGS.

Fifteen ordinary meetings have been held during the year, at which the following papers were read:—On "The Strength of Canadian Douglas Fir, Red Pine, White Pine and Spruce," by Prof. H. T. Bovey, M. Can.Soc. C.E.; on "Cement Testing," Parts I and II, by Cecil B. Smith, M.Can.Soc.C.E.; on "A Micrometer Attachment," by W. T. Thompson, A.M.Can.Soc.C.E.; on "The Application of a Stoney Patent Sluice to River Improvements," by G. E. Robertson, M.Can. Soc.C.E.; on "The Barrie Flood of 1890," by Willis Chipman, M. Can.Soc.C.E.; on "Special Track Work for Electric Street Railways, especially referring to the Montreal and Toronto Systems," by E. A. Stone, A.M.Can.Soc.C.E.; on "Some open Questions on the Minor Problems of Railway Building," by J. G. Kerry, A.M.Can.Soc.C.E; "A New Method for the Design of Retaining Walls," by W. Bell Dawson, M.Can.Soc.C.E.

### ROOMS.

A renewal of the lease of the present rooms has been secured for two years from the 1st of May last at the old rate of $550 per annum, and a Committee has been appointed to look into the question of securing permanent quarters for the Society in one of the new buildings which are being erected on St. Catherine street.

### PROFESSIONAL ETHICS.

The code of Professional Ethics, as presented to the Society at the last general meeting, has been balloted for, and now forms a portion of the By-Laws of the Society.

### PROFESSIONAL STATUS.

The Committee on Professional Status has reported to Council, presenting drafts of bills for incorporation in the Dominion and local legislatures. These have been issued, confidentially, to the corporate members of the Society, and the whole matter will come before this meeting for discussion.

### COMMITTEE ON AN INTERNATIONAL GAUGE.

The report of the Committee on an International Gauge, the formation of which was announced at the last Annual Meeting, is appended hereto.

In accordance with the resolution passed at the last Annual General Meeting, copies of the minutes of Council meetings have been regularly forwarded to non-resident members of Council not present at the meetings.

Acting upon the report of the Library Committee, the following resolution has been adopted by Council:—

"That the Secretary be instructed to send advance proofs of papers, as soon as read before the Society, to the technical press, with a view to exchange, in every case the press to give due credit to the Society."

### AWARD OF THE GZOWSKI MEDAL.

The Committee has recommended that the medal for this year be awarded to Professor Henry T. Bovey, D.C.L., LL.D., F.R.S.C., M.Can.Soc.C.E., for his paper on The Strength of Canadian Douglas Fir, Red Pine, White Pine and Spruce, published in Volume IX, Part I, of the Transactions.

### FINANCES.

The income for the year was $3,591.11, and the expenditure $3,190.78, leaving a balance of $400.33, and a total balance to carry forward in the general fund of $7,217.77, which is on deposit in the Merchants Bank of Canada, bearing interest at 3½ per cent. per annum.

THOMAS MONRO, *President.*
C. H. McLEOD, *Secretary.*

## REPORT OF THE LIBRARY COMMITTEE.

During the year additional shelving has been put up in the rooms, but the extra accommodation thereby obtained can only be considered as a temporary expedient. Our bound volumes of exchange publications increase so rapidly that additional wall space, which is not available in the present rooms, will in the near future be absolutely required.

Exchanges have been effected with the following journals and societies:—

American Society of Irrigation Engineers.
University of Minnesota.
Railway Age, Chicago.
Bureau of Mines, Toronto.
U. S. Department of Agriculture.
*Engineers' Gazette*, Newcastle-on-Tyne, Eng.

Donations to the Library of volumes and pamphlets have been received from E. L. Corthell, M.Can.Soc C.E., Reginald Bolton, Henry Carry, M.Can.Soc.C.E., J. K. McDonald, A.M.Can.Soc.C.E., O. Higman, A.M.Can.Soc.C.E., the Aqueduct Commissioners of the City of New York, Professor J. B. Johnson, J. B. Spence, M.Can.Soc.C.E., D. O. Lewis, A.M.Can.Soc.C.E., and Thomas Middleton, Esq., C.E.

One volume has been purchased, and one journal subscribed for.

A subject matter index of the Transactions of the Society up to the end of the current year is being compiled. This it is hoped will prove of material assistance to members when consulting the volumes of the Transactions.

The following periodical publications are on file in the Library shelves and rooms :—

American Society of Civil Engineers, *New York.*
American Society of Mechanical Engineers, *New York.*
American Institute of Electrical Engineers, *New York.*
American Institute of Mining Engineers, *Philadelphia.*
American Society of Irrigation Engineers, *Denver.*
American Engineer and R.R. Journal, *New York.*
Austrian Engineers and Architects Society (German), *Vienna.*
Association of Industrial Engineers, *Barcelona.*
Association of Engineering Societies, *New York.*
Association of Engineers of Virginia, *Roanoke, Va.*
Association of Industrial Engineers (Spanish), *Barcelona.*
Boston Public Library, *Boston.*
Bureau of Mines, *Toronto.*
Canadian Institute, *Toronto.*
Cornell University, *Ithaca, N.Y.*
Cleveland Institute of Engineers, *Middlesborough.*
Cassier Magazine, *New York.*
Engineers Club of Philadelphia, *Philadelphia.*
Engineering Association of New South Wales, *Sydney.*
Engineering Association of the South, *Nashville, Tenn.*
Engineers Association of Western Pennsylvania, *Alleghany, Pa.*
Engineering News, *New York.*
Engineering and Mining Journal, *New York.*
Engineering, *London.*
Engineer, *London.*
Engineering Magazine, *New York.*
Electrical World, *New York.*

Electrical Engineering, *Chicago*.
Electrical Literature, *Chicago*.
Engineer's Gazette, *Newcastle-on-Tyne*.
Franklin Institute, *Philadelphia*.
Geological Survey of Canada, *Ottawa*.
Hanover Architects and Engineers Society (German), *Hanover*.
Hungarian Society of Civil Engineers, *Buda-Pesth*.
Institution of Civil Engineers, *London*.
Institution of Mechanical Engineers, *London*.
Institution of Electrical Engineers, *London*.
Iron and Steel Institute, *London*.
Ironmonger, *London*.
Indian Engineering, *Calcutta*.
Institution of Civil Engineers of Ireland, *Dublin*.
Institution of Engineers and Shipbuilders in Scotland, *Glasgow*.
Junior Engineering Society, *London*.
Journal of the U. S. Artillery, *Fort Monroe, Va*.
Liverpool Engineering Society, *Liverpool*.
Midland Institute of Civil, Mechanical and Mining Engineers, *Barnsley*.
Marseilles Scientific and Industrial Society (French), *Marseilles*.
Manchester Association of Engineers, *Manchester*.
Mining Journal, *London*.
Mining Institute of Scotland, *Hamilton*.
Mining Society of Nova Scotia, *Halifax*.
Minnesota University, *Minneapolis*.
North of France Industrial Society (French), *Lille*.
Nova Scotian Institute of Science, *Halifax*.
North East Coast Institution of Engineers and Shipbuilders, *Newcastle*.
National Car and Locomotive Builder, *New York*.
New York State Library.
Patent Office Library, *London*.
Philosophical Society of Glasgow, *Glasgow*.
Physical Review, *New York*.
Royal Society of Canada, *Ottawa*.
Report of Chief of Engineers U.S. Army, *Washington*.
Royal Engineers Institute, *Chatham*.
Royal Artillery Institution, *Woolwich*.
Royal Institute of British Architects, *London*.

Royal United Service Institution, *London.*
Royal Dublin Society, *Dublin.*
Royal Society of Edinburgh, *Edinburgh.*
Royal Scottish Society of Arts, *Edinburgh.*
Royal Institute of Engineers, *The Hague.*
Royal Irish Academy, *Dublin.*
Railroad Gazette, *New York.*
School of Mines, Quarterly, *New York.*
Society of Engineers, *London.*
Society of Arts, *London.*
South Wales Institute of Engineers, *Merthyr Tydvil.*
Society of Civil Engineers (French), *Paris.*
School of Practical Science, *Toronto.*
Technical Society of the Pacific Coast, *San Francisco.*
Technology Quarterly, *Boston.*
U.S. Naval Institute, *Annapolis.*
U.S. Geological Survey, *Washington, D. C.*
Western Railway Club, *Chicago.*
Western Society of Engineers, *Chicago.*
Wisconsin University, *Madison, Wis.*

The Reading Room is not as fully equipped with technical journals as it ought to be. We should have on file additional current standard periodicals relating to Engineering in its several branches, so that Members could enjoy privileges in that respect second to no similar society.

To obtain such by subscription would entail considerable cost; the Committee therefore considers it advisable to endeavour to effect exchanges for our advance proofs under special conditions with certain periodicals, and have so reported to Council.

GRANVILLE C. CUNINGHAM, *Chairman.*
W. McNAB, *Librarian.*

# CANADIAN SOCIETY OF CIVIL ENGINEERS.

## ABSTRACT OF RECEIPTS AND EXPENDITURES FOR THE YEAR ENDING DECEMBER 31st, 1895.

| | | |
|---|---|---|
| Balance from 31st Dec., 1894 | | $6,817 44 |
| **General Receipts.** | | |
| Subscriptions :— | | |
| Arrears | $705 25 | |
| Current | 1,962 75 | |
| Advance | 661 00 | |
| Extra on Cheques | 1 80 | |
| | $3,330 80 | |
| Transactions sold | 40 03 | |
| Interest to Dec. 31st, 1895 | 220 28 | |
| | | $3,591 11 |
| **Building Fund.** | | |
| Balance from Dec. 31st, 1894 | $3,604 32 | |
| Interest to Dec. 31st, 1895 | 125 10 | |
| | | $3,729 42 |
| | | $14,137 97 |

| | | |
|---|---|---|
| **General Expenditures.** | | |
| Transactions published and printed | $636 78 | |
| Advance proofs, etc | 90 50 | |
| Printing and stationery | 181 11 | |
| List of members, charters and by-laws | 120 50 | |
| Postage | 183 12 | |
| Messengers | 0 60 | |
| Cabs | 3 50 | |
| Secretary's salary | 300 00 | |
| Asst. do do | 480 00 | |
| Janitor's wages | 120 00 | |
| Janitor for washing towels | 3 00 | |
| Office furniture (includes a new safe) | 169 30 | |
| Rent of rooms for one year | 550 00 | |
| Telephone service | 15 00 | |
| Bank commission on cheques | 10 50 | |
| Gas | 2 64 | |
| Water rate | 26 00 | |
| Electric lighting | 39 76 | |
| Bookbinding for library | 48 65 | |
| Books and Magazines | 49 00 | |
| Express charges | 3 53 | |
| Expenses *re* Close Corporation | 168 02 | |
| Telegrams | 8 27 | |
| Address to Governor General | 41 00 | |
| | | $3,190 78 |
| **Balances.** | | |
| General Fund Treasurer | $7,217 77 | |
| Building Fund Treasurer | 3,729 42 | |
| | | $10,947 19 |
| | | $14,137 97 |

Examined with books and vouchers, and found correct.

K. W. BLACKWELL, *Treasurer.*

H. T. BOVEY,
HERBERT WALLIS, } *Auditors.*

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|---|---|
| | $10,947 19 |
| | $14,137 97 |

*Auditors.*

Examined with books and vouchers, and found correct.
H. T. BOVEY,
HERBERT WALLIS,

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|---|---|
| General Fund Treasurer | $7,217 77 |
| Building Fund Treasurer | 3,729 42 |
| | $14,137 97 |

K. W. BLACKWELL,
*Treasurer.*

# APPENDIX.

## REPORT OF COMMITTEE ON AN INTERNATIONAL GAUGE.

*To the Council of the Canadian Society of Civil Engineers :*

Your Committee appointed last year on the establishment of a standard gauge for thickness, applicable specially to rounds and flats in metals, unanimously approves the resolution of the Joint Committee of the American Society of Mechanical Engineers and the American Railway Master Mechanics' Association, in "earnestly deprecating the use "of any of the numerous wire and sheet metal or other trade gauges "now in vogue, and in strongly urging the use of thousandths of an "inch for all kinds and classes of small measurements."

Your Committee also agrees with the recommendation to use in practice gauges suitable to the requirements of the various industries interested, notched in dimension of and marked in terms of thousandths of an inch.

The following resolution is proposed :

*Resolved.*—That the Canadian Society of Civil Engineers recommends to its members and to all persons interested in uniform practice, the abandonment of the use of arbitrary gauges in favor of gauges expressed in thousandths of an inch.

J. Davis Barnett,
G. H. Duggan,
Herbert Wallis, *Chairman.*

Montreal, October, 1895.

The President. Mr. Monro said the unusual falling off had been due to the number removed from the roll for non-payment of dues. The utmost clemency had been exercised, and only those who had paid no attention to the notices sent them had been removed.

It was moved by Mr. J. D. Barnett, seconded by Major H. A. Gray, and resolved :

" That the report be adopted and printed."

The President. The President read a letter from Mr. Howland, of Toronto, asking the attention of members to the fact that a Canadian Historical Exhibition would be held in Toronto in 1897. It is suggested that scientific societies should lend their assistance, and Mr. Howland asks our help in so far as we deem best.

Mr. Macdougall Mr. Macdougall said the question of the Historical Exhibition, or rather meetings which are to be held in Toronto, in 1897, arose out of the last meeting of the Royal Society of Canada, at which certain resolutions were adopted with a view to celebrating the 400th anniversary of the landing of Cabot on the North American Continent. The idea is that, on the 24th of June, 1897, the day on which Cabot is recorded to have found the northern shore of the North American Continent, the members of the Royal Society shall go to some point on the shore of Cape Breton, and there lay the foundation stone of a monument, which shall be a national monument to the memory of Cabot. Then the proposal is, that there shall be a naval demonstration from that point, following up to the other places where he is supposed to have stopped. They will proceed to Quebec and then they will go to Ottawa, and there will be some further demonstration there.

The visit of the British Association has not been definitely arranged for. It has accepted the invitation of the Canadian Institute, and is coming out in the year 1897. It is expected that other scientific societies will hold their meetings in Toronto, also, in that year. The Historical Exhibition is a very large undertaking, and Mr. Howland is trying to get up a joint stock company for the purpose of carrying on this exhibition, which will run concurrently with the British Association. The list of subscribers is now issued.

It has been suggested that if the meeting of this Society could be changed for one year and brought up westwards, it would be a very good thing, and we in the west would be very glad, indeed, to have you, and can assure you that we would welcome you with a great deal of pleasure, if such a suggestion could be carried out. A meeting could be held here for the election of officers, and the Annual Meeting could

take the form of a summer meeting. We would be very glad, indeed, in Toronto to see some move of that kind. For many reasons, it would be desirable and would be successful. As a society, the speaker did not think we should bind ourselves in any way to take action connected with the Historical Meeting. Our meeting might take the form of papers to be read upon the historical points of Engineering, which would bring it within the scope of the Historical Meeting. A meeting in Toronto, in 1897, would find favour with many members resident in the West.

Mr. C.B.Smith. Mr. Smith said he had wished to bring up the question of holding a summer meeting for the reading and discussion of papers. He understood that a committee on this question had been appointed in 1890, that the Committee had reported to Council asking that action be taken; but, in so far as he was aware, no action had been taken.

Mr. McNab. Mr. McNab said a committee, of which he was the secretary, was appointed in the year 1890, to take up this question of a Summer Convention. The Committee issued a reply post card with three questions: Are you in favour of a Summer Convention? In what place should it be held? In what month of the year? About 140 replies were received, and of these replies 57 per cent. were in favour of Toronto and 48 per cent. were in favour of holding the meeting in the month of June. This report was presented at the Annual Meeting in 1890, and the Council was instructed to make arrangements for a summer meeting in Toronto.

The Secretary. Reference was then made to the minutes of Council, and it was found that the proposed summer meeting had been postponed at the request of the Toronto Branch, owing to the absence of the President, Sir Casimir Gzowski, from Toronto, and to other circumstances, which rendered it inadvisable to hold the meeting that year.

Prof. Bovey. Prof. Bovey said he thought it would be very advisable to hold a meeting in Toronto, as it would serve the very important purpose of bringing a few more of the Toronto members into active connection with the Society.

Mr. McNab. Mr. McNab said, if such a meeting were held in Toronto, it might be arranged that we should visit Niagara Falls. There are special works in that neighbourhood which would interest the members, such as the new steel arch bridge being built across the river, and the great hydraulic power works on the American side.

It was moved by Mr. C. B. Smith, seconded by Mr. C. de B. Leprohon, and resolved:—

"That the Council of the Canadian Society of Civil Engineers make arrangements for a special summer meeting, to be held in Toronto during the summer of 1896."

The President read the following report of the Gzowski Medal Committee:—

TORONTO, January 10th, 1896.

Prof. C. H. MCLEOD,
*Sec'y. Can. Soc. C. E.*

DEAR SIR,—The Gzowski Medal Committee have pleasure in recommending the paper of Dr. Bovey on "The Strength of Canadian Douglas Fir, Red Pine, White Pine and Spruce" for the medal.

J. GALBRAITH, *Chairman*,
WM. T. JENNINGS,
W. BELL DAWSON,
D. H. KEELEY,
JOHN T. NICOLSON.

The President. The President said he had great pleasure in presenting the medal to Prof. Bovey. He was sure that it had been well merited. The paper is one which had taken a great amount of labour and care in its preparation, as also in the tests which had been made, and which he was sure would be of immense benefit to the members.

Prof. Bovey said he thanked them very heartily for the manner in which the medal had been presented. He also begged to thank the Committee for the honour they had done him in awarding the medal for the paper, which had been so aptly described by their former President, Mr. Hannaford, as being "fat, bulky and wooden." The possession of this medal was very gratifying to him, not only on account of the donor, who had done so much for the Society, not only on account of the recognition given for certain work done, but also because it was the highest prize offered by this Society. He sincerely hoped that the competition for the medal will become more active. He was sure that a large number of the members could read most valuable papers on subjects connected with the great works of the day if they would only take the trouble to put their information on paper. He said there were men sitting in the room at the time who, with a little extra exertion, could contribute papers which would be of benefit to every engineer. The prize of the medal is one well worth striving for, and he esteemed it an honour that this year he was the recipient.

The report of the scrutineers on the election of the Nominating Committee was then read:—

## Report of Scrutineers for Nominating Committee.

The Scrutineers beg to report as follows :—

The total number of votes cast was 142, of which 5 were invalidated on account of no name.

For the Province of Quebec, the total number of votes was 59, the following being elected :—

W. J. Sproule, 10. H. Irwin, 8.

For the Province of Ontario, the total number of votes was 57, the following being elected :—

A. Macdougall, 12. W. T. Jennings, 7. J. Galbraith, 5.

For Newfoundland, Nova Scotia, Prince Edward Island and New Brunswick, the total number of votes was 8, the following being elected :—

M. Murphy, 3.

For Canada, West and North West of Province of Ontario, the total number of votes was 8, the following being elected :—

H. N. Ruttan, 2.

For those not living in Canada and Newfoundland, the total number of votes was 5, the following being elected :—

H. T. Bovey, 2.

A full list of votes cast is appended.

R. M. Hannaford,
Wm. Arch. Duff,
Theo. Denis,
} *Scrutineers.*

The President announced the Nominating Committee for the ensuing year to be as follows :—

Province of Quebec.—H. Irwin, W. J. Sproule.
Province of Ontario.—J. Galbraith, W. T. Jennings, A. Macdougall.
Maritime Provinces and Newfoundland.—M. Murphy.
North-West Provinces.—H. N. Ruttan.
Outside of Canada.—H. T. Bovey.

The report of the Scrutineers on the election of Officers and Members of Council for the year 1896 was then read.

## REPORT OF SCRUTINEERS FOR OFFICERS AND MEMBERS OF COUNCIL.

| | |
|---|---|
| Total number of votes cast | 110 |
| " " void for non-payment of dues | 6 |
| " " " having no name on them | 3 |
| " " void | 9 |
| " " good | 101 |

*For President :—*

| | |
|---|---|
| Herbert Wallis | 101, elected |

*For Vice-President :—*

| | |
|---|---|
| Henry T. Bovey | 92, elected |
| Charles Macdonald | 94, elected |
| W. G. Thompson | 97, elected |

*For Treasurer :—*

| | |
|---|---|
| K. W. Blackwell | 100, elected |

*For Secretary :—*

| | |
|---|---|
| Clement H. McLeod | 99, elected |

*For Librarian :—*

| | |
|---|---|
| William McNab | 101, elected |

*For Members of Council :—*

| | |
|---|---|
| W. D. Barclay | 68, elected |
| J. D. Barnett | 69, elected |
| St. Geo. Boswell | 78, elected |
| M. J. Butler | 65, elected |
| W. R. Butler | 61, elected |
| H. J. Cambie | 82, elected |
| R. Clarke | 55 |
| G. C. Cuningham | 76, elected |
| W. B. Dawson | 75, elected |
| G. H. Duggan | 72, elected |
| H. Irwin | 76, elected |
| E. H. Keating | 79, elected |
| D. H. Keeley | 57 |
| Alan Macdougall | 80, elected |
| W. G. Matheson | 68, elected |
| E. Marceau | 48 |
| D. A. Stewart | 74, elected |
| W. J. Sproule | 71, elected |
| L. A. Vallée | 46 |

J. Herbert Larmonth,
J. W. M. Wallace,
J. L. Allison,
} *Scrutineers.*

The President then declared the Council for the ensuing year to be as follows:

*President.*

Herbert Wallis.

*Vice-Presidents.*

Henry T. Bovey, Charles Macdonald,
William G. Thompson.

*Treasurer.*

Kennet W. Blackwell.

*Secretary.*

Clement H. McLeod.

*Librarian.*

William McNab.

*Council.*

W. D. Barclay,
J. D. Barnett,
St. Geo. J. Boswell,
M. J. Bulter,
W. R. Butler,
H. J. Cambie,
G. C. Cuningham,
W. B. Dawson,
G. H. Duggan,
H. Irwin,
E. H. Keating,
A. Macdougall,
W. G. Matheson,
D. A. Stewart,
W. J. Sproule.

Mr. Monro then gave up the chair to Mr. Wallis, who in accepting office thanked the Society for the honour done him in electing him to the Presidential chair for the ensuing year. He stood in the unique position of being the first purely Mechanical Engineer who had been called upon to occupy the Presidential chair. He trusted his confrères would recognize this fact, and shew their appreciation by liberal contributions of papers, thus assisting to maintain and possibly to enhance the value of the published proceedings of the Society. He could not forget that he was following in office men whose names and works were household words in the annals of Canadian Engineering, and he realized the responsibility that rested upon him. He congratulated the Vice-Presidents and Members of Council upon their election, and asked their kind co-operation in the transaction of the business of the Society and the promotion of its welfare. Mr. Wallis.

Mr. Butler called the attention of the Society to the matter of standards of length in Canada, and read a communication from himself to the Minister of Inland Revenue, and the reply thereto. Mr. M. J. Butler.

Mr. M.J. Butler

Mr. Butler said the object was to secure an accurate, uniform and practical standard measure of length. Under the Government Act, any and every measure of length and capacity must bear the certificate of the officers of the Inland Revenue Department, or, if not certified by these officers, any person making use of them is liable to a fine. The local officers may interpret it to be their duty, if they meet a Surveyor or Engineer using a measure of length not stamped by the officers of the department, to compel them to pay a fine. To comply with the demands of the local officer, engineers must have him test their measures. Of course it is simply absurd, because these men have no knowledge of what is required. Last year he brought the matter before the Association of Ontario Land Surveyors. They, acting under the Provincial Act, have had a pine stick for a standard, with one side marked off in feet, the other side in links, the total length being five links. Every Engineer ought to have a correct standard measure. He had addressed a memorandum to the Minister of Inland Revenue, asking him to alter the statute so as to provide each professional man with a standard certified to by the Department of Inland Revenue, and that the working measure which might be used should be made to agree with this standard. Yesterday he had the pleasure of inspecting with Prof. McLeod the fifty foot standard which McGill University had provided, and which, like everything in that University, was magnificent. It would seem to him that if the Inland Revenue Department could be induced to declare the McGill University standard one of the standards for Canada, and if another were provided at the School of Science in Toronto, a great advance would be made. While there is an objection to multiplying standards of length, he thought there should be at least one for each province. If anyone uses an unstamped measure of capacity in buying or selling, they are liable to a fine. For any work done where a measure is necessary, no one, under the Act, has a right to say it is such a length, unless the measure used has been certified by the officers of the Inland Revenue Department. He had received a communication from the Deputy Minister, setting forth the fact that a standard measure had been provided at Ottawa, and that the Department recognized the fact that the local inspectors were not qualified to test measures of this kind. He had received a letter from Capt. Deville, saying that they had a measure; but he did not recollect the details of it.

Mr. Mountain.

Mr. Mountain said he understood Mr. Butler to say the standard with the surveyors is a pine stick. With the Quebec Land Surveyors the standard is metal, and it has been metal for years back.

Mr. Butler, in explanation, said the standard in the possession of the Departmental offices at Toronto is a metal standard, but the practical working standard furnished to the Surveyors has been a pine stick. Mr.M.J.Butler

Mr. Kennedy said he thought something should be done. We ought to know where we stand in these matters. Mr. John Kennedy.

It was moved by Mr. Butler, seconded by Mr. C. B. Smith, and resolved: "That a committee, consisting of Prof. McLeod, W. J. Sproule and M. J. Butler, be appointed by the Society for the purpose of enquiring into and reporting on a means of providing standard measures of length, and that the said Committee report to the Council on or before the next Annual Meeting."

It was moved by Mr. Macdougall, seconded by Mr. H. A. Gray, and resolved :

"That the ballot papers be destroyed."

Mr. G. A. Mountain moved, seconded by Mr. Stuart Howard, that a vote of thanks be given to Mr. Monro, the retiring President, for the efficient manner in which he has performed the duties of President during the past year.

Mr. Mountain said he had great pleasure in moving this resolution, and he was sure that all the members would agree with him in saying that the retiring President had lent himself most earnestly to the duties of his office for 1895. He had attended the majority of the meetings, and he had always assisted in every way possible to uphold the standards of the profession, both outside and in connection with the Society. It is a great honour to have had for President a gentleman who is at the head of one of the greatest public works undertaken, and who, by an Order-in-Council, has been appointed a Commissioner on the Deep Waterways Convention. Mr. Mountain.

Mr. Howard said he had great pleasure in seconding Mr. Mountain's motion, and he was sure he was expressing the sentiments of all the members. Mr. Monro had been, since his term of office, a most energetic President, and had been untiring in his attention to the welfare of the Society. Mr. S. Howard.

The motion was unanimously adopted.

Mr. Monro said he could simply thank them for the very kind way in which they had spoken of him.

It was moved by Mr. Wm. Kennedy, seconded by Mr. Sproule, and resolved :

"That a vote of thanks be given to Professor McLeod for his unfailing attention to the affairs of the Society during the past year."

It was moved by Mr. C. B. Smith, seconded by Mr. J. L. Allison, and resolved :

"That a vote of thanks be given to Mr. Blackwell, for the very efficient manner in which he has discharged the many duties attendant on the Treasurer's office."

It was moved by Mr. E. A. Hoare, seconded by Mr. Mountain, and resolved :

"That a vote of thanks be given to Mr. McNab for his duties as Librarian, and for the very able manner in which he has attended to the Library during the past year."

It was moved by Mr. W. J. Sproule, seconded by Major H. A. Gray, and resolved :

"That a vote of thanks be tendered to the Committee on Professional Status, and especially to its Chairman, Mr. Alan Macdougall, for the very great amount of care and labour that he has given to the subject."

Mr. Macdougall

Mr. Macdougall said he thanked them most heartily for the kind and appreciative expression of the service which he had rendered to them. The work had been great, at the same time he had gladly given the time to the service of the Society. He had always found the Council ready and willing to render him every assistance in the applications that he had made to them. The work of the Committee had come to a very important and crucial point, and he hoped that they would be able to bring it to a successful termination.

It was moved by Mr. John Kennedy, seconded by Mr. Blackwell, and resolved :

"That a vote of thanks be accorded to the railway companies for the facilities which they have given to those attending the meeting."

It was moved by Mr. NcNab, seconded by Mr. Wallis, and resolved:

"That a vote of thanks be given to the scrutineers."

Mr. Monro, the retiring President, read the following address :

# PRESIDENT'S ADDRESS.

## Address of Thomas Monro, President Canadian Society of Civil Engineers.

Mr. President and Gentlemen:—

In vacating the presidential chair of this Society, I shall follow the example of my immediate predecessors, and devote the short time at my disposal to a few remarks upon an engineering subject with which I have been for a long time connected, rather than attempt a *résumé* of the general progress of the profession, or even a description of the principal works begun or carried on in Canada during the year just closed.

A brief consideration of the St. Lawrence as the great water route of our country, and its latest artificial improvements, may prove somewhat interesting at the present time, when there seems to be a revival in canals—at least in those of dimensions sufficiently large to enable them to compete, for the carriage of heavy freights, with the vastly improved railways of to-day.

It is not necessary, in discussing this question before such an audience, to give an historical sketch of the inception and progress, up to the period of Confederation, of the various works connected with navigation on the route in question. This has already been ably and fully done by several writers, some of whom are distinguished members of this Society.

As, however, you are doubtless aware, a mixed Commission was appointed by the Government in 1870—just a quarter of a century ago—to examine into the question of affording greatly increased facilities for commerce by our water routes, which were then found to be wholly inadequate to the wants of trade. In its report, dated 24th January, 1871, this Commission recommended the adoption of a uniform size of lock for the Sault Ste. Marie, Welland, and St. Lawrence canals, the dimensions of which were fixed at 270′ x 45′ in the chamber, with 12 feet on the mitre sills. An estimate of the cost of these improvements was as follows:—

| | |
|---|---|
| Sault Ste. Marie Canal..... | $ 550,000 |
| Welland Canal..... ..... | 6,550,000 |
| St. Lawrence Canals ..... ..... .... . | 4,500,000 |
| Upper St. Lawrence River..... | 220,000 |
| | $11,820,000 |

It is difficult to understand why a lock of such proportions was projected. As a matter of fact, "there begins our sadness." No valid reasons are given for it. It neither suited the shape of the large class of vessels then engaged in the trade of the upper lakes, nor any that have since been built. Unfortunately the Welland Canal was constructed on this plan. It was begun in 1873, and completed to 12 feet in 1881, at a cost of about *fourteen millions of dollars.* The additional two feet cost about *two millions* more, so that the change from a 10 to a 14 feet draught cost about *sixteen millions of dollars.* The canal was opened to the latter depth in the spring of 1887. Meanwhile, the growth of the upper lake trade was enormous. The registered tonnage of vessels passing the Sault Ste. Marie Canal was, in 1870, 690,826. In 1887 it was 4,879,598, whilst the freight actually carried was 5,494,649 tons. The increase in the size of vessels in this interval was so great, that numbers of them could not pass through the enlarged Welland at all. Indeed, the short-sighted policy of 1870 prevented this link in the navigation being placed on a modern basis, and left it as much or more out of date in 1887 as it was when the works were begun, whereas a moderate increase in the length and depth of the locks would have enabled a large part of the lake fleet even of to-day to descend into Ontario instead of being penned up in Lake Erie, to the manifest disadvantage of the St. Lawrence route.

As far back as 1867, Colonel Blunt surveyed several lines for a canal between Lakes Erie and Ontario on the United States side of the Niagara River. His locks were 276′ x 46′ with *fourteen feet* on the sills. In 1870, Congress made an appropriation for the improvements projected at Sault Ste. Marie, where the two locks then in existence, although 350 x 70 x 12, were to be changed for a single lock of 18 feet lift, the dimensions of which were fixed at 515 x 80, with *sixteen feet* on the sills at mean water.

In 1870, the Milwaukee Board of Trade suggested that the locks on the St. Lawrence route should be made 300′ x 45′ with a *depth of* 15 *feet*, and somewhat similar dimensions were advocated by the Board of Trade of Chicago. The lake harbours were well known to be easily

susceptible of being deepened to 16 feet, as has been done since; and even then there was a 14 feet channel through the mud flats of Lake St. Clair. But the Commission decided that to exceed the dimensions fixed by them would be to entail an unjustifiable expenditure upon the limited resources of the Dominion.

One of the chief reasons why the Welland Canal cost so much money was owing to the lift of the locks being restricted generally to from 12 to 14 feet. The summit level of the canal from Lake Erie to Thorold is about 18 miles long, and then there is a rapid descent into Lake Ontario. The total fall between the Lakes is 326¼ feet at mean stages. This is overcome by 25 locks of about 13 feet average lift each. Had this been arranged for 13 locks of 25 feet lift, a much more direct line could have been selected, and both the first cost and subsequent maintenance of the canal greatly reduced. The lift at the Liverpool docks is about 24 feet at low tide. On the Severn it is much greater. As before stated, the "Soo" lock was designed for a single lift by the late General Poe, one of the foremost of United States Army Engineers. Had primeval practice been abandoned, and concrete substituted for cut stone in the greatly diminished number of locks, the saving which would have followed in the item of masonry alone would doubtless have enabled the Welland Canal to be made of much larger dimensions for the same amount of money, and thus confer a vast and lasting benefit on the St. Lawrence route. The total expenditure on this canal up to the 30th of June, 1895, is $23,764,070. Before Confederation, $7,638,239.83; since Confederation, $16,125,831.

In the lower canals the dimensions of the Welland Locks were adhered to, so that in the enlargement works now in progress on the St. Lawrence, they are the same size, viz., 270′ x 45′ with 14 feet on the mitre sills. On the St. Lawrence canals there has been expended up to the 30th of June, 1895, the sum of $23,109,203. Before Confederation, $7,471,208; since Confederation, $15,637,990.

The construction of the "Soo" Canal was not, however, begun until 1888-9. The progress of events prevented the mistake of adopting small dimensions for the lock there. The result has been a greatly increased size of structure. The first design was for a chamber 600′ x 85′ with a depth of 16½ feet. This was subsequently altered to 650′ x 100′, depth 19 feet; and finally, in 1892, the dimensions were fixed at a length of chamber of 900 feet, with a uniform width throughout of 60 feet and a depth on the mitre sills of 20′ 3″ at the lowest

known stage of the St. Mary's River. The cost of this canal, up to 30th June, 1895, was $3,256,510. It was opened for traffic last fall. It has aided considerably in passing United States vessels, and in relieving the congested traffic at their lock. It is a noticeable fact that the Canadian trade at this point is only about four per cent. of the whole. The Canadian lock is a magnificent structure, and its operation by the electrical method an unqualified success. The result of the improvements at the "Soo" is to make all the four upper lakes practically one for commercial purposes. The "Soo" lock and canal will cost about $4,000,000 when completed.

But this reference is aside from the main object of my remarks, as we have really to consider what the prospects are for an increased trade through the St. Lawrence to our own port of Montreal when the canals (still incomplete) shall have been finished throughout to a draught of 14 feet.

The unparalleled reduction in freight rates on the upper lakes bears directly upon this point, and has been brought about by the great increase in the size and speed of the steam fleet there. To form an idea of this, it may be stated that the total tonnage of the lakes on 30th June, 1895, was 1,241,459. Of this, two-thirds were steamers, and the number of these of one thousand tons and over on the 30th June, 1894, was 359, with an aggregate gross tonnage of 634,467. In the lake ship yards, this winter (1895-96), there will be built 65 vessels of all kinds, at a cost of about $8,500,000. Thirty out of the sixty-five are steel freight vessels, twenty of them being steamers. These thirty vessels will average 400 feet in length, and the cargo capacity will average nearly 4,000 tons on a draught of 14½ feet. One of them is 432′ x 4 8. They will cost about $200,000 each. The total carrying capacity of the 42 freight vessels is, on 14½ feet, 136,600 tons gross. Allowing the average number of trips during the coming season, this addition to the fleet will carry about 2½ millions of tons of iron ore or coarse freight.

As a consequence of all this, grain is now carried from Chicago to Buffalo (870 miles) at about half the cost of 1886. In 1886, the season's average on wheat between these points was 3.6 cents; in 1894, it was 1.2 cents; in 1895 the average was 1.9 cents; but in July last it was carried for 1 cent. It must also not be forgotten that between Duluth, Chicago and Buffalo, works are now in progress which will in the near future secure a channel 20 feet in depth between these points and this will surely eventuate in a still further and large reduction in lake freights.

A remarkable change has taken place in last year's grain business between Buffalo and New York. In 1894 the Erie Canal carried 42,608,700 bushels; but in 1895 this had fallen to 14,612,700. The highest canal rate paid on wheat, Buffalo to New York, was 3 cents, the lowest $1\frac{7}{8}$ cents, and the average $2\frac{3}{8}$ cents. And yet, in the face of these prices, the railways carried double the amount of grain between the same points in 1895 that they did in 1894. It may be said, however, that $9,000,000 have been recently voted for the improvement of the Erie Canal, and that the electric trolley system has recently proved a success in towing a small fleet of steel barges. With 9 feet in the canal and the "emancipation of the mule," it may be able again to hold its own. At all events, its long competition with the railways has done much in the past to keep at reasonable rates the cost of grain transportation from the great West to the Atlantic seaboard, and has thereby added substantially to the prosperity of the State of New York.

Taking the probable average lake rate in the near future on wheat at $1\frac{1}{2}$ cents, Buffalo charges reduced to $\frac{1}{2}$ cent, and the Erie improved at 2 cents, it is quite clear that 4 cents at the outside will soon carry 60 lbs. of grain from Chicago to New York, a distance of 1,368 miles, --and pay a fair profit at that.

It is this competitive rate we must face when, upon the completion of the canals to fourteen feet, we shall be in a position to try for a fair portion of the foreign export trade. It may be said here that the total expenditure on the Sault Ste. Marie, Welland and St. Lawrence Canals up to the 30th June, 1895, was $50,129,783. Of this, about 20 millions were spent prior to Confederation, so that about 30 millions have so far been expended on the enlargement. The works could easily be completed in less than three years from date if so desired.

Great advantages are claimed for the St. Lawrence route, and its praises have been sung for years in somewhat stereotyped phrase. But, nevertheless, the "Western trade" does not come this way. The principal reason for this is, of course, that the St. Lawrence does not lead to the chief market. The grain which descends from the lake region is largely consumed in the East, and not exported at all. Take, for example, the receipts at New York for 1894. 123,184,499 bushels were received there by the various routes from the interior, but the freight export was only a little over 62 millions. It is only for the latter half we can compete. We are "not in it" for the balance. Years ago it

was thought that if grain once descended on to Lake Ontario, it would inevitably find its way to Montreal for distribution or export. But it does not. More than half the tonnage which passes east through the Welland Canal is between United States and United States ports ; and one of the chief benefits which its enlargement has so far conferred upon commerce is to permit of a line of American propellors being profitably established between Chicago and Ogdensburg. With reference to the foreign export trade of the St. Lawrence, it is a significant fact that the sea-going tonnage of the port of Montreal has remained at about the same figure for several years, whilst the trade of Buffalo has doubled since 1886, and was, in 1895, 9,612,423 tons, that of Montreal being officially given at 1,069,386 tons. Even with similar freight rates, the trade will go via Buffalo to New York. The reason of this is not far to seek. New York is the commercial metropolis of North America. It is a great money centre. The imports are enormous ; and it is an acknowledged fact, that the route upon which a large import trade is done will invariably be the commercial favourite, and command freights both ways. The exports of an agricultural country are naturally bulky, and cannot stand high transportation charges. If therefore a route has little or no back freights, it has but a poor chance of success, unless the cost of carriage outwards or to the seaboard is so much reduced as to offset the manifest advantages above alluded to. In addition to other drawbacks, the port of Montreal is closed for nearly half the year, whilst those on the Atlantic coast are open all the year round.

During the navigation season, however, Montreal is connected with the sea at Quebec by an artificial channel or submerged canal in the St. Lawrence. This has passed through various phases of deepening, and is now 27½ feet in depth at ordinary low water. It is broad, well lighted, and sufficiently direct to enable ocean vessels to navigate it with comparative ease. The cost of this channel up to the 30th June, 1895, was $3,518,650. The manner in which the operations connected with its establishment have been conducted reflect the highest credit on the enterprise of the city of Montreal and on the professional skill of Mr. John Kennedy, past President Can. Soc. C.E., who has made several important improvements by which the cost of dredging rock and hard material at considerable depths has been greatly decreased.

Reverting to the subject of the passage of United States vessels through the Welland Canal, it is a fact that before the enlargement

took place, and when a small class of vessels was in general use on the upper lakes, this trade, in 1871, amounted to 772,756 out of a total of 1,478,122 tons. In 1880, just before the opening of the new canal to a 12 foot draught, and when the small class vessels were going out, it had diminished to 179,605 tons. Since the opening of the Welland at the increased draught of 14 feet, this trade has steadily grown until in 1893 it was 631,667 tons, representing three-quarters of the agricultural products which were moved on the canal in that year, and about half its total tonnage.

The class of propellers plying to Ogdensburg, previously referred to, now pass through the Welland Canal, carrying 1750 tons on 14 feet. They are 240 feet long, 42 feet beam, and draw about 15′ 6″ when fully laden. At this draught they carry 2100 tons. The cost of lightcrage by the Welland Railway is 2 cents a bushel on corn, which is the principal article carried eastward, and the detention at the elevators will average 3 days in a season of ten trips. The additional cost owing to these drawbacks is not less on each boat than $3,000 per annum. If these propellers could descend to Montreal, the question of back freights would determine whether they would pay or not. But the difference of rate between Ogdensburg and Montreal, if added to their 60,000 bushels of cargo, should go a long way towards making the extended voyage a success. At present they carry about 40 per cent. cargo westward, as they run in connection with the Vermont Central Railroad. The line is, it is stated, a fairly successful commercial enterprise.

My views on the whole question of the St. Lawrence route may be considered pessimistic. But it is better to draw attention to the formidable rivalry which may be counted upon for the export of even our own products, than be led into the belief that the St. Lawrence, when the canals are enlarged, will possess a very great superiority over the southern routes, for the export trade of the West.

Nevertheless, it seems to me that so soon as a vessel of say 2,000 tons can get down from Lake Superior to Montreal without breaking bulk, immediate advantage will be taken of this to introduce a cheaply built class of steel propeller and consort of the full size of the locks, and with such reduced running expenses as will enable the present grain rate to be cut in two, or at least so materially reduce charges that we shall be able to wipe out the present antiquated system of transport, and at last stand the chance of getting a fair share of the through transatlantic trade.

To show that this is worth fighting for, a few representative figures, illustrating the growth of the great lake feeders, will now be given. The tonnage passing through the Sault St. Marie Canal in 1885 was 3,256,628 tons. In 1895 it was 15,062,580 tons, including 46,218,250 bushels of wheat, and over 8 millions of tons of iron ore. The quantity of the latter has more than doubled in five years. The totals for 1895 include what passed through the Canadian canal since it was opened in the fall of the year. The receipts of grain, including flour at Buffalo by lake in 1895, were 162,936,630 bushels, or more than double that of 1885. Chicago shows a similar increase, and the total tonnage passing Detroit, which is about the measure of that coming by water from the upper lakes, was, last year, not less than 35 millions of tons. It is believed that the increase shown by these figures is without a parallel in the history of the world—and the end is not yet. If the St. Lawrence route can secure even the overflow of this enormous traffic, the large sums which Canada has so pluckily spent on her canal system will even yet yield her an abundant return.

But the completion of these canals is urgently required, and an astute American observer has quite recently made the following remarks on this subject: "It must be borne in mind that Canada "has not realized the advantages of her great expenditure, because her "canal system is not yet complete. The strength of a chain is the "strength of its weakest link. The capacity of a navigation system is "measured at its point of least capacity. These canals will be finished "within two years, and then the Canadian 14 foot system will be in "full working order from Lake Superior to Montreal. There will be "no weak link in the chain then, and we will feel it pinch." No further time should be lost in securing the substantial advantages of this main line of navigation, which has been under construction since shortly after Confederation. It has cost, as before stated, from the beginning, about **$53,500,000**, without there being, so far, any adequate return for such a vast outlay.

Before, however, full success can be achieved for the St. Lawrence route, the harbour of Montreal must be adapted for the rapid transfer of whole cargoes from the inland vessel to the ocean steamer. This can best be done by establishing a lower port at the foot of St. Mary's current, and in the vicinity of Longue Pointe. It should be a national undertaking, provided with warehouses, elevators, stock yards, and everything necessary for handling a large through transatlantic trade. Wharves should be arranged so that no time would be lost in taking

on heavy freight of all kinds from the railways or lake propellers. Every branch of trade would benefit by this arrangement, and, as before stated, the way from Montreal to the sea is now broad, deep, and well lighted, it is believed that the St. Lawrence route would, on the completion of this lower port, at last assume the commercial importance to which it is by nature entitled.

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With these necessarily imperfect prefatory remarks, it is now proposed to make a few practical observations upon the leading principles, which it is believed should govern the location of canals designed for the passage of large vessels, and in the position of those in progress or completed between Lake Erie and Montreal. Reference will chiefly be made, for illustration, to the works of the Soulanges Canal, because an attempt has been made to construct them in accordance with modern practice, the writer having been left a free choice in the design and arrangement of the structures, etc., etc. He was really limited only by the general dimensions of locks, etc., fixed by the Commission of 1870 for the St. Lawrence route.

1. The disadvantages attendant upon an abrupt change of direction in a line of navigation of the dimensions of the St. Lawrence Canals are so great as to warrant a large outlay in order to preserve as straight a line as possible. Vessels weighing with their cargo about 3500 tons, when under steam, even at canal speed of say 4 miles an hour, have to be guided with the utmost care to prevent accident. It is obviously easier to steer where the line is straight, and where objects can be seen some distance ahead, thus avoiding in many cases running on the banks, and preventing collisions which would otherwise be difficult to escape. The advantages of a straight line are very manifest at night, when a well lighted canal can be almost as easily navigated, at moderate speed, as during the day. A gradual change of direction, effected by curves of large radius, is, however, by no means objectionable.

2. But not only ought sharp curves be avoided—the dimensions of the prism should be uniformly preserved throughout as far as possible. At bridges the old practice was to place a pier in the middle of the canal, with a narrow opening on each side of it. This is a cardinal mistake, and can be easily avoided by the adoption of a light steel superstructure, one arm to swing over the whole bottom width of the canal (100 feet), leaving this free for navigation and the uninterrupted flow of the water. The pivot can be built on whichever side of the canal

may be deemed desirable, and the other arm made to swing partly over the land. Behind this pivot the prism can be enlarged, so as to give more than the full sectional area of the canal, and entirely obliterate cross currents at the bridges. In this way a double source of accident will be avoided. Vessels will have no tendency to sheer, and there will not be the same danger of collision with the bridges as when a narrow channel on either side of the pivot has to be passed through at such speed as will enable the vessel to be safely steered, especially in high winds. With this arrangement the eastbound and heavily laden craft need not slack up, neither the lighter ones coming west, so that there will be no detention whatever at the bridge crossings. In addition to the safety of this plan, it is by far the most economical. Some of the road bridges on the Welland Canal cost from 40,000 to 50,000 dollars. There is no reason why, under ordinary circumstances, a bridge, to serve the same purposes, if built according to the plan above described, should cost more than say from 25,000 to 30,000 dollars.

3. The reduction in the cost of masonry previously referred to, when discussing the question of the enlarged Welland Canal, is founded in the firm belief that for the purposes of lock walls, weirs, retaining walls, and other hydraulic structures, concrete made of sound and properly tested Portland cement, good clean broken stone and sharp silicious sand, is in all respects better than the expensive masonry hitherto in vogue. A monolithic water-tight mass is obtained of such shape as may be desired, and at a cost which will vary from about one-half to two-thirds of that of dressed stone, according to circumstances. Where, for example, the line of a canal passes through a rock formation, which, whilst not suitable for masonry, yields excellent material for concrete, what valid reason can be given for rejecting this mode of construction? Take, for example, the case of the new Welland Canal. Its line is in heavy rock cutting at the pitch of the Niagara Escarpment at Thorold, and close to where the bulk of the masonry is in the ladder of locks and weirs descending to Lake Ontario. Within a distance of about 9 miles, there are over 325,000 cubic yards of this masonry. And the rock excavation in the vicinity amounted in the solid to over 150,000 cubic yards. This, instead of being chiefly thrown to spoil, would, if broken to proper size, have made nearly 300,000 cubic yards of concrete. If the structures had been built (as might have been done in this particular case) of native cement, through a stratum of which the canal line passed—a vast mass of the work could have been executed at one-half or less than one-half of the masonry prices paid—which were from $10

to $12 per cubic yard. These are of course only approximate statements, but will serve to show the great saving which might have been effected by adopting the use of concrete under such favourable circumstances.

4. Recent experience in the use of properly made concrete places its economy and desirability for canal works in every respect beyond reasonable doubt. The Manchester Ship Canal examined by me in 1891, just previous to completion, afforded a convincing proof of this. The cost of this work even now is enormous. But what would it have been if the 1,250,000 cubic yards of masonry in its locks, quay walls, etc., etc., had been built of cut stone instead of concrete?

Conclusive evidence of the durability of concrete in this climate, under the most trying conditions, is afforded by the present state of the breakwater at Buffalo Harbour. This structure is exposed to the violent storms at the east end of Lake Erie, which entirely destroyed its old wooden superstructure. This was replaced by a solid mass of concrete—and the waves have dashed up against it for years, and masses of ice have clung to it for many rigorous winters, without effecting even the least degradation of its surface. It is, however, superfluous to multiply proofs of what is now a universally acknowledged fact. But it is also a fact that the reputation of concrete has suffered greatly by the use of cement in public works, which can only properly be described as "trash." There is nothing that requires so much care in testing as cement, although the duty is simple and easily performed, but without it there is no guarantee whatever of quality. The choice of cement should not be left to any contractor. Such a course is almost sure to result in failure; and it may here be observed *en passant* that there are several cases of this kind in canal works of recent construction.

5. There is another position in which concrete may, with advantage, be used as a substitute. Of recent years, the increasing cost of timber—its inferior quality—and comparatively short life has directed attention to the plan of using concrete instead of it in the superstructure of entrance piers, dock walls, etc., etc. On each side of both the upper and lower entrances to the Soulanges Canal, the cribs are finished to low water line, and along their inner faces concrete walls are built about 8 feet high and 6 feet wide at the base. These will be coped with cut stone and backed up by material of heavy class, well rammed in layers. The cribs are 25 feet wide. The wall is protected by oak fenders 18″ x 9″. Its face is vertical. The cost of the crib superstructure is approximately about three-fifths of that of concrete, which is

about $5.50 per cubic yard, with Portland cement at $2 per barrel of 400 lbs. The aggregate length of piers at both entrances is about 3,900 feet.

6. None of the other St. Lawrence canals is crossed by a stream of such size as the River Delisle, which intersects the Soulanges at Coteau du Lac. The flood measurement of this was found to be about 300,000 cubic feet per minute. The river is passed under the canal through four lines of cast iron tubes, each of 10 feet inside diameter, and having an aggregate area of 314.16 square feet. The length of the culvert is 290 feet. The banks of the river for some distance above it are flat, and then there is a rise of about 7 feet at what is known as "Sullivan's Falls." The spoil from the canal is used to raise these low flat banks, so that when the river at flood time rises to get the necessary head to pass such a large volume, the land on either side is not overflowed, and the effects of back water are not felt. The tubes are one inch in thickness, strengthened with fillets or bands $\frac{3}{8}$" thick and 4" wide at the centre and ends of each ring. The weight is about 1300 lbs. to the running foot. They are cast on end in lengths of five feet, and were laid on cradle pieces of white oak placed at 5 feet centres. They were butt jointed and surrounded with about 2 feet of concrete.

At the Delisle they are laid in a rock trench 50 feet wide, and the whole trench is filled solidly up with concrete nearly to the level of canal bottom. The cost of this structure when completed will be about $85,000. At the River Rouge there has been a similar culvert built, but with only two lines of tubes. This is finished, and the stream now passes through it. Further down, there is another at River à la Graisse, with only one line of tubes. One of the reasons why this plan has been adopted is that under certain conditions which might occur, the culverts would be subjected to considerable bursting pressure. The tubes take the place of the centres, which would be required either for a stone or concrete arch; and, in brief, the plan seems to answer very well.

7. On the Beauharnois Canal the lift of 82½ feet between Lakes St. Louis and St. Francis is overcome by nine locks. The guard lock is always a lift lock. The lifts are generally nine feet. This suits the configuration of the ground on the south side of the river. But on the north side the land continues for a long distance eastward from the head of the canal, pretty much at the same level as Lake St. Francis, so the summit is about 10½ miles long. There is then a descent by one lock of variable lift; and about 2½ miles further down, the

land pitches off on the right bank of the Ottawa, so as to suggest the idea of concentrating the lockage there as much as possible. When the canal was first located, the rise of 70 feet was proposed to be distributed amongst five locks. This was subsequently changed to four—and, finally, upon full consideration, I recommended that the rise should be made by three locks each of $23\frac{1}{3}'$ lift. In this view of the case I was supported by Mr. Walter Shanly, M. Can. Soc. C.E., and Mr. T. C. Keefer, Past President Can. Soc. C. E., who were consulted by the Government on this important point. The advantages of high lifts when possible are obvious.. The number of locks is reduced. A considerable saving, both in first cost and subsequent maintenance, is effected, and the navigation of the canal rendered easier and quicker. But it must be remembered that it is entirely dependent upon the profile of the ground as to what lifts can be judiciously given to the locks. All the advantages claimed for the plan adopted in the particular case above referred to might disappear if the line adopted had to follow a long flat slope. Here, as elsewhere, judgment and experience are of course necessary in arriving at a proper conclusion.

8. As to the locks themselves, it may be stated that on the Soulanges Canal they will be faced with cut stone, but the mass of the wall will be of concrete. They will be filled from the sides through a number of short cast iron pipes, leading from the culverts into the chamber. There will be no timber in the foundation as heretofore. One of the chief sources of accident is that through a wrong or mistaken signal. a vessel coming into the lock from below may go ahead instead of reversing, and so run against the upper gates, if on the same level,—striking them about the mitre, and from behind, in which case they are jumped off the pivots by the force of the water, and are swept into the lock, damaging the canal and the vessels also. But when there is a heavy breast wall, upon which the upper gates are placed, it is the vessel that comes to grief, and the gates are left intact. There are a number of details in the construction of these locks, which have been thought out, and are believed to be improvements on the old style; but it is not considered necessary to refer further to them in this brief address.

It appears to me that on the Welland and St. Lawrence Canals, where the supply of water is practically unlimited, and for lifts of from 20 to 25 feet, there is no simpler or safer device for passing vessels from one level to another than the form of lock now in common use. If the gates are properly constructed and balanced, they can be operated quickly

and with ease. An ordinary lock can be filled from the sides in four or five minutes. This avoids the surging of vessels, so much complained of when the water is admitted through valves in the gates—and, in short, there is no reason why a lockage cannot be made in from 12 to 15 minutes under ordinary circumstances.

9. It may, however, be well to draw attention to the facts concerning the proposed application of electrical power in opening the locks and bridges, and generally operating the Soulanges Canal. A power house will be established about mid-way of the line, and where it nearly touches the St. Lawrence at River à la Graisse. Here the surface of the river is about 20 feet below that of the canal. The ordinary water cross section of the prism at mean level of Lake St. Francis is about 2700 square feet. The fall in the summit level will, if necessary, give a current in the canal of say 100 feet per minute, or 270,000 cubic feet flow. Ten per cent. of this on a 20 foot fall would give 1000 horse power gross, or say 750 effective. This would obviously cover all requirements as to locks, bridges, weirs, etc.,—and possibly provide power to haul the vessels into and out of the three lower locks without using their own steam at all. Experiments were made, under my direction, at Lock No. 9, Beauharnois Canal, on a simple plan for opening and shutting the gates by means of a rigid girder, worked by rack and pinion movement, and driven by an electric motor. The girder was attached to the top of the gate, and the machines were placed on the copings of the lock. The gates were easily opened or shut in less than one minute, and there is no reason why both the gates, filling and emptying sluices, etc., should not be operated from a single switchboard in a small wooden house or box, placed on whichever side of the lock may be considered necessary. The cables to the motors on the opposite side to be taken across in grooves in the foundations. It is intended that the weirs shall operate automatically, and advantage will be taken of all the improvements made by electrical engineers to render the working of the canal as efficacious and economical as possible. It is evident that the adoption of this plan will greatly reduce the present cost of operating the canals.

10. Incidental to this question of canal location, it may be said that much confusion has arisen in reference to the available depth of canals by the mistake of referring their draught to the *mean water* of the river or lake by which they are alimented. This should be carefully avoided. The depth on the mitre sills should be referred to the *lowest known stage* of such lake or river, and not to any deceptive mean derived

from statistics. In such a case statistics won't do—it is *water* that is wanted, as the late Mr. John Page used to say. This lesson has been forcibly inculcated by the late unprecedentedly low water in Lake Ontario and the River St. Lawrence.

11. I had almost forgotten to say, before closing, that, in my opinion, all canals, especially those taking their supply from a lake or river subject to the effects of storms, or the unusual variations of surface due to heavy rainfall, should have a guard lock at or near the upper entrance.

If the summit or feeding level is very long, and the head of the canal is in such a position as that of the Welland at Port Colborne, where there is a funnel-shaped harbour leading out of the funnel-shaped end of Lake Erie, the effect of a violent storm upon the water levels is, in its way, as remarkable as a Bay of Fundy tide. In October, 1886, and in January, 1889, westerly gales of this kind occurred. The guard lock had been left open and the water was rammed into the long offshoot represented by the summit level (about 18 miles long), where it was piled up and kept there by the force of the wind, so that, during the gale of 1886, the surface rose about four feet at Port Colborne, seven feet at the aqueduct, and a small quantity of water is said to have passed over the coping of the guard gates at Thorold, the level of which is about *nine feet* over Lake Erie, mean surface! Had a break occurred at this point, the damage which must have ensued to the country below can scarcely be imagined.

In this connection it may be asked what would have been the result, on the 11th October, 1888, when a heavy breach occurred in the Cornwall Canal had there been no guard lock at its head? In other words, if the canal had been open to the river at the time of the accident? I venture to say that instead of only the serious interruption so loudly complained of by forwarders, the canal would have been closed to navigation for the remainder of the season.

The safety which a guard lock gives under such circumstances (or a modification of them) is sufficiently obvious. With guard gates only, the canal would not be navigable until the gale had subsided. If left open, they would be useless; and if shut (as they should be), they could not be opened until the head against them disappeared. At the east end of Lake St. Francis the water will rise about 18 inches during a strong westerly gale. A guard lock is therefore indispensable at the head of the Soulanges Canal. With two pairs of gates, the passage of vessels need not cease during storms, and the canal below the lock (which is always liable to accidents) would be saved from the destruction which

would ensue if it were left open to the lake, whilst a break occurred in the high banks, or at one of the culverts.

But I shall not trespass on your patience any longer. There are so many questions arising out of the study of this important subject that it would far exceed the time at my disposal to even touch upon the greater number of them.

In conclusion, I thank you for the honour you have done me by my election as President for 1895. I have endeavoured during my term of office to absent myself as seldom as possible from the meetings; and I may now say that I do not mean, after leaving the Chair, to take less interest than heretofore in the affairs of the Society, knowing, as I do, full well that no success can be achieved, except by a long pull, a strong pull, and a pull altogether.

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It was moved by Mr. Hannaford, seconded by Mr. Wallis, and resolved:

That a vote of thanks be tendered to Mr. Monro for the very able address which he has just delivered.

The meeting was then adjourned.

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On Wednesday evening, at 8 p.m., a lecture on "Electric Power Waves" was delivered by Prof. C. A. Carus-Wilson, in the Physics Building, McGill University. The lecture, which was an exceedingly instructive and interesting one, was largely attended by members of the Society and their friends.