PROCEEDINGS

OF THE

ASSOCIATION OF

PROVINCIAL LAND SURVEYORS

OF ONTARIO,

AT ITS THIRD ANNUAL MEETING HELD AT TORONTO,
ON FEBRUARY 28TH, 29TH, AND MARCH 1ST,

1888.

The Fourth Annual Meeting will be held in Toronto, on Tuesday, 26th of February, 1889.

PRINTED FOR THE ASSOCIATION

BY

C. BLACKETT ROBINSON, 5 JORDAN STREET,
TORONTO.

NOTICE.

Members are requested to carefully examine all advertisements, and to place orders for office or field supplies with our advertisers,

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The Standing Committees should be assisted by all the members of the Association. These Committees are the life of the Association.

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

PREFACE.

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

In presenting the Proceedings of the Association at its Third Annual Meeting, held in Toronto, on February 28th, 29th, and March 1st, 1888, the Executive ventures to hope that it will be as kindly received by our members and our exchanges as the Proceedings of preceding years.

The papers printed will be found to contain much that is interesting and useful to the practical surveyor and the municipal engineer.

The "Question Drawer" is a feature that will, we think, meet with your approval.

Respectfully submitted,

EXECUTIVE COMMITTEE.

CONTENTS.

ASSOCIATION OF
PROVINCIAL LAND SURVEYORS
OF ONTARIO.

ORGANIZED 23RD FEBRUARY, 1886.

Officers for 1888-89.

PRESIDENT.

Alexander Niven, P.L.S., Haliburton.

VICE-PRESIDENT.

Villiers Sankey, P.L.S., 17 Toronto Street, Toronto.

SECRETARY-TREASURER.

Willis Chipman, B.A.Sc., Brockville.

COUNCILLORS.

John McAree, D.T.S., 245 Parliament Street, Toronto.
H. B. Proudfoot, C.E., Clinton.
W. R. Aylsworth, P.L.S., Deseronto.

AUDITORS.

George Brockett Abrey, P.L.S., Toronto.
Lewis Bolton, P.L.S., Listowel.

BANKERS.

The Bank of Montreal.

STANDING COMMITTEES.

LAND SURVEYING.—E. Stewart (Chairman), G. B. Kirkpatrick, M. Gaviller, P. Burnet, H. J. Browne.

DRAINAGE.—Lewis Bolton (Chairman); R. Coad, C. F. Miles, H. B. Proudfoot, D. S. Campbell.

ENGINEERING.—T. H. Jones (Chairman); W M Davis, A. W. Campbell, C. G. Hanning, J D. Evans.

LEGISLATION.—W. R. Aylsworth (Chairman); J. Dickson, W. Chipman, P. S. Gibson, W. R. Burke

INSTRUMENTS.—Jno. McAree (Chairman); A Niven, F. L. Blake, H. J Bowman, Thos. Fawcett.

PUBLICATION.—T. B Speight (Chairman); W. A. Browne, H. L. Esten, Prof. Galbraith, H. D. Ellis.

ENTERTAINMENT.—A. J. VanNostrand (Chairman); V. Sankey, H. D Ellis, G. B. Abrey, F. L. Foster, C. Murphy.

CONSTITUTION AND BY-LAWS

OF THE

Association of Provincial Land Surveyors

OF ONTARIO.

CONSTITUTION.

ARTICLE I.

NAME OF THE ASSOCIATION.

This Association shall be known as "The Association of Provincial Land Surveyors of Ontario."

ARTICLE II.

OBJECTS OF THE ASSOCIATION.

The objects of this Association shall be the promotion of the general interests, and elevation of the standard of the profession.

ARTICLE III.

MEMBERS.

1. The Association shall consist of Active Members, Associate Members, Junior Members, and Honorary Members.

2. Active Members must be Provincial Land Surveyors, and only such shall hold office and have power to vote.

3. Associate Members shall be those persons not Provincial Land Surveyors who may be elected as hereinafter provided.

4. Articled pupils may become Junior Members.

5. Honorary Members shall be those persons only who are distinguished by professional attainments. They shall be exempt from dues.

ARTICLE IV.

OFFICERS.

1. The Officers of the Association shall consist of a President, a Vice-President, a Secretary-Treasurer, and three Councillors, who shall constitute an Executive Committee, which shall have the direction and management of the affairs of the Association.

2. The meetings of the Executive Committee shall be held at the call of the President or Secretary-Treasurer.

3. The Executive Committee shall, as soon after its election as possible, strike the several Standing Committees.

4. Three members of any Committee shall form a quorum.

ARTICLE V.

ELECTION OF MEMBERS.

1. Any Provincial Land Surveyor shall be eligible as an Active Member of this Association upon payment of the necessary fees.

2. Candidates for election as Associate Members and Junior Members must make application in writing, and must be recommended by at least two Active Members.

3. Candidates for election as Honorary Members must be recommended by the Executive Committee.

4. All voting for Honorary, Associate and Junior Members shall be at a General Meeting of the Association.

5. A majority of the votes cast shall decide.

ARTICLE VI.

ELECTION OF OFFICERS.

1. The nomination of Officers shall be at the General Annual Meeting.

2. The voting for Officers shall be by letter ballot, which ballot will be issued by the Secretary-Treasurer to all Active Members on or before the 15th day of March in each year.

3. The ballots are to be returned to the Secretary-Treasurer on or before the 1st day of April in each year, and opened by him in the presence of one or more of the Scrutineers on or before the 15th day of April.

4. Candidates and retiring Officers are to be notified by the Secretary-Treasurer of the result of the elections.

5. The Secretary-Treasurer is to vote only in case of a tie.

ARTICLE VII.

MEETINGS.

1. The General Annual Meeting shall commence on the Fourth Tuesday in February, in the City of Toronto.

2. Special Meetings of the Association may be called by the President, and shall be called by him at the request, in writing, of ten or more Active Members.

3. The Secretary-Treasurer shall give at least one month's notice to all Members of any Special Meeting to be held.

4. Fifteen Active Members shall form a quorum at any meeting for the transaction of business.

ARTICLE VIII.

AMENDMENTS TO CONSTITUTION.

1. This Constitution may be amended by a two-thirds vote of the Active Members present at any General Annual Meeting.

2. Any such amendment must first be brought before the Executive Committee, and must be approved of by such Committee.

3. The Secretary-Treasurer shall give notice to all Members of all such proposed amendments approved of as above as soon as possible before the Annual Meeting.

ARTICLE IX.

AUDITORS AND SCRUTINEERS.

1. Two Auditors shall be appointed at each Annual Meeting to audit the accounts of the Association for the preceding year, and present their report of the same to the meeting.

2. Three Scrutineers shall be appointed at each Annual Meeting to examine the ballots for officers returned to the Secretary-Treasurer, and shall report the result of the election to the Association.

ARTICLE X.

SUBSCRIPTIONS.

1. The fee for membership for active members, associate members, and junior members, shall be three dollars, payable in advance.

2. The association year shall begin on the first day of April in each year, and annual subscriptions must be paid to Secretary-Treasurer on or before that date.

3. Any member twelve months in arrears shall be struck off the roll, and no member in arrears shall be allowed to vote.

BY-LAWS

ARTICLE I.

ORDER OF BUSINESS.

1. Reading of minutes of previous meeting.
2. Reading of correspondence and accounts.
3. Reports and papers.
4. Unfinished business.
5. New business.
6. Nomination of officers (if at the General Annual Meeting).
7. Adjournment.

ARTICLE II.

RULES.

1. All motions must be in writing, and shall contain the names of the mover and seconder, and must be read from the chair before being discussed.

2. Reports of Committees must be in writing, and signed by the chairman thereof.

3. No member shall speak on any subject more than once, except the introducer of the subject, who shall be entitled to reply; every member, however, shall have the right to explain himself, subject to the discretion of the chair.

4. When a motion has been finally put to the meeting by the chairman all discussion thereon shall be closed.

5. The chairman shall appoint two Scrutineers when a ballot is taken.

6. Every member while speaking shall address the chair.

7. All voting at any General Annual Meeting shall be by standing vote, unless a ballot be demanded by at least two members.

8. Parliamentary rules to govern in all cases not provided for in preceding sections.

ARTICLE III.

DUTIES OF OFFICERS.

1. The President shall preside at all meetings at which he is present; in his absence the Vice-President; and in the absence of both the meeting shall appoint a chairman.

2. The presiding officer shall only have the casting vote, but not a deliberative one.

3. The Secretary-Treasurer shall keep an accurate record of all meetings, conduct all correspondence, announce all meetings, receive all fees and subscriptions and other moneys, pay no bills unless sanctioned by the Executive Committee and signed by their chairman, make annual report of all his receipts and disbursements, and shall perform such other duties as may from time to time be assigned him by the Executive Committee.

ARTICLE IV.

DUTIES OF STANDING COMMITTEES.

1. Each Standing Committee, appointed by the Executive Committee, shall endeavour to advance the interests of that branch of the profession allotted to it.

2. Meetings of any Standing Committee shall be held at the call of the chairman, three members to form a quorum.

3. Each Standing Committee shall present to the Association or to the Executive an Annual Report on the work done by said Committee.

PROGRAMME OF THE

Association of Provincial Land Surveyors of Ontario

AT ITS THIRD ANNUAL MEETING, HELD IN TORONTO, FEBRUARY 28TH, 29TH, AND MARCH 1ST, 1888.

PROGRAMME.

Tuesday, February 28th—Morning, 10 o'clock.

Meeting of the Executive Committee.
Meeting of Standing Committees.

Afternoon, 2 o'clock.

Reading of minutes of previous meeting.
Appointment of scrutineers of ballots.
Reading of correspondence.
Report of Secretary-Treasurer, Willis Chipman, B.A.Sc.
Report of Scrutineers.
President's Address, G. B. Kirkpatrick, P.L.S.
Report of Committee on Land Surveying, V. Sankey, P.L.S., Chairman.

Evening, 8 o'clock.

Paper—"Determination of the Meridian," Chas Carpmael, M.A., F.R.A.S., Supt. Meteor. Observatory, Toronto.
"Boundary Commissioners"—Discussion, led by G. B. Abrey, P.L.S.
Question Drawer—Land Surveying.

Wednesday, February 29th—Morning, 9.30 o'clock.

Report of Committee on Engineering, M. J. Butler, M.A., Soc. C.E., Chairman.
Paper—"Local Improvements," W. M. Davis, C.E.
Paper—"Highway Bridges," A. W. Campbell, P.L.S.
Paper—"Notes on Hydraulics," Prof. Galbraith.

Afternoon, 2 o'clock.

Election of Associate Members.
Report of Committee on Drainage, W. R. Burke, P.L.S., Chairman.

Question Drawer—Drainage.
Paper—"Drainage."
Paper—"Practical Surveying," Alex. Niven, P.L.S.
Report of Auditors.

Evening, 8.30 o'clock.

Annual dinner at the Walker House.

Thursday, March 1st—Morning, 10 o'clock.

Report of Committee on Legislation, E. Stewart, P.L.S., Chairman.
Question Drawer—Legislation.
Report of Committee on Publication, J. McAree, D.T.S., Chairman.
Report of Committee on Instruments. G. B. Abrey, P.L.S., Chairman.
Report of Committee on Entertainment, F. L. Foster, P.L.S., Chairman.
Question Drawer—Instruments.

Afternoon, 2 o'clock.

Discussion of Papers in former Reports.
Unfinished business.
Nomination of officers.
New business.
Adjournment.

Full discussion after each paper and each report.

EXHIBIT.—During the meeting there will be held an exhibition of "*Instruments for taking Linear Measurements*," and also "*Office Instruments and Appliances*," including draughting instruments, drawing papers, field books, field notes, etc., etc.

Each member is requested to add something to this exhibit.

ASSOCIATION OF
PROVINCIAL LAND SURVEYORS
OF ONTARIO.

MINUTES OF THE THIRD ANNUAL MEETING.
FEBRUARY 28TH, 29TH, AND MARCH 1ST, 1888.

The Association met at 2 p.m. on February 28th in the Canadian Institute, the rooms at Shaftesbury Hall, where the meeting was first advertised to be held, being engaged for other purposes.

The Association was called to order by the President.

Moved by Willis Chipman, seconded by Thomas Fawcett: That the minutes of the last meeting, as printed in the Proceedings, be taken as read. Carried.

H. D. Ellis and John McAree were appointed Scrutineers to examine the ballots for officers for 1887-88.

The Secretary-Treasurer, Mr. Chipman, then presented his report.

Moved by Mr. Chipman, seconded by Mr. Sankey: That the report of the Secretary-Treasurer be received and adopted, and the statement of accounts be placed in the hands of the auditors. Carried.

Report of Scrutineers was then presented.

The President then read his annual address.

Mr. Sankey presented report of Committee on Land Surveying.

Moved by Mr. Sankey, seconded by Mr. Niven: That the report be adopted. Carried.

Mr. Sankey read letter from J. G. Scott, Esq., Osgoode Hall, respecting registered plans.

The President also read a letter from Jos. Cozens, Esq., P.L.S., of Sault Ste. Marie, on the same subject. (See Appendix.)

Moved by V. Sankey, seconded by A. Niven: That the President nominate a Committee to report on the points referred to in report of Land Surveyor's Committee and Mr. Scott's letter. Carried.

The President, in accordance with the above, nominated Messrs. Sankey, T. H. Jones, and Speight.

Moved by H. W. Selby, seconded by C. F. Miles: That Messrs. Gaviller and Fitton be a Committee to draft necessary resolution respecting death of H. H. Stephens. Carried.

Association adjourned.

EVENING SESSION, 8 P.M.

President in the Chair.

Prof. Carpmael read his paper on "Determination of the Meridian."

A vote of thanks was tendered Prof. Carpmael.

Moved by V. Sankey, seconded by A. Niven: That a Committee be appointed to consider the advisability of having such tables as those in Prof. Carpmael's paper made a permanent feature of our Annual Report, together with the cost thereof. Carried.

Moved by Prof. Galbraith, seconded by Mr. Gibson: That a Committee, consisting of Messrs. McAree, Fawcett, Abrey, and Galbraith, with power to add to their number, be appointed to confer with Prof. Carpmael in the preparation of Azimuth Tables; this Committee to continue in office until the publication of the tables. Carried.

President then called on Mr. Abrey to lead discussion in "Boundary Commissioners."

Moved by A. Niven, seconded by V. Sankey: That a Committee be appointed, with power to add to their number, to consider the draft bill of Mr. Ogilvie's, *re* "Boundary Commissioners," and report on bill at the next annual meeting. Carried.

The President nominated Messrs. Sankey, convener, Aylesworth, Niven, Dickson and Stewart.

Association adjourned at 11.30 p.m.

WEDNESDAY, FEBRUARY 29TH, 9.30 A.M.

President in the Chair.

Questions on Land Surveying in Question Drawer were then taken up and discussed.

Moved by W. Chipman, seconded by P. Burnet: That in the opinion of this Association the centre of posts of fence should be placed on the true line between lots. Lost.

Moved by Mr. Sankey, seconded by Mr. McAree: Moved as amendment, that in the opinion of this meeting the line of a fence be the line between the posts and boards. Carried.

President called for report of Committee on Engineering.

Mr. Galbraith explained that concerning the engineers' report Mr. Butler was chairman of the committee last year, and said he had the responsibility of preparing it. I understood that Mr. Davis was bringing in the report, and I gave it no further thought. The report is very much like it was last year. Our real work is contained in the papers, and that is really all that can be expected.

The different exhibits were then described by the exhibitors.

Mr. W. M. Davis being absent, it was moved by Mr. Aylesworth, seconded by Mr. Evans: That the paper of Mr. W. M. Davis, on "Local Improvements," be taken as read, and be printed in the Proceedings. Carried.

Mr. Abrey read paper on the "Planimeter," illustrated by diagrams.

Moved by Mr. Fawcett, seconded by Prof. Galbraith: That a vote of thanks be tendered Mr. Abrey for his paper. Carried.

Mr. A. W. Campbell then read his paper on "Highway Bridges."

Moved by Mr. Galbraith, seconded by Mr. Gibson: That the thanks of the Association be tendered to Mr. Campbell for his valuable paper. Carried.

Prof. Galbraith then read a paper entitled "Notes on Hydraulics," illustrated with diagrams on blackboard.

Moved by Mr. Gibson, seconded by Mr. McAree: That a vote of thanks be tendered Prof. Galbraith for his paper. Carried.

Afternoon Session, 2 p.m.

President in the Chair.

Proposed amendments to the Constitution and By-laws, prepared by the Executive Committee, were read by Secretary.

Moved by Mr. Chipman, seconded by Mr. Burnet: That the Executive Committee be and are hereby empowered to submit a draft of the proposed amendments to the members of the Association, and that members be requested to vote on said amendments when ballot for officers is taken. Carried.

Report of Committee on Drainage was presented by Mr. Proudfoot, in the absence of Mr. Burke.

Moved by Mr. Proudfoot, seconded by Mr. Kirk: That the Report of Committee on Drainage be received and adopted. Carried.

Mr. Proudfoot then presented paper on "Court Decisions," prepared by Mr. Burke and Mr. Proudfoot.

Moved by Mr. Abrey, seconded by Mr. Gibson: That paper on "Court Decisions" be considered as read, and that it be printed in Proceedings. Carried.

Mr. Niven then read his paper on "Practical Surveying."

Vote of thanks was tendered Mr. Niven.

Report of Auditors was then received and adopted.

THURSDAY, MARCH 1ST, 10 A.M.

President in the Chair.

The President read a letter from the Canadian Institute, signed by David Boyle, desiring to co-operate with this Association for the purpose of procuring specimens for the Archæological Museum. (See Appendix.)

Mr. Dickson remarked as follows: With regard to the letter about this Archæological Institution, he thought the idea a good one. He believed that every surveyor should be ready to contribute relics or collections he may find. He had made several collections in the past thirty years, and had always intended to present them to such an Institution.

Moved by Mr. Dickson, seconded by Mr. Stewart: That the Executive Committee be empowered to send a list of members of this Association to the clerks of the different municipalities in the Province. Carried.

Resolution of condolence respecting death of H. H. Stephens, prepared by Messrs. W. Gaviller and Fitton, was submitted.

Mr. Stewart stated he would not like to let the occasion pass without saying a few words with regard to Mr. Stevens. He had not much personal acquaintance with the deceased, but was very well acquainted with his family from whom he understood his death was caused by reason of his devotion to his profession. He believed the illness from which he died was contracted from hard work on surveys in the North-West. He had much pleasure in supporting the resolution, and would suggest that the Secretary be asked to send copies of this resolution to his widow and father.

Resolution was then adopted, and copies ordered sent to family of deceased.

The Report of Committee on Legislation was read by Mr. Stewart.

Moved by Mr. Stewart, seconded by Mr. McAree: That the Report be received and adopted. Carried.

Questions on Legislation in Question Drawer were then taken up.

Mr. McAree read the Report of the Publication Committee. Moved by Mr. McAree, seconded by Mr. Chipman: That it be adopted. Carried.

Mr. Abrey read a paper on Instruments. He remarked that as all other professions have their libraries, and as the surveying profession has nothing at all in that line some means should be considered with a view to meeting the exigencies of the case.

Mr. McAree moved, seconded by Mr. Niven: That it be referred back to the Committee for revision if necessary with a view to having it published. Carried.

Committee on Entertainment reserved report, but would report to Executive before proceedings were printed.

Mr. Abrey remarked: He thought that some suitable entertainment should be provided for the wives of surveyors when they accompany their husbands to the city, in the nature of a concert or conversazione, and this could take the place or be held in addition to the Annual Supper. The wife of a surveyor is as a rule isolated from the society of her husband a great deal of her time in consequence of his professional duties calling him away from home. He thought in view of this fact that the matter should have every consideration, and those members who had no wives could bring their sisters or friends if they chose.

Mr. Kirkpatrick said: The room upstairs will be opened in afternoon, and I should like all the surveyors to visit and look at the Indian relics to be placed in the proposed new Archæological Museum. I think the collection of specimens for this Institution is a laudable, interesting and instructing object, and I should like all our members to contribute to it.

Questions on Instruments in Question Drawer were then taken up and discussed.

Moved by Mr. Abrey, seconded by Mr. McAree: That answers of Prof. Carpmael and Mr. King to Question 4 be published in the Report. Carried.

AFTERNOON SESSION, 2 P.M.

President in the Chair.

Moved by Mr. Gaviller, seconded by B. J. Saunders: That this Association desires to convey to Mr. F. J. Sager, of Marysville, Ohio, their thanks in sending an exhibit of band chains to our meeting. Carried.

Moved by Mr. Abrey, seconded by Mr. Niven: That a committee be appointed with full powers to secure and publish the paper of Mr. Tyrrell on travels of David Thompson, under Mr. Tyrrell's permission. Carried.

Moved by Mr. Sankey, seconded by Mr. McAree: That a copy of the Sub-Committee's report on registered plans be sent to each registrar of the Province to show what this meeting thinks necessary on registered plans.

Moved by Mr. Niven, seconded by Mr. Abrey: That with reference to the communication of Mr. Boyle, the Curator of the Canadian Institute, respecting the formation of an archæological museum, that this Association recommends its members to give all the assistance in its power in furthering the above object. Carried.

Moved by Mr. Abrey, seconded by Mr. Niven: That Professor Carpmael be made an honorary member of the Association. Carried.

Moved by E. Stewart, seconded by Willis Chipman: That R. S. Latimer be elected an associate member upon payment of fees. Carried.

Moved by Thomas Fawcett, seconded by E. Stewart: That the thanks of the Association be tendered to Prof. Galbraith, the retiring Vice-President, for the valuable services rendered by him to further the interests of this Association. Carried.

Moved by Mr. Burnett, seconded by Mr. McAree: That the President leave the chair and Mr. Niven take the same. Carried.

Mr. Stewart: I cannot let this occasion pass without saying a few words relative to Mr. Kirkpatrick, who has so ably presided over the Association since its formation. It would have been very difficult, I might say impossible, for us to have secured the information and devotion to our interests in the person of any one else other than our President, Mr. Kirkpatrick. I have much pleasure in proposing the following resolution:—

Moved by E. Stewart, and seconded by John McAree: That a hearty vote of thanks be tendered our President, Geo. B. Kirkpatrick, Esq., P.L.S., for his able and courteous conduct as chief officer of the Association from the commencement of its existence to the present time. The Association desire to convey to Mr. Kirkpatrick their sense of their obligations to him for the very great labour that he has so freely bestowed for the advancement of the profession, and they value this all the more on account of the disinterestedness of the motives that prompted him in giving his valuable services for such a length of time in furthering the interests of the Association. Carried.

Mr. McAree: I concur in all that has been said, and am glad to support the motion.

Mr. Stewart: I have much pleasure, Mr. Kirkpatrick, in tendering you the hearty thanks of this Association.

Mr. Kirkpatrick: Mr. Chairman and gentlemen—It does not require that resolution as an expression of approval for any services which I may have rendered to you. I can assure you it has been a great pleasure to me to have had the honour in presiding over you, and to study the welfare of this Association. I have long thought that an Association of this kind was just what surveyors wanted, because from observation I concluded that practically the surveyors of this Province were strangers to one another. As secretary of the Board I necessarily came in contact with all the young surveyors, and I was, apparently, the only one who knew all their faces; however, some of

them often outgrow my recollection. What we require is a brotherhood amongst us, to come together and look into each other's faces at least once a year, to try and help each other, and by so doing to advance the welfare of our profession, and anything which tends to benefit us individually must do so as an Association. I am glad that the Association has arrived at its present satisfactory stage. I think we may safely consider it a live institution with no chance of dying. I was rather afraid before the opening of this session that the members would not come together as they have done, at this third annual meeting, but I am now more than satisfied with the result. I thank you, gentlemen, heartily for your attendance and kindly expressions.

Moved by Mr. Abrey, seconded by Mr. Niven: That the thanks of this Association be tendered to the exhibitors to this Association. Carried.

Mr. Abrey moved, seconded by Mr. Sankey: That the sum of $40 be voted to Mr. Willis Chipman, our worthy secretary, for his services in the past year. I would like to make that sum larger, and in some measure more commensurate with his services to this Association, but I am afraid the Association funds will not bear it.

Mr. Sankey: In seconding that motion I heartily concur with Mr. Abrey's expressions, but I would say it is not the amount voted but the spirit in which it is given, and Mr. Chipman must look upon it rather as a donation than as compensation for the very onerous duties of the office. As chairman of one of the committees I know something of the amount of letters he would require to write from those I received from him.

Mr. Kirkpatrick: I certainly add my testimony to all that has been said regarding Mr. Chipman's services. Motion was then carried.

Mr. Chipman thanked the Association for the grant, and remarked: I hope that next year each surveyor will feel it his duty to prepare some paper, or to do something to help us along. Give us a paper on the work you have done in the past year. If you have any survey which goes to the Court of Appeal bring it before the Association, I think it will be interesting.

ELECTION OF OFFICERS.

Mr. Niven: I beg to move that Professor Galbraith be a fit and proper person for President for the ensuing year.

Mr. Chipman said Mr. Galbraith had told him that the latter could not accept the office of the presidency or vice-presidency of this Association.

Mr. Sankey corroborated the above, adding that Professor Galbraith said, in the interests of this society it would be well to have a practical surveyor, and it would not hurt his feelings in the slightest not to be nominated, as he could not accept office.

Mr. Sankey: I beg to propose that Mr. Alexander Niven be made President for the ensuing year. We all know Mr. Niven, and he has been one of our greatest supporters since we started. It is hard to make a speech when the object of your thought is under your eyes, and I don't want to turn this society into a mutual admiration society, but I don't think we could get a more suitable man. At any rate I should like to see his election carried by a unanimous vote.

Mr. Dickson: I think, Mr. Chairman, the best thing to do is to elect him by acclamation. I have known Mr. Niven for about twenty years, and I say, with no disparagement to any other member, that there is not a better qualified member for the position than Mr. Niven. Mr. Niven's nomination made unanimous.

Mr. Niven: Mr. President and Gentlemen—I hardly know how to thank you for your expressions of good feeling and confidence, and I assure you this is quite unexpected, and I feel rather diffident about accepting it; however, as it seems to be the unanimous feeling that I should take that office I will do so, and endeavour to carry on the work that has been so well commenced, and continued, by my predecessor Mr. Kirkpatrick, to the very best of my ability. I thank you.

Mr. Stewart moved, seconded by Mr. Chipman: That Mr. Sankey be Vice-President for the ensuing year. We all know Mr. Sankey, and I think he will be elected without opposition. Carried.

Mr. Sankey: Mr. President and Gentlemen,—I return you my hearty thanks for the honour you have conferred upon me, and let me assure you that anything I have done in the past for this Association has been a labour of love, and I only wish I had had the opportunity of doing more; but I will say that whatever time I have spent in furthering the objects of this Association has been given most willingly, and I have derived great pleasure therefrom. I thank the Association, and I trust your continued esteem will incite me to still greater efforts on behalf of this Association.

Mr. Saunders: I beg leave to nominate W. R. Aylesworth, of Deseronto, as Councillor.

Mr. Sankey moved that H. B. Proudfoot be a Councillor.

Mr. Ellis moved that T. B. Speight be a Councillor.

Mr. McAree moved that Mr. Stewart be a Councillor.

Mr. Burnet moved that Mr. Fawcett be a Councillor.

Mr. Stewart moved that Mr. McAree be a Councillor.

Mr. Stewart moved that Mr. Dickson be a Councillor.

Mr. Dickson: I thank you, gentlemen, but I will ask you to withdraw my name, as there are many more members better entitled to it, having been longer in the Association. I might serve at some other time, but I must ask to have my name withdrawn. Withdrawn.

The President: We will have to keep Mr. Dickson in view for the future as he says he will be willing to serve some time.

Mr. Niven: I beg to move, seconded by Mr. McAree: That Mr. Willis Chipman be Secretary for the ensuing year. It does not require any words of mine to inform this Association of Mr. Chipman's worth. I quite agree with all that has been said about him. I don't know any one who could take his place. I would not undertake it for quite a consideration. I think we ought to elect him without opposition. Elected unanimously.

Mr. Chipman: I thank you, gentlemen, for the nomination and election, and I will in the ensuing year, with good health, do all I can to promote your interests.

Moved by Mr. Chipman, seconded by Mr. Dickson, that any new business, or omissions or corrections, be made by the Executive Committee or the Committee on Publication. Carried.

The President, in closing, said: I thank you all, gentlemen, for the information you have contributed, and to the earnest endeavours of each member to promote the welfare of this Association; and now that we are about to adjourn to our respective homes I would call your attention to the very valuable papers of this Association, and suggest that they are well worth our subscriptions. I believe our papers will compare favourably with those of a similar institution, and although we have only been in existence about three years we have no reason to feel ashamed of our achievements in that time. We can, however, all of us lend a hand in collecting information, even the most modest. We may not class ourselves among those who think they have nothing to advance for the interest of science and truth; if we do let us get over our shyness, and keep in mind that in unity there is strength, and by so doing shall be benefited. There is a verse in the Bible which I think applicable, "He that waters shall be watered himself." I believe in temporal, as in spiritual matters, in helping others we help ourselves. I now bid you all good-bye.

Third Annual Meeting adjourned at five o'clock.

CIRCULAR NO. 15.

RESULT OF THE ELECTIONS.

President	Alexander Niven	(by acclamation).
Vice-President	Villiers Sankey	(by acclamation).
Secretary-Treasurer	Willis Chipman	(by acclamation).

Councillors.

John McAree	41	Thomas Fawcett	21
H. B. Proudfoot	38	G. B. Abrey	17
W. R. Aylsworth	31	T. B. Speight	10
Elihu Stewart	30		

Amendment.

For, 35; did not vote, 14; partial, 14; total votes given, 63.

I therefore declare the following Councillors elected:—John McAree, H. B. Proudfoot, and W. R. Aylsworth. I also declare the Amendments to the Constitution carried.

WILLIS CHIPMAN,
Secretary.

MEMBERS IN ATTENDANCE AT THE THIRD ANNUAL MEETING.

Abrey, G. B.
Apsey, J. F.
Aylsworth, W. R.
Blake, F. L.
Bolton, J. N.
Bolton, Lewis.
Bowman, H. J.
Brown, H. J.
Burnet, Peter.
Campbell, A. W.
Campbell, D. S.
Chipman, Willis.
Coad, Richard.
Davis, John.
Dickson, James.
Ellis, H. D.
Esten, H. L.
Evans, J. D.
Fawcett, Thomas.
Fitton, C. E.
Foster, F. L.
Galbraith, Prof.
Gaviller, M.
Gibson, P. S.
Hanning, C. G.
Jones, T. H.
Jones, C. A.
Kirkpatrick, G. B.
Kirk, Joseph.
McAree, John.
McEvoy, H. R.
McKay, Owen.
Murphy, C. J.
Myles, C. F.
Niven, Alexander.
Proudfoot, H. B.
Sankey, V.
Saunders, B. J.
Selby, H. W.
Sherman, R.
Speight, T. B.
Stewart, E.
Unwin, Charles.
VanNostrand, A. J.
Warren, James.
Wheelock, C. R.
Whitson, J. F.
Wilson, Hugh.

REPORT OF SCRUTINEERS.

Mr. President,—We find the following members elected as officers for 1887-88:—Mr. John Galbraith, Vice-President; Messrs. M. J. Butler, Villiers Sankey and P. S. Gibson for Councillors; and we also find the amendment of the Constitution carried.

H. D. ELLIS,
JOHN MCAREE,
Scrutineers.

REPORT OF THE SECRETARY-TREASURER.

MR. PRESIDENT,—Your Secretary begs to submit the following report on the business of the Association for the year 1887.

Our paid up membership increased from seventy on January 1st, 1887, to 118 on January 1st, 1888. Only three members whose names appear on the printed "List of Members" have not yet paid their fees, and four members joined since the printing of the Proceedings.

Our Association can congratulate itself on this large increase in the membership. A majority of the active members of the profession are now in our ranks, and it will be but a short time when all P. L. S.'s of standing will be proud of being mentioned with our members.

One hundred and eleven of our members reside in Ontario, two in the Province of Quebec, two in Manitoba, and three in the United States.

The following counties and cities have as yet no representatives on our list:—The counties of Russell, Glengarry, Stormont, Dundas, Grenville, Prince Edward, Peterborough, Wentworth, Welland and Norfolk, and the cities of Hamilton and Peterborough.

Every other county and town of importance in the Province is well represented.

During the year 1887 two meetings of the Executive Committee were held in Toronto, the first meeting on July 29th, the second on December 23rd, both of which were well attended.

The Executive desires to thank those who have volunteered papers for the present meeting.

The Executive and Standing Committees have met with difficulty in securing papers to be read before the Association.

We have endeavoured to get papers from many members whom we considered competent and willing to assist us, but met with many disappointments. We have found greater difficulty this year than last year, and cannot divine the reason.

In soliciting "contributions" from members we have found three classes: (1) the *willing* member; (2) the *modest* member, and (3) the *busy* member. Of these the third class is the most numerous.

The modest member thinks he can write nothing new, or nothing worth mentioning. This may be the result of modesty or of a false pride that prevents him from undertaking anything unless of very great importance.

A busy man is a man to be admired, and should be imitated by all. Surveyors are of necessity busy men, but no surveyor can be so busy as not to prepare a paper for this Association. It is a well known fact that busy people are generally the best able to prepare papers. The fact that a surveyor is busy is the best evidence we can have that he has something to write about, and that he has the necessary ability to economize his time as to spare a few hours' recreation for the benefit of his professional brethren.

Members who make this *excuse* (the word excuse is used advisedly) cast an unjust reflection on those who have prepared papers. Those who have assisted us in the last two years were not idlers in any sense of the word.

Another charge against the *too busy* member is this:—He is getting from the Association more than he puts in. His subscription pays his share of the publishing of Proceedings and necessary expenses connected therewith, and his share of securing legislation that will be to his benefit, *that* is all. Now who makes the most use of our reports and exchanges? Certainly the busy member.

Time and money are to a great extent convertible: the busy member makes the most money and can therefore afford the most time for preparation of a paper.

If a member finds his time too much occupied with his business, the proper and legitimate thing for him to do is to increase his fees—if sufficiently increased the charm will work instantaneously.

The Secretary owes to the members an apology for the errors that appeared in the last Proceedings, the most of them being of a typographical nature. The bad orthography displayed in the list of members is accounted for by the bad penmanship of the Secretary.

This year the usual reduced rates have been extended to the members of the Association by the railway companies.

The financial condition of our Association is good, there being a cash balance in our favour of $64.90, and $9.50 due us for advertisements. Last year our Constitution was amended so as to increase yearly subscription to $3. The decrease of our "surplus" from $106.05 to $64.90 shows the wisdom of passing the amendment.

A statement of receipts and expenditure of the Association from January 1st, 1887, to January 1st, 1888, is appended.

All of which is respectfully submitted.

WILLIS CHIPMAN,
Secretary-Treasurer.

STATEMENT OF RECEIPTS AND EXPENDITURES OF THE ASSOCIATION OF PROVINCIAL LAND SURVEYORS OF ONTARIO FOR THE YEAR 1887.

1887.	RECEIPTS.		
To Balance from 1886			$106 05
" Fees, 1886-87—two at $3		$6 00	
" " 1887-88, Old Members—sixty-eight at $2		136 00	
" " " New " —fifty at $3		150 00	
" " 1888-89, " " —one at $3		3 00	
			$295 00
" Advertisements			77 50
" Proceedings sold			2 25
" Thirty-nine Dinner Tickets sold at $1.50			58 50
Total			$539 30

EXPENDITURE.

By Postage, Telegrams, etc	$33 60
" Stationery	10 95
" Rental of Rooms	24 50
" Amount granted Stenographer	25 00
" " " Secretary-Treasurer	40 00
" Printing Circulars, Programmes, etc., etc	30 25
" " 900 Proceedings	191 10
" Lithographing, etc	41 20
" Express, Cartage, Freight, etc., etc	14 30
" Annual Dinner	63 50
" Balance December 31st, 1887	64 90
Total	$539 30

REPORT OF AUDITORS.

The undersigned Auditors beg to report as follows:—That we have examined the books and accounts of the Secretary-Treasurer, W. Chipman, Esq., and have annexed to this report a statement showing the amount of receipts and expenditures, which shows a balance on hand of $64.90. We find vouchers for $384.40, chiefly for printing, engraving, etc., a great portion of the balance being for postage, duties, freight, express. We think that it would probably be more satisfactory to have vouchers—for all accounts save postage.

All of which is respectfully submitted.

G. B. Abbey,
Lewis Bolton,
Auditors.

REPORT OF COMMITTEE ON LAND SURVEYING.

The Committee on Land Surveying beg to report as follows:—

I. With regard to the working of the "Survey Act," as amended at the last session of the Provincial Legislature.

The Act embodies all the amendments set forth in the draft as adopted at our last annual meeting with but very few alterations or additions.

As far as your Committee has been able to learn, the Act works satisfactorily. The real test, however, will not be had until some decisions have been given in the courts. Your Committee would here urge the necessity of making arrangements to have reports of all surveying cases made a permanent feature of our Annual Report. As

there are not a great number of cases reported each year the expense would not be great, and a digest of each case would suffice, with proper references as to where the full report is to be found. The reports of all cases, as now published for the legal profession, are the property of the Law Society, but, no doubt, satisfactory arrangements could be made whereby our Association might procure either sufficient copies or permission to publish in our Annual Report.

II. With regard to Registered Plans, your Committee wish to urge the fullest discussion of this most important subject, and would point out the great responsibility which rests with the surveyor in this matter. Who is responsible for the correctness of a registered plan, the Surveyor or the Registrar? The correct answer to this question is the certificate required by law to be signed by the surveyor, which, to bring the point home forcibly is here reproduced:

"I hereby certify that this plan accurately shews the manner in which the land included therein has been surveyed and subdivided by me, and that the said plan is prepared in accordance with the provisions of the Registry Act."

The first point that presents itself in the above certificate is this: An actual survey is compulsory at least as far as the outlines are concerned. Then comes subdivision. Now is it necessary that the final operation of subdivision that is the staking out be completed before this certificate be signed? Generally speaking, your Committee think not, but are of opinion that the surveyor must exercise his own judgment in each case as to the amount of staking out necessary to enable him conscientiously to sign, having regard to the provisions of the Registry Act which require, among other things, that the plan shall shew the width and length of all lots, and the courses of all division lines between the same (see sec. 63, sub-sec. 1, Surveyors' Act), the nature of the ground, whether level or broken, and the relation which the subdivision bears to the original lot; whether the lines are on the same courses or differ therefrom. Also curved roads, crooked fences, and natural boundaries, such as hill crests and high-water marks, are all important considerations, which must be taken into consideration in forming that judgment. The next point to consider is that of courses or bearings. These may be astronomic or magnetic. With due respect, however, to the time-honoured compass, let magnetic bearings be kept off registered plans. But by doing so, some may say, an observation will have to be taken for every plan. This would not be necessary. Let the course of some original line on the plan, preferably that of the principal road, be selected, and let all the bearings be referred to it. And generally it is not wise to show the bearing of an original line different from that expressed in the patent. The above requirements being exclusively surveyors' work, shew him to be the responsible party, though the registrar, who is responsible for all documents, plans, etc., received by him, is no doubt quite justified in requiring any further information which appear to him to be wanting on a plan. Finally, on this subject, your Committee consider that

all parties interested in the lands should sign the plan, and that some affidavit of execution similar to that on a deed should be attached to each plan.

III. With regard to descriptions, your Committee are of opinion that surveyors should endeavour to prepare, in all cases, careful and accurate descriptions, from the fact that a description is either the cause or result of all surveys, and that years after both the surveyor and the posts planted by him are dead and gone the description still remains, copied perhaps, through a long chain of deeds, mortgages, etc., to bear evidence of the carefulness or carelessness with which it has been prepared. As this is a very large subject, too large to be properly discussed in a report, your Committee, with a view of promoting discussion, would simply point out a few of the different headings under which descriptions may be classed: such as descriptions of aliquot parts of, or fixed areas of, lots either before or after survey; descriptions of lots and parts of lots on registered plans, making due allowance for surplus and shortage; descriptions of lands acquired for railway right of way, for new streets, local improvements, mill sites, water privileges, water lots; descriptions of lands, the boundaries of which are governed by natural or artificial objects; descriptions in which it is necessary to combine the existing conditions with the "former description." And it must not be lost sight of that this "former description" may "commence at the distance of one chain from nowhere; thence all round the compass—chains—links—hundredths more or less to the point of commencement, containing by admeasurement acres, hundredths, be the same more or less, and all the time the lands intended to be conveyed may contain a gold mine producing $50,000 per ton. Let surveyors bear in mind that they, of all men, are the proper persons to write descriptions, and by carefulness and accuracy convince every one interested, that when he wants a description, no matter for what purpose, he has only to go to the surveyor.

IV. On the subject of Fences, your Committee think it would be well for the Association to give an opinion as to the operation of the ten year limit for possession.

In conclusion, though the subject has not yet been formally relegated to it, your Committee would urge the careful consideration of Mr. Ogilvie's Boundary Commission Scheme. Undoubtedly there is much to be gained by such a scheme, but the establishing of it is surrounded by many difficulties which can only be overcome by careful consideration and cautious foresight, prompted by a thorough knowledge and full appreciation of the points of the case.

All of which is respectfully submitted.

Signed on behalf of Committee,

VILLIERS SANKEY,
Chairman.

REPORT OF SUB-COMMITTEE ON THE SUBJECT OF REGISTERED PLANS,

As mentioned in the Report of the Land Surveying Committee, and in the letter of J. G. Scott, Esq., Q.C., Master of Titles, Osgoode Hall, hereto appended.

I. Your Committee concur entirely in the statement in the Report and letter above mentioned, that in all cases an outline survey is necessary.

II. With regard to the limits within which paper subdivision after outline survey may be made without subdivision survey, your Committee would lay down the following limits: On level ground having a regularly bounded parcel of land, paper subdivision may be made of areas not exceeding 10 acres; no side of which should exceed 20 chains in length.

III. In cases of irregular boundaries, and rough ground, sufficient subdivision survey is necessary to determine all broken distances and irregular courses.

IV. As to bearings. It should be clearly stated on the Plan which are the governing line or lines; and also state whether the bearings are actual "astronomic" or "magnetic" (in the latter case, giving the date when observation was made) or "assumed."

V. In all cases the Plans for the Registrar and for the Treasurer should be properly drafted plans, and not lithographs, showing the distances on each lot.

VI. The "Owner's Certificate" should clearly state what lands are being subdivided by the Plan, and no roads should be coloured except those dedicated by the Plan.

VII. In cases where monuments have been planted to mark out the lots or blocks this should be stated on the Plan.

VIII. Surveyors should be careful to mark on all proposed Plans of subdivisions that they are such, and thus prevent any other surveyor being misled by them.

Signed on behalf of Committee.

VILLIERS SANKEY,
Chairman.

VILLIERS SANKEY, ESQ., P.L.S.,
17 Toronto Street, Toronto:

MY DEAR SIR,—In reply to yours of 25th inst., I beg to say that I am glad to learn that you propose bringing the subject of registered plans before the Association of Provincial Land Surveyors. I trust the Association will take such steps as are necessary to see that all surveyors are informed that it is alike contrary to professional duty

and the law for any surveyor to certify, under the Registry Act or the Land Titles' Act, to the correctness of any plan where he has not actually surveyed the land on the ground. I cannot understand how any surveyor can have formed a different idea of his duty, as any contrary practice would make the certificates of surveyors attached to plans simply worthless.

Sometimes surveyors are called upon to draw plans showing proposed divisions before survey. It seems to me that it would be correct for the Association to enact a rule requiring that in all such cases the fact that the plan shows an intended subdivision and not an actual survey should appear upon the face of the plan.

How *far* it is necessary in practice to make the subdivisions upon the ground so as to ensure accuracy is a practical matter on which I am unable to give an opinion.

It has been supposed that all plans of sub-division show actual work, but I presume from what I have since learned that this is a mistake, and that in many cases it is not deemed necessary to plant stakes at the corners of each lot before certifying a plan. Of course, if the outline measurements are mathematically correct this can make no difference. As, however, it is practically impossible to make absolutely accurate measurements of any long distances, I think the surveyors might well lay down a rule fixing the limits beyond which paper divisions must not be made.

I have noticed in the Registry Office many plans certified as being in compliance with the Registry Act which ignored many of its provisions. I trust, however, the clearer language of the recent Act will prevent the occurrence of these omissions.

I have, of course, to be more particular than registrars, as the duty is thrown upon me of seeing that a plan is in accordance with the rule, and is consistent with other descriptions of the same land in my office, or, if not, that the discrepancies are properly explained.

It has been the practice of surveyors, when a number of lots have the same width, to content themselves with simply inserting the width of the lots at each end leaving the intervening lots unmarked. The statute requires that the width of each lot should be shown.

Ought not surveyors to adopt the practice showing what is the governing line both in plans and in descriptions wherever the courses are given? According to the present practice it is impossible to tell from most descriptions whether they are magnetic, astronomical or assumed courses. Most, I believe, are assumed courses. That is, it is assumed that a former survey, as, for instance, the old lines of "north 16° west," are correct. I understand surveyors sometimes put these assumed lines within inverted commas, but this is a very unsatisfactory way of stating the governing line, and I think it would be well to adopt the practice of saying "in above description —— street is assumed to run on a course north 16° west," or, where the survey is made from actual observation it should be stated "the courses are astronomical by actual observation." My attention has been particularly called to this by two adjoining surveys made by the same surveyor, whose courses, seemingly intended to be a continuation of the same lines,

were given differently. Upon enquiry, I learned that one was made from actual astronomical observation, while the other assumed the old survey line of "north 16° west" to be correct. There was nothing in the descriptions to indicate the cause of the difference. The quotation marks sometimes used do not seem to me to be sufficient for this purpose. One objection is that a clerk ignorant of their object would very naturally in copying leave them out. This is, I think, a matter of very great importance, as, at present, unless we happen to meet with "north 16° west, or the complementary line "south 74° west," or some such similar well-known lines, the absolute direction of courses is a mere surmise until the notes of survey are examined.

Yours truly,

J. G. SCOTT.

Osgoode Hall, February 27, 1888.

REPORT OF DRAINAGE COMMITTEE.

MR. PRESIDENT,—As Chairman of the Drainage Committee, I beg to present the following report:—

The Committee met, pursuant to notice, on the 23rd of December, 1887, at the Crown Lands Department, Toronto. Members present: H. B. Proudfoot, Clinton; R. H. Coleman, Toronto; and W. R. Burke, Ingersoll, Chairman.

Correspondence was read from Engineers and Surveyors in answer to letters and circulars sent out by the Chairman, asking for information relating to the Drainage Acts and the changes they thought necessary for their improvement or an explanation of any difficulties they had met with when laying out drains or assessing for drainage. Although a circular, or letter, was sent to every member of the Association who was likely to be engaged in drainage work, very few replies were obtained.

We considered it inadvisable, through this Association, to ask the Legislature for any change or amendments in the Drainage Acts at their coming session. We deemed it beneficial to the Association to distribute circulars to the members of the Association, reeves and clerks of the various townships, asking their opinion and advice regarding the hearing of appeals from the Municipal Drainage Act and the Ditches and Watercourses Act, not to be to the County Judges, but to three competent persons, one of whom shall be a P. L. S., whose duty it shall be to examine the lands, have power to take evidence, etc., or in some way improve the Act in this respect, and it is to be hoped that at this annual meeting it will be fully discussed.

The following is a form of circular that might do to send to the various clerks of municipalities, etc.

W. R. BURKE,
Chairman.

[*Circular.*]

ASSOCIATION OF PROVINCIAL LAND SURVEYORS OF ONTARIO.

SIR,—At the meeting of the Local Legislature in 1887 the above Association sent delegates to appear before the Municipal Committee of the Ontario Legislature to be examined on the various changes proposed in the different Drainage Acts of Ontario, the Municipal Act, section 570, etc., and the Ditches and Watercourses Act of 1883 and the Amendments thereto, and were very successful in having nearly all the changes proposed by the Association carried and included in the Statutes of 1887, most of the delegates sent by the municipalities concurring in the changes proposed.

At the meeting of our Association, held in Toronto, on February 28, 29, March 1, 1888, it was decided to have the opinion of the various Municipal Councils and Farmers' Institutes throughout Ontario, and of the Ontario Branch of the Dominion Grange, on the change in the two Acts that were proposed at the above meeting of the Legislature, but which were not sustained by the Municipal Committee, and ask them also to propose any changes they might think would make the Acts more worked. The most important alteration on which we would like to have the opinion of your

is concerning the appeal from the award of the Engineer under the Ditches and Watercourses Act of 1883, which is contained in the following sections of Bill No. 107, 1887, presented by Mr. Waters, which reads as follows:—

6. Section 11 of the said Act is hereby repealed and the following substituted therefor:

11.—(1) Any person dissatisfied with the award and affected thereby, may, within fifteen clear days from the filing thereof, deposit with the clerk of the municipality a written notice of his intention of appealing therefrom (shortly setting forth his grounds of appeal) to the Court of Revision of the municipality of which the lands in respect to which the proceedings are initiated are situated, which Court the Council shall from time to time, as the occasion may require, hold on some day not earlier than twenty, nor later than thirty days from the day on which the time of appeal expired.

(2) The clerk on the receipt of the notice of appeal shall notify the reeve or other head officer (as the case may be) of the same, who shall instruct the clerk to notify the other members of the court of the time and place such court shall be held.

(3) Such court shall be constituted in like manner, and have the same powers as Courts of Revision under the Assessment Act.

(4) The appeal from the Court of Revision shall be to three competent persons (one of whom shall be a Provincial Land Surveyor) whose award shall be final, and who shall be appointed by the judge, junior, or acting judge of the County Court of the county in which

the lands are situated, and the proceedings in such last mentioned appeal shall be as follows:—

(*a*) The appellant shall serve upon the clerk of the municipality, with whom the award is filed, a notice in writing of his intention to appeal therefrom (which notice must be filed with the clerk within at least ten clear days from the finding of the Court of Revision) shortly setting forth the ground of appeal.

(*b*) The clerk of the municipality shall, at the expiration of the time of appeal from the Court of Revision, forward by registered letter, or deliver a copy of such notice, or notices of appeal, if there is more than one appeal, to the clerk of the Division Court of the division in which the land of the owner filing the requisition (as provided in section 6 of this Act) is situate, and such Division Court clerk shall immediately notify the judge of said appeal, whereupon the judge shall appoint the three persons named in sub-section 4 of this section, and may, if he thinks fit, order such sum of money to be paid by the applicants to the said clerk as will be sufficient indemnity against costs of appeal.

(*c*) The three so appointed persons shall examine all the lands and are hereby authorized to examine the parties, and their witnesses on oath, and may administer an oath or affirmation as in courts of law, and may set aside, alter or affirm the award, correcting any errors therein, and may order payment of costs (including the costs as set forth in the award) by the parties or any of them, and fix the amount of such costs, and shall within thirty days from their appointment file with the clerk of the municipality a report, together with the copies of any evidence they might have taken, setting forth their finding in the matter of such appeal.

Also your opinion of the following which was presented by Mr. Waters as an amendment to the Municipal Act:—

Section 570. In case the majority in number of persons *as certified by the County Judge (whose certificate thereto shall be final) at a sitting of the Division Court in County in which the lands or a part of the lands are situated* to be owners, whether resident or non-resident of the property to be benefited in any part of any Township, City, Town, or Incorporated Village, petition the council *(in Form A)* for the deepening or straightening of any stream, creek, or watercourse, or for draining of the property, describing it, or for the removal of any obstruction which prevents the free flow of the water of any stream, creek or watercourse as aforesaid, or for the lowering of the water of any lake or pond for the purpose of reclaiming flooded land, or for more easily draining any land, the council *shall* procure an Engineer or Provincial Land Surveyor to make an examination of the stream, creek or watercourse proposed to be deepened or straightened, or from which it is proposed to remove obstructions, or of the lake or pond the waters of which it is proposed to lower, or of the locality proposed to be drained, and *shall* procure plans and estimates to be

made of the work by such Engineer or Surveyor and an assessment to be made by such Engineer or Surveyor of the real property to be benefited by such work, stating as nearly as may be in the opinion of such Engineer or Surveyor the proportion of benefit to be derived therefrom by every road or lot, or portion of lot, and if the Council is of the opinion that the said work or portion thereof is desirable the Council may pass by-laws.

Instead of S. S. 13, 14 and 15 insert:

S. S. 13. *The appeal from the Court of Revision shall be to three competent disinterested persons (one of whom shall be a Provincial Land Surveyor) appointed by the Judge, junior or acting Judge of the County Court of the County in which the petition originated, who shall constitute a Court to hear the appeal, and who shall examine all the lands assessed, and may vary the assessment of the lands and the roads benefited as aforesaid, without further notice to the parties interested therein, so that the aggregate amount assessed shall be the same as if there had been no appeal, except as to the costs of appeal which may be added thereto as hereinafter provided, and the Court of Appeal, or, in case there is no appeal to the Court of Appeal, the Court of Revision, shall return the roll to the municipal clerk from whom it was received, and the assessors shall prepare and attest a roll in accordance with their original assessment as altered by such revision.*

S. S. 14. *If the assessment be varied in any way by the Court of Appeal, the costs of appeal shall be added to the aggregate assessment, otherwise the costs shall be ordered to be paid by the appellant.*

Sec. 571. Sixth line in form of By-law: strike out "as shown by the last revised assessment roll" and insert *as certified by the County Judge.*

Sub.-Sec. 2. Where word "Judge" occurs insert *Court of Appeal.*

Sub.-Sec. 3. Where word "Judge" occurs insert *Court of Appeal.*

Sec. 572. *Before the final passing of the By-law a printed copy of the same (together with a notice that any one intending to have such By-law or any part thereof quashed must not later than ten days after the final passing thereof serve a notice in writing upon the reeve or other head officer and upon the clerk of the municipality of his intention to make application for that purpose to the High Court of Justice at Toronto during the six weeks next ensuing the final passing of the By-law) shall be served upon each of the several owners, their lessees or occupants, or upon the agent or agents of such owners, or left at their place of residence with some grown up member of the family, or, where the land is unoccupied and the owner or owners, or their agent or agents, do not reside within the municipality, may cause to be sent by registered letter to the last known address of such owner or owners a copy of such By-law and notice, and the said By-law shall not be finally passed until after the expiration of three weeks from the last of such services, and the clerk shall keep on file in his office a statutory declaration or declarations*

by the party or parties making such service or services, and the manner in which the same were effected.

Sec. 576 (49 Vic., chap. 37, sec. 27). For the amendment in sec. 27 read *and until he obtains a sufficient outlet for such water so that no lands shall be flooded thereby without the written consent of the owner or owners, and in every such case to charge the lands and roads to the same extent and in the same manner as is provided by the next succeeding section of this Act.*

Farmers in Ontario have now arrived at the conclusion that to make farming pay it is necessary to have their farms well and properly drained, and that must be accomplished in the most inexpensive manner. To do which the drainage laws must be put in such a shape that farmers as well as engineers and lawyers will understand them and know where, when and how they may have any of their grievances alleviated.

We trust that you will make a point of having this circular laid before your and have their answer forwarded to any of the following addresses:—

W. R. BURKE, Ingersoll.
R. H. COLEMAN, Canada Company, Toronto.
H. B. PROUDFOOT, Clinton.
I. L. BOWMAN, Berlin.
WILLIS CHIPMAN, Brockville.

DISCUSSION.

Mr. Proudfoot—The amendments to the Act which we proposed to send to the different municipalities were just the same as were proposed last year, but they were not carried through the House as there were too many lawyers there. I think these same clauses were brought up last session. The clause about changing the court of appeal to three competent persons under the Ditches and Watercourses Act or to the County Judges I have always thought would be a good one, as many judges don't care to have to deal with it. If people were appointed right on the ground to examine the cause of complaint it would be much more practical.

Mr. L. Bolton—In reference to changing the court of appeal I think it would be advantageous if you got a judge favourably inclined to the engineer.

Mr. Kirk made a suggestion about amending the Bill and as to conferring more power on engineers as to repairing drains, etc. The Act was framed to provide for drains to be constructed, and to prevent bad feeling between neighbours. It is proposed by this Bill to give them power to discharge the water.

Mr. Gibson—It appears to me that the trouble is this—for any natural flow of water I think the common law is sufficient to make them let it off, but by the proposed Ditches and Watercourse Act it

is not necessary, only for the better improvement of the land. As between individuals they can go and make ditches, but railroad companies may block the natural flow of water.

Mr. Proudfoot—Take the case of the original construction of a railway through a bush or a beaver meadow. Perhaps at the time of construction there was no natural flow, but years afterwards the natural flow came into the railway. Are not the railway company bound to put in the culvert?

Mr. Gibson—Yes, but they won't!

Mr. Proudfoot—But that is just what we want to do by this Bill.

Mr. Gibson—If a railway company draws water from a source that it would not otherwise naturally come from they are amenable, but the trouble is to make them comply with the Act.

Mr. Proudfoot—I had a case in the County Huron against a railway company, where a man wanted to drain a beaver meadow, and they would not let him and would not do it themselves, and the water is there yet.

Mr. T. H. Jones—I had a case against the Grand Trunk Railway Company about a culvert deep enough to carry off the surface water, but which I considered should be two and a half feet deeper to drain the land. The railway company contended through their solicitor that they were not liable under the Ditches and Watercourses Act. It was submitted to arbitration, and the company had not their work done, but they consented to deepen it and make it wider, the counsel consenting that part of the expense of increasing the width should be borne by them.

REPORT OF COMMITTEE ON ENGINEERING.

This Committee had nothing to report.

REPORT OF COMMITTEE ON LEGISLATION.

Mr. President and Gentlemen,—Your Committee on Legislation beg to report that they have little to add to the postscript inserted in last year's published report of the proceedings of your Association, in which the amendments to the Surveying Act and the Ditches and Watercourses Act are referred to.

Inasmuch as important amendments have so recently been made to these Acts and as they have been incorporated in the consolidation of the Statutes, your Committee would not deem it wise to urge any further change at present on the Legislature, but they consider that

the time may be profitably employed by the Association in maturing for future legislation any improvements that may be thought desirable in the interest of the public and the profession.

Among these they would mention that of a court or commission to settle disputed boundaries, a notice of which was given at the last meeting of the Association.

All of which is respectfully submitted.

E. STEWART.
PETER S. GIBSON.

Mr. Stewart—Mr. President, this Report has one great merit, viz., brevity. I might say the committee on land surveying, engineering and drainage, have taken up many points on drainage and land surveying, and much ground has been covered thereby that would otherwise be contained in this Report.

REPORT OF COMMITTEE ON PUBLICATION.

MR. PRESIDENT,—We your Committee on Publication, beg leave to report as follows:—

The contract for printing our second Annual Report of Proceedings was given to C. Blackett Robinson, of Toronto, who, it will be remembered, printed our first report. The cost was $191, being at the rate of about $1.26 per page, for the issue of 900 copies. The increased cost over last year was due to the larger number of copies printed, and to the considerable amount of tabular matter and algebraical expressions in several of the papers. In addition to the printing, the lithographing of the plates belonging to the paper on "Highway Bridges," cost $37.50, and the portrait accompanying the biographical sketch cost $5.

The account of our exchanges is as follows:—Two hundred copies of our report were sent to the Michigan Society of Engineers and Surveyors, in exchange for 120 copies of their Report; 100 copies were sent to the Illinois Society of Engineers and Surveyors, in exchange for 120 copies of the Report of that Society; 100 copies were sent to the Indiana Society of Engineers and Surveyors, for which we received 120 copies of their Report; 100 copies were sent to the Ohio Society of Engineers and Surveyors; and 50 copies to the School of Practical Science Engineering Society, from each of which societies we received 120 copies of their respective reports.

We recommend that the following prices be charged for single copies of our Reports:—

For the Report for	A.D.	1886,	per copy	.....	$1 00
" "	"	1887,	"	.....	0 50
" "	"	1888,	"	.....	0 50

For advertising space we charged $6 per page; $3.50 for half a page; and for lesser space 25 cents per square inch, and we recommend that these rates be adhered to for our next report.

The revenue from advertisements defrays a considerable portion of the cost of publishing our Proceedings; and we beg leave respectfully to urge upon the members of our Association the duty of a careful perusal of the advertisements, and we hope that in purchasing supplies for the field or for the office, and in placing orders for work of any kind in connection with the pursuit of their profession, our members will not ignore the claims of those who patronize our advertising columns.

Respectfully submitted.

JOHN MCAREE,
Chairman.

REPORT OF COMMITTEE ON ENTERTAINMENT.

MR. PRESIDENT,—Your Committee on Entertainment have to report as follows:—

Enquiries were made by us as to cost of rooms for holding annual meetings, price of dinners, etc., previous to the last meeting of the Executive Committee, and a report thereon submitted to said meeting.

In view of a reduction in rent of meeting rooms, it was decided by your Committee to engage the front room in the Shaftesbury Hall building on Queen Street, but when it was subsequently ascertained that continuous occupation during the session of the Association could not be given, and that the Library of the Canadian Institute, where the meeting took place last year, could be got for the same rental as the Shaftesbury Hall room—$12, it was engaged.

It was decided by your Committee to have the dinner at the Walker House, but as it was learned that we could not be accommodated there on the date fixed we gave the order to the Rossin House. Your Committee would recommend that in future it should be positively ascertained at least two weeks before the Annual Meeting whether the dinner is to be ordered or not, and the number of members taking tickets.

The failure to give entire satisfaction, of the late dinner at the Rossin, was perhaps as much due to the short notice at which it was ordered, as to any want of attention on the part of the proprietor.

All accounts in connection with the transactions of your Committee will be forwarded to the Secretary-Treasurer.

Respectfully submitted.

FRED. L. FOSTER,
Chairman.

Toronto, March 1, 1888.

REPORT OF COMMITTEE ON INSTRUMENTS.

MR. PRESIDENT AND GENTLEMEN,—As chairman of this Committee I would say that the members of it all reside away from the city, excepting myself. Mr. Fawcett, one of them, was away in the mountains of British Columbia until a very few weeks ago, and could well be excused from attendance at a Committee meeting, and perhaps also from getting up a paper upon the subject. From the other members I could learn nothing, though I sent the usual notice and request to attend, as well as to prepare a paper on the subject for the annual meeting; therefore nothing has been done by the Committee in the way of a report, neither has a paper been prepared on the subject of instruments, unless that one describing the Rolling Planimeter be accepted as one.

The subject, I think, might be written upon, and a very interesting and useful paper compiled, showing the improvements made in the instruments used at this day compared with those of the old days, some of which were very evident from the instruments shown in this room at our last annual meeting. In this report I will only mention one or two points that occur to my mind. In the days when I passed my examination (twenty-eight years ago) the English cradle theodolite was the *beau ideal* of the Canadian surveyor, and with it the surveyor could not only produce straight lines and measure angles, but make observations for latitude and take observations on Polaris and establish the meridian. It did not matter what was wrong with the instrument, he had his adjustments by rule to correct all errors. One of the adjustments was to sight to a star, then to its reflection in still water or artificial horizon, and adjust by raising or depressing one of the standards of the horizontal axis. This was said to be equal to a plumb line millions of miles long. Now, of course, most stars that the surveyor would choose for this adjustment would be moving in azimuth to some extent, and this correction could at best be but an approximation. But suppose the surveyor got the corrections fairly well made, he had only succeeded in making the horizontal axis horizontal, while another almost equally important element was ignored, and from the rules given the instrumental errors were supposed to be eliminated (very few instruments indeed were provided with the means for correcting this error). Now, in the above no mention is made of the possibility that the telescope might not be at right angles to its axis, and the rules given do not search for such an error. When requiring the true azimuth of a line surveyors used to be satisfied with a single observation on Polaris at one of its elongations, made with an instrument adjusted as above, and perhaps levelled up by means of plate bubbles, not showing or reading nearer than several minutes of arc, and without of course a striding level or other measure of the inclination of the horizontal axis. Then fix a point in the horizon by depressing the telescope and sighting in a picket.

Suppose the above observation was made for the bearing of a governing line. Next, suppose a similar observation made at a point

where it is required to run a line on the same course as the governing line. We might also suppose that sometimes at the second observation the instrument is reversed, or that the telescope at least may have been reversed in its Y's. Now, gentlemen of the present day, how many would trust or vouch for the correctness of a line the course of which was obtained by an instrument of the above description?

Then, as to instruments for measuring distances. We all a few years ago used the old Gunter chain, made up of one hundred longer pieces of iron or steel wire and from two hundred to three hundred shorter pieces of wire, so put together as to form the chain. These were all sure to wear and liable to accidents, and in a short time the chain was anything but sixty-six feet long. To-day most of us would not like, for work requiring care, to trust to the old-fashioned chain. For my own part, I may say that I have not used one for any kind of work for nearly ten years, but have used continuous steel bands of various kinds. I have had some of Chesterman's blued steel bands that have measured not less than one thousand miles of line, and some of the lines in new townships amongst the rocks and mountains in the worst portions of Algoma, in both winter and summer.

I would say that I think some better method than that now followed should be adopted for testing and correcting the lengths of chains and tapes. The old pine stick five links long is quite incompetent to correct a steel tape sixty-six feet or more in length.

I understand that the Dominion Lands Department have perfected arrangements for issuing to D.L.S.'s standard steel tapes, one hundred links long, divided and marked at given temperatures. If these could be made available to P.L.S.'s, and a copy of the standard be deposited with the Inspectors of Weights and Measures throughout the Province, this might give all the uniformity desired; but I think every surveyor should be in possession of a standard of not less than sixty-six feet long himself.

I would make a passing reminder also of some of the instruments common nowadays, used for economy's sake, such as the various telemeter appliances for measuring distances, the different planimeters for mechanically adding the area of any figure, and the equatorially mounted transit, commonly called the solar, for mechanically solving the astronomical triangle. One of our members, Mr. McAree, presented a good paper at our last annual meeting on Solar Azimuths, which reminds us that one of the objections to taking observations on the sun for azimuth is on account of the rapid movement of that body making it difficult to get the exact instant of observations of the limb, and time being a very essential element in the calculation. With the solar this source of error does not apply. The contacts are taken by it with the same ease and precision that the same could be made on Polaris or other slow moving star at its elongation, and if the instrumental error can be eliminated I see no reason why an observation by the solar on the sun should not approximate to the same precision as one on Polaris.

I had intended to substitute my description of the planimeter for my report on instruments, but as that got in yesterday, and as our

indefatigable Secretary insists upon a report also, I had hastily prepared the foregoing during the morning, and I hope that Mr. President and the members will bear with what has been written.

I should have said at the outset that I used my best endeavours to induce a few of the principal American instrument manufacturers to send an exhibit to our meeting, and from the correspondence I believe it is useless to expect them to come and face our Customs regulations. This year I did not ask our Toronto makers to repeat their last year's exhibit. I saw some of the stationers and others, and in response Messrs. Hart & Co., the Map and School Supply Company, and some others, have sent in some lines in which we are interested. These will be found somewhat more in detail in another part of this Report.

Respectfully submitted.

G. B. ABREY,
Chairman.

PRESIDENT'S ADDRESS.

GENTLEMEN OF THE ASSOCIATION OF PROVINCIAL LAND SURVEYORS OF ONTARIO,—It gives me great pleasure to welcome you to our Third Annual Meeting. Let us, in the first place, render our thanks to the great Architect of the universe for His protecting care during the past year, and invoke the Divine blessing on that on which we have entered. We meet to-day with bright prospects for the future. Our membership now stands at one hundred and twenty-two, an increase of forty-seven over that of our last annual meeting. I trust that before long all the live, active men of our profession will have enrolled themselves in our ranks. It rests with yourselves, gentlemen, to make the Association a success; you all know the old proverb, "God helps those who help themselves." I hope that none of you will allow the well-known timidity and bashfulness of our profession to stand in the way of letting "your light shine" for the benefit of your fellows.

I have to announce the removal by death of one of our number since last we met, Mr. H. H. Stephens, of Owen Sound, who died last year after a short illness.

It was only yesterday when it was my mournful privilege to follow to the grave one who has left his mark on the annals of his country; one, too, who was second to none in his endeavours to advance the status of the surveyor, who, if I mistake not, was the "father of our Survey Act," and the "inaugurator of the Board of Examiners," who was the first Assistant-Commissioner of Crown Lands, and afterwards held an important position in the Dominion Lands Branch of the Department of the Interior. I allude to the late Andrew Russell, who passed away in this city, on Friday last, the twenty-fourth of February, in his eighty-fourth year. I have always looked on Mr. Russell as the connecting link with a bygone generation. It is given

to few men to hold an official position in the public service for fifty years.

At the last session of the Legislature of Ontario the "Act respecting Land Surveyors and the Survey of Lands" was amended. It is perhaps too early to pronounce it an unqualified success, but we must all allow that it is an improvement on the old one. The qualifying examination for admission to practice has been extended to include among others the kindred subjects of railway surveying and drainage work, both of which are likely to engage the attention of an increasing number of our surveyors in the future. It is a matter of satisfaction that provision has been made for the guidance of surveyors when called upon to act in those townships which have been subdivided under the system prevailing for the last thirty years and upwards, as doubts have often arisen in the mind as to the law in such cases. It is now laid down clearly in the fifty-second section of the amended Act. I trust that any doubtful points may be well ventilated in the discussion likely to arise through the "Question Drawer," a new feature, as you will perceive, in our programme this session, and one I venture to think which will commend itself to you. The papers on the agenda are all of practical importance to the surveyor, and I invite free discussion thereon. It does not seem to me as if the public or the profession itself are sufficiently aware of the facilities which our best qualified surveyors have of acquiring valuable information, or why are not their services more frequently called into requisition? Some of our soundest Loan Companies have Provincial Land Surveyors of repute as valuators; why should not more of them follow suit? As a judge of timber our practical surveyors ought to be sound. I know several who are such, and who have found it not unremunerative; why should not many more avail themselves of the unrivalled chances of acquiring this knowledge and fitting themselves for positions of trust and emolument? The mining industry of this Province is as yet in its infancy. Here is a field in which our educated men may have full scope for their talents. Possessing as they must an elementary knowledge of mineralogy and geology at the outset of their career, they enter the field with a fair start. Study and practice must do the rest. I know more than one surveyor whose services as a mining engineer and expert have been eagerly sought, and who have been professionally employed outside the Dominion.

I think I may say that last year has been a busy one with most of our brethren. At least we have found great difficulty in getting "papers" prepared, want of time has been invariably pleaded. I am glad that this should be so, and trust that the good time may continue. In my own case, I have to ask your indulgence for not having prepared something more worthy of your attention, but I think I can truly say that I have not had half a day at my disposal in which I could sit down quietly to devote to the proper preparation of something wherewith to interest you. I am glad to be able to report that very shortly we hope to have the different Acts by which a surveyor has to govern himself printed in a pamphlet form of useful size and shape. During the year a Digest of Survey cases as reported has

been prepared with care by one of our members, which cannot fail to fill a want long felt by us all. Before closing, I would throw out a suggestion whether it would not be advisable to publish a list of the members, with their addresses, for distribution freely among our municipalities. It is but right and due to the public that they should know who are the reliable and go-ahead men of the profession, and whom it will be in their interest to employ. Let us have faith in ourselves and others will do the same.

In retiring from the office of president of your Association, which I have held by your suffrages for the last two years, allow me to thank you, one and all, for your kindness and courtesy to me. It has been a great pleasure to me to think that I have been, even in a small way, useful to my fellow-workers, and I would bespeak for him who will follow me in this chair the same cordial assistance which you have rendered me. The co-operation of one and all is necessary to success; assured of that, I have no fear for the future of our Association.

GEORGE B. KIRKPATRICK,
President of the Association of Provincial Land Surveyors of Ontario.

Toronto, Canada, February 28, 1888.

Mr. W. R. Aylesworth, in moving a vote of thanks, said that the President had done invaluable work for the Association and to the profession during the two years he had held that office, and that his address was a very valuable one.

Vote of thanks was seconded by Mr. Niven, and then tendered the President.

Mr. Kirkpatrick in reply thanked Association for hearty vote of thanks tendered, and stated he would always endeavour to do all he could for the benefit of the Association. Let each member use a paddle and the canoe will then get along all right. (Applause.)

PAPERS.

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

PRACTICAL SURVEYING.

By A. NIVEN,
Provincial Land Surveyor, Haliburton.

The subject upon which I have been requested to read a paper, viz., "Practical Surveying," is too wide to be condensed interestingly into one article, and I shall therefore at present touch upon a few points only, and will first call your attention to that part of it which relates to the preparation of *Descriptions for Deeds*:—

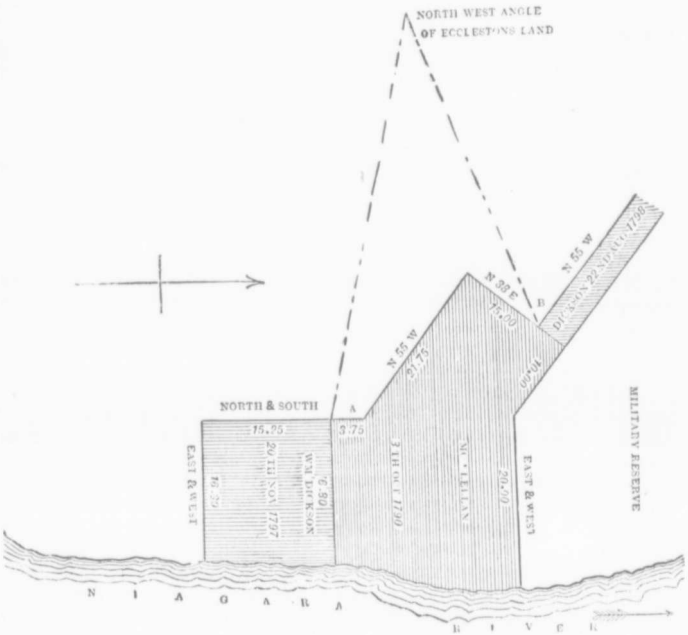
A blazed tree which may have been erroneously marked could soon be cut down. A stake or stone which may have been wrongly planted could soon be removed to its new site, but when a description once passes from our hands and becomes incorporated in a deed and the deed signed, and witnessed and sworn to and sent to the Registry Office it has utterly passed beyond our control.

Very often a township clerk or village schoolmaster, and sometimes the estate agent or the articled clerk in a lawyer's office, for economy's sake, prepares both description and deed. Any error which may have been made may perhaps not be discovered until all the original parties to the transaction are dead, and when it is discovered I am afraid it is often very ungenerously set down as having been made by a Surveyor when a Surveyor was not called at all. Against such accusations we cannot well protect ourselves, very often we can say after reading a description that it was not prepared by a Surveyor, there is a want of genuineness in the ring of it, just as an expert can detect a counterfeit coin or bank bill. We should therefore aim at making descriptions clear and concise. A very celebrated conveyancer and real estate Surveyor, not now in practice, was accustomed to prepare descriptions but there was such a redundancy of words that it was difficult to understand what was meant, he never seemed to know when he had said enough.

There should be uniformity in our style. The words "more or less" should not be used unless the case actually required it. The phrase is now too often used as if a description could not be properly closed without it. When bearings are given I think it should be mentioned whether or not they are original magnetic bearings or present magnetic bearings or astronomical bearings, as without the addenda suggested courts are, I believe, inclined to say that all bearings are

astronomical. The limits of the old Town of Niagara (the home of my boyhood) may some day be the subject of an expensive lawsuit if ever the "boom" of land speculation should strike it before an error in it is rectified, and it will be caused by the word *easterly* having been used instead of mentioning the exact bearing.

"Commencing at Mississagua point, thence easterly along Lake Ontario to Cookstown; then along the rear or town line of Niagara to the Black Swamp Road; then along the eastern limits of the land



of the late Thomas Butler, and the lands of Garratt Slingerland to the north-west angle of the lands of John Eccleston; thence *easterly* to where the lands of William Dickson and Martin McLellan come in contact; then east along the northern boundary of McLellan's land to the Niagara River," etc., etc.

The difficulty which exists here is in being directed to go *easterly* from Eccleston's land, and the question which will arise is whether or not McLellan's land is in the Town or Township of Niagara, for Dickson owns and did own land on the north side of McLellan's and also on the south side.

There are two points A and B where Dickson's land and McLellan's land come in contact, and both are *easterly;* from the north-west angle of Eccleston's land towards the point, A being *south-east*, and towards the point, B being *north-east*.

It would seem as if the error occurred by saying then east along the *northern boundary of McLellan's land*, instead of along his *southern boundary*, or otherwise along the *northern boundary of Dickson's land*. The effect is either to include or exclude a large tract of land from the Town or Township of Niagara.

Another impracticable description occurred in Niagara, where the radius of a circle of 1,200 yards was to be drawn from *a point in Fort George*.

Fort George enclosed a piece of land of considerable area, and no particular point could be selected. One thought it might have been where the flagstaff stood, another hazarded the conjecture that perhaps it was the centre of the magazine, as it was a very solid structure of brick and iron, but no definite spot could be agreed upon.

A similar description occurs in Toronto, where the western boundary of the city was limited by the periphery of a circle of 1,000 yards radius to be drawn from a point where the east limit of allowance for road between lots 18 and 19 (now Bathurst Street) on being produced S.16°E. would intersect *high water mark of Lake Ontario*.

Now, as there are no tides in our fresh water lakes our predecessors supposed that the water of Lake Ontario always remained at the same height, and considered that they had thus sufficiently well defined the centre of a circle from which at any time the circumference could be marked out; but the south limit of Bathurst Street terminated where the Gore Vale Creek had its outlet into the lake, and a considerable deposit of low alluvial land was formed there. The centre of this circle was fixed at high water mark, but in or about what year it was fixed there is no record; and when it is taken into consideration that the difference between high water and low water every six or seven or eight years is 4ft. 6in., or thereabouts, which would shift the centre from 200 to 300 feet, there is little hope at any time of being able to determine either the centre or circumference of this circle.

Whilst we are now criticising these descriptions, which were made eighty or ninety years ago, we might ask the question whether descriptions, which are made at the present day, of mining tracts, etc., will be free from difficulty to Surveyors who may succeed us eighty or one hundred years hence?

The "Windmill Line" in Toronto Harbour.

I was very much surprised to hear a Chief Justice interrupt and contradict a Surveyor who was giving his evidence, and who made a statement to the effect that no one could say where the "Windmill Line" was (that is, a line to the south of which no wharves are to be built). The said Chief flatly contradicted the Surveyor, and said that the "Windmill Line" was as well known as King Street.

Judges on the bench and lawyers on a cross-examination have considerable power, but they sometimes exceed their privilege. I

studied in Toronto, and claim to know that the "Windmill Line" was almost a myth. It existed theoretically, but practically I believe that no Surveyor could define it.

It was a line to be drawn from the old French Fort on a course "N.65°E." to an old stone building called "*Gooderham's Windmill.*" One would think the old French Fort was a mere point, having neither length nor breadth, and from it you were to draw a line N.65°E. The plans of the Fort were long since carried back to France. Its actual site is, I believe, entirely obliterated by the encroachment of the lake. The old windmill which stood at the east end of the city, 30ft. or 40ft., or perhaps more, in diameter, was torn down about forty years ago. What, then, is there remaining by which a Surveyor can define this line, so as to be able to say that any particular wharf has been built beyond its limits? Nothing but the empty bearing of "N.65°E." Supposing it were possible to make an approximation by evidence as to the site of the old windmill, then comes the difficulty about the bearing. Was the N.65°E., as recorded in those early days, magnetic or astronomical? I cannot believe that it was astronomical, any more than I can believe that the course of King Street as "N.74°E." was astronomical, and yet a court of law would not allow it to be assumed that it was magnetic, for courts have decided that "N.65°E.," or some other similar bearing is an astronomical course. No Surveyor in Toronto will believe otherwise than that "N.16°W." and "N.74°E." are and were original magnetic bearings. If so, it is also most likely that the bearing of the "Windmill Line" was magnetic. If that be granted, then in order to renew the "Windmill Line" I should require that same compass from which was observed that bearing, and require it to be in the same state of magnetic intensity as it was at that date, and so range the line from the site of the old windmill. Any other compass would not do. Take several of such instruments, and set them up on the same straight line and they will give different bearings, Take the same instrument and it will itself give different bearings to the same line on different days, and project a straight line from the open field and glare and heat of a summer sun into the shade of a dense wood and the bearing at each end of the line will be different. Who, then, was right—the Chief Justice or the Surveyor—respecting the existence of the "Windmill Line"? "As true as the needle to the pole," is all very nice in poetry, but it will not do for practical surveying.

In a certain criminal case which occurred in the year 1818 the question arose in the court as to what was the meaning of the expression "northward," for on it depended whether or not the crime of murder was committed within the boundaries of Canada or in the United States; and it may not be uninteresting to submit the discussion on that word at the present time:—

Mr. Sax, a witness for the Crown, is being examined, and says: A line, supposing it ran due north, from the junction of the Ohio and Mississippi rivers would leave the River Winnipeg five degrees out of the Province of Upper Canada; not a northward line, but a due north line.

Attorney-General.—Do you mean to say that a northward line is not a north line?

Mr. Sax.—It is not always; it may be north by east, or north by west, or north north-west, or many other points of the compass. A due north line is one that goes direct to the North Pole without any deviation whatever.

Attorney-General.—And does not a northward line go to the North Pole? If you had a northward line to run, would you not run it to the North Pole?

Mr. Sax.—Perhaps I might, and perhaps not. I would certainly run it northerly, though I might not run it due north.

Attorney-General.—What is to prevent you taking it due north? If you had a line to run from a given point until it struck a river, and thence to continue along the course of that river northward, would you call that drawing a northern line?

Mr. Sax.—Undoubtedly it would be a northern line, but not a due north line.

Attorney-General.—Would it not? Could it be east or west?

Mr. Sax.—It might, according to circumstances, be a north-eastward or north-westwardly line, and yet a northern line; that is a line having a northward course or drawing nearer to the North Pole as it progressed, though not an astronomical north line.

Attorney-General.—Is not a north line a line northward?

Mr. Sax.—Certainly, a line running due north is undoubtedly a northward line.

Attorney-General.—And a line due north-westward you would call a north-westward line?

Mr. Sax.—Certainly, a line due north-west is a north-westward line; but a line, for instance, that runs towards the north, notwithstanding it may gain in its course more northing than westing or easting, is not therefore necessarily a due north line, but is a northern or northward line.

Chief Justice Sewell.—I do not really comprehend the distinction. To say that a northward line is not a north line, I confess, appears to me to approach the *reductio ad absurdum*. Suppose that we had a compass here, and from a given point I draw a line north-westward, that is to say, terminating at a point north-westward, would not that be a due north-west line?

Mr. Sax.—It would, if drawn due north-west, but if in drawing it you gained northerly it would from the course of its deviation be a line northward, though not a north line.

Chief Justice Sewell.—Then its course northward must unquestionably be due north, if a line north-westwardly is a north-west line. I want to know whether in point of fact—a fact that any man can tell as well as a surveyor—whether a line from the eastern or western point of the compass, drawn northward, is or is not a north line? Just answer that question, yes or no, and then you may explain that answer in any way you think proper.

Mr. Sax.—It certainly must be to a certain extent a north line, but not a due north line.

Chief Justice Sewell.—Why not?

Mr. Sax.—A line drawn from any point between two cardinal points of the compass direct to any cardinal point is a due north or due west line as the case may be, but a line may be so drawn between two points as to be called by surveyors a northward or a southward line as it may chance to gain in the course of running it upon that point of the compass to which it is approaching; as I might draw a line from a point north-westwardly, but gaining in a northerly direction in its course, so that at its termination it would be a line northward from having more northing there than at the point from which I started.

Should the private field notes of a Surveyor be received in evidence after his decease? My own private opinion is that they should not, and for the same reason that affidavits taken by a Surveyor are not received in court, because it is very often the case that a Surveyor is only employed by one party interested in the matter, and his manner in taking the evidence sometimes has a leaning towards his employer, and that the examination is not sufficiently searching. There is no cross-examination; for if so such replies might be made as would perhaps rather more entangle the subject than clear up the difficulty, and the surveyor finding a certain line of evidence easy for himself and also favourable to his employer follows it up and by doing so arrives at an *ex parte* conclusion.

A witness on giving evidence respecting the front limit of two adjoining lots said: "The place which I have this day pointed out is, I verily believe, the exact site of the original post planted in the first survey of the township." At the conclusion of his own voluntary statement on being asked why he believed so said "because there has been a cut stone monument planted there," and could give no other reason, so that if the stone monument had been planted a rod or more either on one side or the other, his assertion would in all probability have been the same. Witnesses are sometimes observed to call "old" stakes "originals" when they do not know what an original stake is; so that unless there is a Surveyor acting for each party interested in the survey, or unless one Surveyor is equally employed by both parties, I think that such evidence is rightly excluded from our courts.

A similar course of objection may be made to the entries made by a Surveyor in his field notes, unless his entries relate to facts, but sometimes his entries are but *his opinions* or the *opinions of others*.

I have however been surprised to hear that the original field notes of some townships which have been retained more by oversight than by any intention in the family of the Surveyor, and because they had not been deposited in the Crown Lands office, would not be allowed to be received in evidence in court. According to strict rules of the law of evidence this may be right enough—nevertheless I do think they should be now—even at this late date, gathered in and deposited in the Crown Lands office subject to the inspection of Surveyors, to be able to glean whatever information was possible from them, and thereafter to be used in court for what they are worth. If any interpolation

occurred anywhere not in the handwriting of the original Surveyor, then such parts of the notes might fairly be rejected.

The Statute of Limitations, which prevents a line from being moved to its true position after a lapse of "ten years," is in my opinion a most unjust and absurd law, and should be repealed. A person should never be ousted from his just right by any such frivolous claim.

Two people, wishing to live on adjoining farms peaceably and neighbourly with each other, neglect to enquire whether or not the line fence between their lots is correctly located. After their decease the old rails are so rotten as to be no longer fit for a division line, and in all probability it is mutually agreed to erect a post and board fence, but before doing so one side thinks it advisable to call in the services of a Surveyor, and finds that the position of the old snake fence was wrong, but the other side having the "ten" or even "twenty" years possession to sustain him refuses to allow justice to be done, although there is nothing in the way but a lot of rotten rails which could be moved in twenty-four hours. I admit that where a solid stone wall or brick building is occupying the ground, *that* and *that only* should alter the case, but even then compensation should be made for the land taken and this amount of compensation should be settled by arbitrators of their own choosing.

In former times a similar law existed respecting ancient window lights, where if a person erected a house with windows overlooking his neighbour's lawn or garden or other unoccupied piece of land, and such windows had existed over "twenty years," that then I could not build a house on my own land so close to those windows as to obstruct the light within certain limits. That relic of a feudal law has, I am glad to say, been repealed in Ontario, and the Statute of Limitations respecting the "ten years'" possession should be made to follow it.

Shortly after I commenced practising as a Surveyor in the Town of St. Mary's—now more than a quarter of a century ago,—while walking up the street one day with my instrument on my shoulder, I was accosted by a farmer in this way: "Hello there, Mr. Surveyor! What do you charge for running a line?" I replied, "Six dollars a day." "But," said he, "I don't want you a day; I've got a post at the corner of my lot, and I want you to start there and go ahead; you can do all I want in two hours."

In vain I explained to him that the law compelled me to go to the end of the concession from which the lots numbered, and get my bearing and then angle up to this post, or take an observation before I could start to run his line. "Well," said he, "after you get your bearings at your own expense you can come and run the line at mine." Bidding him good-day, I continued my journey.

This is one of the greatest difficulties a Surveyor has to contend with in a new country where the people are poor and cannot afford to pay for the work necessary to be done to comply with the Act, and it has often occurred to me that it would simplify surveying very much if all lines were run on the astronomical course of the original survey of the township.

In most cases the side roads and concession roads are not cut out, and we all know that this means a good deal more work to get a start than doing what is required to be done—and I throw out the suggestion for consideration: Whether the law should not be so amended that when a Surveyor is called upon to run any line, that he should run it on the astronomical course given on the original plan and field notes of the township on record in the Department of Crown Lands.

It might be said that this would not answer in the older townships where most of the lines have been run: but could this not be applied to the northern townships of this Province? say for instance, all north of a range of townships across the country in the vicinity of the rear of the older counties—such a line would be almost a line from Collingwood to Ottawa. As the section of country north of such a line is mostly surveyed into blocks or sections of 1,000 acres or 640 acres where the side of the block from which the lots number becomes the governing line for the block, the effect would simply be that in the 1,000 acre blocks, where the Surveyor had not run the boundaries on the true course of N. 20° 51′ 40″ W. astronomically for instance, there would be two lots whose sides would not be parallel, instead of one as under the present law, and in my opinion this evil would be more than counterbalanced by being less troublesome to the Surveyor, and consequently less expensive to those requiring surveys to be made.

I might say a few words with reference to *Bush Surveys* but feel that my paper is perhaps now too long.

The "management and equipment of a surveying party" was admirably treated of in a paper by Mr. Fawcett, D. T. S., read before the Dominion Land Surveyors' Association at Ottawa in 1885, and also in "Crown Surveys," read before this Association last year by Mr. Stewart.

I can endorse all that those gentlemen said of the trials and tribulations of a Surveyor, but anything that can be written descriptive of a "Bush survey" falls short of the reality, and one requires to "go through the mill" as the saying is, to really understand what is required.

In conclusion I would say that the basis of good surveying is accurate measurement, and that the frequent examination of chains and instruments is of the greatest importance. No man can do accurate work unless he has accurate instruments to do it with, and given these he has to exercise the intelligence and care that is necessary to the performance of accurate work, remembering that what is worth doing is worth doing well.

DISCUSSION.

Mr. Niven, referring to his paper on Practical Surveying, said:—I would particularly like to ask your opinion, Mr. President, and the opinion of those who are acquainted with practical surveying, to express their views on the suggestions I have thrown out in my paper.

Mr. Fawcett—I came across some very defective descriptions in British Columbia, and if there had been nothing but the description

to guide me as to which way to run I would never have known; and if I had not had a sketch I would have been entirely at sea. I think it would be a good idea if Surveyors would adopt some uniform method in describing by giving the azimuth of the lines. That is done in making Government surveys for the Dominion Government; the north point zero, and then around by the east to 360 degrees. Then in giving the azimuth there could be no mistake. I think it is just as convenient to use the complete circle, as you lay off your azimuth at once on the circle, and it would be just as well to adopt that method.

Mr. Dickson—With regard to descriptions I don't think that any deed should be drawn until the description was written by a Surveyor, and not by a lawyer. I had an action where a description was written by a solicitor; and how do you think he began to describe? He began at the point of a stump, and said we will call this stump so many rods in one direction, and so many in another. If that stump were removed it would be impossible to find that piece of land. With regard to bearings I think we should have true astronomical bearings.

Mr. Proudfoot—There is a point in the paper that deserves some attention—that with regard to deceased Surveyors' notes being taken in evidence. I have lately had a case in which the whole notes on file in the Crown Lands Department were put in as evidence. It was urged that they should be taken as evidence (perhaps not as substantial evidence) so as to clear up certain points. I thought it unfair that they should be produced, as they were not in ink, shewing that they were copies, but they were sworn to. Now as to the description. I know one that commences at the corner of a house, and that house has since been moved away half a mile. When another deed is to be given, and that mark is gone, what are you to do to correct this description? If we go on we will have to copy that old description, I suppose.

Mr. Sankey—With regard to Surveyors' notes being taken in evidence, take the case of a Surveyor's private notes; ought they to be received in court? I think not; for as a rule I think the Surveyor who takes them is the only man in the world who can say what is intended by the entries; and I know some years afterwards one has to rack his own brains to know what they do mean. In regard to correcting descriptions, there is no difficulty about that, and you can easily say in your deed, "At the place where the old pine stump was standing" on such a date. Finally, in regard to the "Old Windmill" in Toronto I would just say, for the information of this Association, that I succeeded in locating it. It was a circular structure of about thirty-nine feet in diameter, and I found the foundation, which was of masonry, the brick superstructure having disappeared. But with regard to the other end of the line, the Old French Fort, I fear that is more difficult to place, and it is probable that it has been washed away altogether, but for all practical purposes the site of the "Windmill" has been established.

Mr. Dickson—I think the fact of the Surveyor's notes having been taken in ink should not preclude their being taken in evidence; all my notes are copied that way, and, under the circumstances, ought to be received in evidence as original notes.

Mr. Chipman—Regarding a deceased Surveyor's notes, I think that comes up before the Legislature on that heading. There is one point I would like to refer to Mr. Niven. He thinks the Statute of Limitations should be done away with. I would like to know how we are are to do in the eastern part of the Province if that Statute were done away with, as I have found side-lines varying from one to five degrees from their proper bearings run nearly one hundred years ago. I don't see, if you do away with the Statute of Limitations, under these circumstances, what you would do?

Mr. Esten—I read over a case a short time ago where a judge held that a man could not hold a lot unless he could prove possession for forty years.

Mr. Niven—With regard to ten or twenty years' possession—in Mr. Chipman's case, over one hundred years—I would not, certainly, like to go back as far as that. I would not mind twenty years, but I certainly think ten years is an absurdity.

Mr. Gibson—As to old notes of deceased Surveyors, if not satisfactory evidence the Court has a right to rule them out. Then as to affidavits in Court, they are invariably ruled out because they are not made to conform to the law. A Surveyor who will draw an affidavit improperly destroys his own case. With reference to the ten years' possession you must look after your property in time.

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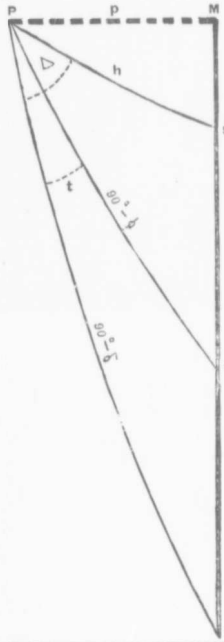
FORMULÆ FOR FINDING THE TIME BY OBSERVATIONS IN THE VERTICAL OF POLARIS.

By E. DEVILLE,
F.R.A.S., F.R.S.C., Surveyor-General, Ottawa.

When a time star is observed on the same vertical as the pole star at a time θ before or after the setting on Polaris, the results and computations are the same as if both stars had been observed at the same instant, the right ascension of the pole star being decreased or increased by θ. Consequently in the following formulæ we shall suppose both stars observed at the same instant.



P being the pole, Z the Zenith, S and S' the time star and Polaris, let—

$PM = p$ = perpendicular to SM, ϕ = latitude
$ZPS = t$ δ, δ' = declinations
$S'PS = \Delta$ α, α' = right ascensions
$90° - MPS = x$

In triangle ZPM we have:

$$(1) \quad \sin (t + x) = \tan p \tan \phi$$

and in SPM:

$$(2) \quad \sin x = \tan p \tan \delta$$

Therefore, p being known, the values of $(t + x)$ and x might be deduced from the above equations and t found by subtraction, but considering that t, x and p are small arcs, we may write, when no great accuracy is required:

$$(t + x) = p \tan \phi$$
$$x = p \tan \delta$$

subtracting

$$(3) \quad t = p (\tan \phi - \tan \delta)$$

which formula is easily calculated with a table of natural functions. If none is at hand, the following form of the same formula will be used:

$$(4) \quad t = p \frac{\sin (\phi - \delta)}{\cos \phi \cos \delta}$$

Note.—The above demonstration by E. Deville, F.R.A.S., F.R.S.C., etc., Surveyor-General, of the formulæ for finding the time by observations in the vertical of *Polaris*, given in the Manual of Dominion Land Surveys, will be highly valued by all our surveyors, who will also feel much obliged to their distinguished *confrère* for the elucidation of this problem.

If the pole star had been observed at a time T', and the time star at T, then:

Expression of p:

$$\Delta = (d - \alpha') - (T - T')$$

Let $PS' = 90° - \delta' = n$

In triangle $S'PM$ we have:

$$\tan p = \sin (\Delta + x) \tan n;$$

using the developments of $\tan -^1 y$ and $\tan y'$, and neglecting the powers of p, x, and n above the third:

$$(5) \quad p = n \sin (\Delta + x) + \tfrac{1}{3} n^3 \sin \Delta \cos^2 \Delta.$$

Developing $\sin (\Delta + x)$ and neglecting the powers of x above the second:

$$(6) \quad \sin (\Delta + x) = \sin \Delta - \frac{x^2}{2} \sin \Delta + x \cos \Delta$$

In triangle MPS we have, neglecting the powers of p and x above the second,

$$x = p \tan \delta$$

substituting this value of x in (6):

$\sin (\Delta + x) = \sin \Delta + p \tan \delta \cos \Delta - \dfrac{p^2}{2} \tan^2 \delta \sin \Delta$ and Eq. (5) will become:

$$p = n \sin \Delta + np \cos \Delta \tan \delta - \frac{np^2}{2} \sin \Delta \tan^2 \delta + \tfrac{1}{3} n^3 \sin \Delta \cos^2 \Delta$$

which is reduced by neglecting the powers of n and p above the third to:

$$(7) \quad p = n \sin \Delta + \frac{n^2}{2} \sin 2 \Delta \tan \delta + n^3 \sin \Delta (\cos^2 \Delta \tan^2 \delta + \tfrac{1}{3} \cos^2 \Delta - \tfrac{1}{2} \sin^2 \Delta \tan^2 \delta$$

The table was computed with a mean value of δ' equal to 88° 41′. The result must be multiplied by $\dfrac{\cos \delta'}{\cos \delta'_0}$ for the time of the observation.

When Δ is smaller than 12^h, the correction is to be subtracted from the star's right ascension, and to be added when it is larger than 12^h.

The arguments of the table are:

$\Delta = (\alpha - \alpha') - (T' - T')$ and
δ = Declination of time star.

(See Table VII. of the "Manual of Surveys.")

EXAMPLE.

On April 29th, 1880, the pole star and a Columbæ were observed on the same vertical, the times being by a sidereal chronometer $5h.\ 28m.\ 37s.$ for Polaris, and $5h.\ 33m.\ 14s.$ for the time star. Latitude, 46° 49′. Required the chronometer correction.

Approximate Solution.

a =	5	35	18.5	T =	5	33	14	δ = − 34°	08′	30″
a' =	1	13	04.5	T' =	5	28	37	δ' =	88	40	13.8
$a - a'$ =	4	22	14	$T - T'$ =		4	37			
$T - T'$ =		4	37							
Δ =	4	17	37 =	4	17.6					

Nat tan ϕ = + 1.06551
Nat tan δ = − 0.67811

tan ϕ − tan δ = 1.74362

log = 0.24145
(Table VII. of Manual) log p = 2.45179
$\log \frac{\cos \delta'}{\cos \delta_0}$ = 0.00421

log t = 2.69745
t = 8m 18.3s
a = 5 35 18.5

5 27 00.2
γ = 5 33 14.0

Chr. fast 6 13.8

Rigorous Solution.

In the triangle SPS' we have:

Angle SPS' = 4h 17m 37s = 64° 24′ 15″
PS' = 1° 19′ 46.2″
PS = 124° 08′ 30″

Whence by spherical trignometry the angle S = 1° 26′ 20.6″

Then from the triangle SPM we have sin p = sin PM = sin S cos δ

Whence log sin p = 8.3177673
and log tan p = 8.3178512

Then by the formulæ for $t + n$ and x,

log tan p =	8.3178512	log tan p	8.3178512
log tan ϕ =	0.0275587	log tan δ	9.8313014 n
log sin $(t + x)$ =	8.3454099	log sin x =	8.1491526 n
$t + x$ =	5m 04.6s	x =	− 3m 13.8s
x =	− 3 13.8		
t =	8 18.4		
t =	8 18.3 by the approximate method.		
	0.1 Error of the approximate method.		

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COURT DECISIONS ON DRAINAGE CASES.

By W. R. BURKE, C.E., and H. B. PROUDFOOT, C.E.

White *vs.* Township of Gosfield.

2 O. R. 287; 10 A. R. 555

Gosfield Township in 1865 passed a By-law for the construction of a drain, which went through White's land, and for assessing certain lands, including plaintiff's, for making the drain. The drain was commenced in 1866 and completed. In 1873 they passed another By-law for deepening and widening this drain, which was accordingly done. In 1881 they constructed another drain running into first one below the plaintiff's land. The first drain having become out of repair and choked up, the plaintiff's lands were to some extent flooded in the spring and fall, and the water lay longer than if the drain had been kept properly clear. White, whose lands were injured thereby, notified the Council, calling upon them to repair, which they omitted to do. White brought an action against Council for damages. Trial came before Hagarty, C. J., at the fall assizes, at Sandwich, in 1882, without a jury. The learned Justice decided that defendants were liable to maintain the drain, and that they had not done so, and White should receive $200 damages. He directed judgment therefor with full costs of suit, and that a mandamus do issue as prayed in the pleadings.

Gosfield appealed to full court of Q. B. D. This court upheld Hagarty, C. J. The Township of Gosfield then appealed to the Court of Appeal. This court affirmed the judgment of the Q. B. D.

Thurlow Township *vs.* Sydney Township.

The Arbitrators appointed by the two Townships on an appeal by the defendants from the report of the Surveyor made an award, pursuant to the Municipal Act, whereby they adjudged that the deepening of a creek, etc., benefited lands in the defendant's municipality, and that the latter pay therefor $350, but the award did not specify the lands which in their opinion were so benefited, nor charge such lands with a just proportion of the cost of the works.

Held for this reason the award was invalid and of no use.

J. D. Evans, of Belleville, surveyor.

Township of Romney *vs.* Township of Mersea.

Tried at Toronto Court of Appeal. 11 A. R. 712.

A By-law was passed by the Township of Mersea, providing for the drainage of lands in Mersea and Romney, and assessing property owners in both Townships.

Held that the By-law was invalid because the petition therefor did not describe the property to be benefited, and the By-law itself, which did not show the property to be benefited, disclosed that the petitioners were not the majority of the owners of such property.

Township of West Nissouri *vs.* N. Dorchester Township.

Ont. Reports, 1887, Vol. XIV. Pt. 3, p. 294. Mentioned further on.

N. Dorchester, on a petition of 23 out of 39, passed a By-law assessing ten persons in W. Nissouri. Subsequently 17 persons in N. Dorchester withdrew their names from the petition, and N. Dorchester dropped the matter. Afterwards 7 out of the 10 in W. Nissouri petitioned the Council to proceed with the work, which they did, and afterwards brought an action compelling N. Dorchester to pass a By-law to raise the necessary amount. The case was dismissed with costs by Galt, J., who held that it was a case for the County Council under Sec. 598, and that the Township Council had no authority to pass such a by-law. Plaintiffs appealed to the Divisional Court, before Boyd, C.J., and Ferguson, J., who confirmed Galt's ruling, and held that there should always be a majority of the parties interested, whether they are all in one township or not.

Malott *vs* The Corporation of the Township of Mersea.

9 O. R. 611.

Malott brought action for an injunction against the Township of Mersea. A drain constructed by the Township of Mersea had caused an increased quantity of water to flow into a creek running through his land, which was in an adjoining Township, without making provision for the increased quantity, and his (Malott's) lands had consequently been flooded and damaged, partly from the increased quantity and partly from the increased velocity of water. The case came first before Ferguson, J., at Chatham. He held that Malott was entitled to an injunction restraining the increased flow of water into the creek and also the increased velocity, and that he was entitled to damages. Township of Mersea appealed from this decision to the full Chy. Div. Court, in Toronto, when Ferguson's decision was confirmed by Boyd, C.J., and Proudfoot, J.

Smith *vs.* Township of Raleigh.

Case came before Judge Ferguson at Chatham on May 11, 1882. Then argued at Toronto. 3 O. R. 405.

Raleigh passed a By-law for a drain on the petition of plaintiff and other ratepayers for construction of a drain, and assessed lands

for same, part of which Smith owned. Drain had not been completed, though a reasonable time had elapsed, and portions of the moneys assessed had been applied upon a certain other drain not mentioned in the petition, the report of the Provincial Land Surveyor made pursuant to R. S. O. chap. 529, or in the said By-law, and of no value to the said petitioners,

Held that the plaintiff was entitled to an order compelling the corporation to complete the drain according to by-law, to an injunction to restrain further misapplication of the moneys assessed, and to an account thereof, for that the by-law created a trust which had been violated.

IN RE CLARK ET AL. AND TOWNSHIP OF HOWARD.

14 O. R. 598.

On 21st September, 1868, a By-law was passed by defendants for constructing three several drains in a township, setting forth in separate schedules the land to be benefited according to the engineer's report, and the amount required therefor to be assessed and levied on the said lands. On the 11th December, 1883, a By-law for repairing and clearing one of said drains, the amount required therefor to be assessed and levied on the said lands assessed for the original construction of said drain. On 21st September, 1886, another By-law was passed to change the assessment for the construction of said drain, and to make it more equitable and prevent injustice in levying the same. The engineer was, in making his assessment, limited by the reeve to the lands assessed for the original construction of said drain, and he accordingly limited his assessment thereto, but he reported that great injustice would be done thereby, as a large area of land that would be benefited by the work would escape assessment. The last mentioned By-law declared that the report was adopted, and that, in accordance therewith, the original assessment should be changed and the assessment as made by the engineer adopted, disregarding his protest as to a large area of land benefited being unassessed. There was an appeal to the Court of Revision against the assessment, and the Court, discriminating in favour of some and against others, altered some of the assessments by deducting amounts therefrom and placing the amounts so deducted on others, leaving others undisturbed, thus not making a *pro rata* variation of all the assessments.

Held that the By-law was bad and must be quashed.

In 1886 an application was made to the Chancery Division to quash the By-law passed in 1883, which was heard in December, 1886, and judgment delivered in February, 1887, declaring the By-law to be a void proceeding. The By-law in question was passed on 21st September, 1886.

QUÆRE.—Whether this rendered the By-law in question invalid?

Notes from Judgment.

June 25th, 1887, Robertson, J.

By-law of 1868 passed by authority of 29 and 30 Vict. chap. 51, secs. 281 and 282.

On 11th December, 1883, passed a By-law for cleaning out said drain. Augustine McDonell, Esq., C.E., P.L.S., made the examination (and also the original assessment), reported the $2,000 was required.

On 21st September, 1886, passed By-law now in question, "To change the assessment made for the construction of the McGregor Creek drain," etc., recites passing of the previous By-laws, and declares "that in the opinion of the said council it has become necessary to change the said assessment for the purpose of making it more equitable, and to prevent injustice in levying said assessment," etc.

Mr. McDonell's report in extracts:—

In accordance with your instructions, received from the reeve, etc., requesting me to make an examination of certain lands in your township for the purpose of levying an assessment to defray the expenses of repairing, etc. . . . I beg to say, etc. . . . I find in the first place, that certain lands . . . assessed for the original construction cannot be assessed for the recent improvements, as the said lands drain into the creek below where any improvement was made, etc. . . . as I am limited in my instructions to confine the assessments to the lands originally assessed for the construction of the drain being, etc., . . . the amount required, which is $2,000, will come very heavily on the above described territory. Again I find that several other drains, such as the Crouch drain, the Harrison drain and the Crawford drain, have been constructed since the McGregor drain, and using the said McGregor drain as an outlet, draining some 9,000 acres of land into the McGregor Creek drain and not paying a cent for the use of the outlet, which is a grievous wrong to the people who paid for the construction and maintenance, etc., . . . inasmuch the above mentioned 9,000 acres should be taxed in fair proportion for both construction and maintenance.

Mr. McDonell made an assessment (Sec. 570) of the lands to be benefited according to his limited instructions. Object of assessment. S.S. 3, sec. 570, sub-section 15. Assessment to be varied *pro rata*. As the Council discriminated in favour of some and against others assessment was not varied *pro rata*.

The assessment as varied cannot be what was intended by the legislature, nor can it be the meaning of the statute.

In the first place, the appointment of a P.L.S., or a C.E., as required by the Act, to be taken preliminary to the consideration of the question of gratuity, the prayer of the petitioners, the object being to ascertain what the costs will be, and to charge each lot or parcel of land benefited according to the benefit to be received by the construction of the work. The legislature therefore declared that a C.E.

or a P.L.S. should be the person employed to do this work, and from the simple reason that from the nature of his profession and his education he is the description of professional man who could make the proper calculation and arrive at the just and most accurate conclusion.

It is held By-law should also be quashed, as it purports to amend or correct a By-law passed in 1883 which has been declared by the Chancery Division to be a void proceeding. In that decision it is held that a By-law based on another By-law which has been declared void must itself be void.

Judgment same as Chancery Division.

The interference of reeve gross and unwarrantable; engineer could not do work under Sec. 570.

It is difficult to find language to express properly the character of this municipal legislation.

Council fly in teeth of Sec. 584, and in direct opposition to what the Surveyor had declared to be just. By-law quashed with costs.

NISSOURI *vs.* DORCHESTER.

See *ante*, No. 4, p. 2.

Extracts from Judgment and Report. 14 O. R. 294.

Plaintiffs' By-law was provisionally passed June 10th, 1886—finally July 16th, 1886. Plaintiffs claimed a mandamus to compel defendants to pass a By-law. Defendants said plaintiffs' By-law was invalid. The petition was not signed by the requisite number of owners, and showed on its face that more than those owning lands in West Nissouri were interested in said drain, and none of them were parties to the said petition.

Galt, J. (without jury) May 11, 1887:

"I find that the work in question proposed to be constructed affects both the Municipalities of Nissouri and North Dorchester, and that under Sec. 598 of the Municipal Act, 46 Vic., the County Council is the proper authority to pass By-laws for such a purpose, and that the plaintiffs had no power to pass the By-law now before me. I therefore dismiss this action with costs."

Boyd, J.—Referring to sections of Municipal Act relating to such questions: "These sections have been characterized in a late case by the Court of Appeal (as difficult and obscure) and their elucidation has not been aided by diametrically opposite opinions of the Judges of the Superior Court in the same case: Dover *vs.* Chatham, 11 O. R. 248 and 12 S. C. R. 321. The intent of the Statute appears to me is, that if the drain projected in one township is carried into a neighbouring township, it should only be for the purpose of outlet, where that outlet can be found within a reasonable distance of the boundary," "would not go so far as Henry, J., who says a majority of the persons to be benefited in both townships is necessary. This construction appears to overlook the provisions of Sec. 581, which directs the Council of

the servient Municipality to pass the By-law 'as if a majority of the owners of the lands to be taxed had petitioned as provided in Sec. 570.'"

Judgment affirmed with costs.

Vol. XII. and XIII. O. R. No drainage cases.

Vol. XI., p. 74.

IN *Re* FUNSTON AND THE CORPORATION OF THE TOWNSHIP OF EAST TILBURY.

11 O. R. 74.

In the drainage by-law the assessments as made by the engineer and contained in the schedule to the By-law were revised by the Court of Revision and alterations made, but the By-law was not amended before being finally passed so as to correspond with such alterations as required by Sec. 571 of the Municipal Act of 1883, and it was impossible to discern from such alterations as made the amount of the "total special rate" against each lot or part of lot, and therefore the amount to be annually levied to be ascertained by dividing such total special rate by the number of years the By-law has to run, which in this case was fifteen years.

Held that the defect was fatal to the By-law.

The *locus standi* of the applicant was herein objected to, but on the evidence the objection was overruled.

In moving to quash a By-law the practice has been adopted of applying to a Judge sitting alone, an objection that the application should have been to the Divisional Court was not entertained: but such an application if required to be made to the Divisional Court must be to the Common Law Divisional Courts and not to the Chancery Divisional Court.

Vol. X., no cases reported.

IN *Re* CLARK AND THE MUNICIPALITY OF THE TOWNSHIP OF HOWARD.

9 O. R. 576.

This case relates to the appointment of Inspector of Drains, and is of interest more to Municipal Corporations than to Engineers.

(As the question does not affect Engineers to any extent I will not say anything about it.) By-law quashed.

CORPORATION OF CHATHAM *vs.* CORPORATION OF SOMBRA.

44 Q. B. 305.

The declaration was for money to be paid by the defendants to the plaintiffs according to the award of Robert Fleck, Augustine McDonell and Thomas R. K. Scott, made under submission to arbitra-

tion by plaintiffs and defendants of matters in difference between them. There were also the common counts. The plea was "Never indebted."

The trial took place at the last Fall Assizes at St. Thomas, before Galt, J., without a jury.

The plaintiffs' township desired to effect some works under the drainage clauses of the Municipal Act, and alleged that parts of the defendants' township would be benefited thereby. A report was made by the engineer, and a sum was assessed against certain lands and roads of the defendants by reason of the benefit to them arising from the work in question, all of which was to be executed within the plaintiffs' township.

The defendants appealed and an arbitration was duly arranged, and the above named parties were appointed referees.

By award dated 30th September, 1875, and signed by all three, they awarded "that the Township of Sombra, for benefit of road and lands by the deepening of Otter Creek as recommended by I. W. Shakleton in his report to the Council of Chatham, shall pay to the said Township of Chatham the sum of $700, instead of the sums named in the report, which said sum of $700 the said Township of Sombra shall apportion in the same ratio for benefit to roads and lands as is set forth in the said report, or in such other manner as shall be lawful, and shall pay the said sum of $700 to the said Township of Chatham.

The work was proceeded with and finished two or three years ago. In August, 1887, the defendants were applied to, but did not pay.

At the trial the defendants called witnesses to show that the work was not done well, that the cutting was not deep enough, that it was not of much benefit to Sombra, and that it could be made a good deal better.

For the plaintiffs witnesses said the work was done well, and that it was impossible to ascertain how the work was completed several years ago.

The Judge entered a verdict for the plaintiffs for the amount of the award, with interest from four months after the demand.

May 22nd, 1879, Bethune, Q.C., obtained a rule *nisi* to enter a verdict for the defendants, on the grounds that the plaintiffs had not performed the work for the doing of which the action was brought.

June 2nd, 1879, McMichael, Q.C., showed cause.

Falconbridge contra.

June 28th, 1879, Hagarty, C.J.: If we accept the learned Judge's finding, which we regard as in favour of the plaintiffs on the merits, the objection is at an end. On reference to him, we find he is quite satisfied as to the merits.

On this point alone the defendants fail, unless we take a different view of the merits. But a perusal and consideration of the evidence induce us to think that we cannot safely interfere with the finding. It was also urged for plaintiffs that the doing of the work, or the doing of it in any particular manner, was not a condition precedent to their right to receive the money. Section 538 declares that the report, plans and specifications of the engineers shall be served on the defend-

ants, and unless appealed from shall be binding on them. Section 539 directs the defendants within four months from the delivery to them of the report to pass a by-law to raise such sum as is named in the report, or, in the case of appeal, such sum as may be determined by the arbitrators. In this case it does not appear that the defendants took any steps whatever after the award was made. The work was proceeded with and finished a couple of years before the action was brought. It does not appear to us that they are entitled to refuse payment until the work is done. This award is partly for the benefiting of lands and partly for roads.

In this case the validity of the award was undisputed. It contains an absolute award for payment of a named sum. The statute directs that sum to be raised in a named time. We are not concerned with the question whether the defendants raised the money as directed and then refused to pay it over, or whether they have done nothing whatever in the premises beyond standing by and allowing the plaintiffs, without objection or remonstrance, to carry out the improvements on Otter Creek, which were undertaken clearly on faith of this contribution from defendants' township.

It seems to us that in the case before us the verdict must stand.

Armour and Cameron, JJ., concurred. Rule discharged.

In re Montgomery et al. and the Township of Raleigh.

C. P. 381.

To a By-law passed under 32 Vict. ch. 43 (Ont.), was annexed a schedule (declared to be part of the By-law) entitled "Schedule showing the benefit to be derived by each lot from the drainage to be performed under the By-law," Held that such a By-law containing such a schedule sufficiently indicated that the lands so assessed were assessed as the only lands within the municipality regarded as benefited by the proposed work; and that it was not necessary that the By-law should specify the mode of ascertaining and determining the property to be benefited under sub-sec. 4 of sec. 2 of the said Act.

Held also that, supposing the question open for the consideration of the Court, whether or not the lands assessed were the only lands benefited, which should have been assessed, lay upon the applicants against the by-law and that in this they had failed. But held, that the objection that all the lands would be benefited had not been assessed, or that the assessments upon the respective lots were overcharges, or that the by-law did not provide properly for determining what lands were benefited, were not grounds for moving to quash the same as by the said 4th sub-section an appellate tribunal is appointed.

Held, also, that an objection, that the petition mentioned in the by-law was not signed by a majority of the resident owners of property assessed, etc., was not open to the applicants upon the motion, but that if it were the onus of proof was upon them, and in this also they had failed.

Held, also, that the 3rd section of the by-law set out below was not open to the objection, that it did not properly provide for a special rate sufficient to include a sinking fund for payment of the debentures therein mentioned, but provided for levying and raising certain instalments with interest.

Held, also, that there was no necessity for the By-law to name a day in the financial year from which it was to take effect, as this was not required by the statute which authorized its passage.

Osler obtained a rule *nisi* why this By-law regarding drainage, passed by the Township of Raleigh, should not be quashed, for the following reasons:—

1. Because the said By-law did not provide for ascertaining and determining what real property would be benefited by the proposed drainage. 2. That no By-law was passed for ascertaining or determining through engineer or other competent persons what lands would be benefited by the proposed drainage, and assessing the same, and that the said By-law itself did not make any provision therefor. 3. That the said By-law did not show that the properties mentioned therein did not show that the properties mentioned therein and assessed thereby were the only lands benefited by the proposed drainage, and that the property and lands mentioned therein and assessed by the said by-laws were not the only lands benefited thereby. 4. That the petition mentioned in the said By-law was not signed by a majority in number of the resident owners of the property mentioned in and asssessed by the said by-law or of the property to be benefited by the proposed drainage, nor did a majority in number of the resident owners or of all the owners of property to be benefited petition the council of the said corporation for the deepening of the stream, creek or water-course, or the draining of the property mentioned in said by-law. 10. That the said By-law did not properly provide for a special rate sufficient to include a sinking fund for the payment of the debentures therein mentioned, but provided for the levying and raising of certain instalments with interest, and did not state or provide from what date interest was to be charged. 11. That the said by-law did not name any day in the financial year from which the same was to take effect.

It appeared from the facts stated that a number of residents of the Township of Raleigh petitioned the Council of Raleigh to cause a drain to be opened. The council hired an engineer to go over the proposed drain, and make out a report of it, and he did so, making the different assessments with which each township and each person should be assessed. The estimate amounted to $4,537, but the heads of the corporations of Harwich and Chatham appealed from this award, and arbitrators were appointed. They decided that Chatham should pay $475, Harwich $990, and the balance was to be raised by the Township of Raleigh and other sources. A By-law was passed enacting:—1. That the drain and branch should be made in accordance with the survey and levels of the said engineer. 2. That the township of Raleigh should raise the sum of $2,606. Debentures were raised by the Township of Raleigh,

and this was divided into three annual payments, which payments were collected along with the taxes, and were placed to form a sinking fund to meet these debentures. This was done on the 29th August, and on the 23rd of September an appeal was put in by Mr. Harris, an attorney for certain parties, moving to have the By-law quashed. The reasons put forward in the appeal were these: 1. That certain lots were too highly assessed in proportion to the benefit they would derive from the drain, and in proportion to other lots taxed. 2. That all the lots and roads that would be benefited by this drain were not taxed. 3. That a majority of the land owners to be benefited had not signed the petition. This appeal was heard but was not entertained, on account of insufficient evidence.

C. Robinson, Q.C., now shewed cause, citing *Re* Michie and the City of Toronto, 11 C. P. 379. Osler contra.

The statutes are referred to in the judgment of the court, which was delivered by Gwynne, J. He ruled that there was no foundation for the 4th objection, and he also ruled that the 10th objection was insurmountable. The 11th objection was also thrown out, as there did not seem to be any grounds for it. Then, in closing, he said: "The municipality has, I conceive, been put to considerable and unnecessary expense in resisting this application. Some of the objections should not have been renewed after the appeal to the council, in accordance with the provisions of the Act and the decision of the council thereon. If the parties were dissatisfied with the decision of the council upon the grounds of appeal, they should have carried their appeal to the Judge of the County Court, as required by the Act. Where municipal councils act, as the council whose conduct is impugned here appears to have done, with an anxious desire to comply with the provisions of the Act and to promote public benefit, I think that application to quash the By-law, if unsuccessful, should be visited with costs, to be paid to the municipality. The rule, therefore, will be discharged with costs. Rule discharged with costs."

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

THE LOCAL IMPROVEMENT ACT.

By W. M. DAVIS,
Town Engineer, Woodstock.

WORK may be undertaken under this Act, if initiated in one of the three following methods:—

1st. On a petition of a two-thirds majority of the property owners representing at least one-half the value of the property.

2nd. By the council taking the initiative after due notice being given of the proposed assessment and no petition by a majority of the owners being presented against it within the limited time.

3rd. On a report of the engineer or other sanitary officer, and of a committee of the council, adopted by the council.

Under the second method, if the work be petitioned against by a majority of owners, no second notice of the same kind, for the proposed work, shall be given within two years.

Land on which a place of worship has been erected, and land used in connection therewith, can be assessed when a two-thirds majority of the property owners are in favour of the improvement, or where the frontage system has been adopted by by-law for all improvements.

Sub-section 4, section 617, 1883, provides that any real property specially assessed by the council for any work or improvement under this Act shall be exempted by the council from any general assessment for the like purpose, except cost of works at street intersections, cost of works opposite real property exempt from such special assessments, and cost of maintenance of works constructed under local improvement by-laws.

As much discussion has arisen from the ambiguities of this section, it may be as well to refer to the old Acts on which this Act appears to be based.

Section 551, R. S. O, provides that local improvements be paid for by an annual rate on the dollar.

Section 554, R. S. O: "Nothing contained in the preceding sections shall be construed to apply to works of ordinary maintenance. All work done under this Act to be kept in repair by the city generally." There is no provision made for exemption up to this point.

Section 11, chap. 27, 1880: "Where property owners petition for a local improvement under section 551-555, R. S. O., the petition may

pray exemption for any named period from any general rate for the like purpose, except that imposed to meet cost of street intersections and work opposite property exempt from special taxation." This is again amended by section 5, chap. 23, 1882, which provides that property shall be exempt by the council from any general rate for the like purpose in same manner and to the same extent as would have been done if petition had been presented as in 1880.

Although the tax was still an annual rate on the dollar, the law must have been highly satisfactory to those who constructed the improvement, for they were exempt from a tax for the like purpose, except cost of street intersections and of works opposite real property not specially taxable, and in addition had the improvements opposite their own property kept in a state of perpetual repair by the unfortunates who had not taken advantage of this Act. The injustice of this was apparently too glaring, and the Act, in 1883, was amended accordingly.

By this amendment the property owners are still exempt from any general tax for the like purpose; there are the same two exceptions, viz., cost of street intersections and of works opposite real property exempt from special taxation; and another exception is added, "Except the general rate which may be imposed to meet the cost of maintenance and repairs on works and improvements constructed under local improvement by-laws." Now let us consider the correct interpretation of "assessment for the like purpose." The most reasonable conclusion appears to be, that a property which has paid for a sidewalk is exempt from any general tax for sidewalks of any material. A property that has built a paved roadway is exempt from general tax for roadways of any kind, and properties constructing both sidewalk and roadway are exempt from any general tax for sidewalks and roadways of any description, outside of course of the exception given above.

The property has also to pay a general rate imposed to meet the cost of maintenance and repairs of works constructed under local improvement by-laws. This clause is no clearer than the "like purpose" clause. If it means (which seems most likely) that the total cost of repairs to all improvements constructed under the Act should be levied as a general rate on all taxable property without regard to the date of construction of an improvement or its life, it is most inequitable, and property owners will be deterred from making permanent improvements, for they would be obliged to assist in keeping in repair the short-lived improvements of their neighbours. A much more equitable plan would be to assess the cost of maintenance of the improvement under each petition against the property which constructed it, according to the frontage.

Recognizing the injustice of this manner of assessment for maintenance one or two cities appointed deputations to wait on the Government to endeavour to get this clause amended. Probably, in accordance with suggestions from those deputations, section 620, 1883, was amended; for section 30, chap. 39, 1885, gives councils the power of dividing the municipality into districts within which streets, or

parts of streets, may be maintained, repaired, lighted, etc., and a special rate imposed on the property therein according to the frontage thereof. This amendment, however, only applies to cities and towns which have adopted the frontage system as provided for by section 620, 1883.

Section 613, 1883, provides that the *council* may devise an equitable mode of assessing corner lots, triangular and irregular shaped pieces of ground, etc.

Section 614 gives the *council* the power of determining the rate to be paid by lands unfit for building purposes.

Section 615: "In constructing or repairing bridges, culverts, etc.," the *council* determines the property to be assessed.

Each of these might be amended advantageously by the substitution of "engineer" for "council" subject to appeal to court of revision and county judge.

Section 615, as it now stands, virtually places the assessment for a bridge or culvert on the ward in which it is situated; for each member of the council is anxious to get his own ward off as cheaply as possible, and the majority would be very likely to agree that the ward in which the improvement is located derives the whole benefit therefrom.

Section 619 leaves the time over which the exemption shall extend in the hands of the council or an arbitrator. This might be simplified, and justice done to all parties by limiting the time of exemption to the life of the improvement.

In cities in which the frontage system has been adopted cases may arise where it is impossible to construct a necessary improvement. Take the case of a vacant block with no sidewalk opposite, the adjacent blocks having sidewalks, and the owners of the unoccupied property being opposed to the work, it could not be undertaken under any of the three methods provided. The advantages of the frontage system over the ward appropriation, or "ward grab," system are so evident it is surprising that a greater number of cities and towns have not adopted it for maintenance and repairs as well as construction.

Under the old system the apppropriation is frittered away by the ward councillors on repairs and petty improvements wherever there are votes to be caught. A councillor who honestly endeavours to construct some lasting improvement uses the bulk of the appropriation in one place, and having no money left to conciliate the electors in other parts of the ward is certain to be defeated the next year by a man who is content to scatter the money in the old-fashioned way.

It is generally conceded that no council has the right to leave a debt to their successors in office, so their hands are practically tied, as they cannot issue debentures without the consent of the electors. Speculators obtain possession of unimproved lots, and hold them for improvements on the adjacent property to enhance their value. Under the frontage system all men are equal or as nearly so as legislation can make them. At any rate each gets what he pays for and pays for what he gets. This system has been adopted by the most progressive of American cities and gives general satisfaction.

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HIGHWAY BRIDGES.

By A. W. CAMPBELL,

P. L. S. & C. E., A. M. Can. Soc. C. E.

A GREAT deal has been written on the subject of bridges and bridge construction, but almost exclusively we find the writer dealing with works of large dimensions, from which the ordinary local or county engineer can abstract but little information relative to common highway bridges with which he has to deal, and it is to be regretted that some of our experienced engineers do not instruct us on this subject, although it may be considered but elementary.

As a general thing the local engineer has to take into consideration the cost as well as the principle on which the bridge is to be built and the kind of material to be used in the structure. Stone substructure with iron superstructure of modern design might be to him very appropriate, but he is, as it were, encircled by a limit of cost, and is therefore thrown upon his own resources to devise some structure whereby the stream may be crossed in safety and the expenditure within the limit. It is here that a word from the experienced man would be of great value. Wooden bridges may be looked upon as the origin of all other constructions for crossing streams, whether of stone or iron, for it seems natural to suppose that in the earliest times the simple method of throwing a plank across a stream may have been adopted. A plank thrown across from one bank of a stream to the other is then the most elementary type of a wooden bridge, and the principle on which it is suspended or kept in its proper position is worthy of consideration.

When a strong plank is thus laid upon two supports, that part of it which lies midway between them has to sustain a certain transverse strain caused by its own weight and that of anything crossing over it, by the cohesion between its particles, that is by the power with which the atoms or fibres of which it is built up cling together, for as that part of the plank has nothing to rest upon, it is clear that it will have a tendency to break somewhere between the supports when the strain upon it exceeds its strength. But owing to the cohesion of the particles which attracts them one to the other, such a plank cannot snap asunder with absolute suddenness, because the cells of which timber is formed are lengthened out into fibres or

hollow threads, and these are so interwoven one with the other that one particle or atom of the material will not readily be separated from its fellow as long as such material remains in a sound state. This being the case the weight upon the plank will cause it to bend or what is technically termed to "sag," and it is to prevent such bending or sagging, extending beyond a safe amount of elasticity, that the efforts of the engineer of wooden bridges are particularly directed.

It will be easily understood that when a timber is laid across from one support to another, and a load is placed on any part of it, it bends, because the particles of which it is formed are pressed close together upon the upper side, whilst on the under side they are drawn out. Thus we understand that two forces are acting upon the beam at the same moment, for the upper portion is subjected to a compressive force whilst a tensile or stretching force is acting upon the lower side. It is the strength with which these two forces counteract each other that constitutes the rigidity of timber, and it is evident that there must be some intermediate plane between the upper and lower surfaces of the beam in which the two opposite contending forces will meet, in which, of course, neither will preponderate. This is denominated the neutral axis, and is differently situated according to the thickness of the beam and the power of cohesion which is possessed by the fibres of the various kinds of timber. The upper and the lower parallel chords of the truss of a bridge are in the same condition as the upper and lower fibres of the beams. It is, as it were, removing the neutral axis without the beam (or lower chord) and leaving all its fibres in tension while another beam (or upper chord) is substituted for the fibres in compression.

The truss of a bridge as well as a timber has a neutral axis, with its position somewhere between the said chords. If the upper and lower chords are of the same size and shape, its axis will be at the centre of the height of the truss. If the dimensions of the upper and lower chords are not similar, it will be half way between the centres of gravity of their cross-sections. The other members of the truss such as the posts, braces, counters, ties, etc., serve to keep the two chords asunder and to prevent them from bending, also to transform the transverse strains produced by the weight of the truss and its load into other strains acting longitudinally along the different members, and conduct said strains along the truss to the abutments. A load placed at any one of these members is of course partly supported by each abutment; one part of it travels up and down alternately between the chords and along the successive members until it reaches one abutment, and the other part in like manner until it reaches the other abutment.

The point chiefly to be aimed at in designing a bridge truss is to dispose its various parts so as to form a series of properly connected triangles, because in that shape they present more resistance to disarrangement of form than in figures of a greater number of sides, for in the case of a polygon, if each joint was like a hinge incapable of

offering any resistance to alteration of the relative angular position of the members connected by it, it would be necessary, in order to fulfil the condition of rigidity, that every polygonal frame should be divided by the lines of resistances of stays and braces into triangles and other polygons so arranged that every polygon of four or more sides should be surrounded by triangles on all but two sides and the included angles at farthest; for every unstayed polygon of four sides or more with flexible joints is flexible unless all the angles but one be fixed by being connected with triangles.

All bridges should be calculated to carry a dead load, or the weight of the structure, and a moving or live load, which is composed of teams, persons, or other loads which may at any time come on the bridge, and to resist a certain wind pressure. The live load may be assumed, or is given in the original data, but the dead load must be assumed, and can be accurately determined only by successive approximations, for it is dependent upon that which we seek, namely the dimensions of the parts of the bridge. We, therefore, at first should assume such a value of the total weight as is indicated by other similar structures, and, after the dimensions of all the other parts have been computed the weight is calculated from these dimensions, and if the assumed weight does not largely exceed the computed weight it may not be necessary to review the calculation. The live load should be assumed to equal or slightly exceed the greatest load which we think will ever be placed upon the bridge. The structure should not be so heavily loaded as to damage the elasticity of the materials which compose it. It is impossible to tell the exact load which the structure can sustain without passing this limit, but considerations of safety and durability demand that we should keep upon the safe side, and it is often the case in practice, that bridges are made about twice as strong as would be absolutely necessary if the materials were all of a known standard quality and the workmanship practically perfect. In order to make the structure safe against all these contingencies a factor of safety is employed and the bridge is made several times as strong as is necessary for sustaining the load at the crushing limit. There is no absolute rule for determining the correct value of the factor which is the ratio of the computed strain to the actual strain, but its value is assumed arbitrarily by the engineer. Observation in this particular, in my opinion, is a good rule. Let the engineer observe the margin of safety that has been used in various structures, and it will serve as a guide in designing new ones. If the margin of safety is so small that the structure appears to be insecure, and gives indications of failure, it evidently should not be followed. If the margin is evidently excessively large, demanding several times the amount of material that is necessary for stability and durability, such factor is too great. Any engineer, without scientific skill or economy in the use of materials, may err in his direction to any extent; but, if the margin appears reasonably safe, and the structure has remained stable for a long time, it serves as a valuable guide, and one which may safely be followed under similar circumstances. All bridges should be made to sustain a live load of not less than one hundred pounds per square

foot of floor, where they are on main roads subjected to heavy travel, and not less than eighty pounds per square foot of floor on those roads not subjected to special or excessive loads.

A wind pressure of not less than thirty pounds per square foot of the total area of the side of the truss should be provided for: this, together with the sway caused by passing loads, should be resisted by horizontal lateral bracing, one-half of said pressure to be treated as a moving load. Timber, in tension, should not be strained more than eight hundred pounds per square inch.

In calculating the compressive strain on timber it is necessary to consider that the breaking and the safe load per square inch are not constant quantities but diminish as the piece becomes longer in proportion to its diameter. If a very long piece be so braced at intervals as to prevent its bending at those points, then its length becomes virtually diminished and its strength increased; therefore, long horizontal or inclined pieces exposed to compression in the form of upper chords and braces in bridges are thus braced. Mistakes are sometimes made by assuming one thousand pounds as the safe compressive load for timber without any regard to the length of the piece. The strength of timber also depends on the degree of seasoning; well seasoned timber will resist about twice the crushing load of green timber. In finding the breaking load of timber, the following formula of C. Shaler Smith may be used:

$$\frac{5{,}000}{1 + \left(\frac{\text{square of length in inches}}{\text{square of breadth in inches}} \times .004\right)} = \text{breaking load in pounds per square inch of area.}$$

Not more than one-sixth of the breaking load should be taken as the safe load.

The timber used in a truss should be of first quality of their several kinds, straight in grain, free from large loose knots, shakes, sap or decayed wood, or other defects that would impair the strength or durability of the same.

The strength of timber subjected to transverse strain may be determined as follows:

$$\frac{W \times X^2}{Y} \times 450$$

W = breadth of beam in inches.

X = depth of beam in inches.

Y = length of beam in feet.

450 = coef. for centre quiescent breaking load.

For safety in practice not more than one-sixth of the quiescent breaking load should be employed. This margin is left for jars, jolts, irregularities in timber, vibration, etc.

Timber should be sawn so as to leave its sides parallel and its angles right angles. Care should be taken to have all wind taken out before put in the structure so as to have perfect joints; this is necessary in order to secure equal bearings. It should be well seasoned, as this is of great importance, not only to its durability but also to the stability of the structure, as a very slight shrinkage of some of the pieces arising from the seasoning of the wood might cause material injury if not complete destruction to the structure. I consider timber sufficiently seasoned for bridge work when it has lost one-fifth of its weight when in a green state. Natural seasoning is preferable to any other, as timber seasoned in this way is stronger and more durable than when prepared by any artificial process.

In order to assist the timber in a bridge to withstand the effects of exposure to the weather it should be thoroughly coated with paint, but as this substance is of a perishable nature it should be renewed from time to time.

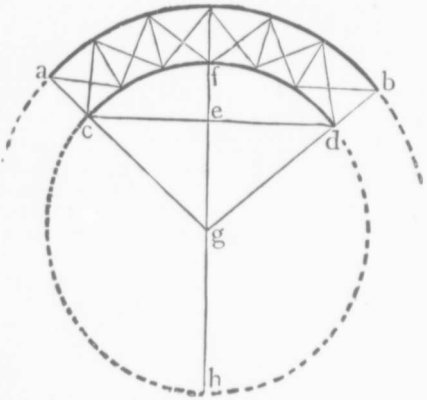
All joints of chords or braces, bearings, ends of posts and braces, ends of chords, keys and packing pieces, and wherever there is a bearing end grain, seat or joint, should be thoroughly coated with thick white lead before being put together, this adds greatly to the preservation of the joints and ends of the timber.

Where the chords and braces of a truss are packed or built, that is, formed of a number of separate members, it assists preservation to cover the same with galvanized iron extending about two inches down the sides of the chord or brace and securely fastened with metal nails, this prevents the water from entering the joints, while a free circulation of air enters from below.

The iron used in the structure for panel or main straining rods should be upset at the screw ends, so that the diameter at the bottom of the threads will be $\frac{1}{16}$th inch larger than any part of the body of the rods, and should not be strained more than ten thousand pounds per square inch, and that for horizontal lateral bracing should not be strained more than fifteen thousand pounds per square inch, and should be tough, fibrous and uniform in character. The angle blocks on the chords at the ends of the braces should have their faces at right angles to the line of such brace, and have a rib on the under side about half an inch in depth, to be let into the chord.

There is no rule for determining the amount of camber for a bridge, but it should certainly be such that the heaviest load placed upon it will not bring the chords horizontal, but in practice $\frac{1}{30}$th of the span in feet, measured from centre to centre of the outer panel points, is considered sufficient to represent the camber in inches. When the chords are cambered they become the concentric arcs of two circles, with the upper one longer than the lower, and the vertical become radii of said circles, and although their length remains the same the space between them at the upper chord becomes greater than at the lower, and this renders it necessary to lengthen the diagonal braces. Therefore in practice the importance of ascertaining how great this

increase in length is cannot be overlooked; for if so, the different parts of the truss will not fit accurately together. I determine this increase in the following manner:—



Let *a b* in the accompanying figure represent the upper chord in camber; *c f d*, the lower chord; *c d*, length of span; *e f*, camber; *x*, number of panels. Then, *e f d* is an arc of the circle *c d h*. Produce *f e* to meet the circle *c d h* at *h*. *c e* will equal $\frac{1}{2}$ of span.

∴ Rect. *c e e d* = rect. *f e e h*.

$$\therefore \frac{c\,e \times e\,d}{f\,e} = e\,h.$$

∴ *f e* + *e h* = diameter of the circle *c d h*.

∴ $\frac{1}{2}$ *f h* = *f g*, or radius.

∴ *c g* = *f g*.

∴ *f h* × 3.1417 = circumference of circle *c d h*.

Then, in the triangle *c e g* we have the sides *c g c e*, and the right-angle *c e g*.

∴ *c g* : *c e* :: *c e g* : *e g c*.

∴ Log. *c g* : Log. *c e* :: sin. *c e g* : sin. *e g c*.

Then, twice the angle *e g c* = angle *c d g*.

∴ 360° = circumference *c d h*.

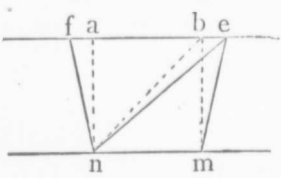
∴ 1° = *c d h* ÷ 360°.

$$\therefore c\,g\,d = \frac{c\,d\,h}{360^\circ} \times c\,g\,d = \text{arc } c\,f\,d, \text{ or lower chord.}$$

Then, *c f d* ÷ *x* = length of panel on lower chord.

And in a similar manner by adding the height of the truss to the radius of the circle the length of the panel on the upper chord may be found.

When the increased length of the panel at the upper chord is found, the length of the diagonal brace may readily be determined thus:—



Let *a b m n* in the accompanying figure represent a panel without camber, and *f e m n* represent a panel with camber.

Let *x* = width of panel on lower chord.

Let *y* = depth of truss.

Then *f x* and *b e* together = increase to panel.

∴ to find *n e*, or length of diagonal with camber, we have the right-angled triangle *a n e* with *a n* = *y*, and *a e* = *x* + $\frac{1}{2}$, increase.

∴ *n e* = $\sqrt{x^2+y^2}$.

It is not my intention in this paper to deal with the manner of finding strains on the different members of a bridge, as a large number of the members of the profession have gone fully into this in works easily procured.

The general practice in building wooden bridges is to use the King truss up to thirty-five feet span, the Queen or trapezoidal truss up to eighty feet span, and the Howe or Pratt truss up to one hundred and sixty feet span.

The most important branch of carpentry to the engineer is that which relates to the method of joining or connecting timbers together. The joints or surfaces at which the pieces of timber in a structure touch each other, and the fastenings which connect these pieces together, are of various kinds, according to the relative positions of the pieces and the forces which they exert on each other. Lengthening ties are made by fishing or by scarffing. In a fished joint the two pieces of the tie butt end to end, and are connected together by means of fish pieces of wood or iron which are bolted to them. In a scarf the ends of the two pieces of the tie overlap each other. Ties are often fished with iron as well as scarfed. In a plain fish joint the fish pieces have plane surfaces next the tie, so that the connection between them and the tie for the transmission of tension depends wholly on the strength of the bolts together with the friction which they may cause by pressing the fish pieces against the sides of the tie. The tie is only weakened, so far as its effective sectional area is diminished, by the bolt holes. The joint sectional area of the fish pieces should be equal to that of the ties. The bolt holes should be so distributed and placed at such distances from the end of the two parts of the tie that the joint area of both sides of the layer of fibres, which must be sheared out of one piece of the tie before the bolts can be torn out of its end, shall be as much greater than the effective area of the tie as the tenacity of the wood is greater than its resistance to shearing. The joint sectional area of the bolts should be at least one-fifth of that of the timber left after cutting bolt holes, and the bolts should be square rather than round. The fish pieces and the parts of the tie may also be connected by indents or keys; in either case the effective area of the tie is reduced by the cutting of the indents or of the key seats. The area of the abutting surface of the indents or key seats should be such as to resist safely the greatest force to be exerted along the tie, and their distances from the ends of the fish pieces and of the parts of the tie should be sufficient to resist safely the tendency of the same force to shear off two layers of fibres. A timber tie may be fished with plates of iron, due regard being paid to the greater tenacity of the iron in fixing the proportion of the parts. The iron fish plates may be indented into the wood. When a joist or floor beam has to be supported on another beam, the method which least impairs the strength of that beam is simply to place the said joist or floor beam above it, a shallow notch being cut on the lower side of the joist or floor beam so as to fit on the support.

In selecting the site for a bridge, in many cases, very little room is left for the exercise of the engineer's judgment in the matter, the

position of the bridge being determined by other circumstances, such as the necessity of joining two existing roads, but in all cases it becomes necessary for him to make a careful personal inspection of the locality, to have the banks of the stream accurately surveyed, as well as soundings taken of the depths of the stream at uniform distances apart, and borings of the nature of the strata composing its bed. The velocity of the water, and its height at all times and seasons of the year. Prepared with these data, he will be in a position to properly consider the subject and arrive at correct conclusions.

The bridge should, if possible, be built at right angles to the course of the stream, and, if this be prevented by circumstances, the piers and abutments should still be placed parallel to the stream and making an angle with the direction of the bridge.

The most important point claiming the attention of the engineer, as far as the stability of the bridge is concerned, is to obtain a secure and unyielding foundation for the piers and abutments, such as will safely support the superincumbent weight of the bridge and its load, and is not likely to be affected or disturbed by the changes in the bed of the stream or other circumstances.

There is a variety of ways in which piers and abutments may be made. Those for common bridges are usually either built of masonry on the solid foundation of the ground or on a platform constructed upon piles driven into the earth, or they are built of timber framed together in the form of a crib, or of one or more rows of piles driven into the ground in line and extending to the required height of the pier or abutment, and braced diagonally to secure stability, and capped at the top to receive the structure. It is usual in forming the aforesaid foundation to drive the piles about three feet apart from centre to centre and saw them off to the required level, then bolt capping pieces to the top of such piles and plank the same in, and either fill up the space with broken stone laid dry or grouted with mortar. On this the masonry should be placed, or timber framing if desired. In selecting the timber for piles, care should be taken to select that which is straight grained and free from large knots and ring shakes. Rock elm, red beech, blue oak and cedar are the timbers mostly used. In my opinion piles squared are more lasting than round timber, as removing the sap wood renders it less liable to decay. In general practice the timber is left round and the bark removed, in this way they drive easier and are less liable to split. They should be from eight to ten inches in diameter at the small end. In driving the piles a hammer properly concaved and of not less weight than two thousand pounds, with an average fall of from twenty to twenty-four feet should be used. The advantage derived from using a heavy hammer with a moderate fall is that the piles are driven with much less injury or liability to splitting. Every one who has had the management of pile driving is fully alive to the anxiety, delay and expense attendant on replacing injured piles.

Piles which have to be driven through hard ground should be ringed before being raised into the leaders, that is, they should have an iron hoop tightly fixed on their heads to prevent splitting, and also be shod

with iron shoes; these shoes may be of wrought-iron or cast-iron. The shoe should be placed truly in the centre of the pile. Great care is required in shoeing a pile to ensure that the shoe is driven perfectly home. The advantage of a cast-iron shoe is that the inside can be formed with a square butment on which the pile rests, whilst a wrought-iron shoe has to be driven up until the toe of the pile is wedged tight; and as the force with which the pile is driven into the ground greatly exceeds that with which the shoe is driven on the pile, it will often happen that the shoe will burst open and allow the point of the pile to be crushed before it is down to the required depth. When driving a pile into the earth very often it happens that before it is to the required depth a hard strata is reached in which the pile pierces it very slowly. In such case, after about half-a-dozen repeated blows from such a hammer and fall as described above the pile moves almost imperceptibly, the driving of such pile should be abandoned, as further pounding only shatters the pile and loosens the hold it already has in the earth When driving piles for submerged foundations they should be cut off so as to leave the timber platform about two feet below the low water mark to prevent decay.

It behooves the engineer at all times to associate his energies with those of the builder or manufacturer of bridges in ferreting into the actions of material of all kinds. The suggestion that the engineer and builder or manufacturer of bridge structures go hand in hand in extending a common research into the behaviour of materials is a good one. Theory is very good, but it must be tested by practice to be valuable, and the practical knowledge of the builder or manufacturer can be made of utmost use to the engineer. The practical man may meet with difficulties or stumble on combinations that the purely theoretical man would never dream of with all his philosophy.

I have appended to this paper a side elevation of a wooden highway bridge of the Howe truss principle.

DISCUSSION.

Prof. Galbraith—I must compliment Mr. Campbell upon his plain and practical paper; it is somewhat different from Mr. Butler's of last year. And I felt at the time that a paper of this kind would meet with more acceptance from Surveyors, for the reason that they have a great deal to do with county engineering. Upon enquiry I have not found where a book upon wooden highway bridges can be got. I have never been able to find any book of the kind. Books that treat on bridges are principally confined to calculations of forces, etc. They treat also of the strength of material, and all engineers should make themselves acquainted with both of these subjects. Of course that is all very well, but at the same time it would be a good thing if a short treatise on bridges of this character were gotten up, giving in the introduction the relative strength of materials and calculation of forces, etc., and this could be followed by a great many practical details. I think a great deal is to be learned with regard to the connections both as to strength and durability. The way we manage that in the School

of Science is to get the students to take notes during the summer from their own experience. The connections are one of the things rather hard to calculate. A great deal of their strength must depend upon the circumstances generally. So, I think if we had some information of this kind brought together it would afford the engineer of ordinary practice great assistance. I think Mr. Campbell is working in the right direction, and I should like to see him go ahead with it. I think from his paper he is well qualified to go on and get up information of this kind. We might have it in such a shape as to be incorporated in the Proceedings.

Mr. Gibson—I am very much pleased with this paper from the fact that it does not go into mathematics. It is not necessary to go into formulas; what we want are *practical hints.* I think a book giving this information would be very useful, as there are none in existence on wooden bridges that I am aware of. There are works on iron bridges. I think any bridge over sixty feet in length or thirty feet in height should be built of iron. I have built a great many bridges twenty-four feet span, and these can be built very cheaply, and the matter of cost is everything, but if an iron structure is put in, even in the case of a small bridge, it is a financial benefit in the end. Iron bridges are not so liable to be carried away by wind or water as are wooden bridges. But in the U. S. stone is being largely used for bridge building, being considered preferable to iron on account of the discoloration of the latter from exposure to the weather.

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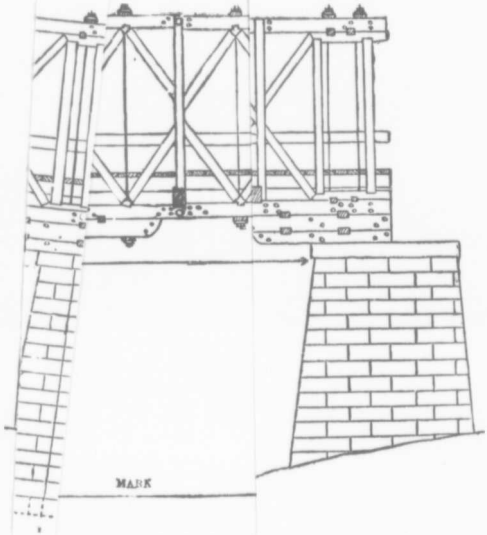
HYDRAULICS.

By J. GALBRAITH,



to be calculated from the greatest surface velocity, or from a small number of velocity observations in different parts of the section. Other velocity formulas give the velocity at a cross-section in terms of the dimensions of the cross-section and slope of the surface, and others again include the roughness of the channel. Even float experiments give very little idea of the actual motions of the water particles. Masses of water in a flowing stream are continually sinking from the surface to the bed and rising from the bed to the surface, and floats

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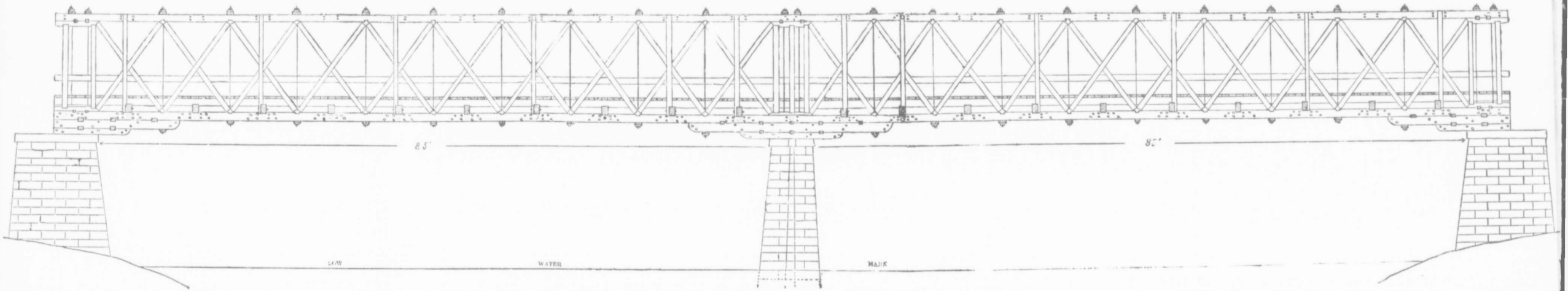

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HYDRAULICS.

By J. GALBRAITH,
Professor of Engineering, School of Practical Science, Toronto.

The flow of water in treatises on hydraulics is generally considered under the following heads, viz.: flow through orifices and notches, through mouth pieces or short pipes, through long pipes, and through open channels. The driving force is the force of gravity, or the pressure of pumps. The resistances are due to friction, bends, contractions and eddies, to gravity where water is raised, and to the machinery driven where it is used as a source of power. The principal applications of hydraulics are to waterworks, sewerage, drainage, irrigation improvement, and water power. Such being the case, the importance to the engineer of correct hydraulic formulas can hardly be over-rated.

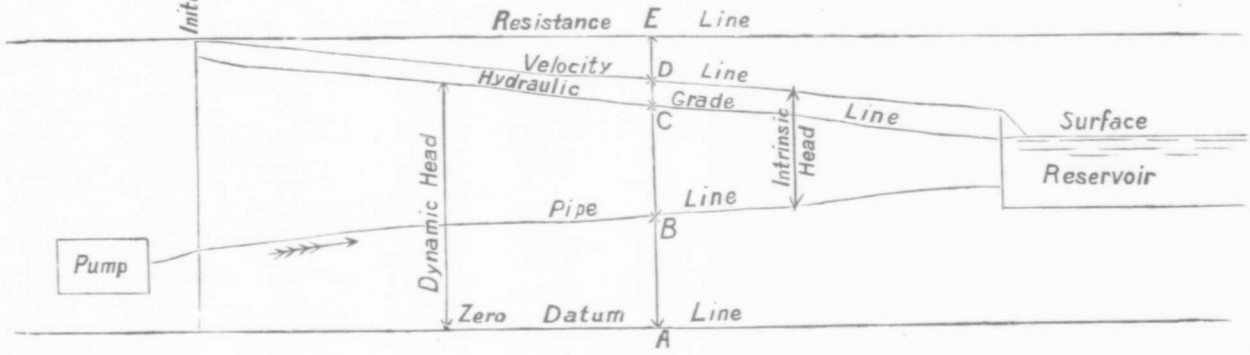
The main object of the great mass of experiments which have been made from the earliest times down to the present is the determining of the resistances due to friction. These are of two kinds, viz.: the friction of the water against the channel in which it flows, and the friction of one portion of the current against another, which causes eddies and all sorts of curious modifications of the flow; the resistance caused by bends and sudden changes of cross-section is probably due to the latter kind of friction. If frictional resistances could only be properly formulated and measured, hydraulics would become as exact a science as astronomy. It is manifestly impossible to trace every particle of water in a stream or pipe through its erratic path. It therefore becomes necessary to consider the motion by the method of averages. A cross-section of the flow is imagined, and the velocity found by dividing the discharge per second through this cross-section by its area is made the subject of investigation. This velocity is called the average velocity of the given cross-section. In the case of open channels a large number of experiments have been made by floats and current meters to determine the various velocities at different points in the cross-section, and various formulas constructed therefrom to enable the average velocity at the cross-section to be calculated from the greatest surface velocity, or from a small number of velocity observations in different parts of the section. Other velocity formulas give the velocity at a cross-section in terms of the dimensions of the cross-section and slope of the surface, and others again include the roughness of the channel. Even float experiments give very little idea of the actual motions of the water particles. Masses of water in a flowing stream are continually sinking from the surface to the bed and rising from the bed to the surface, and floats

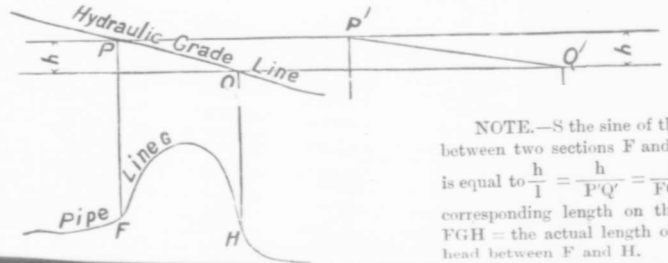
I.—HYDRAULICS.—CLOSED PIPE UNDER PRESSURE.

EQUATION OF HEAD.

$$h_e + h_p + h_v + h_r = H \text{ (a constant)}$$

$AB = h_e$ = elevation head
$BC = h_p = \frac{p}{w}$ = pressure "
$CD = h_v = \frac{v^2}{2g}$ = velocity "
$DE = h_r$ = resistance "
AC = dynamic "
BD = intrinsic "





NOTE.—S the sine of the hydraulic gradient or inclination between two sections F and H in a closed pipe under pressure is equal to $\frac{h}{l} = \frac{h}{P'Q'} = \frac{h}{FGH}$ and *not* to $\frac{h}{PQ}$ where PQ is the corresponding length on the hydraulic grade line, $l = P'Q' =$ FGH = the actual length of the pipe and h = loss of dynamic head between F and H.

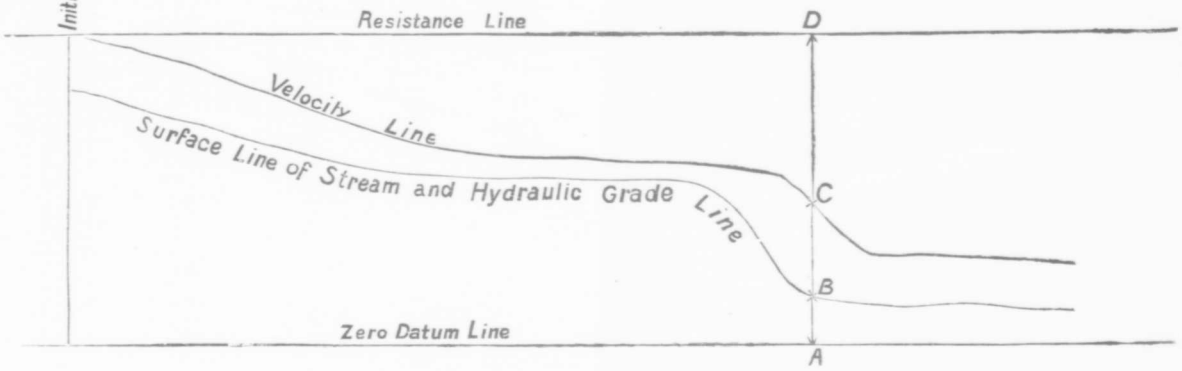
II.—HYDRAULICS.—OPEN STREAM.

head between F and H.

EQUATION OF HEAD.

$h_e + h_v + h_r = H$ (a constant)

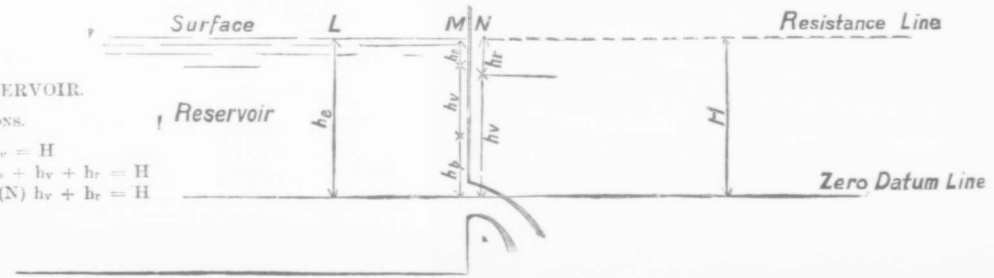
AB = h_e = elevation head
BC = $h_v = \frac{v^2}{2g}$ = velocity "
CD = h_r resistance "
also AB = dynamic "
BC = intrinsic "



FLOW FROM RESERVOIR.

HEAD EQUATIONS.

Hor'l Section at surface (L) $h_e = H$
Vert'l " orifice (M) $h_p + h_v + h_r = H$
" " vena cont'a (N) $h_v + h_r = H$



give no idea of these vertical movements. The motion of water in artificial channels and pipes is less complex than in natural channels, owing to the absence of disturbing irregularities. In spite of this, however, there is a considerable margin of uncertainty in the accepted formulas. In designing new works the engineer is forced to use formulas for average velocity and discharge, and must therefore provide a margin in his design sufficient in his judgment to cover the uncertainty of the formulas. In examining actual flows he may use appliances for measuring velocities and discharge which will give much closer results than the formulas.

The simplest and at the same time most useful case of flow which demands the attention of the engineer is that known as steady flow. The flow at a given cross-section of the stream is called steady when no alteration takes place in it with the lapse of time. When this is the case at all the cross-sections of the stream under consideration it follows that no accumulation or deficit of water can take place between the cross-sections; in other words, the same quantity of water must be discharging through all the cross-sections of the stream or pipe at the same instant. Hence the average velocity at a cross-section will be inversely as the area.

Perhaps the best way of obtaining a clear view of the generally accepted principles governing the flow of water is to study them as illustrations of the law of conservation of energy. Consider a case of steady flow in an open channel. Let Q cubic feet be the discharge past a fixed cross-section per second, w the weight of a cubic foot ($=62.3$ lbs. nearly), v the velocity at the cross-section in feet per second, $g=32.2$, then the energy of the discharge per second at the given cross-section in virtue of its velocity is $\frac{Q\,w\,v^2}{2g}$ ft. lbs. Let there be a second cross-section taken further down the stream, the difference of level of the surface at the two cross-sections being h feet, and let the velocity at the latter cross-section be u feet per second, then the velocity energy of the discharge per second at the second cross-section is $\frac{Q\,w\,u^2}{2g}$ ft. lbs. The increase of energy of the discharge per second between the two cross-sections due to the attraction of the earth through the difference of level h is $Q\ w\ h$ ft. lbs. Let the loss of energy between the two cross-sections of the quantity discharged per second due to all causes, such as resistances of the channel, friction of the air, etc., be $Q\,w\,h_r$ ft. lbs. We thus arrive at this equation,

$$Q\,w\,\frac{v^2}{2g}+Q\ w\ h-Q\ w\ h_r=Q\,w\,\frac{u^2}{2g}$$

which is simply the law of conservation of energy. Dividing out by the common factor $Q\,w$, or the weight of the discharge per second, we have

$$\frac{v^2}{2g}+h-h_r=\frac{u^2}{2g}$$

which is the equation referring to a discharge of one lb. per second.

Writing h_v for $\frac{v^2}{2g}$ and h_u for $\frac{u^2}{2g}$ we obtain the equation in the following shape—

$$h_v + h - h_r = h_u$$

which is known as the head or height equation. Put into words this equation may be read: The height due to the velocity at the first cross-section + the difference of level between the first and second cross-section − a difference of level due to the energy lost by resistances = the height due to the velocity at the second cross-section.

When the head equation is multiplied by 1 lb. it becomes the energy equation for a discharge of 1 lb. per second; when multiplied by $Q\ w$ lbs., the weight of the discharge per second, it becomes the energy equation for the discharge per second for that portion of the stream between the given cross-sections.

The simplest case of the application of the head equation is to a straight stream of uniform cross-section and inclination. In this case $u = v$, hence $h_v = h$, or the difference of level between any two cross-sections is equal to the difference of level due to the resistances. In other words all the energy acquired by falling through the height h has been removed by the resistances. Certain mechanical considerations have led hydraulicians to the belief that there is a relation between h_v and h_r, in this case expressed by the equation—

$$h_r = f\frac{l}{R} \times h_v$$

where l is the length of stream between the given cross-sections R, the hydraulic mean depth (obtained by dividing the area of the cross-section by the length of that portion of its boundary under water), and f a numerical coefficient. Now $\frac{h}{l} = S$ is the sine of the inclination of the water surface. Hence we have

$$S = \frac{h}{l} = \frac{h_r}{l} = \frac{f}{R}h_v = \frac{f}{R}\frac{v_2}{2g}$$

$$\text{Whence } v = \sqrt{\frac{2g}{f}}\sqrt{RS}$$

$$\text{Or } \qquad v = c\sqrt{RS} \quad \text{where } c = \sqrt{\frac{2g}{f}}$$

This formula is due to Chezy, and is the basis of all formulas for the flow of water in open channels.

The formula which seems now to have the greatest claims upon the acceptance of hydraulicians is the above formula combined with Kutter's formula for variable values of the coefficient c.

The Chezy and Kutter formulas seem also to be the most rational formulas for determining the velocity of flow in long pipes under pressure.

The question will naturally arise,—How is the value of S in such cases to be determined? Analogously to the suppositions upon which the Chezy formula was based, imagine two cross-sections of a straight

pipe of uniform calibre, the distance between them being l. Evidently the velocity in the pipe will be uniform between the cross-sections. Now h, in the case of the open channel, was the difference in level of the water surfaces exposed to the atmosphere at the given cross-sections. We have therefore to imagine a long open-topped vertical tube, to be attached to the pipe at each of the cross-sections chosen. The water will then rise to fixed heights in each of these tubes, the heights depending upon the amount of pressure in the pipes at the points of attachment, the value of h will then be the difference of level of the upper surfaces of the water in the two tubes. By the same reasoning as above $h_r = h$, also $S = \frac{h}{l}$, and the Chezy formula thus becomes applicable to long pipes with proper values of the coefficient c deduced from Kutter's formula.

The inclination whose sine is $\frac{h}{l}$ is termed the hydraulic inclination or gradient, and is synonymous with the actual inclination of the surface in open channels. In closed pipes, however, it is evident that the hydraulic gradient between two cross-sections may differ to any extent from the actual inclination of the axis of the pipe. If we define it as the ratio of the difference in level between the water surfaces when exposed to the atmosphere to the length of the channel between the given cross-sections, we have a definition which covers both cases.

The term dynamic head is a useful one in treating of the flow of water. By the dynamic head at a given cross-section of a stream is simply meant the height of the water surface above any arbitrary horizontal plane assumed as a zero datum of levels. Similarly the dynamic head at a cross-section of a pipe in which water is flowing under pressure is simply the height of the free surface of the water in a vertical tube attached to the pipe at the given cross-section above an assumed datum plane.

Thus the hydraulic gradient of any stream, whether in an open channel or close pipe, under pressure between two given cross-sections, is simply the ratio of the difference of dynamic head to the length of the pipe or channel between the cross-sections.

In order to draw the hydraulic grade line accurately for a pipe under pressure the sections should be taken at every point on the line of pipe where there is a decided difference of sectional area; at the beginning and end of horizontal and vertical bends; at both sides of valves or other obstructions to flow; and at all junctions with branch pipes. Vertical ordinates are then drawn at each cross-section, whose tops are at the heights of the dynamic heads above the assumed zero datum. The line joining the tops of these ordinates is the hydraulic grade line.

The definitions above given of hydraulic gradient, hydraulic grade line, and dynamic head hold in the case when the flow is not steady, and when the cross-sections and velocities vary whatever be the physical causes. Thus in the same channels or pipes the dynamic

heads and hydraulic inclinations may vary from instant to instant, as well as from cross-section to cross-section.

The general flow of water is in the direction towards which the dynamic heads decrease but for short distances, owing to acquired velocity, it may flow up a hydraulic grade line.

In fact the hydraulic grade line bears to water the same relation that the slide does to a toboggan. The descent of the toboggan is, on the whole, downwards; but, for short distances, it may rise over humps in the path.

The height above the axis of the pipe to which water would rise in a vertical tube attached to a pipe at any section is called the pressure-head at that section. The height of the axis of the pipe at the section above the assumed datum plane may be called the elevation head. Thus the dynamic head at any section is the sum of the elevation and pressure-heads, and the hydraulic grade line is the line joining the tops of all the pressure-heads of the pipe.

The height due to the velocity at any cross-section is called the velocity-head for that section. If now the ordinates representing the pressure-heads be extended by amounts equal to the velocity-heads, and the tops of these ordinates joined, we shall have a line above the hydraulic grade line, which may be called the velocity line, the vertical distance between these two lines at any point indicating the velocity-head at that point. The sum of the pressure and velocity-heads may be called the intrinsic head, as the energy of the discharge per second due to this head may be called the intrinsic energy. If we again imagine a horizontal line drawn from any point on the velocity line towards the direction in which the water is flowing, the vertical distance between the velocity line and this horizontal line at any point represents the resistance-head for the portion of the pipe between this point and the point in the pipe vertically below the point on the velocity line from which the horizontal line is drawn. Imagine now, all the ordinates produced to meet this horizontal line. We have thus five lines, namely, the horizontal datum line, the axis of the pipe, the hydraulic grade line, the velocity line, and the upper horizontal line, which may be called the resistance line. Any vertical ordinate is divided into four parts by these five lines, the first and lowest part is the elevation head; the second, the pressure head; the third, the velocity head at the cross-section of the pipe in question; and the fourth, or highest part, is the resistance head for the above described portion of the pipe.

Let H = whole length of ordinate between the horizontal lines—H is therefore constant.

h_e = elevation head.

h_p = pressure head = $\frac{p}{w}$ where p is the pressure per sq. foot and w is the wt. of a cubic foot of water.

h_v = velocity-head = $\frac{v^2}{2g}$ where v is the velocity at the cross-section in question.

h_r = resistance head.

We may then represent the above results by the equation:

$$h_e + h_p + h_v + h_r = H \text{ (a constant)}$$

for all cross-sections of the pipe below the arbitrary cross-section corresponding to the upper horizontal line.

In the case of flow in open channels h_p the pressure head is zero, and the hydraulic grade line coincides with the surface of the water in the channel, the distance of which above the assumed datum line is h_e. The corresponding equation in this case will be:

$$h_e + h_v + h_r = H \text{ (a constant).}$$

It will be easily seen that the head equation for an open stream in the early part of this paper is a particular example of the general equation; thus let the zero datum be at the level of the lower cross-section, and let the upper cross-section be the initial section. Then h is the h_e of the upper cross-section, the h_r of the upper cross-section is o, the h_p of the lower cross-section is also o, and the equation $h_v + h - h_r = h_u$, becomes $h_v + h_e + o = h_u + o + h_r = H$ (a constant).

These imaginary lines are of great assistance in studying the flow of water. The same system may be applied in studying the discharge from reservoirs through orifices. For instance, let the datum line be drawn through the centre of the *vena contracta* and the upper horizontal line coincident with the still surface in the reservoir. Then for the section at the *vena contracta* $h_p = o$ $h_e = o$ and the equation becomes: $h_v + h_r = H$. In other words, the whole fall H is partly employed in producing the velocity at the *vena contracta*, and partly in overcoming the resistance. At the horizontal section at surface of reservoir, $h_p = o$, $h_v = o$, $h_r = o$, $h_e = H$; and the equation becomes $h_e = H$ simply. Again, if we consider the section at the orifice, $h_e = o$, and we have $h_v + h_p + h_r = H$. In other words, the velocity in the orifice is less than in the *vena contracta*, because there is pressure in the orifice. In other words, the pressure that exists within the reservoir does not suddenly vanish at the orifice.

It must be remembered that the pressure that we speak of is not the absolute pressure at a point in the fluid, but the difference between the absolute pressure and the pressure of the atmosphere. It is in fact the pressure that would be indicated by a pressure gauge of ordinary construction. It must also be borne in mind that h_r depends upon h_v, and becomes zero when h_v becomes zero.

For illustrations of this method, the reader is referred to Plates I. and II. accompanying this paper.

DISCUSSION.

Mr. Gibson—I am very well pleased with the method of illustrating this intricate and somewhat awkward subject adopted by Professor Galbraith. I have always been very much pleased with this subject, but my experiment have always been conducted on too small a scale to be useful.

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

ROLLING PLANIMETER.

By G. B. ABREY,
P. L. S. and D. L. S., Toronto.

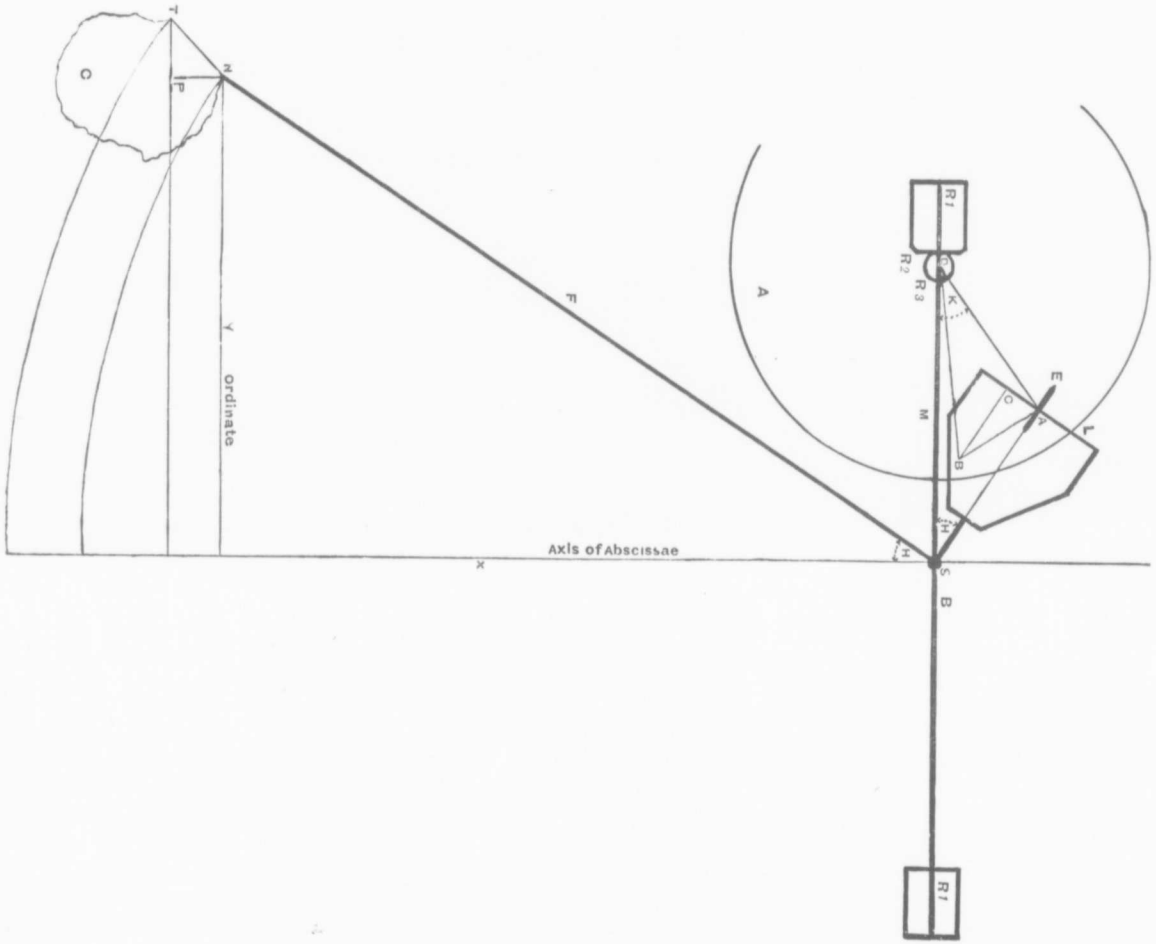
MECHANICAL integrators are constructed on the assumption that if a wheel is moved over a smooth surface in the direction of its axis it will slide without revolving, and if moved at right angles to its axis it will revolve without sliding, and if moved in any other direction it will both slide and revolve.

In the instrument here exhibited and represented in outline on diagram, it is mounted on rollers of equal size and equally weighted, and when moved over a figure the fulcrum of the tracing arm moves over a straight line, and it differs from those shown at our last meeting in the principle that they were anchored at a point termed the pole; this then, as you will see, cannot be called a Polar instrument. It possesses great advantages over all Polar planimeters, inasmuch as it will cover and measure at one operation a figure of considerable width and of unlimited length. It is also more easily manipulated than a Polar. In moving the instrument around a figure the arm is always nearly in a line at right angles with the axis of the rollers, and very little difference in force is required to move the tracer over one part than another, whereas with the Polar it is required over some parts to move nearly in line with the anchor point, and then from the greater force required the tracer goes by a more or less jerking motion.

The instrument is also what is called suspended, and possesses greater precision than any yet constructed; and although a large instrument it is very precise in measuring small figures. Of course, like all planimeters, it requires great care, and every part must go smoothly, and yet no shake in any place.

In describing the theory of this rolling planimeter it is convenient to develop it by a system of rectangular coördinates (see sketch). The tracing arm F is at right angles to the plane of the recording wheel E, and the axis of E parallel to F. In moving the instrument it will be observed that the speed of the recording wheel increases as the tracing arm moves away from the line X, drawn through its fulcrum g, at right angles to the axis B of the rollers, and reverses its motion in passing the line X, therefore with tracer on the line X the recording wheel generates no motion. We will call the line X, which is the path of the fulcrum of the tracing arm, the axis of abscissæ, and all lines perpendicular thereto ordinates. It will also be seen that if the rollers R remain still, that moving the tracer to either side does not cause the recording wheel to revolve, as it simply slides on the disc A in the direction of its own axis.

ROLLING PLANIMETER.



Let c be any figure to be measured, and tn be an element of its perimeter. In moving the tracer over tn its path may be considered as made up of two motions, one parallel to the axis X, and the other at right angles thereto. Now as the latter of these motions in the direction of the axis of ordinates is but an alternate motion of the tracer, which takes place in an equal ratio, by the time the tracer returns to the spot it started from the plus and minus motions of the recording wheel balance each other, and we conclude that all components of motion of the tracer at right angles to the axis of abscissæ have no influence on the result, we will therefore only discuss a differential motion of the tracer in the direction of the axis of abscissæ. Now, it is to be shown that the motion of the wheel E, caused by moving the tracer over the path pn, is equal to the corresponding area $y.pn$ multiplied by some constant, which is a function of the dimensions of the instrument. Now, it will be seen that if the tracer is moved over the elementary path pn the entire instrument is moved on the rollers the same amount. This causes a movement of the pitch circle $R_2 = pn \frac{R_2}{R_1}$ This is conveyed to the disc A, through R 3, so that any point on the disc, as a, distant ad from its centre, moves through a distance $= pn \frac{R_2}{R_1} \times \frac{ad}{R_3}$. The motion of that part of the disc on which the recording wheel rests $= ab$ causes the circumference of the wheel E to revolve an amount = the component of ab at right angles to the axis R of E. This distance is bc and is the measure of E's motion. It is now only necessary to show that $bc = y \,.\, pn$ multiplied by the instrumental constant. Now, $bc = ab$, sin bac, but $bac = k + h$, = supplement of dag, because dab and gac are both right angles. Also from dag we have sin dag to sin agd, as M to ad. That is sin $(h + k) = \frac{m \sin h}{ad}$. Fga is also a right angle, and $Fax = h$, therefore sin $h = \frac{Y}{F}$, and we may write $bc = ab$. sin $(h + k)$ $= ab \frac{m \sin h}{ad} = ab \frac{my}{F.ad}$ and by substitution of values of ab from (1). We have $bc = y.pn \frac{m R_2}{F R_1 R_3}$, and as M, R_1, R_2, R_3 and F are all constants for any one instrument. We see that the wheel record is a junction of the area generated by the tracer and the instrumental constant, and that the sum of all the elementary areas included between the path of the tracer, the limiting ordinates and the axis of abscissæ is represented by the total wheel movement, or the difference between its initial and final readings. Now if the area to be measured be bounded by one right line and limiting equal ordinates, it would not be necessary to move the tracer over the entire perimeter provided the instrument could be adjusted with the point g exactly over the base of the figure, and with the axis B at right angles to it, so that in rolling the instrument along, the point g would remain over the base line. Then, for motion of the tracer over this line, the recording

wheel would not revolve, and for equal end ordinates ± recordings would balance, so that for the portion of the figure bounded by the base and the equal end ordinates no area would be generated. This is explained a little differently in Professor Johnston's Surveying, and if I have understood what is there stated his explanation is not exact. He uses the expression end ordinates, whereas it should be equal end ordinates. To simply pass the tracer over the irregular part of the boundary would give the area of the figure shown in curved outlines on the diagram, and not that bounded by the y ordinates. In practice, we have to trace the whole figure, as it would generally be impossible to so place the instrument that the fulcrum would travel the path of the figure's base.

From the theory it will be seen that the distance ga of the wheel E from the tracing arm is immaterial and is not a function of the area, but the axis of E must be parallel to the axis of the tracing arm, else the area generated by the tracer on one side of the axis will be greater than on the other. This suggests a test for the adjustment—for suppose we draw two figures, say of equal areas, one on each side of the axis of abcissae, it will be seen that if the axis of the recording wheel is not parallel to that of the tracer the measured areas will not agree. The instrument is fitted fully for making this test, and with an eccentric socket at one end of the axis L, which may be adjusted until the areas of equal figures will agree. Also from the same figures, if we know their areas in any desired unit, we may test the corrections, of the length of the tracing arm, and adjust it by the clamp and tangent provided. If the known area reads $\frac{1}{n}$ too great or small, adjust the arm by $\frac{1}{n}$. This same principle enables the instrument to be adjusted to correctly measure an area of which the plot may have shrunken. Of course the instrument measures the area of the plotted figure drawn to scale. This record then requires a suitable multiplier to get the area of the field, or cross section, of which the plot is the diagram, and it is immaterial whether the horizontal and vertical scales are alike or not. In practice it is desirable that the point from which we start to trace be as near the axis of abscissæ as possible, as a small error in bringing the tracer back to same point is then a minimum. Also, if possible, an approximately equal area should lie on each side of the axis of abscissæ, to eliminate any remaining error in the axis of E. The figure should be traced slowly and by an easy motion forward. Too great a speed, or a jerky motion, may cause the recording wheel to slip.

The accuracy and precision of this instrument may be seen from the published tests. In repeating the tracing of a figure the difference should not be more than about 0·002 of each other. With an Amsler Polar, I found the difference of two readings might be about ·02 on the vernier, and was not satisfied with anything greater than that. This error would be about the same independent of the size of the figure. With this instrument the error is more nearly some per cent. of the size of the figure.

In this instrument there is a counting wheel having a differential motion, counting revolutions of the recording wheel up to 420 circum-

ferences. The vernier of the recording wheel subdivides its circumference into 1,000 equal parts. The tracing arm is divided into half millimeters. For English measures index marks are given by the makers for 0·001□″, 0·00001□′, and 0·002□″, thus corresponding to a length of arm of 346·9, 499·3, 692·3 half millimeters, or in English 6·829, 9·837, 13·681 inches. With care in tracing, the instrument should give the true area of the figure to within the $\frac{1}{1000}$ to the $\frac{1}{10000}$, depending upon its size. The instrument may be arranged to give cubical contents as well as surfaces.

DISCUSSION.

Mr. Gibson explained his method of finding areas by traverse table and scaled offsets.

Mr. Abrey—Your method is only guessing at it. I have used the Planimeter on Government work for fifteen years and have always been checked by the Department, and have never found any error.

Mr. Gibson—I think that the Planimeter would work very well for ordinary work, but the traverse table will do for calculating land areas, etc.

Mr. Abrey—The United States Coast Surveyors use this instrument altogether. There is another principle, that of repetition; you can give the figures as often as you please and take the mean. If you are not satisfied you change your base and go around again and you eliminate all errors.

Mr. Fawcett—It is pretty hard for us to fully understand Mr. Abrey's mathematics. Of course that paper gives us the theory of the work, but what we are more particularly interested in is the practical application of it. If Mr. Abrey takes the instrument, and measures a figure, so that we can see the working and facility with which it can be done, I think it will be very interesting.

QUESTION DRAWER.

LAND SURVEYING.

QUES. 1.—When a post and board fence constitutes the boundary between two lots, what is the precise location of the division line? Is it the line through the centres of the posts, or the line between the posts and the board, or the centre line of the fence considered as a whole?

ANS.—The discussion on this question is too lengthy to be given in detail. Some members held that the line was between the posts and boards, others that the line through the centres of the posts was the true line, and others again that it was the line midway between the outside limits of the fence. A member pointed out that the desideratum was to secure uniformity of practice throughout the country, especially when new fences are being erected. Another member informed the meeting that in Toronto the judges had held that the line between the post and board was the correct one, but that this decision was founded upon custom. Finally it was moved by Mr. Chipman, seconded by Mr. Burnet, That the centre of the posts should be placed on the line. Moved in amendment by Mr. Sankey, seconded by Mr. McAree, That the line between the posts and the boards be the true division line.

The amendment was carried.

QUES. 2.—In chaining a boundary line crossing a river I note the abrupt descent to the river valley at 14.84 chains, the edge of vegetation as 16.95 chains, and the edge of the water of the stream at 17.30 chains; between the edge of the vegetation and the edge of the stream is bare gravel, being in fact a part of the bed of the stream when the water was higher than it is at the time when my notes were taken; at 14.84 chains is what might be called the top of the river bank. Which of these three numbers is to be *written on the plan* as giving the length of this boundary between the corner where the chaining was started and the river?

ANS.—Messrs. Aylesworth, Niven, Campbell and McAree considered that the measurement should be taken to the edge of vegetation.

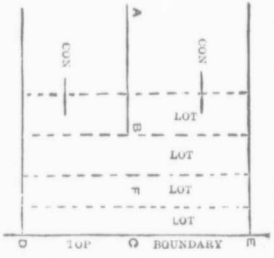
Mr. Sankey—I understand that legally high water-mark is the proper mark; a person can legally extend his boundary to high water-mark, and protect himself from any encroachment within that limit.

Mr. Jones—It is pretty hard to give a rule that would cover every case.

Mr. Niven—I think these questions can best be settled by the surveyor on the ground.

QUES. 3.—In following a concession line it becomes obliterated or lost within half a mile of the Township boundary: How do you establish the line when no post is to be found on the boundary?

ANS.—Mr. Chipman—That appears to me rather vague, and I think there is but one solution, viz., by chaining from *E* to *D*: divide up and connect *C* and *B*. This would be according to the Act.



Mr. Kirkpatrick—Suppose you find a marked tree at *F*?

Mr. Chipman—Join *B* and *F*, and *F* and *C*.

Mr. Kirkpatrick—A case in point occurred in the Township of Enniskillen, where a Surveyor having to run a line, ran a straight line from *B* to *C* as it were, but contrary to law I fancy, for instead of defining the boundary between the two concessions by the straight line from *B* to *C*, he should have established the corners of the lots along the missing boundary by dividing proportionately the total depth of the two concessions at the various corners, and then joining the corners so found: thus *B C* might be a broken line instead of a straight one. As it happened, there were several oil wells, which by the straight line theory would have been placed in a different concession from the one they were always supposed to be in, and it was going to raise a terrible row. In that case it was a blind line I think.

LEGISLATION.

QUES. 1.—Does subsection 2, sec. 63, chap. 25, 50 Vic., apply to compiled plans?

ANS.—A Member—Looking at the Act as to certificates of Surveyors as amended at the last session of the Legislature I cannot see how a Surveyor can certify to a plan of which he does not make a survey, that is to file and certify to a plan which is nothing but a compilation of old plans, and the Surveyor may never have stretched a chain across the land. Therefore I cannot see how a Surveyor can sign that certificate.

Mr. Stewart—I entertain the same idea, because you are certifying to a plan to be filed in the Registry Office that may have been compiled from a number of other plans. Before such could be registered I think an actual survey must be made. I suppose the question is whether I can attach that certificate to a compiled plan?

Mr. McAree—I think the Surveyor should state on the plan the source from which he derives his information, and merely certify to what he did himself, and not make himself responsible for the work of other people.

Mr. Kirk—A person came to me a few days ago and wanted some original lots (three or four) subdivided, and wanted to have the plan registered so that he could make sales of it, but he did not want to

have it surveyed. I showed him the Act, and pointed out the difficulty. I said I could not do it and certify to the plan for registration, as required by the Act, without first making a survey of the ground. He said, "Oh, you are too particular about trifles." He admitted himself that it was not right for him to do so, and the consequence was that he got me to survey the ground.

Mr. Chipman—I ask if a Surveyor can conscientiously sign that certificate?

Mr. Dickson—He would want an elastic conscience.

Mr. Kirkpatrick—Does not the 4th section of the Act meet it?

Mr. Chipman—I think the whole Act respecting the compiling of plans is very defective.

Mr. Dickson—It would entail a large amount of expense for a Surveyor to have to make a new survey in every case.

Mr. Chipman—I suggest that the Legislative Committee be hereby instructed to examine into the Act referring to the compiling of plans, and get the necessary legal assistance, and draft such amendments to the Act as may be considered necessary, and submit them to the next meeting.

QUES. 2.—Is it not compulsory for a P. L. S. to file evidence in Registry Office of county in which lands affected are situated? Sec. 72, chap. 25, 50 Vic. If P. L. S. refuses to file evidence can he be compelled to do so? If so, how?

ANS.—Mr. Dickson—I was a witness in a case tried before Mr. Justice Patterson, and I had filed notes of evidence in the Registry Office, and the other party had not, although the Surveyor had taken his field notes; the judge decided against him, as he had not complied with the law in filing his notes. The case was appealed, and Judge Morrison concurred in the decision of the former judge. My opinion is that every one of a Surveyor's notes should be registered. I register them as soon as I can after taking them, and put an entry in the field book of the date of registration of such notes.

Mr. Chipman—But suppose a Surveyor does not do it, how are you going to make him?

Mr. Stewart—If the Act says he shall he can be proceeded against for not doing so.

Mr. Gaviller—In sec. 72 of the Act it reads "may be filed." I have heard the opinion that "may be" means "shall."

Mr. Kirkpatrick—The question is quite clear that the evidence shall be filed, and the plan or other documents may be filed.

Mr. Warren—I once applied to a registrar to register some affidavits that I had taken in regard to posts and monuments, and he would not do it. I pointed out to him that we had to do it in compliance with the Act; he said he would not do it, but would keep them in his office, and they were filed in that way, without being actually registered.

Mr. Kirkpatrick—I think that the evidence should be filed with the plan and other documents relating thereto, and if the Surveyor refuse to do so I suppose you can get an order from the County Court Judge to compel him.

Mr. Stewart—I think where there is an Act providing that certain things be done, and a person infringes that Act, there is a penalty for any such infringement under the common law.

Mr. Dickson—Don't you think from the reading of the Act it compels us to file the evidence?

Mr. Kirkpatrick—I think so, certainly. [Section of the Act read.] That section evidently presupposes that the Surveyor must decide what the expenses will be, and he is empowered to determine the same without going to the Registry Office to find out, and having done so to put the charge on both parties.

QUES. 3.—In preparing compiled plans of villages and towns are errors in old plans to be perpetuated or corrected?

Mr. Burnett—I have made sales where I had to change the description in the deed as described in the old plan.

Mr. Chipman—I would like to ask Mr. Burnett what he would do in a case where one lot too many was registered. This case occurred to me. I could not make it fit in the plan.

Mr. Burnett—Was it shown on the registered plan?

Mr. Chipman—Yes, it was made up of fifteen or twenty different plans, but it would not fit, as there was no room for it. What would you do in that case?

Mr. Burnett—Were you copying an original plan?

Mr. Chipman—I was compiling a plan, and this particular plan was made up of several parcels; but this particular lot would not fit in, although all the others did.

Mr. Burnett—That was a special case.

Mr. Stewart—That, Mr. President, no doubt occurred in consequence of the land not having been surveyed, and this kind of thing we are trying to avoid. That lot was to be put in but there was no room for it; that is the way it was dropped out of the original.

QUES. 4.—To what extent are the field notes of a deceased Surveyor admissible as evidence in court?

ANS.—Mr. Stewart—I heard a case tried before the County Judge in Barrie, in which a square fight was made about the admission of Charles Rankin's notes; copies of the plan were produced, which showed that a certain side road was not run as stated in the original; and they wished to introduce his personal notes in support of their contention, and we succeeded in keeping them out on the ground that they were merely copied from the book used in the field. Another objection that we took was that we had not his full notes. The judge

ruled that he could not admit them as evidence. They were notes of the original survey, but were not signed by Charles Rankin. Another Surveyor swore that they were in his handwriting.

Mr. Kirkpatrick—I have no doubt that ruling was correct regarding an original survey, but suppose a Surveyor made a survey thirty years ago, and I have his field book stating what he did; it is not signed, and the only connection is that his name is in it; I go on to the ground to make a re-survey, and find the posts and monuments as stated in his field book. Can I not bring his notes and book into Court to support my position? I have done so. I think the notes of a deceased Surveyor should be taken for just what they are worth.

QUES. 5.—Is there a section in the "Survey Act" for making re-surveys of township lots in those townships in the districts of Algoma and Nipissing laid out into lots containing 320 acres? If so, which?

QUES. 6.—What is the difference between a section block and an alternate concession survey?

QUES. 7.—What is the governing line in a section block and in an alternate concession with the side lines run in the original survey?

ANS.—Mr. Kirkpatrick—This case seems to be thoroughly settled in the case of the Corporation of Stafford *v.* Bell. This was a case in which a sideroad had to be re-established, the governing line for which was the sideroad on the opposite side of the block or *section*. This governing sideroad had an original post still standing on the "blind line," but said post was about a chain and a half off the straight line joining the adjacent corners of the section. The line through these corners and the original post at the "blind line" was thus a broken line, and the various Surveyors who attempted to establish the sideroad in question committed the error of taking this broken line for their governing line, instead of making the straight line between the section corners their governing line, as required by the Act; in so far as taking their bearing was concerned they should have ignored altogether the post on the "blind line."

Mr. Burnett—Were not the posts on the "blind line" planted in the original survey under instructions? If so, I think those Surveyors would be quite correct in taking their bearing from that post.

Mr. Kirkpatrick—I think not, because you cannot override the Statute. These posts were only to govern as defining the angle of the lots.

Mr. Burnett—I suppose, then, if these posts were not planted under instructions they could not be recognized.

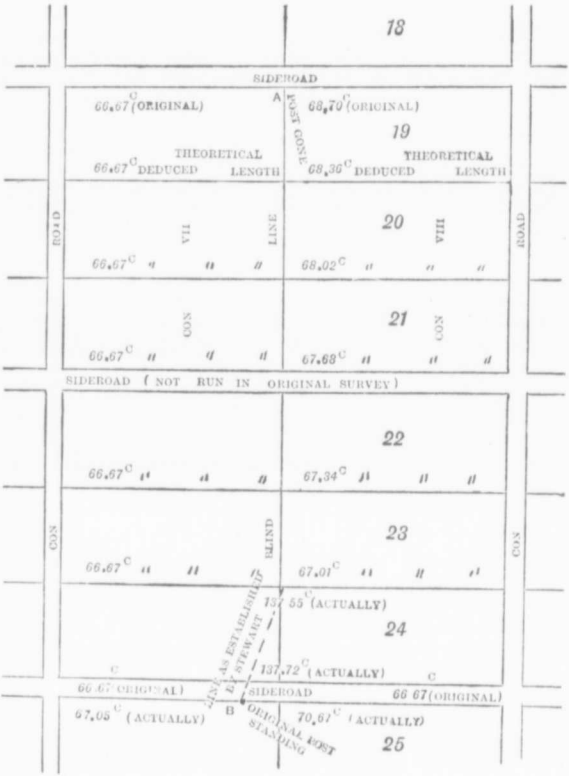
Mr. Kirkpatrick—Unless planted under instructions from the Department they would not be binding even as measuring points, although planted in the original survey.

Mr. Burnet—Suppose that the field notes show that these posts *were* planted in the original survey, but there is no evidence that they

were planted *under instructions;* would you, in that case, recognise them as governing the bearing?

Mr. Kirkpatrick—There has not been, so far as I know, any decision on that point.

Mr. Stewart—The annexed diagram represents a case that occurred in my practice in the Township of Nottawasaga.



It was required to run the "blind line" between concessions 7 and 8, across lot 24. The post at *A* had disappeared, but the post at *B* was standing. The only depths of lots given on the original plan are the depths marked on sideroads between lots 18 and 19, and 24 and 25 respectively. Since the sideroad between lots 21 and 22 was not run, we must consider the twelve lots in question as one block or section. The points to be established are the corners of lot 24 on

the "blind line, and this is how I established them. I adhered to the old post which I found at *B*. I considered that it was the true corner on this sideroad (24 and 25), between the adjacent concessions. The other corner on the "blind line" of lot 24 I established by ascertaining the actual total depth of the two concessions along the line between lots 23 and 24, and dividing that distance in the ratio of 66.67 to 67.01, which ratio I obtained as follows:—According to the original plan the concessions should have an equal depth on sideroad between lots 24 and 25, while on sideroad between lots 18 and 19, the depth of concession 8 exceeds the depth of concession 7 by 2.03 chains, *i.e.*, the difference in the depths increases from zero to 2.03 chains in crossing the six lots, or at the rate of 34 links nearly per lot; therefore the ratio of the depths between lots 24 and 23 will be as 66.67 to $(66.67 + .34) = \frac{66.67}{67.01}$

Mr. McAree—The question is whether that post at *B* should be recognized.

Mr. Burnett—Was it the intention in the original survey that the depth should be equally divided?

Mr. Stewart—Yes, but they were not so divided.

Mr. Kirkpatrick—I think you will find that it was the intention that they should all be 200 acres.

DRAINAGE.

QUES. 1.—Does the Act respecting Ditches and Watercourses apply in the case where owners who have in consequence of some digging on the part of those living above them, had their lands overrun by water, or must they gain redress in some other court?

ANS.—Mr. Proudfoot—I think the Ditches and Watercourses Act applies in this case. If a man has a lot of land which is flooded from above he can call on an engineer to make an order to have it removed.

Mr. Gibson—What section applies to that?

Mr. Proudfoot—It is generally provided by the Act.

Mr. Gibson—Do I understand that if a person from above turns water from him, that a person below can call on an engineer.

Mr. Proudfoot—He can within fifty rods above him, but you cannot exceed that distance. But a party cannot get anything like the amount of damage under the Ditches and Watercourses Act as he can under the Common Law.

QUES. 2.—*Re* sec. 1, sub. sec. 4 of Amend. 1887. It says, "Any one of the owners who is liable for maintaining and keeping in repair any portion of such ditch or drain may in writing notify, etc." How shall they proceed where it has been the allotted portion of only one party to maintain and keep the ditch in repair?

Ans.—Mr. Abrey—When one man has the whole ditch to keep in repair, and does not do so, it is likely the engineer would call upon some other party to keep it in repair. The same way when there are more than one party.

Mr. Gibson—Suppose you and I have property adjoining, yet I have to keep the whole ditch in repair, yet I understand that the party who has to do the work is the one who has to give the notice.

Mr. Proudfoot—If a man has a whole drain to keep in repair and he does not do it properly, then I think the next man can keep it in repair.

Mr. Jones—I understand that when there is only one man to do the work, he is the one who has the benefit; as the people through whose land it may pass cannot notify him, as they are not the ones who originally had to keep the ditch in repair. The Act says any one is liable to maintain any portion of this ditch; and there is no provision to call upon the engineer supposing the person himself refuses to do it: he is the only one who can call upon the engineer.

Mr. Proudfoot—In cases where ditches are dug by other parties they are liable to keep them in repair.

Ques. 3.—*Re* sec. 1, sub. sec. 7, 3rd line, "him." Does this refer to the engineer or inspector, or either?

Ans.—Mr. Jones—I think that might be got over by inserting "Or any person through whose lands such ditches pass."

Ques. 4.—See 46 Vic., cap. 27, sec. 3, 14th line. After the words "or widened" would it not be well to make the following change, so as to make it clear that the engineer has the power to order one person to make a portion of drain and another person to maintain said portion?—"Unless the engineer hereinafter named otherwise direct, either in the award in respect of the original opening, deepening or widening, or subsequently, in consequence of altered circumstances, upon application of any party interested in the same form and manner, etc., etc., as in this Act provided."

Ques. 5.—See 46 Vic., cap. 27, sec. 6, 8th line, as amended by 50 Vic., cap 37, sec. 3. After the word "purpose" reads as follows: ". . . Be asked to appoint a day in which he will attend at *the time* and place named in the requisition, etc." The words in italic should be left out; also in "Form C," after the word "drain" in the 15th line leave out all the words to the word "noon" in the 17th line. As matters now stand the engineer has not the appointing of the day.

Ans.—Mr. Proudfoot—I don't think it is necessary to strike out the words "at the time," as the engineer receives a letter beforehand asking him if he go out, etc.

Mr. Jones—The only trouble is that the Act already provides that they shall name a time and place, and this is already fixed.

Ques. 6.—Sec. 8 of 46 Vic., cap. 27, will need some amendment, such as the following 4th line; "At the time appointed by himself and at the place named in the requisition."

Ans.—Mr. Chipman—This goes right back to the same thing as the other.

QUES. 7.—See 46 Vic., cap. 27, sec. 18, 6th line. After the words "original proceedings," what is the meaning of the following sentence ?—"But no person shall make use of such ditch or drain constructed under the provisions of this Act, unless under agreement or award pursuant to its provisions as to the use of the lands of others."

ANS.—Mr. Proudfoot—The way the Act stands we cannot assess a man's land more than 60 rods from the drain, but in the award there may be something provided for paying the other parties for the use of the drain they have dug. We could not bring him in if he is 60 rods from the drain.

QUES. 8.—In sec. 1, c. 43, 47 Vic., amending sec. 3, c. 27, 46 Vic., who is to decide where a proper outlet is reached ?

ANS.—Mr. Chipman—I know of a case where the engineer thought he had decided all right, but the Court decided that he did not know anything about it.

QUES. 9.—If the lower owner will not give his consent to construction of ditch on to his land, must the ditch be carried across his land ?

ANS.—A Member—You would just have to follow the provisions of the Act.

Mr. Abrey—I happened accidentally last week to see a letter to the Attorney-General by a member of the Association of Civil Engineers, asking that no person can act as civil engineer except a civil engineer under that Act.

Mr. Galbraith—I hope this Association don't think I have any hand in it.

INSTRUMENTS.

QUES. 1.—What is the best method of illuminating the telescope crosshairs at night, and what is the best lamp for night observations generally ?

ANS.—Mr. Abrey—I think that for illuminating the crosshairs at night the method of illuminating the cross axis is the best.

Mr. Chipman—I think that it would be better not to illuminate the cross axis, as this mode heats it up too much. I believe in lighting through the object glass when the star is not less than the third magnitude, but if smaller than that some other method of illuminating would be necessary.

Mr. Dickson—I have been in the habit of having the light held by an assistant at a distance from the instrument. I never yet failed in taking an observation even with a reflector; and if an assistant cannot be obtained to hold the light you can put it upon a pole.

Mr. Burnett—If you simply take the object glass off the telescope, and put in a piece of white paper around the inside of the telescope tube, this will act as a capital reflector.

Mr. Sankey—If you take a brick and soak it in coal oil, and have it held at a distance of three or four feet from the instrument, this will answer the purpose. It will burn half an hour or an hour.

Mr. Dickson—At a distance of ten or twelve rods I have never had any trouble with a flambeau.

Mr. C. A. Jones—I have sometimes used a reflector, but did not use the ordinary lamp that goes with the instrument. I had the light held at two or three feet so as to throw the light into the reflector, then the instrument is not affected either by heat or extra weight.

QUES. 2.—Has any one experienced difficulty on account of the spindle of his theodolite working too stiffly in very cold weather? Is there any remedy?

ANS.—Mr. Abrey—Use little or no oil in cold weather. I have used instruments at fifty or sixty degrees below zero, and there is a difficulty when using oil. It is recommended to wipe the axis perfectly dry for winter work, but it is also recommended to use black lead, but there is an objection to this latter method, as it is not easily distributed on the spindle. I may say that I rubbed the spindle of the instrument with the oil of a badger, and my instrument never bothered me again. I suppose the oil of any other animal would be as good.

QUES. 3.—How do you prevent the telescope axis from climbing in the Y's while the vertical arc is being moved by its tangent screw?

ANS.—Mr. Chipman—This motion may be caused by opposing screws at lower end of clamp arm to vertical circle not moving in same straight line.

QUES. 4.—Required formula for errors in azimuth caused by the following errors (supposed to be small) of adjustment in the Surveyor's solar instrument (Equatorially Mounted, Transit or other instrument), with their effects in surveying in changes of hour angle both forenoon and afternoon, and in different latitudes and declinations:

(*a*) Error due to error of the latitude zero.

(*b*) Error due to error of the declination zero.

(*c*) Error due to inclination of latitude axis, viz.: Latitude axis not horizontal or perpendicular to spindle of instrument.

(*d*) Error due to the inclination of polar axis, viz.: Polar axis not perpendicular to latitude axis.

(*e*) Error due to inclination of declination axis, viz.: Declination axis not perpendicular to polar axis.

(*f*) Error due to error of collimation, viz.: Collimation not perpendicular to the declination axis.

ANS.—Mr. Abrey—I may say these are all very difficult questions. I know the effect of the errors, however. I took trouble to ask those whom I thought could answer them. Professor Galbraith said they were very difficult, but his time was too much taken up with the School of Practical Science to allow him to go into the matter. I also asked Mr. Carpmael, and he has not yet given his answers. I also asked Mr. King, of Ottawa, and I have his answers to the whole of them, and I would like to have them published in our Report. I should like also to have Mr. Carpmael's answers (when received) published. It is really necessary for us to know what these are, for all the instruments. Mr. King's answers are not lengthy.

BOUNDARY COMMISSIONERS.

DISCUSSION.

Mr. Abrey—I will have to make an apology in reference to this matter, as I have made no preparation for it, and I don't like saying anything at all, still I believe it would be a good thing if we could get it accomplished—one commissioner I think would be enough. We should I think have some legal advice on the matter; it might be done I think by taking some lawyer on the Committee.

Mr. Niven—I have given this matter some little consideration, but I think this proposed act of Mr. Ogilvie's will be too expensive, as it I think would necessitate having three arbitrators appointed. Our people should have the privilege of accepting one; in many cases one might settle the disputes that arise on boundary lines. They should have the option of having two, and if these two could not agree, then they might choose a third. I am not prepared to submit any particular scheme, but I think it would be well to appoint a committee to look into this matter and report before our meeting dissolves. I would move that a committee be appointed to consider this question and report at a future meeting.

Mr. Abrey—Of this session or another season?

Mr. Niven—I think we might have it this session.

Mr. Sankey—The motion has not been seconded, and I will be pleased to second it. I would like to say that I have had the opportunity of discussing it with some members of the legal profession, and I think we have got to admit the legal profession into the discussion. One of the amendments proposed was this: If two Surveyors are appointed by the parties interested then the County Judge is the third. In a case where you could establish a court there could be no reason why the parties interested might not select counsel to represent them at that court. I think two Surveyors can tackle two lawyers and keep them in bounds. The question that bothers Surveyors at court is, what is evidence and what is not, therefore this court requires to know what is evidence and what is applicable. There is another point—a court established in this way would have no power—because the County Judge has no jurisdiction over boundaries. These powers are all vested in the High Court of Justice. These are points I would like to bring before the meeting. No doubt all admit that Mr. Ogilvie's scheme is a wise and useful one because the evidence can be got on the ground, and if the court sees it on the spot it has great weight. Then the difficulty again, that the witnesses may be all posted as to their answers. Then with regard to having Surveyors appointed;

questions may come before the court that nobody but a Surveyor can answer. But the principal difficulty we have to contend with and the real difficulty, is the construction of such a court with such powers as they would have. Unless you bind both parties pretty tight they kick the whole thing over. Then another difficulty may occur; this court would have a president, then three or four decisions may run one after the other, some fellow goes wrong and says the chances are the decision will go against you. But supposing you don't take it to this court at all, and go to the High Court of Justice then the decision is likely to be kicked over. If we are going to make this a practical thing we want to do it with the assistance of some legal mind. I think we should get a good lawyer to try to help us; personally I am very much in favour of it, and if a court were once got into good working order it would save a lot of trouble, but if we don't establish it on a proper basis on the start it will fail at once. Surveyors themselves have not knowledge enough to frame rules without further assistance, and it would be well for this committee to add legal assistance to their numbers. I have spoken to one or two legal gentlemen about it and they all seem to think that a Judge in a higher court always makes a reference to the Master, and then the Court makes the award.

Mr. Stewart—Mr. President, I have not given this matter much attention since last year, but I was led to consider that something of the kind might be done by the arbitrators similar to those who are appointed to settle railway matters, and I think we might settle this in much the same way, viz., that the two parties each appoint an arbitrator, and the County Judge be the third, or some one appointed by the County Judge. With regard to the last speaker's suggestion that the County Judge be a third party, I think that was mentioned too. But I think it would be almost impossible to get the Judge to take hold of it, for the reason that I think an appointment made by a Judge would be preferable. I have spoken to a legal gentleman and he thought you should have a court for establishing matters of this kind, that he had noticed the need of such a court, and suggested our establishing one at once. I asked him if it would be subject to appeal; he thought not, that we could make the thing final. There is one clause in this motion that I think would be difficult for a Surveyor to subscribe to. [Reads clause.] I don't think that a Surveyor should attempt to arbitrate on his own work. Now he may not be interested in that way, but he might be interested in some other survey of a similar nature, and he cannot help being prejudiced in favour of his own fees. I approve of Mr. Sankey's idea of appointing a committee and I will second the motion.

APPENDIX.

LIST OF EXHIBITS.

List of Stationery Exhibited by Hart & Company, 31 and 33 King Street West :—

Whatman's hand-made drawing papers, rough, medium or smooth, imperial tracing linen, in rolls 36 and 42 inches wide, tracing paper, in rolls, cross section paper, in rolls, profile paper, in sheets, Faber's Siberian graphic pencils, all grades, Indian ink, finest quality, in sticks, rubber and steel erasers, drawing pins, vulcanite rulers, level books, transit books, record books, cross section books, field books, specification papers, samples of printed note heads and envelopes, specimens of finely engraved steel dies, for professional and private note paper and envelopes.

System of Drainage Tables. Calculated for the use of Township Officers, Contractors, Land-owners, and all persons interested in drainage works. By J. H. Jones, D.L.S. & C.E., of Sarnia, Ont. Price $1.50 cloth, and $2.00 limp morocco.

The Map and School Supply Company, 31 King St. East, exhibited some specimens of Map-mounting, including plans on tracing cloth, mounted on cloth and on card board ; also some of the same varnished and mounted. They also sent in some folded for pocket use and for filing in cases, some of which showed a good degree of skill in the arrangement for mounting and folding a really large map to fit a small case. This Company are reliable and will give satisfaction in their line.

Fred. J. Sager of Columbus, Ohio, exhibited some patent band chains done up in patent self-winding reels which attracted attention.

Messrs. Unwin, Brown & Sankey, Surveyors, showed some maps and plans of the old times, which showed a large amount of draughting compared with what is now done upon plans of equal importance.

Mr. Chipman exhibited form of Field Book for Crown Surveys; also General Index Book for Township and Town Surveys.

Mr. G. B. Abrey exhibited a Rolling Planimeter.

COMMUNICATIONS.

President Prov. Land Surveyors' Association:

DEAR SIR,—For some time the Canadian Institute has been putting forth efforts to form an Archæological Museum, illustrative of all that pertains to the aborigines of Canada in general, but of Ontario more particularly.

Situated as are most of the gentlemen connected with your Association in various parts of the Province, and having to perform duties that bring before them the topographical features of the country, they are very favourably circumstanced with relation to the procuring of just such information as the Institute requires.

It may also be that many of the members are already in possession of facts bearing upon matters archæological.

In any case, the Council of the Canadian Institute would take it as a great favour if they can in any way enlist the co-operation of your Association for the purpose of locating old Indian village sites, temporary camping-grounds, battle-grounds, mounds, ossuaries, trails, etc.

The council would also be pleased to receive from members of the Provincial Land Surveyors' Association any specimens of Indian relics for preservation in the Provincial Archæological Museum.

Our collection, yet in its infancy, is open for the inspection of your members, all of whom are cordially invited to examine it before they leave the city.

I have the honour to be yours respectfully,

DAVID BOYLE,
Curator.

Toronto, March 1, 1888.

G. B. Kirkpatrick, Esq.:

MY DEAR SIR,—Will you, at the Association meeting next week, bring up the question of Surveyors signing plans of subdivision which have no existence?

I made outline survey of a 75-acre block. The owner sends me an elaborate plan of subdivision and requests me to register the same. I refuse to do so unless I make subdivision. His solicitor then writes me: "We do not intend placing any subdivision posts, or having any such survey made. The law does not require more than a certificate by a P.L.S." I, *of course*, refuse to certify, and say that under the circumstances "no Surveyor of any standing would do so." In reply I receive a letter saying, "The plans are registered by this time, so"—etc., etc.

Now, is it according to the ethics of the profession for a Surveyor to certify to plans of a survey of a block of land nearly a thousand miles away, *which he has never seen*, and plans of subdivision of which have been got up in an architect's office? Pray have this question ventilated. Pardon my troubling you, and believe me always,

Yours most sincerely,

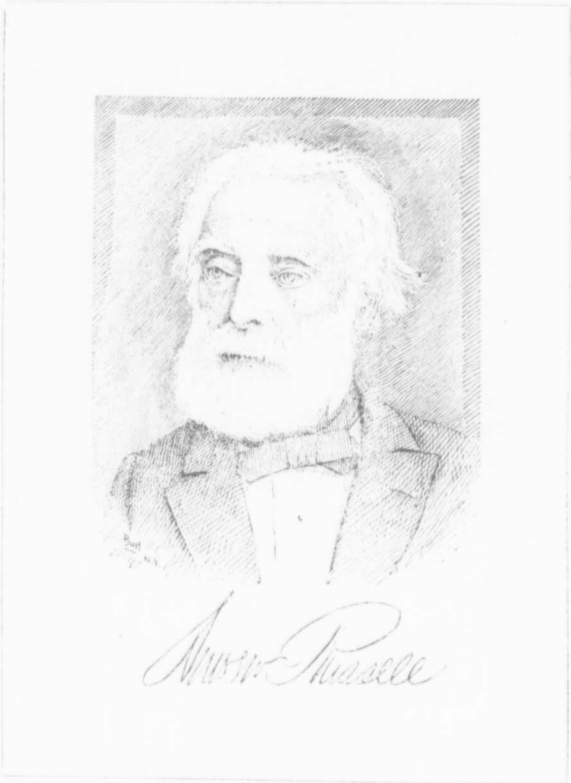
Sault Ste. Marie, February 18, 1888. JOS. COZENS.

[Read and laid over till Report on Surveying received.]

RESOLUTION ON THE DEATH OF H. H. STEPHENS, OF OWEN SOUND, ONT.

Resolved, as it has pleased the Great Architect of the universe to remove from amongst us by death our professional brother, Mr. Haldane Hincks Stephens, that at this, the first meeting of our Association since the sad event, we wish to put on record our sympathy with the family of our departed comrade, of whom it can be said, as when the time of our departure comes may it be said of all of us, "He strove to do his duty."

Carried.



BIOGRAPHICAL SKETCH

OF

ANDREW RUSSELL, Esq.

The following obituary notice of the late Mr. Russell from the *Evening Journal*, of Ottawa, and the sketch of his life and career, taken from Rose's Cyclopedia of Canadian Biography, make up a concise history of this eminent public servant, whose name is respected and beloved throughout the length and breadth of our Dominion, by all who had the privilege of knowing or coming in contact with him.

To make the sketch complete, it is only necessary to add that since Mr. Russell's withdrawal from the public service in 1883, he has lived in quiet retirement at his home in Ottawa, and was on a visit to his daughter, Mrs. A. K. Roy, in Toronto, when he received the summons to depart this life.

(From the Evening Journal, Ottawa, Feb. 25, 1888.)

Andrew Russell, of Glasgow, Scotland, whose name was well known throughout Ontario and Quebec, as Assistant Commissioner of Crown Lands, and who served his adopted country faithfully from the time of his first appointment as Superintendent of Government Roads in June, 1829, to the time of his well-earned retirement from the Department of the Interior in January, 1885, died last night at the residence of his son-in-law, 40 Cecil Street, Toronto, aged eighty-five years. His exemplary, unswerving constancy to the cause of Temperance has been fruitful of much good, and the following testimonial (see address from Association of Dominion Land Surveyors, below) is a monument of which a large number of relatives are justly proud: A consistent Christian. His end was peace.

(From Rose's Cyclopedia of Canadian Biography.)

Andrew Russell was born in Glasgow, Scotland, on the 29th June, 1804. He is a son of Alexander Russell and Janet Jamieson. He received his education at Glasgow, in the Common and Grammar Schools, leaving Glasgow with his parents, sister and brother for Quebec in May, 1822. The family settled in the Township of Leeds, County of Megantic, in June, 1822. Our subject was appointed Superintendent of Colonization Roads and Settlements in Megantic by the Governor General, Sir James Kempt, in June, 1829. On the union of Upper and Lower Canada he was placed in charge of the Surveys

Branch of the Crown Lands Department for Canada West; and in 1857 he was appointed Assistant Commissioner of Crown Lands for the Province of Ontario. In 1870 he returned to the Capital to assist in the Census service. In 1874 he received the appointment of Chief Clerk in the Department of the Interior; and in 1883 retired, after fifty-four years of public service.

Confining his attention purely to official duties, our subject never meddled in politics. He married in May, 1834, Lucy Chandler Lord, eldest daughter of Lieutenant-Colonel P. C. Lord, senior J.P. for the County of Megantic. During Mr. Russell's term of office he faithfully devoted his professional abilities to raising the standard of the surveying profession, and what he accomplished may be gathered somewhat from the following copy of an address presented to him by the Dominion Land Surveyors:—

To Andrew Russell, Esq.:

The Surveyors throughout the Dominion of Canada embrace this opportune time, on your retirement from active service, of presenting you with this Address, expressing, as it does, in but a feeble manner the esteem in which you are held by the profession.

During your fifty-four years of public service in the departments of the old Province of Canada and of the Dominion of Canada, you have preserved throughout that high standard of public morality, integrity and faultless character so worthy of emulation.

In the Crown Lands Department, as well as in the Department of the Interior, you have left your ineffaceable mark; ever prompted by the sense of duty, regardless of personal ends.

A generation has seen you in harness, unassuming, but treading the path of honour.

But our gratitude centres especially upon your professional career. It was you who introduced into Canada the use of the transit theodolite upon public surveys, displacing the less accurate and variable compass. It was you who pointed to the stars for a sure guide, instead of the fickle magnetic pole.

Through your unceasing efforts surveying has attained its present high standard, ever aiming higher, and now is an honourable profession. Rightly may we style you the father of astronomic surveying in Canada, and proud are we of so worthy a progenitor.

May the laurel wreath you have won, resting on its snowy bed, brighten your remaining days in your quiet retreat.

And posterity will record, "His work is well done."

Signed, on behalf of the Surveyors, by

OTTO J. KLOTZ,
President of Association Dominion Land Surveyors.

A. F. COTTON,
Secretary-Treasurer.

Ottawa, March 20, 1884.

Mr. Russell's surviving family are his widow, Mrs. Russell; his three sons: Alexander L. Russell, P.L.S., D.L.S., etc., of Port Arthur, Ont.; Wm. L. Russell, associated with his brother Alexander L. in the same profession at Port Arthur; Andrew Russell, who lives in Ottawa; his four daughters: his eldest, Lucy, married to Wm. R. Ross, wholesale grocer, Montreal; Kate, married to Rev. O. R. Lambly, M.A., Methodist minister, of Madoc, Ont.; Jenny, married to Jno. B. Simpson, of the Dominion Government Audit Office, Ottawa; Annie E., married to Alex. K. Roy, of the firm of Hart & Co., booksellers and stationers, Toronto, Ontario. Mr. Russell died 24th February, 1888, at the residence of his son-in-law, A. K. Roy, 40 Cecil Street, Toronto.

LIST OF MEMBERS.

ACTIVE MEMBERS.

NAME.	OCCUPATION.	ADDRESS.
Abrey, George Brockitt		17 Arcade, Yonge Street, Toronto.
Apsey, John Fletcher		47 Gloucester Street, Toronto.
Aylsworth, Wm. Robert	Engineer for Tyendinaga, Engineer for Bay of Quinte Railway, etc.	Deseronto.
Baird, Alexander		Leamington.
Bazett, Edward		Midland.
Beatty, David		Parry Sound.
Bell, James Anthony	City Engineer.	St. Thomas.
Berryman, Edgar, M. Can. Soc. C.E.	Engineer Great Eastern and Montreal & Sorel Railways.	17 Place d'Armes Hill, Montreal.
Blake, Frank Lever	Astronomical Assistant at Observatory.	Toronto.
Bolger, Francis		Penetanguishene.
Bolton, Jesse Nunn		Albion.
Bolton, Lewis	Engineer for Townships of Elma, Grey, Morris, Town of Listowel and Village of Drayton.	Listowel.
Booth, Charles Edward Stuart, A. M. Can. Soc. C.E.,		393 Division Street, Kingston.
Bowman, Clemens Dersteine		West Montrose.
Bowman, Herbert Joseph, Grad. S. P. Sc. (Toronto)		Berlin.
Bowman, Isaac Lucius		Berlin.
Bray, Edgar		Oakville.
Browne, Harry John		17 Toronto Street, Toronto.
Browne, Wm. Albert		17 Toronto Street, Toronto.

NAME.	OCCUPATION.	ADDRESS.
Burke, Wm. Robert	Engineer for County of Oxford.	Ingersoll.
Burnet, Peter		Orillia.
Burt, Frederick Percy	Artist "Engineering News."	New York City.
Campbell, Archibald Wm		St. Thomas.
Campbell, David Suter	Engineer for five Townships.	Mitchell.
Casgrain, Joseph Philip Baby		Morrisburgh.
Cavana, Allen George	Engineer for Townships of Rama, Mara and Dalton.	Orillia.
Chipman, Willis, B.A.Sc. (McGill); M. Am. Soc. C.E.; M. Can. Soc. C.E.	City Engineer.	Brockville.
Coad, Richard		Glencoe.
Coleman, Richard Herbert	Engineer for Canada Company.	Toronto.
Cozens, Joseph		Sault Ste. Marie.
Davidson, Walter Stanley	Engineer for Township of Moore.	Arkona.
Davis, John	Engineer Guelph Junction Railway.	Guelph.
Davis, Wm. Mahlon, Grad. R. M. C. (Kingston); A. M. Can. Soc. C.E.	Town Engineer, Woodstock.	Woodstock.
Deans, William James		Oshawa.
De Gursé, Joseph		Windsor.
Dickson, James	Inspector Crown Lands Surveys.	Fenelon Falls.
Doupe, Joseph, C.E. (McGill)		7 Princess Street, Winnipeg, Man.
Drewry, Wm. Stewart, A. M. Can. Soc. C.E.	Engineer for Townships of Sidney and Thurlow.	Box 386, Belleville.
Ellis, Henry Disney	Assistant Engineer N. & N.-W. Division G. T. R.	74½ St. Patrick Street, Toronto.

NAME. OCCUPATION. ADDRESS.

Esten, Henry Lionel ..... 26 Adelaide Street East, Toronto.

Evans, John Dunlop ..... Trenton.
Chief Engineer Central Ontario Railway, Engineer Weddell Bridge and Engine Works.

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

Fitton, Charles Edward ..... Orillia.

Foster, Frederick Lucas ..... 176 Argyle Street, Toronto.

Franks, Cecil Bushe, M. Can. Soc. C.E. ..... Box 116, Hamilton.
Assistant Engineer G. T. R.

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

Galbraith, William ..... Bracebridge.

Gardiner, Edward ..... St. Catharines.
City Engineer.

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

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

Hanning, Clement George, C.E. (Trinity College, Dublin, Ireland), 135 Bloor Street East, Toronto.

Henderson, Eder Eli ..... Brownville, Me.
Engineer on International Railway, Maine.

Jones, Charles Albert ..... 215 Dundas Street, London.
Engineer for Townships of London, Delaware and West Nissouri.

Jones, Thomas Harry, B.A.Sc. (McGill) ..... Brantford.
City Engineer, Engineer for Townships of Burford, Brantford and South Dumfries.

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

Kirk, Joseph ..... Stratford.
Engineer for Townships of Mornington and South Easthope.

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

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

Laird, Robert ..... 771 King Street West, Toronto.

NAME.	OCCUPATION.	ADDRESS.
Lumsden, Hugh David,	M. Inst. C.E.; M. Can. Soc. C.E.	Sherbrooke, Q.
	Engineer for Atlantic & North-West and International Railways.	
McAree, John,	Grad. S. P. S.; D.T.S.	237 Parliament Street, Toronto.
McDonell, Augustine		Chatham.
McEvoy, Henry Robinson		St. Marys.
McGeorge, Wm. Graham		Chatham.
McGrandle, Hugh		Huntsville.
McKay, Owen		Windsor.
	Assistant Engineer L. E. E. & D. R. Ry.	
McKenna, John Joseph		Dublin.
Maddock, Junius Arthur		Gladstone, California.
Manigault, Wm. Mazyck		Strathroy.
	Engineer for Townships of Caradoc, East Williams, Adelaide and Town of Strathroy.	
Miles, Charles Falconer		Walkerton.
Moore, John McKenzie		London.
Murphy, Chas. Joseph		30 Adelaide Street East, Toronto.
Niven, Alexander		Haliburton.
	Outline Surveys, Crown Lands Department.	
Ogilvie, William,	D.T.S.	Ottawa.
	Exploration Survey Alaskan Boundary.	
Paterson, Jas. Allison		Moose River, Me.
Patten, Thaddeus James		Little Current.
Proudfoot, Hume Blake,	C.E. (University of Toronto)	Clinton.
	Engineer for eleven Townships.	
Purvis, Frank		Eganville.
	Engineer for Townships of Bromley and Wilberforce.	
Robertson, James,	Grad. S. P. Sc	Glencoe.
	Engineer for several Townships.	

NAME.	OCCUPATION.	ADDRESS.
Rogers, Richard, Birdsall;	B.A.Sc. (McGill)	Peterboro'.
	Assistant Engineer Trent Canal.	
Russell, Alexander Lord		Port Arthur.
Sankey, Villiers		17 Toronto Street, Toronto.
Saunders, Bryce Johnston,	B.A.Sc. (McGill)	Brockville.
Scane, Thomas		Ridgetown.
	Engineer for Townships of Howard and Ridgetown.	
Selby, Henry Walter		Stayner.
	Engineer for Townships of Nottawasaga and Sunnidale.	
Sewell, Henry DeQuincey,	Assoc. M. Inst. C.E	Port Arthur.
Smith, Henry,	M. Can. Soc. C.E	Toronto.
	Superintendent of Colonization Roads in Ontario.	
Speight, Thomas Bailey		Arcade, Yonge Street, Toronto.
Sproatt, Charles,	M. Can. Soc. C.E	Toronto.
	City Engineer.	
Stewart, Elihu		Collingwood.
Traynor, Isaac		Dundalk.
	Engineer for Townships of Egremont, Proton, Melancthon and Osprey.	
Unwin, Charles		17 Toronto Street, Toronto.
Van Nostrand, Arthur Jabez		Arcade, Yonge Street, Toronto.
Vicars, John		Cannington.
Warren, James		Kincardine.
	Engineer for the Townships of East Wawanosh, Huron, Bruce and Kincardine.	
Weatherald, Thomas		Goderich.
West, Robert Francis		Orangeville.
Wheeler, Arthur Oliver		Ottawa.
	Department of Interior.	
Wheelock, Chas. Richard		Orangeville.
	Engineer for Counties of Wellington, Dufferin and Peel.	
Whitson, James Francis		North Bay.
	Engineer for six Townships.	

NAME.	OCCUPATION.	ADDRESS.
Willson, Alfred	Chief Engineer Canada Company.	Toronto.
Wilson, Hugh, F.G.S.		433 Carlton Street, Toronto.
Yarnold, William, Edward	Engineer for Townships of Reach, Scugog, Mariposa and Georgina.	Port Perry.

JUNIOR MEMBERS.

Rathbun, Edward Walter, Jr	Assistant Engineer N. T. & Q. Ry.	Deseronto.
Sherman, Ruyter		Brantford.

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