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Problems In City Surveying

Absence of Original Posts in Older Parts of Cities Leaves Proper Location of Lot Lines to Good Judgment of Surveyors and Results in Differences of Opinion—Paper Read at Annual Meeting of Association of Ontario Land Surveyors

By WILLIAM W. PERRIE
Hamilton, Ontario

IN the city, the work of the land surveyor is naturally divided into two general classes—original surveys and resurveys. In an original survey the boundaries of the property are generally in evidence on the ground and the surveyor is required to obtain the necessary data for drawing up plans or writing descriptions of the property, or to lay out on the ground from a plan already drawn, certain parcels of land. These are mostly subdivision surveys and present no great difficulty.

By far the greater part of the city surveyor's work consists of resurveys. In making a resurvey it is necessary to retrace on the ground from a plan or description, all or part of an original survey. The resurveys which a surveyor in the city is required to make may be divided into the following classes:—

Three Classes of Surveys

1—Surveys in the newer parts of the city where a considerable number of the original posts or monuments are to be found, as evidence of the location of the boundary lines. Surveys of this kind are, with few exceptions, a very simple matter.

2—The second class consists of work of an engineering nature, such as the taking of levels, staking out of buildings, roadways, etc. Almost every surveyor is familiar with work of this kind and it requires only the exercising of ordinary care in the performance thereof.

3—This third class is made up of all those surveys in the older or improved part of the city. Here, as a rule, there are none of the original posts or monuments remaining and the proper location of the street or lot lines rests largely on the good judgment of the surveyor. As it does not seem probable that any two surveyors would agree on a location that depended on their individual judgment, it appeared to me that interesting discussion would follow the presenting of a few such problems. It is with the hope that such discussion would be beneficial to the profession as a whole, and particularly to the younger members like myself, that I have gathered together the data on some such surveys.

The first case may probably not be considered to present much of a problem to the surveyor, and yet it is one which will no doubt cause trouble at some future time. It is required to stake out Lot 27 on the west side of Avondale Street in Avondale Survey, laid out by Surveyor B. (See Fig. No. 1.) Before this subdivision, which is a comparatively recent one, was laid out, the land to the south and east, known as Orchard Hill Survey, was laid out by Surveyor A and monuments were planted along the southern limit of the Beach Road and along Gertrude Street. On the plans of both surveys the width of the Beach Road is shown to be 60 feet, measured on the line of the streets crossing it.

In making the survey of Lot 27, old stakes were found in the positions shown in Fig. No. 1. These check up

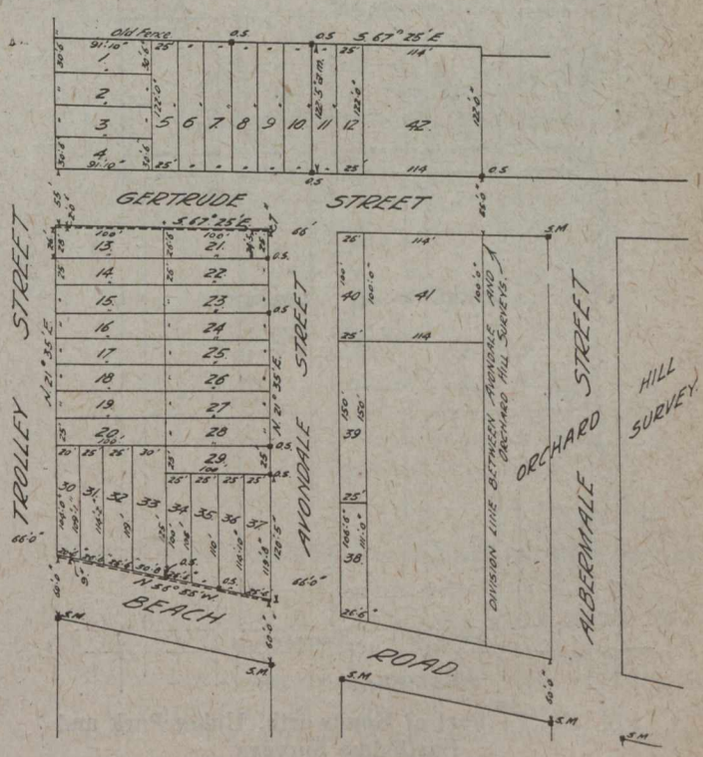

Fig. No. 1—Avondale Survey
Letters O S denote original stake; S M, stone monument.

fairly well for the line of Avondale Street and the distances between the stakes south of Gertrude Street measure up correctly according to the plan. Using the stone monuments in Orchard Hill Survey to obtain the line for the north side of the Beach Road, the old stakes were found to be 9 inches too far north. That is, the depth of Lot 37 becomes 120 feet 5 inches, not 119 feet 8 inches, as shown on the plan. The old stakes found on the north side of Gertrude Street and the stones in Orchard Hill

Survey are in one and the same straight line. Extending the south limit of Gertrude Street in Orchard Hill Survey westerly, we find the north limit of the lots in Avondale Survey to be north of this extension. This makes the frontage of Lot 21 measure only 24 feet 5 inches and that of Lot 13 only 26 feet. Measuring northerly along the rear of the lots from the old stake at the south-west angle of Lot 34, the plan measurements come 9 inches north of the fences. That is, the fences at the rear of the lots

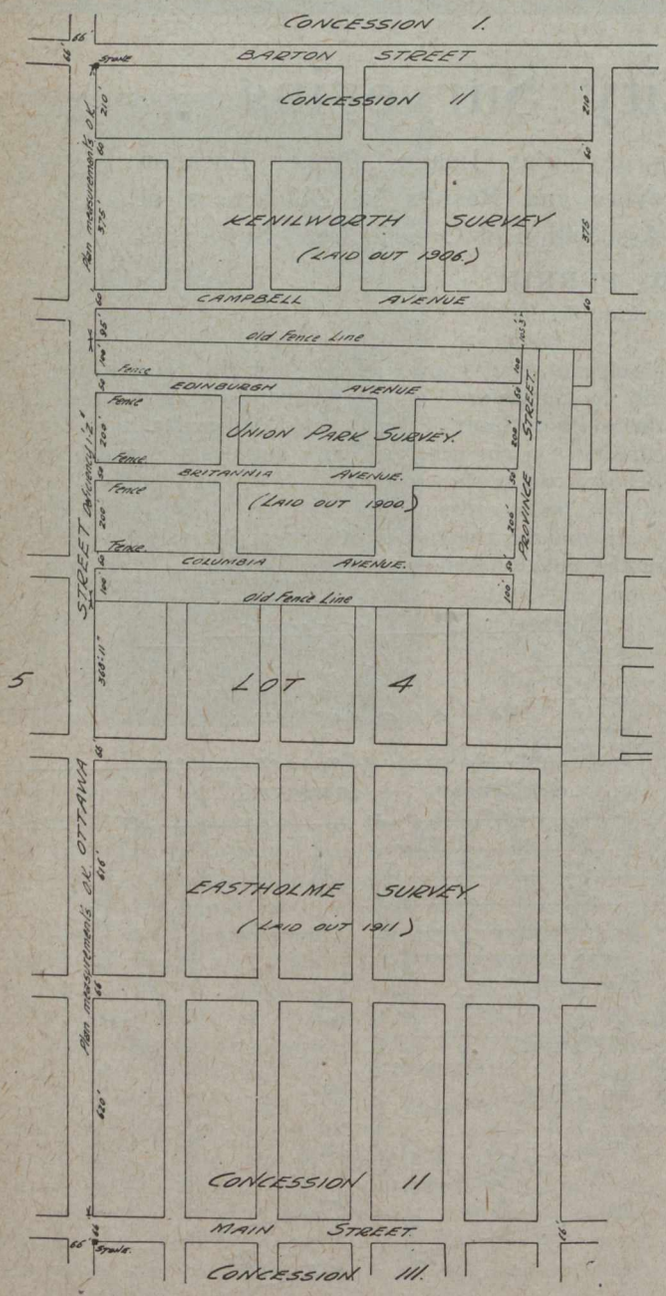

Fig. No. 2—Part of Kenilworth, Union Park and Eastholme Surveys

check up correctly if the line obtained by using the stone monuments were used for the northern limit of the Beach Road.

In a case like the above, is the surveyor justified in using the old stakes as the governing point of the survey? In a few years' time these stakes will be obliterated and another surveyor making a survey here would find that the measurement along Avondale Street from Gertrude Street to the Beach Road checked up within two inches and that this agreed with the position of the fences. This would probably lead to a difference in the two surveys and might bring about a lawsuit. If the first surveyor is correct in using the old stakes, should not some means be provided whereby the error in the original plan might be corrected and the measurements properly shown on the plan in the Registry Office?

Fig. No. 2 shows part of Kenilworth Survey, Union Park and Eastholme Surveys. It is required to define the limits of Edinburgh, Britannia and Columbia Avenues in Union Park Survey. Union Park was laid out in 1900, Kenilworth in 1906 and Eastholme in 1911.

Deficiency in Width

On the north and south boundaries of Union Park there are now in existence the remains of old fences. The measurement along the east side of Ottawa Street from Barton Street to the old fence on the north boundary of Union Park is correct as shown on the Kenilworth plan. Similarly the measurement northerly from Main Street to the old fence on the south boundary of Union Park checks with measurement shown on the plan of Eastholme. This leaves a deficiency of 1 foot 2 inches in the width of Union Park, both at Ottawa and Province Streets. From old notes it was seen that the original stakes in Union Park Survey were still in existence at the time Kenilworth was laid out and that the south boundary of Kenilworth Survey was established by using these stakes. This determines the northern boundary of Union Park. Measuring southerly along Ottawa Street from this, boundary fences were found at the proper distances at both sides of Edinburgh, both sides of Britannia, and at the north side of Columbia Avenue. That is, the deficiency all appears to be in the row of lots lying between Columbia Avenue and the southern boundary of Union Park. These street lines were established in this way and the deficiency left between Columbia Avenue and the old fence at the south boundary.

There are probably two points that might cause disagreement here. First, it might be claimed that the deficiency, 1 foot 2 inches, should be distributed throughout all the blocks in Union Park. I think, however, that judgments in cases of this kind prove that this distribution would be incorrect in view of the fact that the fences indicated are in their proper positions in accordance with the plan measurements. There then remains this question: As Union Park was first laid out, should it not be given its proper frontage and the deficiency placed in the last row of lots in Eastholme Survey? This appears to me to be a matter of opinion only.

In the next survey (see Fig. No. 3) it was required to stake out Lots 23 to 27 in the re-subdivision of part of Fairleigh Park Survey. The original Fairleigh Park Survey was laid out in 1907 and included a row of lots on the west side of Fairleigh Avenue, Lots 1 to 11, lying south of Delaware Avenue and the lots shown in dotted lines lying north of Cumberland Avenue. The plan shows the measurement along the east side of Fairleigh Avenue from Delaware to Cumberland, but no measurement is given along the division line between Fairleigh Park and Delaware Park Surveys.

Differs from Plan

In 1907, Delaware Park Survey was laid out by the same surveyor and this plan shows that measurement to be 754 feet 2 inches. The re-subdivision of the southern part of Fairleigh Park was laid out in 1912 by another man and while he obtained the same line of Cumberland at Fairleigh Avenue, he evidently used some old fence posts that remain on the south side of Lot 29 for the line of Cumberland Avenue at the east side of the survey.

Several old stakes were located in the original Fairleigh Survey and the distance from Delaware Avenue southerly to the stake marking the south-eastern angle of Lot 11 was found to measure correctly. In the resubdivision an old stake was located marking the south-eastern angle of Lot 28 and an iron bar was found at the north-western angle of the same lot.

These points were all the evidence obtainable regarding the position of the lot lines, no fences having been built on the east side of Fairleigh Crescent up to this time. The distance between these two points of the survey checks correctly and were made the governing points of the survey. The distance from the true line of Cumberland Avenue to the old stake between Lots 28 and 29 measures 44 feet 9 inches, not 43 feet 3 inches, as shown on the plan. That is, there is a surplus of 1 foot 6 inches in the rear measurement of Lot 29.

No Attempt to Establish Boundary

Measuring northerly from this stake, each lot was given its proper measurement according to the plan, stakes being planted to mark the corners of Lots 23 to 27. After doing this, Lot 20 was laid out 46 feet 7 inches in width, as shown on the registered plan. This point was found to be 4 feet 4 inches southerly from the stake marking the south-eastern angle of Lot 11 in the old survey. That is, Lot 20 should have had a width of 50 feet 11 inches at the rear. This makes a total surplus of 5 feet 10 inches from Cumberland Avenue to the south-eastern angle of Lot 11. As the measurements along Fairleigh Avenue all check up correctly, there is no reason to suppose that the surveyor's tape was incorrect. Consequently, it appears as if he made no attempt to establish the southern boundary of Lot 11 before making his survey. This gives us a somewhat similar case to the one first stated, with no means of correcting the error and eliminating the possibility of conflicting surveys.

Fig. No. 4 is a copy of the registered plan of J. J. Scott's Survey. This survey was laid out and the plan registered in 1889, the lots numbering from 1 to 39, as shown. In 1898 this plan was amended by another surveyor, the new plan showing Lots 1 to 44 and Lots 29, 30 and 39 being affected by the change. The lots fronting on St. Matthew's Avenue were not affected and are shown the same on both plans. There is no measurement shown on Lot 31 and it appears to be smaller than the others. Lots 32 to 37 are all shown to have a frontage of 49 feet. In the survey here illustrated it was required to ascertain whether or not house No. 54 St. Matthew's Avenue was situated on the southerly 21 feet of Lot 36.

Differences in Fence Lines

Measuring southerly along the eastern limit of St. Matthew's from the line of Birge Street, established by lining from Cheever Street to the west side of Birge, and giving the lots their proper frontage of 49 feet, as shown on the plan, the southern boundary of Lot 36 was found to be 10 feet north of the fence at the southerly side of house No. 54. A similar condition exists at each of the other boundary fences farther on.

It appears as if in building the fences the old fence at the south side of Lot 31 had been taken as the starting point and the lots measured off northerly from it, allowing 49 feet for each lot until the north boundary of Lot 35 was reached. Lots 36 and 37 have been divided into smaller parcels, as shown, the northern parcel being described as the northerly 20 feet 6 inches of Lot 37. Since the fences south of Lot 36 are all very nearly 49 feet apart, the fence to the south of house No. 54 was accepted as the best evidence of the division line between Lots 35 and 36 and house No. 54, said to be on the southerly 21 feet 0 inches of Lot 36.

This leaves a surplus of 10 feet between this boundary and the southern limit of Birge Street, 5 feet 0 inches of this surplus being between the street line and the line of occupation and the remaining 5 feet between the line of occupation at the street and the fence at the southern boundary Lot 35.

Just what should be done with this surplus is a question that might lead to many disputes were it not for the fact that the fences have been in their present positions for considerable number of years. It does, however,

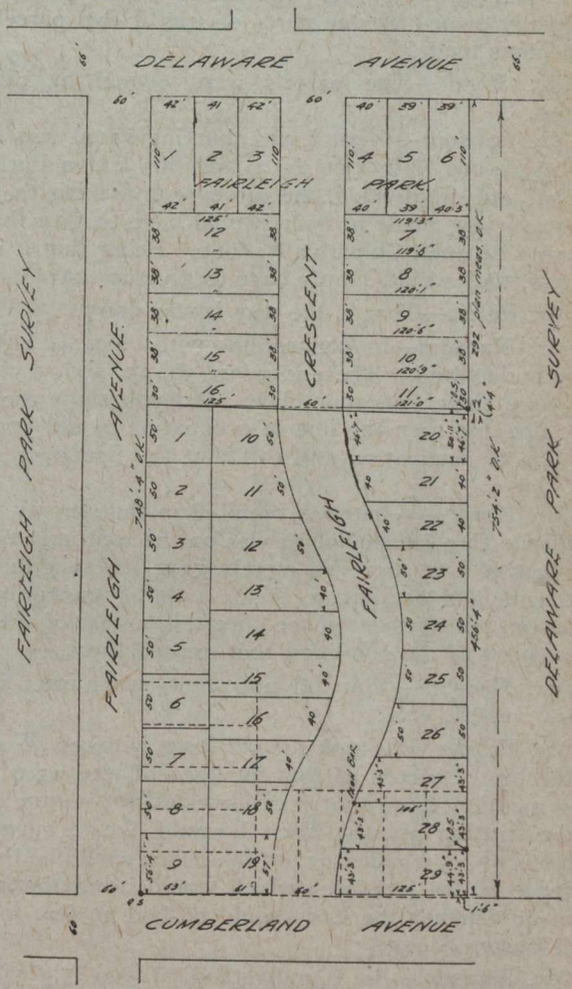

Fig. No. 3—Resubdivision of Fairleigh Park Survey

cause great trouble in the adjusting of the paper title to the property at the time of a transfer.

The above problems represent the class of work that the city surveyor is constantly encountering in his practice. It is impossible to establish any definite method of procedure that will apply to all cases, and the surveyor has to be guided entirely by the evidence afforded by occupation in most cases.

There are also in most cities a considerable number of old surveys, the plans of which have never been registered, the only evidence as to the size of lots, width of streets, etc., being either in the deeds of the property or possibly a sketch deposited in the Registry Office or in the possession of a private individual. In a great many of these surveys it is absolutely impossible for a surveyor to establish street lines, and he certainly cannot write proper descriptions of property so located. It seems to me that it would be to the advantage of all concerned if legislation

could be provided whereby a person owning property so situated could apply to the city council to have a survey made and the street lines properly monumented to conform with existing conditions. The plan of the new survey could then be approved and registered and would serve as the basis of all future work.

Discussion

The President—Is there any discussion on the points in Mr. Perrie's paper? I think Mr. Perrie would like to know whether the decisions arrived at were reasonably concurred in.

Mr. Ransom—In connection with No. 2, taking Union Park Survey and this Eastholme Survey, was that originally owned by one party or was it two parcels and then plans made?

Mr. Perrie—The parcels were owned by different parties.

Mr. Ransom—What I was thinking about was that if they were owned by one party and this Union Park area sold off and sub-divided, the surveyor in making the Eastholme survey, made in 1911, would have to give that full distance between Columbia Avenue. Being that it is two owners, they would simply have to give up that land.

Mr. Perrie—That is the way it was done.

Mr. Ransom—In connection with No. 4, I do not quite understand. These lots (37, 36, 35, and so on) you say were shown on your plan. Did you show the theoretic line and then the line of occupation or did you take the line of occupation and call that the boundary of the lot?

Mr. Perrie—What was required in that survey was a certificate that house No. 34 was on the southerly twenty-one feet of Lot 36. We merely gave the solicitors that certificate and also wrote them a letter explaining the situation, telling them of the uncertain nature of the work on account of the condition that existed there.

Mr. Ransom—You did not show which was 37 and which was 36, etc.?

Mr. Perrie—We took the old fence between 36 and 37 as the best evidence of that lot line. There were no lot lines mentioned, so that it really does not matter except in the starting point. What I would like to have other opinions on, is whether or not this fence would be the best evidence of the lots lines which would bring the 49 feet there or whether the lots should be laid 49 feet starting from Barton Street.

Mr. Ransom—As I understand, if you laid your 49 feet starting from Barton Street, you would conflict with every fence and the position of every house that is built on these lots. And starting up the other way, you do not know the measurement of that first lot. There is always the possibility that the surveyor made a mistake in the first place. Yes, I would think that you would have to start at Barton Street.

Mr. Gibson—Suppose there was no house or fence there, could you not start at Barton Street and lay out 49 feet to each lot and put the surplus in Lot 31?

Mr. Perrie—You conflict with all the fences up on the street. It is a matter of whether or not it is not the best policy to accept the fences and say nothing about the distribution.

Mr. Jackson—Have these fences been up more than ten years?

Mr. Ardagh—That question about the ten years' possession would not come in here at all.

Mr. Jackson—Would they not have possession after that?

Mr. Ardagh—The question is the original post, not as to the length of time.

Mr. Ransom—How did you locate the other street line of Birge?

Mr. Mucklestone—The measurements check correctly from Barton to the Grand Trunk and Emerald Street, also measure up correctly.

Mr. Ransom—Did you check up the 120 feet on the west side of Lot 20 by the Grand Trunk?

Mr. Perrie—That checks correctly.

The President—Mr. Murphy, I would like to know what you think of that case. What would be your idea of the thing to do?

Mr. Murphy—I could not hear very distinctly, but as I understand it, the lots shown 1, 2, 3, 4, etc., to 11, and Delaware Avenue were originally laid out. After that Delaware Park and to the east of these two subdivisions were laid out. Then the curved street was afterwards laid out and evidently, in laying out that street, the surveyor did not go up to the southern boundary of Lots 16 and 11, so that his survey of the two lines were not coincident. The question is, what would you do with that surplus?

Mr. LeMay—You have just got to leave it.

Mr. Perrie—There were just the two stakes shown there. There was one on the southerly limit of No. 11 and one between 28 and 29 on the other plan.

Mr. LeMay—You have nothing to mark the northerly limit of the southern plan. I think the surplus would have to be divided.

Mr. Murphy—It does not seem as if the boundary of either plan is well defined. You cannot define the boundary to the south and you cannot define the boundary to the north exactly.

Mr. Ardagh—In the second plan, is the northerly boundary shown to be coincident with the southerly boundary on the northern plans?

The President—On the registered plan it is.

Mr. Ardagh—That makes quite a difference.

The President—On the registered plan these two lines are shown to be one and the same line.

The President—You would have to recognize the southeast corner of Lot No. 11 as the proper southerly boundary of the northern plan and would have to subdivide up to that if there were no original stakes.

Mr. Beatty—Yes, that is right.

Mr. Routly—The gentleman who read this paper suggested that some legislation might be procured to assist men in these difficulties. I would make the motion that the questions arising in Mr. Perrie's paper be referred to the Legislation Committee for consideration.

Mr. Sutcliffe—I second the motion. Carried.

Mr. Murphy—There are a great many members in this association who, whenever there is any paper read like this, are always calling for more legislation. Now, I think it is a very difficult thing for them to say what shape that legislation should take and if the gentlemen who bring these questions before the association could only give some suggestions to them what they think should be done, it would help out the legislation committee a great deal. On my part, I can't imagine what legislation could be made or what shape it would take.

Mr. Perrie—The suggestion that I made as regards legislation did not apply to these problems. It was in connection with cities, as in Hamilton, where a great many of the registered plans of the old surveys have been lost or destroyed and there is no record as to what should establish all these lines, what width the streets are or

anything of that kind, in a great many cases. My idea was, and it is something similar to that suggested here yesterday, if the parties owning property in that locality could apply to the city council to have a survey made of the street limit or anything that was necessary and that would be the registered plan. That plan could be approved by the city council and probably any one else who had to approve it and be registered in the Registry Office as the final plan. That was my idea.

Mr. Murphy—So far as the city or township council goes, I do not see what power they have to go into any one man's property and take part of his land away and give it to another, because that is the effect of what you propose doing.

Mr. Perrie—It is not a question of taking a man's land away from him. It is getting something definite for the future. Show his lot as it exists now, but have that plan registered so the next surveyor will have something that he can go by.

Mr. Murphy—There is something in that.

Mr. LeMay—As I understand it, that seems to be not exactly the same point. As I understand Mr. Perrie, this is a case where the registered plan is lost and the occupation does not agree with the registered plan in any case. I have had similar cases in the city of Toronto, and especially Toronto Island, which is lease-held, and the way we have dealt with it is to get power of attorney from all the lessees or owners approving of the new plan, and they obligate themselves to accept new leases under the new plans for the land they actually have occupation of. This is a case of not having a registered plan. The case which arose particularly before was where it was impossible to make a survey in conformity to the Survey Act without butting up against public highways and matters of that kind.

Mr. Rutherford—Wou'd not such legislation as is proposed now be overlapping the Survey Act which is laid down governing such cases?

Mr. LeMay—I cannot see that a case such as this should be the subject of legislation. You have got to have the people get together and file another plan. If there are different owners they have all got to sign it.

The President—Supposing you find an obvious error in the plan. Should there not be some means whereby that registered plan in the Registry Office could have something done to it to show where the error has occurred and how?

Mr. LeMay—That can be done now by application to the judge or inspector of the Registry Office.

Mr. Speight—I am sorry I was not present to hear that paper and hear the discussion but it seems to me that the present legislation is sufficient probably to meet the condition. If the attention of the inspector of the Registry Office was called to this, he has authority to have a new plan made.

Mr. LeMay—He could order a re-survey of the whole city.

The President—If you can get them to do it.

Mr. McGeorge—If the registered plan is missing entirely, do I understand that he could have a plan made?

Mr. Speight—There is provision made for that in the Act.

Mr. Ardagh—Does that new plan signed by all the owners make their holdings legal unless quit claim deeds are also registered from one to another?

Mr. Ardagh—Our registrar holds that a plan signed by all the owners is a great convenience, but does not make their holdings legal unless they have quit claim deeds one to the other.

Mr. McCubbin—That is the very point we are trying to elucidate here. We cannot see where the quit claims come in.

Mr. Speight—One way of meeting that difficulty is having a trustee. Every one on the particular plan conveying to the trustee and then he signing the plan on behalf of the different owners and then conveying the lots according to the new plan. I think that would get over the difficulty and be a most satisfactory way.

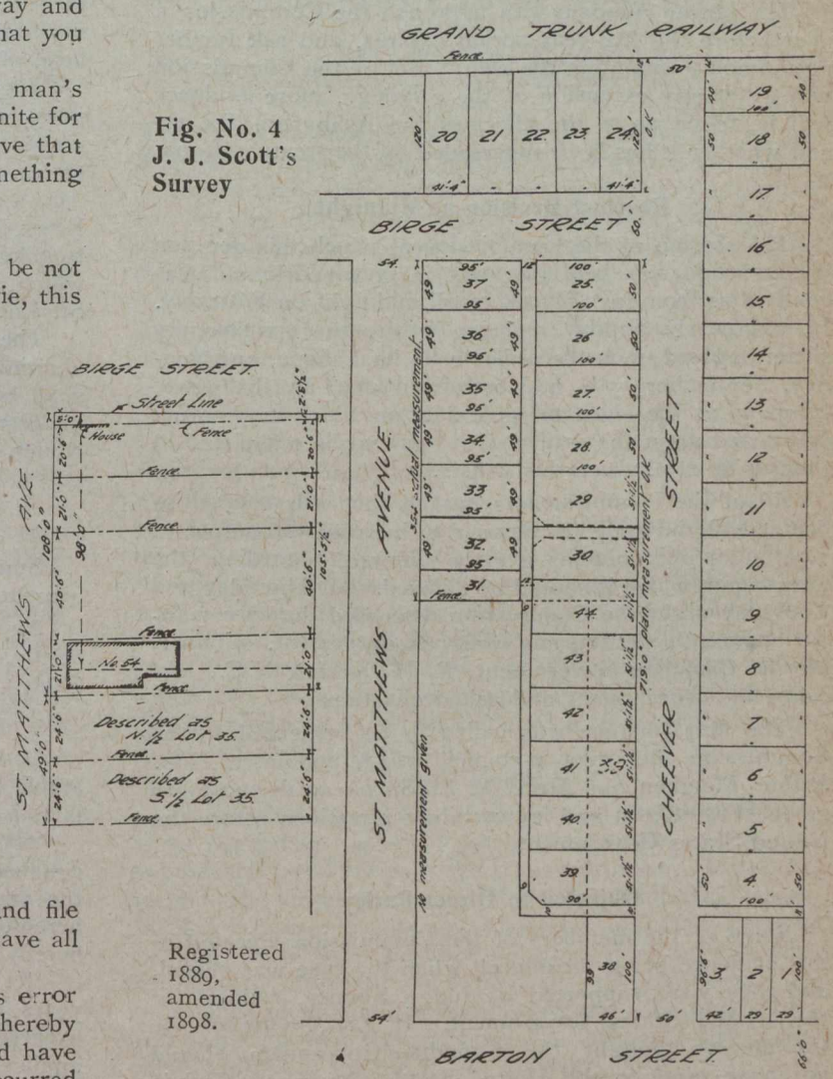

Fig. No. 4 J. J. Scott's Survey

Mr. McGeorge—May I ask Mr. Speight: Suppose you are asked to make a survey line between two lots. You find there is nô registered plan. It has disappeared from the Registry Office. You have simply nothing to show the dimensions of any of the lots in that section?

Mr. Speight—You cannot make the survey under those conditions.

Mr. McGeorge—What are you going to do, simply refuse to make the survey?

Mr. Speight—If there are no measurements on the plan and nothing to help you, what else can you do?

Mr. McGeorge—The plan possibly has disappeared from the Registry Office; the present owner of the property purchased it and all the lawyer has is a deed having the number of the lot.

Mr. Speight—That would certainly be a case for the inspector of the Registry Office to get busy.

PERMIT WEIR IN ST. LAWRENCE

PERMISSION has been granted by the International Joint Commission to the St. Lawrence River Power Company to build a submerged weir in the South Sault Channel of the St. Lawrence River, from the mouth of their power canal to Long Sault Island. The weir is to stay in for five years or till the end of the war, whichever is the later date. It must then be removed unless the Commission grants further permission for its maintenance.

The power company can approach the Commission a year before the five-year period expires, and ask further permission to maintain the weir. Before the Commission will grant any extension of the privilege, more evidence will be taken as to the effect of the Ashburton Treaty, and whether it has been superseded by the treaty of 1909.

Reached Decision at Midnight

The session of the Commission at which this decision was reached was held privately in New York and was continuous from last Thursday till midnight on Saturday. It was nearly Sunday morning before the six commissioners agreed upon the order in its final shape, and Sunday, September 15th, had been mentioned by the power company as the latest possible date on which work could be started upon the project if it were to be completed in time to be of any use this winter.

All of the commissioners agreed that war necessities demand the building of the weir to increase the output of aluminum, but opinions greatly differed regarding the terms upon which it should be allowed. All Thursday and Thursday night the Commission discussed the case without apparently getting any nearer to agreement. Counsel for the Canadian Government, F. H. Keefer, K.C., was called in several times and asked questions.

The first time he was called in he presented to the Commission the order-in-council which appointed Hon. Arthur Meighen and Hon. A. L. Sifton as delegates to go to Washington and lay certain suggestions before the United States Government.

Objected to Direct Parley

Some of the members of the Commission objected to this evidence being introduced when the case was closed, and they were supported by Judge Koonce, counsel for the United States Government. In fact, some of the Commission thought the Canadian Government should not have gone to the United States Government while the Commission had the case under consideration.

Friday, however, the Commission seemed to get together better, and more suggestions were made by the different members. It took till Saturday afternoon before the whole Commission could agree unanimously upon even a rough draft of an order.

Is an "Interim Order"

In the order, the Commission definitely states that it is an "interim order," made solely because of war needs. That it is not a final decision in the case is shown by the statement in the preamble to the order that "in order to arrive at a final decision further evidence should be taken, and further argument submitted, especially as regards to the effect of article 7 of the Webster-Ashburton treaty in so far as it may or may not constitute a bar to the construction of the said weir, and with regard to the question of whether the said article has been superseded by the treaty of January, 1909."

The Commission also hold the right to make such terms and conditions as it deems appropriate and equitable in regards to the maintenance of the weir. If there should be any need for protecting the rights of citizens of either country, the Commission will issue further orders. The order is made "without prejudice to the Commission's right to decide the question at a later date."

Regarding the question of the Commission's jurisdiction, which had been raised by the counsel for the Canadian Government, the Commission decided that it has jurisdiction because the weir will be an obstruction in the boundary water of the St. Lawrence, and will affect the level of the river on the Canadian side.

The order does not state how much water the company can take from the St. Lawrence River, down their power canal to Massena, and in fact its wording intimates that the Commission is not clear upon the company's right to use any water at all from the St. Lawrence River. At present the company claims that it is entitled to take the whole flow down the South Sault Channel, which, they say, is 20 per cent. of the entire flow of the St. Lawrence River.

The Commission does not state that the extra aluminum produced as the result of the placing of the weir shall be used for war purposes only, but this is fully understood and there is no doubt but that the United States Government can and will commandeer the entire output of the plant if it be needed.

What Power Company Requested

Summed up briefly, the request made by the power company in its application to the Commission was:—

Approval of submerged weir to be allowed permanently, giving the company the entire flow of the South Sault Channel.

Text of the Decision

Leaving out the statement of the case and the preamble, the text of the Commission's decision, or order, is as follows:—

"It is hereby ordered as an interim measure that the construction of the said weir and its maintenance until the expiration of the term of five years from the date hereof, or until the termination of the present war, is hereby approved upon the following conditions:—

"(1) That at the expiration of said period of five years, or upon the termination of the present war, whichever shall last occur, said weir shall be removed by the applicant; reserving, however, to the applicant or any other interested party the right to apply to the Commission at least one year before the expiration of the said period for a further continuance of the said weir, and on such application the Commission may approve of such continuance on such terms and conditions as it may deem appropriate and equitable for the protection of the rights and interests of the people on both sides of the line.

"(2) That the said weir shall be constructed and maintained in accordance with the plans mentioned and under all the terms and conditions set forth in the permit granted by the Secretary of War, dated September 10th, 1917, so far as the same are applicable.

"(3) That for the purpose of protecting the rights, property and interests on either side of the boundary from any injurious effect resulting from the construction and maintenance of said weir, the Commission will during the term of its approval herein retain jurisdiction over the subject matter of said application, and may make such further order or orders in the premises as may be necessary.

"Provided that in the foregoing order the Commission shall not be deemed to have considered nor passed upon any question pertaining to the rights of the applicant to divert water from the St. Lawrence River."

Canada's Proposals to U.S. Government

Canada questioned the jurisdiction of the International Joint Commission in this case and sent Hon. Arthur Sifton, Minister of Customs, and Hon. Arthur Meighen, Minister of the Interior, to Washington to lay the following proposals before the officials of the United States Government:—

"If the United States is satisfied that unless the proposed works are constructed in the South Sault Channel, there must necessarily be a substantial shortage in the supply of aluminum for the purposes of the United States and allies in the prosecution of the war, the Government of Canada will assent to the proposed construction as a war measure. In pursuance of this undertaking, the present application of the St. Lawrence River Power Co. to the International Joint Commission should be withdrawn.

"That the terms on which proposed works shall be constructed be agreed upon at a conference between representatives of the two governments.

"In order that the South Sault Channel may be restored to its present status, the terms should include a provision to the effect that the submerged weir, if constructed, shall be removed within twelve months after the conclusion of the European war.

"There shall not be diverted from the St. Lawrence River by the company a greater quantity of water than is at present being diverted.

"The Canadian Government, being advised it would be possible to develop some 700,000 horse-power from the waters of the St. Lawrence River in the vicinity of the Long Sault Rapids, and recognizing such development could only proceed under agreement between the two countries, proposes for consideration that the two governments should take steps jointly to prepare a scheme looking to such power development in the interests of the two countries. In the light of this possibility, the Canadian Government is strongly of opinion that no project of private interest at this time should be permitted that would interfere with or prevent the carrying out of the joint project of the two countries."

Financially Satisfactory to Company

The order as given by the Commission will no doubt be satisfactory to the company from a financial standpoint, even if the weir does come out in five years, and from the terms of the order it is not at all a certainty that the weir will be removed within that time. The president of the Aluminum Co. of America testified that the company would be able to produce six or seven million more pounds of aluminum each year if the weir were built. At six million pounds per annum, in five years thirty million pounds additional will be produced as a result of the construction of the weir.

The price to the government is 26 cents a pound, making a total additional gross income of $1,560,000. There would hardly be sufficient profit in aluminum at that price to pay for the construction of the weir, which is estimated to cost $300,000, but the supply of that new thirty million pounds to the government may mean the release to the public at higher prices of a large quantity of aluminum which otherwise would be demanded by the government at the lower price. If it means the release of even 10,000,000 lbs. to domestic users during the five years, at a price, say, of only forty cents a pound, there would be a clear margin to the company of $1,400,000 over and above any profit there may be in the 26c. price. And if the war ends within the five years, as it undoubtedly will, the whole of the extra production can then be sold each year at domestic prices.

The company, therefore, undoubtedly would be quite willing to undertake the construction of the weir even if there were no opportunity of applying for extension of the privilege.

CITY PLANNING FOR SMALL MUNICIPALITIES*

By A. Pearsons Hoover
Consulting Engineer, New York City

IN the arrangement of streets the small city can be guided by the lessons learned by larger cities. Here should the importance of comprehensive planning be felt by the small cities. The street system of every municipality is directly related to topographical conditions as well as to the intensified use of certain sections. Certain streets should always perform and serve a distinct function in respect to traffic, if the development and improvements upon the land are followed out upon a comprehensive plan for the future.

The value of a street system depends in a certain measure upon the extent of its diagonal highways and major thoroughfares, and the value of any diagonal highway or main thoroughfare depends upon the connections served to different sections. The small city should feel the importance of providing means for the widening of certain streets to meet future requirements. This can be accomplished at the time when improvements have not yet become intensified by making provision for the ultimate widening of such streets to provide for the traffic which they shall be called upon to handle, when the city has increased to a certain population and covers a contemplated area.

Transit Problem

In the planning of small cities one important question to be studied in the light of present needs and future growth and possibilities is the transit problem. Mistakes made in the larger cities by permitting transit facilities to develop indiscriminately so as to feed and tap certain localities, have been a source of great importance to the community. To rectify such mistakes, the expenditure of huge sums of money has been necessary. To utilize the best facilities for transportation in the small city is to plan and lay out for the future growth.

The small city should lay out on a comprehensive plan all the transit facilities that will be required to meet demands far in the future, based upon past record of growth. To be able to transport workmen or mechanics quickly to and from work is of vital importance in the development of any community. In all cities thought should be given to the possibility of future need for elevated systems or subways and in connection with such rapid transit facilities consideration should be given not only to the location of stations, but to the intersection of streets, where it is likely that subways will be required, so that curves may be located from cross street to the main avenues without the demolishing of buildings or the heavy expense of underpinning large superstructures.

In the planning of small cities the question of the elimination of grade crossings arises. It is well known that in several communities the cost of eliminating grade

*Abstracted from address before the City Managers' Association.

crossings, under present conditions, amounts to considerable more money than if this problem had been studied in the past with an eye to the future growth. In this problem alone the small city is in a more advantageous position relative to the city planning than is the larger one whose development has been allowed to continue without any comprehensive plan.

Districting of City Important

One of the most important subjects in the development of the small city is the vital question of districting. To be able to district means the ability to set aside certain sections for certain usages. The districting of certain sections of the small city for future growth and development means that the small town will automatically assume the shape of an economic and efficient municipality. Districting means the healthy development of the whole community on broad lines and on an economic basis. It means the stabilizing of real estate values. It means the producing of the best the community affords relative to its natural resources and geographical location.

A small city depends for its development greatly upon its industrial progress. To be able to operate industries efficiently and to be able to produce commodities cheaply depend upon the efficiency of the industrial section. Without industrial efficiency municipal expansion cannot obtain. The question resolves itself into the vital need, together with city planning, of an industrial survey.

Object of Industrial Survey

An industrial survey means that a comprehensive plan and study is made of the resources of the industrial community. These resources are tabulated and analyzed and upon the results recommendations are made for the rectifying of present mistakes and suggestions for economic future growth. An industrial survey means an inventory of the industrial section. It means the study of the different elements entering into the industrial community, to be able to plan a healthy growth for the future. It denotes the same for an industrial community as does the taking of stock in and the laying out of efficiency lines of the different departments in a large industrial plant. It means to so regulate and so locate the different industries in the section that each shall receive the services required with the services that can be offered.

The industrial survey places economy and efficiency in operation above all else. It emphasizes the need of coordinating the different transit facilities, industrial locations and the development of the natural resources near or adjacent to the municipality, to bring about efficiency in production and efficiency in management. Lack of appreciation of the advantages of the natural resources of any municipality can only hamper the normal and healthy development of industrialism. Industrialism can reach its highest development only when equal opportunity is secured to all and when reward is equitably proportioned to services rendered. It can reach its highest development only when appreciation is thoroughly sensed of the vital importance for an industrial survey as a means of bringing out clearly the production on economic lines of raw materials near at hand.

Suggested Industrial Survey Program

Briefly, the industrial survey would in general cover the following subjects:—

An analysis of the present transportation facilities showing their advantages, needs and future expansion.

Analysis of the transportation charges and plan for readjustment so as to increase more effectively the interchange of commodities.

Study of the position of the municipality with respect to other commercial centres of the country.

Study of the position of the municipality as a centre for certain types of industries with analyses showing why and how certain industries would be developed.

Study of the relation of the municipality in regard to the development of any distinct line of transportation.

An analysis of the industrial section with plans for present improvement together with suggestions for future development.

An analysis of the present industries with suggestions for development in the future.

An analysis of the labor condition in regard to present industries together with suggestions as to the kind of labor necessary for certain industries which should be developed.

An analysis of the housing problem in conjunction with the labor system.

FIFTY YEARS HENCE

EARLY this year Dr. J. A. L. Waddell, of Kansas City, Mo., delivered a lecture entitled "The Engineering Profession Fifty Years Hence," at several United States engineering societies and universities. With slight modifications the lecture was then printed in the Scientific Monthly, and reprints of the article have been obtained which are being distributed with Dr. Waddell's compliments. The reprint contains 56 pages and cover, 6½ x 10 inches. The lecture is divided into two parts—the prelude, which is fact, and the "retrospect," which is fiction. The latter is in the form of an address of a retiring president of an engineering society in the year 1968, reviewing the advances made in engineering during the period 1918-1968. "It takes a bold man to endeavor to foretell what changes will occur in engineering during the next fifty years," says Dr. Waddell, "nevertheless I will make the attempt for the purpose of pointing out a few of the salient possibilities, some of which are easily within reach and should be attained as quickly as possible, while others may, by some engineers, be deemed chimerical. It must be remembered, though, that that highly imaginative French author, Jules Verne, in some of his wildest flights of fancy, was fortelling actual occurrances which are today so common as to cause no comment."

Contracts for the construction of five steel ships for the Norwegian government have been let and they will be constructed in Prince Rupert, B.C. Mr. John Little, of Pittsburg, head of the construction company, is expected in Prince Rupert this fall. Besides the construction of steel freighters much repair work will also be undertaken. It is expected that word will be received soon to commence grading at the site of the shipyards to be erected at Hays Creek.

Were freight rates on the Intercolonial Railway equivalent to the average rate on all the Canadian railways, the revenue of the government-operated road, on the basis of the traffic of 1917, would have been $2,154,600, or 19 per cent. more than it was. That is the significant conclusion drawn by Sir Henry Drayton, chairman of the Railway Commission, in a judgment recently handed out by the Railway Board ordering an increase in the commodity rates on sugar, affecting principally the Maritime province refineries. In the course of the judgment Sir Henry goes at some length into the Intercolonial rates generally, comparing them with the rates charged on the other railway systems of Canada. "It is perfectly apparent," he concludes, "that the Intercolonial returns are abnormally low."

ROADS DURING AND AFTER THE WAR*

By E. Purnell Hooley

WITH the pre-war facilities, one looking back to the state of affairs thirty-five years or more ago cannot but be struck with the progress of road maintenance up to 1914, but the period since passed through also brings back many of the troubles, difficulties and conditions that so many years ago did not seem to so frighten one then as may be they will at present. The hope is ventured that mentioning a few of the writer's dealings with roads years ago which seem applicable in a measure to the present conditions may be useful, at any rate to the younger members of the institution, without needlessly giving offence to those who are always too wise or too old to learn from others.

The taking away of 75 per cent. of the available steam rollers, traction engines, self-propelled tractors to another sphere of usefulness in great measure returns the surveyors to the days of the Victorian era. The difficulty of obtaining road material equally returns them to the days when each member of the old Highway Board begrudged the necessary material for efficient management because "the roads were good enough for farm traffic," and to those "wise men" "farm traffic" seemed nearly all that the roads were ever intended or likely to carry! It can hardly nowadays be appreciated that in 1881 steam rollers were looked upon by very many as the expensive toy of the amateur road-maker, or the fool's paradise tool of the enthusiastic reformer!

The modern road user has of necessity sounded the death-knell of the old roller scoffer and snubber, but the roads, the traffic, the grumblers, the wearing out and the amateur cure-all are still here, and seemingly likely to remain.

In districts where roads have once gone through a period of improvement, everyone of commonsense must appreciate that great effort must be made by modern road engineers to minimize the undoubtedly backward step that has lately had to be endured through causes no one less than Britishers have brought about, though few will have, mercifully as they have, more silently suffered.

Alas! in very many counties the roads have gone back, and, whilst admitting the fact, it behoves the surveyors to be up and doing as soon as they can, so that the ills may be remedied, and, if possible, even good may come of the ill that has been wrought.

Why Roads Have Suffered

It has long been appreciated that ordinary macadam roads with compulsory starvation of materials and manual labor cannot stand, and the war has only gone to prove that if better construction had been earlier attempted even the war would not have caused such destruction as has been meted out, and this is clearly shown where permanent material has been properly used.

A few counties have been so short-sighted as to starve the roads and reduce the rates during the war. Those counties which have done so are certainly deserving of no pity or assistance in the future for having adopted such a short-sighted, illogical position, but will doubtless be the first to call for aid. Most counties and other authorities, it is hoped, have continued to make their rates as of old, and judiciously saved their balances, knowing full well that the time must come when the roads will again have to be placed in first-rate condition and these balances be required. It is hoped that, having learned the lesson that water-alone-consolidated roads must be placed with other passed-over "relics of the past," more modern treatment will be allowed to show the sensible advancement with the times.

A few suggestions of how to bring this must-be-admitted sensible procedure are therefore offered.

Attempts in the last forty years have been made to improve urban or "in town" roads, and every credit must be given for what was done; but it is only in the last twenty years that any effort was made to really permanently improve the method of our out-of-town county main and district roads.

In the year 1901 the writer in a report urged his then council that water-consolidated roads must be improved upon, and was quickly dubbed on many sides as "a crank." A reference to the year of office of our esteemed past president, Mr. J. A. Brodie, of Liverpool, alone will show that so short a while ago other than water-consolidated roads were somewhat novel, and yet no sensible present-day engineer would now say he was satisfied that water-consolidated surfaced roads could be successfully made to economically and satisfactorily carry modern road vehicles for any extended period. Yet, alas! in many districts up to 1914 have they gone on without seriously attempting to stop the water-consolidated system, though even grants, doles, and almost bribes have been offered by the Road Board and others to induce better systems of a more lasting character.

Traffic in Its Infancy

The results of all is the roads are now suffering, and unless differently dealt with will more seriously suffer still when times are more settled.

Undoubtedly, self-propelled traffic is yet in its infancy, and the advent of cheaper cars for light use and the great advantages of heavy and light tractor traffic for business purposes will call for permanent roads or terribly increased cost of present roads.

Now seems the time to get ready for this coming alteration, and when the ordinary traffic is not so much in evidence a great deal of useful and by the public unappreciated work can be undertaken.

Few roads have any real foundationing such as Telford (wise man!) suggested.

If roads can be gradually made in some measure on a mixture of the systems advocated by Telford for foundation, Macadam for "subcrust," with a finished surface of more lasting material presented to the wearer, all may yet be well.

It is useless to think it possible to construct a sound permanent road on 4 ins. of round pebbles or ground-up granite and imagine because one is laying down 3 ins. of pavement facing that a road will be constructed which will stand regular 'bus traffic and hundreds of fast-speeded motors every eight or ten hours; but this is a course many men have attempted and cursed the "surfacing" for their failures!

The Use of Furnace Slag

If all the work now carried out can be done with a view to preparing the country main roads for permanent surfacing later, well and good, and no more useful material can be used for this purpose than a layer of sound furnace slag, in gauge about 3½ ins. or 4 ins. with every void carefully packed with smaller material, the whole well and efficiently rolled into one mass and laid on top of an existing surface, if the bottom is sound and dry. As furnace slag seems specially to lend itself, a "sub-

*Paper presented at the annual meeting of the Institution of Municipal and County Engineers.

crust" will be presented almost ideal for receiving a permanent face, and a "subcrust" that will well carry ordinary traffic until the permanent surfacing is ready. Care must be taken that the uniform thickness as far as possible is used, and any small shaping should be done under this slag "subcrust."

Of course other—perhaps local—material may be used for this work. If the road is at all waterlogged or even has a damp foundation, a careful layer of angle-wise-laid faggots as a bottoming packed with engine ashes and steam-rolled down, then on top a layer of good coarse engine ashes or furnace clinkers laid to a 4-in. consolidated thickness, with finer ashes brushed in between the slag, limestone or other local material will give an excellent result as a base for road forming.

When the writer some fifteen years ago saw this was the right course to pursue he had no war time to take advantage of, and well he remembers the unkind suggestions that he had to bear on the ground that he was starving his roads of "decent" material for the sake of making motor roads of his pet material.

Unfortunately, there are always members of councils as well as the ordinary public who will not credit any work as likely to have a good result if outside their limited sphere of knowledge; but the writer's advice to his younger brethren is, know your duty and your work, go on and do it—you will not suffer in the end. Your conscience is more deserving of comfort than carping critics' back-patting; these seldom openly show their own failures.

Roads Need Side Supports

Soft sides are the fault of many roads and are often caused by continual and often unnecessary siding. Now appears a time when sides can be strengthened and made the necessary abutment of all really good roads. Men will forget all roads are—or should be—arches. Who ever built a bridge with no abutment or side support? The writer has proved one of the best methods of dealing with soft sides is to excavate the undesirable matter, be it sand, clay or soil, lay in a thickness of 4 ins. of rolled clinkers and on top lay a course of rolled faggoting at an angle of 45 deg. to the side of the road to the desired width, fill every space up with ashes, lay a thickness of 4 ins. rolled clinker again on top, and proceed with the slag, limestone or local material as before described, always taking care to remember that each layer or method requires a steam roller to consolidate the work as well as a sensible man to watch its progress, as road-making is an art, not a mechanical process, that requires life to administer and guide it if satisfactory results are desired.

Much has been said and written of "carpeting," "subcrusts" and "road waves." The writer's opinion is that to a great extent the last are caused by the absence of the second and the wrong use of the first-mentioned term. He has not found it desirable or possible to lay down any other definite rule for his final face work that applies to all sorts and conditions of roads than "Use your brains." The mixing up of town, harbor, country, main, rural and urban roads and imagining that cost, method and life are but degrees suitable to all is one of the greatest mistakes and causes many pitfalls.

He has found that for an ordinary 18-ft. wide road maintained in the old pre-war days at a cost of about £100 per mile, a thickness of permanent material for "carpeting" or facing of 3½ ins. to 4 ins. when consolidated is good, sufficient and necessary. Such a road with material costing about 12s. 6d. per ton will last out dry macadam costing 10s. per ton at least six times, giving satisfaction to all reasonable folk and compare favorably at the end of that period with a road that has had its dry surface renewed every other year.

It is useless to say any surveyor can satisfy everybody. The surveyor, being only human, though often thought or treated as if otherwise, will find that permanent material will only at first begin fresh troubles, but commonsense must in the end prevail, and good roads will eventually lead to a good time for all.

Importance of Roads

Undoubtedly railways are the main arteries, roads the actual nerves that feed and supply these arteries with nourishment, and are consequently of vital necessity to all well-governed communities.

Permanent material can give good roads if sensibly used, and now seems the special time for the roads to be more thoroughly dealt with after their period of semi-starvation, when funds and materials have been compulsorily held over and are again available, instead of causing the already burdened ratepayer to pay more to get back into the old rut. It would seem to be a time when money should be judiciously and sensibly expended for the good of the public and to the ultimate saving of the rates.

One if not the only trouble of permanent road surfaces on its first introduction to a district is its supposed slipperiness. The nervous driver seems to make his horse nervous, and his complaints after hitting the horse will be loud and constant about the "new road." Of course every care should be taken to have sand or grit everywhere to minimize the cause of these complaints, but even then they will arrive. Only this winter, after a sudden frost, complaints were received about a road that had been tar-washed as a temporary step before permanent material was to be used by the writer, and on making inquiries he was much struck by the remark of an old Irish roadman, who said: "Nothing satisfies some of these yer folk! Th' Almighty in His wisdom sends us fine weather, wet, frost and snow. These yer complains about dust all summer; you cures it with stopping the dust for 'em, and now they grumbles at the Almighty because He don't send a shower of sand or grit to please 'em when 'tis frosty like!"

It is almost impossible to make permanent roads without their being somewhat more slippery than rough macadam. Doubtless if the horse is to return and continue on our roads, and thus still to be the chief, if not the only consideration, an improved horse-shoe will be devised. Whilst more complaints as to the cost and condition of roads comes from horse-users, few attempts are made by the owners and complainers towards improving the horse-shoes, which as now constructed cannot be finality in man's ingenuity and humanity.

WINDSOR-TORONTO HIGHWAY

MEMBERS of the Ontario Provincial Highway Association met last Thursday at Brantford, Ont., to discuss the proposed route of the Windsor-Toronto highway. After a luncheon as guests of the city and county, they approved unanimously of a resolution calling upon the Ontario Government to declare immediately that the location of the highway would be through Woodstock, Brantford and Hamilton (connecting at Hamilton with the Toronto-Hamilton and Hamilton-Niagara Falls highways), instead of by way of the southerly route through Simcoe or the northerly one through Kitchener and Guelph.

B. COLI IN SWIMMING TANKS

B. COLI has been found in five swimming tanks in Toronto, according to a report by the Medical Officer of Health of that city. "The capacities of the tanks range from 25,000 gallons to 285,000 gallons," says the report. "The times at which the tanks are emptied vary from once a week to every three months. The amount of water added to the various tanks daily varies from none at all to 6,000 gallons. Five of the swimming tanks chlorinate the water regularly. Four of them do not. The other one is not in use during the summer time. The water is filtered in four of the tanks in varying quantities daily, while in five no filtration is done. A shower bath, with soap, before entering, is required at all of the baths. A health certificate is only required at one of the ten baths. The appearance of the water at time of inspection was found to be clouded in three of these baths, murky in one and light blue or light green in the others.

"From a health standpoint, however, the most important fact was that the colin bacillus was found present in five of these baths, in some portions of the bath samples being taken from different portions of the tank, and was absent in four. The bacterial count ranged all the way from 50 bacteria per cubic centimetre to 340,000 per cubic centimetre."

With a view to safeguarding the health of those using the baths, Dr. Hastings, the Toronto Medical Officer of Health, has asked the Toronto Board of Health to endorse rules and regulations which in effect are as follows:

New Regulations Suggested

General supervision of such baths must be assigned to a person who understands their operation, and is provided with the necessary assistance and laboratory facilities for carrying out this work.

The bacterial count in the pools must not exceed 250 per c.c., with the absence of B. coli in 1 c.c.

Bathers must be under medical inspection, and all persons suspected of or suffering from communicable diseases must be excluded from the pools.

The pools must be cleaned when any suspended matter is visible to the naked eye.

The filter and chlorination plant should be operated whenever the pool is in use and for at least an hour following, in order to remove suspended matter before it settles to the bottom.

Daily operating data must be kept by the supervisor, showing the time of operation of the baths and filters and the chemicals used.

Any bather who has been exposed to a communicable disease must report the fact to the person in charge of the pool.

Every person must take a thorough shower bath, with the use of soap, before entering the pool.

Expectorating troughs along the side of the basins must be provided.

Bathers are warned against swallowing any water taken into their mouths while swimming.

"As showing the useful purposes to which so-called waste materials may be successfully applied," says an English contemporary, "it is recorded that during the past six months between 18 and 19 miles of linen, calico, and brown holland, of a most excellent quality for surgical work, have been sent to naval and military hospitals, and all this valuable material was obtained from the material on which engineering and other drawings were made. The old plans came from government, municipal and private offices."

ROAD WORK IN MANITOBA*

By M. A. Lyons
Chief Engineer, Manitoba Good Roads Board

ROAD improvement in Manitoba is being carried on under the Good Roads Act. This act was passed in 1914 and provided for the borrowing of $2,500,000 for the construction of main market roads and provincial highways. On main market roads assistance is given by the provincial government to the extent of one-third of the cost of earth roads and one-half the cost of gravel roads, and on provincial highways two-thirds of the cost is paid by the government.

On all so-called permanent structures, such as those of concrete, masonry or steel, pavement of one-half the cost is made, and on wooden structures one-third the cost. In 1915 an amendment was made whereby assistance is given in the building of bridges not on a good roads system; permanent structures costing $200 or over, one-half of the cost; on wooden bridges costing $500 or over, one-third of the cost.

Organization

The Good Roads Act is administered by the Good Roads Board, consisting of three members, of which the highway commissioner is chairman. Attached to the board are a chief engineer and such engineers, surveyors, inspectors, clerks, etc., as are necessary.

The engineering staff is divided into two branches—bridge engineers and road engineers. The work of the bridge engineers extends over the whole province, but for the road work the province is divided into districts and a district engineer has charge of all road work and general supervision of bridge work in his district. Wherever such assistance is needed, the district engineer has an assistant engineer.

Where any large scheme of road improvement is being carried out in a municipality, that municipality is required to put a resident engineer on the work. The expenses of this engineer are charged against the cost of the road and he works under the direction of the "Good Roads District Engineer."

On bridge work the municipality is required to have a competent inspector on the work. The expenses of this inspector are charged against the cost of the bridge. This inspector is under the general supervision of the district engineer and the direct supervision of the bridge engineer in charge of this particular bridge. All engineers and inspectors are required to report weekly to the Winnipeg office.

Application of the Act

The primary intention of the Good Roads Act is to assist the municipalities in developing and improving a system of main market roads. To this end the municipal authorities desiring assistance under the act must first lay out a system of market roads in their municipality and submit this system to the Good Roads Board for approval. The board then deputes an engineer to examine the scheme and report on its serviceability and probable cost. After the system has been accepted by the Good Roads Board, and by the government by order-in-council, the municipality is at liberty to carry out the construction of the scheme with the expectation of receiving assistance from the government.

The Good Roads Act provides three ways of financing this road work—by current revenue, by special rate or by

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*Paper read August 8th, 1918, at the Saskatoon meeting of the Engineering Institute of Canada.

debenture issue. If by the last mentioned method, the road system and debenture issue must be approved by the ratepayers before any further steps can be taken.

Up to the present, twelve municipalities have taken advantage of the debenture method for construction of roads. All works are to be done by contract unless another method is approved of by the Good Roads Board. All work must be carried out under the direction of a good roads engineer who must verify that all works done are according to plans and specifications. To obtain the payment of the government's portion, the secretary-treasurer of the municipality is required to send in a statement of the cost of the work accompanied with necessary vouchers and a statutory declaration that the statement is correct.

Contract Work Most Satisfactory

About ninety-five per cent. of the bridge work is done under contract and about seventy-five per cent. of the road work. While in a number of cases roads constructed by day work with local labor have been cheaper in first cost, when the finished appearance of the work is considered, the contract work is, in ninety-five per cent. of the cases, more satisfactory, and any slight extra cost is justified. The municipal authorities are becoming more favorable each year to letting work by contract, even at a slightly higher cost.

Having work done by contract does not always insure a good piece of work, but a class of contractors is being developed in Manitoba who will turn out good work, and as this method of doing work is carried on, the difficulty of securing a satisfactorily finished road will become smaller. This year's contract price varies from fifteen cents per cubic yard to thirty-eight cents, depending on the nature of the soil, and the type of the contractor. Some of the small contractors doing perhaps one or two miles of road, and who only expect to work for a short while in the farmer's slack time in summer, do work as low as fifteen cents per yard, where all the work is side-work.

A contract for nearly ten miles of gravel road, where there were old ditches, but little overhaul, was let for twenty-eight and a half cents per cubic yard. A contract for twenty-four miles in Sifton municipality was let at thirty cents per cubic yard. About five miles of this contract will be quite wet and another two or three miles very sandy; some parts there will be considerable end haul, mostly within the free haul limit. In another municipality the contract was let for twenty-seven miles at thirty-one cents. A large amount of this was end haul coming just within the free haul limit.

In many portions of Manitoba the scraper is about the only way of building roads. In some places, however, the push grader can be used. One municipality, which intends to construct about two hundred miles under the Good Roads Act, and which has already passed a debenture by-law for $171,960, has purchased a traction engine and two 12-foot-blade graders. The district engineer in charge of this work is keeping careful records of the cost of the various items in this work and we hope to have some valuable data in this connection for this year's report.

Material

The soils of Manitoba vary from the heavy gumbo to pure sand. The gumbo, when dry and properly dragged, makes an excellent road but when soaked with water is almost impassable. Wonders can be worked with this class of soil through good side drainage, a good crown and above all, a properly maintained surface. Gravel surfaces have been built on some gumbo roads and about twelve inches of gravel are required before the surface is satisfactory. The first coat of four inches will probably disappear entirely; the second coat of three inches will leave its mark; with the third coat of three inches, it begins to look like a gravel road. and two inches more of fine material makes a very good surface.

Unfortunately, in much of the gumbo region gravel is scarce. On one of the main roads, on which grading has just been completed, it is intended to construct a sand clay surface, using sand from the Assiniboine River which closely follows the road. In the western portions of the province about five inches of gravel makes an excellent road. This is applied in two coats—one of three inches and one of two inches. In some of the sandy country a good road has been built by the addition of about six inches of clay and again covering the clay with an inch or two of sand. In some parts of the south-west the light, drifting sand has been treated by working straw into the grade and when this has been thoroughly mixed in, to cover the surface with gravel. The gravel in this district has a large amount of soft limestone which cements quickly under the traffic and moisture.

Gravel is not so plentiful in Manitoba that the engineer can pick and choose. He takes what he can get and is generally pretty well pleased to find any within reasonable hauling distance.

Engineering

In the construction of roads great care is taken to provide suitable side drainage. This is sometimes quite a difficult task, especially in the Red River Valley where the country is quite level. Deep ditches along the road are being avoided whenever possible but this is not always possible without going on private land or making long offtakes. The only proper drainage of country is along natural drainage lines, whether for farm drainage or road drainage. But in Manitoba, to attempt to open up drains across fields would often lead to unpleasant consequences. Therefore the road allowances carry many ditches which should not be there and the safeness of the road is endangered. In the cross-section of the road we are eliminating a berm wherever possible. We give the road a crown of one inch to the foot and a slope of four or five to one to the ditch, and about three to one on the outside of the ditch. This makes a road which is pleasing in appearance, safe for nervous horses, easy to maintain, and has good transverse drainage. Our ordinary market roads are eighteen feet wide and more important roads are twenty to twenty-four feet wide. We try to keep grades down to five per cent., but it is not always economical to do this, so that grades as high as seven per cent. are in use and in a few cases ten per cent. Culverts are made with a minimum length of twenty-four feet between headwalls.

Maintenance

The Good Roads Act provides that all roads built under the act must be satisfactorily maintained by the municipality. If this is not done the municipal commissioner has the power to have it done and assess the cost of the work to the municipality In nearly every case, however, the municipalities are taking great interest in the maintenance of roads. In many places, "Good Roads Dragging Districts" are formed and prizes offered for the best maintained roads in the district. This year the provincial government has offered two splendid prizes for competition in road maintenance—one for gravel roads and one for earth. The government also will pay to a

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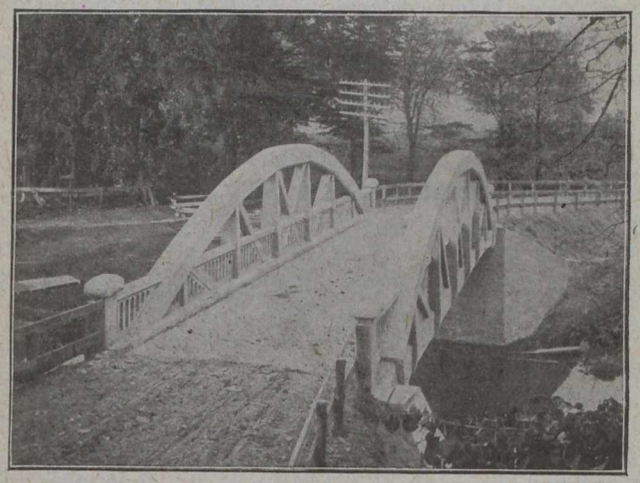
Letter to the Editor

Open Spandrel Arches

Sir,—I was very pleased to see the letter published in your issue of September 12th from P. Burke Gaffney, including a list of ten open spandrel arch bridges built by the Manitoba Government. The first two of these should be included in the list of my letter in your issue of August 29th.

I am sorry that through an oversight the fine Calgary arch bridge was not also included. The data for this follows: Centre Street Bridge, Calgary—Length of bridge, 1,300 feet, double deck. Three river spans of 150 feet. John F. Greene, bridge engineer.



Middle Road Bridge, 80-ft. Span

The other bridges in Mr. Gaffney's list are of arches with floors below the level of the crown and suspended from the arches. This is a recent and noteworthy development of the open spandrel arch bridge. I am not surprised that Mr. Gaffney intimates that the Riverview, Manitoba, bridge, built in 1917, is the first concrete arch bridge with suspended floor in Canada, as very little has been said of the Ontario bridges of this class. The Middle Road Bridge, build in 1909, between the counties of York and Peel is, however, a reinforced concrete bowstring with one deck at springing level. of which I enclose a photograph. The Middle Road bridge has counter braces, but nearly all the others have only vertical hangers with no spandrel bracing.

Enclosed is a list of twenty such bridges which I have built in Ontario. Mr. A. W. Connor has also built a number of these bridges and I suggest that if he would send you a list of them for publication, it would be very interesting to bridge engineers. Personally, I know of no others in Canada, but I should like to hear through your journal from any other engineer who has built them.

FRANK BARBER,
Consulting Engineer.

Toronto, Ont., September 17th, 1918.

OPEN SPANDREL ARCHES WITH SUSPENDED FLOORS.

Name.	Location.	Clear Span.	Year.	Municipality.
Middle Road	Etobicoke River	80′	1909	York and Peel.
Freeman's	Rouge River	91′	1911	York County.
Lower Bridge	Haliburton	55′	1911	Dysart.
Highland Creek	Highland Creek	60′	1912	York County.
Simpson's	....	60′	1912	Amaranth Twp.
Nottawa	Pretty River	55′	1912	Simcoe County.
Birrell	River Don	65′	1913	York Twp.
Sproule	Grand River	50′	1913	Amaranth.
Eckardt	Rouge River	70′	1913	York Highway Com.
Avery	Mimico River	50′	1914	Etobicoke Twp.
Lambton Golf Club.	Black Creek	45′	1914	York.
Pegg's	....	30′	1914	York County.
Pelmo Park	Black Creek	30′	1914	York.
Burton	River Don	50′	1914	York.
Whitchurch	Holland River	40′	1914	Whitchurch.
Wardlaw	Humber River	65′	1914	Vaughan.
Toole's	Toole's Creek	40′	1915	York and Ontario.
Turner	....	60′	1916	Vaughan.
Udora	Black River	40′	1917	Georgina.
Dick	Humber River	58′	1918	Vaughan.

AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS

FOLLOWING is the program for the twenty-fourth annual convention of the American Society of Municipal Improvements, to be held October 2nd, 3rd and 4th at Buffalo, N.C. :—

Wednesday, Oct. 2nd—Meeting of sub-committees on standard specifications; executive committee meeting; meeting of general committee on standard specifications.

Wednesday evening (8 p.m.)—Addresses of welcome; president's address; report of executive committee; report of secretary; report of treasurer; report of finance committee; selection of committees on nominations, place of meeting and resolutions; report of special committee on standard tests for bituminous materials; report of special committee on revision of constitution.

Thursday morning—Report of committee on sewerage and sanitation (F. A. Dallyn, chairman. Toronto, Ont.); "Miles Acid Process for the Recovery of Grease from Sewage," by Charles-Edward Amory Winslow, Professor of Public Health, Yale University, and Dr. F. W. Mohlman, Chemist, Connecticut State Department of Health, New Haven, Conn.; discussion of Kenneth Allen's paper on "Pressing of Sewage Sludge," by E. S. Dorr, sewer service, Boston, Mass.; "The Sewers of Buffalo and Its Neighbors," by Carl L. Howell, assistant engineer, Buffalo, N.Y.; a paper on a sewerage subject by Morris Knowles, Pittsburg, Pa.; "The Private Sewerage Question," by D. H. Wyatt, Columbus, O.

Thursday afternoon—Report of committee on street paving; "Who Shall Pay for Paving," by Ellis R. Dutton, assistant city engineer, Minneapolis, Minn.; "Pavement Base in Buffalo," by George F. Fisk, assistant engineer, Buffalo, N.Y.; "Maintenance of Old Asphalt Pavements," by C. E. P. Babcock, first assistant engineer, and J. A. Vanderwater, assistant engineer, Buffalo, N.Y.; "Standardizing of Required Consistency of Asphalt," by J. R. Draney, sales manager, U.S. Asphalt Refining Co., New York; a paper on longitudinal cracks in brick pavements, by Wm. C. Perkins, chief engineer, Dunn Wire-Cut-Lug Brick Co., Conneaut, O.; "Napped Trap Block Pavements," by Thomas E. Collins, city engineer, Elizabeth, N.J.;

report of committee on sidewalks and street design.

Thursday evening—Action upon report of special committee on revision of constitution; report of committee on nominations and election of officers; report of committee on place of meeting and selection of same for 1919; report of committee on standard specifications; report of committee on street lighting; report of committee on municipal legislation and finance; "Regulation of Street Occupation Under Franchise," by Lee W. Eighmy, assistant engineer, Buffalo, N.P.

Friday morning (Jubilee Session)—Address by George H. Benzeberg, the first active president of the society; paper on the early history of the association, by George W. Tillson, Lagrange, Ill., a member since 1896, and the second secretary of the society; paper by President N. S. Sprague on the recent history of the society, including its amalgamation with the Association for Standardizing Paving Specifications; statistics and documentary history of the society, by Charles Carroll Brown, a member since 1895 and secretary for the past five years; report of committee on parks and parkways; "Modern Tendencies in Park Design," by Wm. E. Harris, superintendent of parks, Buffalo, N.Y.; report of committee on city planning; report of committee on fire prevention (Alcide Chausse, chairman, Montreal, P.Q.).

Friday afternoon—An automobile trip about the city and its surroundings, including visits to the city waterworks and to industrial plants.

Friday evening—Report of committee on street cleaning and refuse disposal; "Motor Tractors in Street Cleaning," by Wm. F. Schwartz, street commissioner, Buffalo, N.Y.; paper by E. R. Conant, chief engineer, Savannah, Ga.; report of committee on waterworks and water supply; "Buffalo's Water Supply," by George C. Andrews, water commissioner, Buffalo, N.Y.; "Niagara River Pollution," by George H. Norton, city engineer, Buffalo, N.Y.; paper on a New Jersey water supply, by Geo. W. Fuller, consulting engineer, New York City; report of committee on standard forms.

Three Day Convention of Engineers at Halifax

Engineering Institute of Canada Holds Third General Professional Meeting—Summary of Proceedings

ABOUT sixty-five members of the Engineering Institute of Canada were present at the Board of Trade rooms in Halifax, Wednesday morning, September 11th, when the third general professional meeting of the Institute was called to order by President Vaughan. The lieutenant-governor of Nova Scotia delivered an address of welcome, also conveying greetings from Mayor Hawkins, of Halifax, who was unable to be present.

C. E. Dodwell, district engineer at Halifax for the Public Works Department of Canada, read a paper on the preservation of timber for use in salt water; and A. E. MacLeod, accountant of the Halifax Ocean Terminals, delivered a paper on the economic aspects of the terminals. Both papers were followed by keen discussion, and the authors were required to answer many questions.

Interesting Papers Read

The visitors lunched at the Green Lantern as guests of the Commercial Club. Nearly all the members of the club were present, F. A. Bowman presiding. Messrs. Campbell and Joy delivered addresses upon the coming Halifax drive to aid the patriotic fund, and H. H. Vaughan, president of the Institute, expressed the pleasure of the engineers in visiting Halifax.

After luncheon, A. F. Dyer, engineer of the Furness Withy Co., Halifax, presented a paper on the use of reinforced concrete in harbor work. The meeting then adjourned for a two hours' trip around the harbor on a tug boat, ending with tea at Waegwoltic.

At 8 o'clock Wednesday evening, J. J. FacDonald, assistant engineer of the Halifax Ocean Terminals, delivered an illustrated lecture on the diving bell used in that work. This bell was invented and designed by Mr. MacDonald.

Thursday morning a party arrived from St. John, including Mayor Hayes, Chairman Wetmore of the Board of Trade, B. M. Hill, New Brunswick Provincial Engineer, Alex. Gray and G. C. Kirby, of the Public Works Department, and a number of others, increasing the attendance at the meeting to eighty-five.

H. L. Seymour, town planning assistant to the Commission of Conservatoin, read a paper on town planning in Halifax and vicinity, in which he complimented the Halifax Relief Commission for obtaining the services of experts for their housing and replanning developments. He outlined the work of the Nova Scotia town-planning boards and explained the objects sought in replanning the devastated area. Mr. Gray then read the paper on the St. John Harbor, which appears on the following page. G. C. Kirby, of Mr. Gray's department, also explained features of the harbor work.

After luncheon as guests of the Commercial Club, the visitors were motored through the devastated area and were then taken by train over the new railway line to the south terminals, where they inspected the dock and terminal facilities. The engineers were accompanied on this trip by Lieutenant-Governor Grant and Provincial Attorney-General Daniels. It is expected that the new station and terminal railway will be ready for use for all passenger and freight traffic about November 15th.

Thursday evening, G. F. Porter, formerly superintendent of erection of the St. Lawrence Bridge Co., lectured on the Quebec Bridge in the auditorium of the School for the Blind, the public being invited.

Double-Tracking Government Railway

The last session was held Friday morning, R. H. Smith, resident engineer of the Ocean Terminal Railway, delivering a paper descriptive of that railway. Mr. Smith was followed by G. F. Pearson, a representative of the Halifax Board of Trade, who addressed the meeting on the double-tracking of the Canadian Government Railway. (See *The Canadian Engineer*, April 18th, 1918.)

"If you look at the map," said Mr. Pearson, "you will see that three lines of railway connect the great hinterland of Canada with Moncton and St. John. Halifax, which may be likened to the end of the wharf, is connected with Moncton by a single track of railway, of

which only 21 miles out of a distance of 126 miles are double-tracked. I believe the day is not far distant when all these three lines should be double tracked from Montreal and Quebec to St. John and Halifax. Nobody, of course, can tell exactly what will happen after this great war is over, but this much I think we can assume, and that is that we cannot go along after the war in the ordinary lackadaisical manner in which we carried on our business before the war.

"I am strongly in favor of taking everything we can get from the Germans, even to their methods of national organization for business. I look upon Canada as one great departmental store. We shall have a national debt of over two billions of dollars. Upon this we must pay the interest. We cannot make money as a nation by trading jack-knives between provinces. We must become an exporting nation; we must reach out to the markets of the world and lay tribute upon them for the wares which we have to sell. We must become a ship-building nation; we must earn freights from the rest of the world and bring the gold into Canada to add to our national wealth.

Can Compete with United States

"I have it on the authority of F. P. Jones, chairman of Canada's War Board, that we can manufacture in this country the things we are naturally adapted to produce in competition with the United States. 'But,' said Mr. Jones, 'our industrial life must be organized and specialized.' If this were done, Canada can lay the whole world under tribute for access to her wares.

"The Maritime Provinces, as I have pointed out, are the wharf from which this trade must be carried on, so it becomes of vital importance to prepare against that time the highways upon which our goods shall roll down to the ocean for export, and complementary to that, we must develop in these Maritime Provinces the manufacture of things which we are adapted to produce in order that they may be carried back to the hinterland in the cars which have brought down our products for export."

On the invitation of Mayor Hayes, of St. John, and Mr. Wetmore, chairman of the St. John Board of Trade, it was unanimously recommended to the council of the Institute that the next maritime professional meeting of the Institute be held in that city.

ST. JOHN HARBOR*

By Alex. Gray,
Chief Engineer, Public Works Department of Canada, St. John, N.B.

ST. JOHN HARBOR is situated at the estuary of the River St. John, which is about 460 miles long, with a drainage area of 26,000 square miles and an average flow of about 20,000 c.f.s.

Numerous articles have been published on the tidal phenomena in the Bay of Fundy and St. John River, but it is unnecessary to deal with these in this paper further than in so far as they affect the engineering features of harbor development.

The river discharges into the head of the harbor through a rock gorge, about 1,200 feet long and 400 feet wide. The small cross sectional area of the channel does not admit the flood as fast as it rises, or dicharge the ebb as fast as it falls into the bay. The minimum summer level of the water surface of the river is 15.0 feet above low water datum of harbor, and the tidal range in the harbor is 13 to 30 feet. The variation of the sea level, therefore, at high water is from 2 to 14 feet higher than the river, thus forming at every tide the Reversing Falls. The extreme high water of the river during spring freshet rises from 10 to 18 feet above the minimum. Navigation between the harbor and the river is only possible for a period of from one-half to one hour, occurring before and after high water—the time generally being about two and a half hours ebb and three and a half hours flood. At Indiantown, about one mile above the Falls, high water occurs about one hour six minutes, and low water occurs two hours twenty minutes later than high and low water in the harbor. The average tidal rise at Indiantown, about one-half mile above the Falls, is about 1.3 feet.

*Paper read last week at Halifax meeting of the Engineering Institute of Canada.

Gorge Forms Settling Basin

The gorge at the head of the harbor, with its merged reef, forms a slack water reach, which is navigable for small craft from St. John to Fredericton, about 84 miles, and for a total of about 90 miles on several tributaries of the river. This slack water reach acts as a settling basin, in which the heavier silt is precipitated.

The exposure of the harbor is from the south-east to the south-west. The prevailing winds are from the north-west, from which quarter the severe storms generally originate, and afterwards change to the south, causing considerable inconvenience in the harbor. The height of the maximum waves during these storms is about 10 feet.

The Negro Point Breakwater, 2,250 feet long, is of the rubble mound type, with stones placed at random on the outer slope, weighing 2 to 8 tons, with concrete superstructure for about 940 feet. It was originally designed with a cribwork core, commenced in the spring of 1875, and completed in September, 1877. A heavy storm, however, on the 11th and 12th February, 1879, carried away 1,300 feet of the cribwork to from 10 to 19 feet below high water. From that date to about 1887 work was annually carried on in placing stone to bring the seaward side to a uniform slope of 3 to 1.

Good Concrete in Salt Water

There is now a concrete superstructure 15 feet wide for a length of 946 feet. The seaward slope at concrete superstructure is 2 to 1. The portion of breakwater, without concrete superstructure, has been raked down by storms to a slope of about 6 to 1, and the crest has been moved towards the harbor about 35 feet off centre line. Around the lighthouse are placed concrete blocks, weighing 60 to 80 tons each; they are founded a little above low water level. Mr. Shewen, who designed these blocks and the method of construction, arranged the work so that the pouring of concrete was begun as soon as the foundation was dry, and proceeded with at such speed as to keep the top of block above the rising tide—the covering of the casing being pressed down upon a cushion of jute, stuffed with oakum, before the tide rose to the top of the block. After extreme storms, marks on the stones, the disappearance of seawood from the surface, and the displacement of the larger stones indicate the considerable forces exerted. The concrete work in the breakwater is in first-class condition, and offers encouragement for concrete in salt water, providing sufficient care is exercised in mixing and placing.

Observations with a marine dynamometer give the force of waves at breakwater a pressure of upwards of 4,000 lbs. per square foot. Part of the concrete work

and the dynamometer observations were carried out under the direction of Major E. T. P. Shewen, who was for a number of years District Engineer for the Department of Public Works.

Through the opening of about 1,500 feet between the end of the breakwater and Partridge Island heavy southerly waves break and expend, following the ragged face inside the shore, and continue to roll towards the harbor, causing such extensive erosion of the coast line that protective measures had to be taken in building a revetement wall along the foot of Fort Dufferin.

The principal development in the harbor to date has been on the west side, on which there are at present ten berths, with 32 foot draft, and room for fifteen additional berths as soon as Negro Point Breakwater is extended to Partridge Island and railway facilities rearranged. On account of the limited frontage and the railway terminal situation, however, the harbor is being developed from both sides.

Annual Dredging

The entrance channel is 12,000 feet in length and 600 feet in width, and 32 feet clear depth at low water is maintained by annual dredging—the annual siltation varies, but generally amounts to about two feet.

When the Negro Point Breakwater is extended to Partridge Island (about 1,500 feet) the littoral drift from the south-west will be arrested and the flow more concentrated in the channel will increase the scour and assist in maintaining the channel depth.

The materials dredged in the harbor are principally clay, sand, gravel and silt. There is considerable quantity of submarine rock to be removed in order to straighten the channel, but on account of the extreme cost of same this work is being delayed.

During the year there are generally only two to eight tides below zero, forty 0.5 tides and sixty tides 1.5 feet above zero; the remainder of the tides range from 2.3 to 6.7 feet above zero. Boats generally prefer to berth at slack water. It is, therefore, evident that the channel is navigable for the largest steamers.

The wharves are built to provide 32 feet at low water. The harbor, fortunately, is free from the teredo, limnora and other sea worms. The type of construction up to the present has been timber cribwork and concrete, with cribwork substructure. On account of the scarcity and high cost of timber and the necessary extreme height of the wharves (about 65 feet), other types of structure are being investigated.

Extreme Tide and Consequent Currents

The outstanding features in St. John harbor are the extreme range of tide and the consequent currents.

The inward mean tidal flow is about 20,000 c.f.s. and the outward is about 40,000 c.f.s. (The maximum surface current velocity at the minimum section in the harbor is about four miles per hour.)

Unfortunately, no systematic meterings have to date been made of the river, and, consequently, the river flow is only an estimate. A series of float observations have been taken at various stages of the tide and at various depths below surface. These show very erratic current conditions. The fresh water from the river flows out, while underneath the tide rises and falls regularly.

The principal wharves are of cribwork with concrete superstructure, the cribs being placed on a prepared dredged bed, covered to an average depth of five feet with broken rock. Behind the cribs, selected dredged material is filled in, on which the necessary railway sidings and sheds are built. The sheds are one story, of timber construction. At a number of the wharves grain conveyers are built from which boats can be loaded with grain at any stage of the tide. In addition to vertical fenders of 12 x 12 inches hard pine, floating fenders, about 36 inches diameter and 33 feet long, are placed about 80 foot centres. It may be noted that in berths 15 and 16, which are more exposed to wave action, the life of these floating fenders does not exceed two years.

Courtenay Bay Development

The Courtenay Bay development, on the east side of the harbor, comprises the building of a dry dock, 1,150 feet in length, 125 feet wide, with 40 feet of water on sill at high water, ordinary spring tides, and elevation of sill 14 feet below low water, spring tides; the building of a breakwater, 7,070 feet long, of which 4,570 feet have been completed; the dredging of a basin 32 feet below zero, and channel 22 feet below zero (zero being extreme mean low water). The details and layout of the wharves have not yet been decided. The breakwater is of the rubble mound type, top width 20 feet, seaward slope varying from two to one to three to one, according to location.

The breakwater does not have the exposure of Negro Point Breakwater, and it is, therefore, not expected that the slopes will suffer the raking down experienced at the latter place. The stones at the outer end, weighing upwards of ten tons, were lifted from their beds and moved about fifty feet during a storm in October last. The rock from the breakwater is obtained from the dry dock site, loaded by steam shovels and hauled by locomotive on standard track on trestle and dumped in the work. At the outer end of the breakwater, where the embankment is wide on account of the slopes and depth, two trestles will be used to ensure the larger stones being placed outside.

St. John, on account of geographic situation and consequent long railway haul, to date is principally a winter port. The traffic in 1895 amounted to three and a third million dollars imports, and three million dollars exports, whereas during the year 1917, the traffic amounted to sixteen and three-quarter millions imports, and two hundred million dollars exports.

BENEFITS OF THE PANAMA CANAL

THE United States government this fall will move far western wheat by way of the Pacific and the Panama Canal instead of across the continent by rail.

The plan is prophetic. While the Atlantic and the gulf feel the changes occasioned by the Panama Canal, it is the Pacific ports that actually realize the transformation. There is not a value upon the Pacific Slope that has not been enhanced by the canal, as there is not a cost of western products in New York that has not been favorably affected. And this influence is extending back from the Pacific into Montana, Idaho and the Rocky Mountain region generally.

British Columbia and Alaska also feel the benefit. The shipyards of the Pacific are quite as good for the purposes of this war as those of the Delaware. But for the canal the launchings at San Francisco, in the Columbia and Puget Sound would not have been, and Schwab would not have rejoiced Independence Day in the feats of ship construction on "the coast." Germany diligently prepared for war for a generation. but the United States forestalled her by a construction that will do much to thwart the Kaiser's plans immediately. and to prevent German aggrandizement hereafter. The canal as an engineering feat took the popular imagination for a day. Now it is accepted as an ordinary fact, like the Great Lakes. But the canal operates every day and more and more. It is a tremendous factor in the life of all the globe.—From *The Monetary Times*, Toronto.

The Engineer's Library

Any book reviewed in these columns may be obtained through the Book Department of The Canadian Engineer, 62 Church Street, Toronto

SEWERAGE

Reviewed by R. O. Wynne-Roberts
Consulting Engineer, Toronto

By *A. Prescott Folwell.* Published by John Wiley & Sons, Inc., New York; Canadian selling agents, Renouf Publishing Co., Montreal. Eighth edition, 462 pages text, 5¾ x 8¾ ins., cloth. Price, $3.00 net.

This book was first published about twenty years ago but has since passed through many revised editions. The aim throughout is to cover the fundamental principles and approved practices of both sewerage and sewage treatment, giving the latest development in each. Such is the statement contained in the preface to the eighth edition. It is well printed and contains 80 illustrations and 27 tables. The subject of sewerage is dealt with in 300 pages and sewage treatment in about 123 pages.

In connection with the definition of terms the writer agrees that "sanitary sewage" is an absurd misnomer. The American Society of Municipal Improvements has adopted the term "house sewage" and the author states that domestic sewage and industrial sewage are commonly combined for removal and called house sewage. On page 12, industrial sewage is shown to often contain pickling acids, grease, alkalis, dyes, and so on. It would appear more logical to apply the simple term "sewage" to liquid wastes from premises which are not industrial in character.

The chapter on storm sewage is interesting and instructing, inasmuch as the author deals with the subject in comprehensive manner, showing the rational method of arriving at the approximate quantity of rain water that may be estimated to reach the storm sewers. Many formulas have been devised by engineers to estimate the runoff, but they are not reliable, hence the development of what is called the rational method, which has been adopted by many of the leading engineers. Although the author has gone fully into this matter, the example given by him on pages 54-57 needs to be amplified, because certain assumptions or assertions are made without giving reasons for the same. With such amplifications the example of runoff calculation would be more easy of comprehension.

The question of combined versus separate sewers is discussed in a thorough manner. Having regard to the cost of the treatment of sewage and the cost of construction of the work, it is strange that the question of adopting the separate instead of the combined system has not been more extensively considered. There are, of course, many difficult problems involved in arriving at a decision in this connection and the author presents the case for the reader's attention.

It is not clear what "a" represents on page 157, and on page 164 the statement that "the demands of economical construction and the necessity for sufficient fall in house connections should not, however, be sacrificed to reduce velocities to less than 10 or 12 feet or increase them above 2½ feet which, however, should be the limit allowed," needs to be clarified.

Specifications and contract are dealt with in Chapter 10 and standard specifications, as adopted by the American Society of Municipal Improvements after two years' discussion, are given and occupy 39 pages.

Sewage disposal, which must be such that it will "lose permanently its power for evil," is discussed by the author in the last third of the book. Disposal by dilution, removal of suspended matter, oxidation methods and other forms of treatment are dealt with. The former ideas of disposal by dilution are gradually assuming different standards. The Chicago drainage canal, the New York sewage disposal problem, as well as other dilution disposal schemes, involve questions of immense importance and enormous expenditures, as the reports on contemplated improvements indicate. Certain rivers and waters have been seriously deteriorated in this manner and the authorities controlling the sanitation of waterways, as well as those contributing to the evil, are confronted with the problem of how best to ameliorate the conditions. This matter is fully discussed by the author. Dispersion and diffusion of sewage and the limit of deoxygenation of streams are most important factors in the disposal of sewage by dilution.

The removal of suspended matter by different methods is described. Screens, rough filters, tanks, chemical precipitation, and the activated sludge process are dealt with under this head. The oxidation methods include filtration and irrigation, although it would appear reasonable to place the activated sludge process in this category. The other treatment methods include disinfection, aeration of filters, electrolytic treatment, etc.

The activated sludge process has received but a limited consideration despite the fact that it is being applied in North America and in Britain on a practical scale, and with good results.

This volume is to be recommended as a valuable addition to a municipal engineer's library.

PORTS AND TERMINAL FACILITIES

Reviewed by Frederick W. Cowie
Chief Engineer, Harbor Commissioners of Montreal; Designer and Consulting Engineer, Halifax Ocean Terminals

By *Roy S. MacElwee,* Ph.D. Published by McGraw-Hill Book Co., Inc., New York. First edition, 1918. 315 pages, more than 117 illustrations, cloth, 6 x 9 ins.

This volume on ports and terminal facilities, by a lecturer in economics and foreign trade in one of the leading American universities, comes at an opportune moment. The last year has demonstrated in North America that although railroad design and construction in America has surpassed all competition, the ports and ocean terminals have been left to unco-ordinated effort and that in the present emergency of self-preservation they have woefully fallen down for lack, in the past, of study of the requirements and skill in design.

Grave fears may also be expressed that in the present imperative corrective effort by the greatest executive

authorities in the United States, and backed up by inexhaustable war appropriations, the work is being carried out on right lines, either for the present or for the future.

The American Association of Port Authorities meets this week at one of the great American ports. It would appear that, if not too late, a vast good could be accomplished by a discussion at that convention of the principles of the Port War Development now being carried out.

Prof. MacElwee has evidently studied the commercial and economical aspects. In his valuable book he has set forth the problem in clear terms. He has given splendid and detailed examples of successful foreign ports. The solution, so far as America goes, is not yet forthcoming, however.

Without giving heed to war efforts, when the best brains in the country, together with the unlimited credit and insistent patriotic demands, cannot but result in success, can it be hoped that American ports will be on a par with American railroads or American industrial success? It is only necessary to study the record and experience of the executive heads of successful railroads. Or the manufacturing or mining magnates; are they made in a day or would they be equal to the task with the usual life of an American port authority?

In foreign countries, the port authorities, as representative committee men, chairman of committees and president, following a successful career in allied ventures, spend the later part of their lives in analytic and studied effort. There, port engineers are in a class by themselves, and it is the most remunerative and highest class in the profession. What wonder if, when the author asks the question, "What does make a successful port?" he cannot answer by a good example in the United States, a country full of economically successful examples.

A few quotations from Professor MacElwee's book will be sufficient to call the attention of port authorities and engineers to the necessity of obtaining a copy and the interest and value it will give them.

"Economic aspects of the problem of efficient ports.

"Expensive harbor works alone do not make a port which will bring commerce and wealth to a city.

"The need for better port and terminal facilities is not only a vital war measure but of continued and increasing importance in securing to the United States its place as the leading maritime power after the war.

"The importance of the subject to the nation and community.

"What does make a successful port?

"The importance of ports and terminals in national economy.

"The Port of New York has been congested.

"As a war factor, the port problem is a serious one.

"The commerce of the United States overseas is hampered or limited by lack of development of the terminal facilities in our American sea ports.

"After the war, fierce commercial struggle to capture the markets of the world.

"The marine terminal problem is a national and not a private one.

"The railroad costs for 90 miles are 27c. The terminal expenses are nearly fourteen times the rail haul.

"Goods once loaded, may move from Havana, Cuba, to Boston (1,320 miles) cheaper than from one pier to another in Boston.

"There is no short-cut to the perfect port. Engineering-economist and administrator must co-operate. Planning and execution will require engineering-economists.

"The efficiency of a port is not its size.

"With equal facilities for handling and with equal port charges, the port with the widest choice of transportation facilities to the interior will be the greatest port.

"Needless duplication. . . . It is the old story of a port built by a railroad.

"Montreal is one of the most conspicuous examples of a publicly owned and operated harbor belt line. It has been most successful.

"At the Port of New York most of the export and import freight is handled by lighter."

The author has personally studied European ports. He writes:—

"In time, we should develop at New York and New Orleans transshipping ports for grain as efficient as those of Hamburg, Rotterdam and Antwerp."

The reviewer visited the three last-mentioned ports three months before the opening of the war. It is true that their equipment and their charges for grain handling were examples of efficiency and economy as compared with the ports of London, Liverpool, Havre and Marseilles, but not so good as Manchester or Genoa, and it was demonstrated by the writer before the Institution of Civil Engineers that the plant for the storage and handling of grain at Montreal, Canada, for despatch, economy and permanence, was in a class far in advance of any.

The author should visit Montreal and he would convince himself that in the case of liners taking on other cargo at piers, he is not correct in saying "loading is only possible from the water side."

The author has stated the case. Advisability and necessity may be considered as demonstrated. A solution is still open. Legislation, co-ordination and engineering will be factors in any real solution.

The publishing is excellent; the style makes the reading attractive and the matter is most interesting.

PUBLICATIONS RECEIVED

Air Compressors.—New bulletin on Class EL-2, power driven, two stage, straight line air compressors, 6 x 9, coated paper, well illustrated, 12 pages. Canadian Ingersoll-Rand Co., Limited, Montreal.

Coal Saving.—Reprint from "Engineering" of article on "Coal Saving by the Scientific Control of Steam Boiler Plants," by D. Brownlie, B.Sc. Distributed free by Brownlie & Green, Limited, Manchester, England.

O.L.S. Annual Report.—Issued by the Association of Ontario Land Surveyors, annual report and proceedings of the last annual meeting. 228 pages, 5¾ x 8¾ ins., illustrated. L. V. Rorke, secretary, Parliament Buildings, Toronto.

The Barrett Trail.—Under this name a new house organ is being issued by the Barrett Co., of New York, Toronto, Montreal, etc. Two well-printed numbers have already been published, full of personal news of interest to the large Barrett staff that is scattered from coast to coast.

Building and Ornamental Stones.—Volume 5 of a report on the building and ornamental stones of Canada. This volume covers the province of British Columbia, previous volumes having dealt with Ontario and the Prairie Provinces. 236 pages and cover, very well illustrated and accompanied by maps. Some of the illustrations are notable, being excellent reproductions in their natural colors of various granites, marbles, etc.

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Principal Contents of this Issue

PORTS AND THE WAR

ON page 273 of this issue is published a review by Mr. F. W. Cowie, chief engineer of the Montreal Harbor Commission, of Prof. MacElwee's "Port and Terminal Facilities." This review is very opportune on account of the annual convention this week in Boston of the American Association of Port Authorities, of which Mr. W. G. Ross, of Montreal, is president.

When Mr. Cowie questions whether the present port emergency effort in the United States is being carried on along the right lines, either for the present or for the future, he no doubt refers to the tremendous expenditures being made on terminal warehouses. These warehouses are being located near the ports but require in all cases a movement from the warehouses to the ships, and Prof. MacElwee states that it costs as much to transport freight from one pier in Boston Harbor to another pier in the same harbor as it does to transport it from Cuba to Boston.

It is not in a boastful spirit that Mr. Cowie declares that for the expenditure up to date there is no port in the world—and he has visited most of them—where there is anything nearly equal to the central concentrated division of the port of Montreal.

Mr. Cowie refers to the past lack of study of the requirements of American ports, and to the lack of skill in design. Canadians who have followed the record of the port at Montreal know that there has been no such lack there. For nearly one hundred years past, the engineers of the port of Montreal have made records for permanence of position, and have always stood well toward the front in the ranks of the engineering profession in Canada. When Sir John Kennedy recently resigned as responsible engineering head of the Montreal Harbor, he brought to a close a record of forty-one years of notable service in that work. Mr. Cowie's connection with the Montreal Harbor Commission dates back originally to 1886, although he has not been continuously connected with that work since then and has, in fact, been chief engineer of the commission only for the past twelve years. The latter period, however, has probably been the time of greatest development in the port of Montreal, in which development Mr. Cowie has taken a leading part.

SECURITY OF TENURE

IN a letter written to the Municipal Engineer and Sanitary Record, of London, England, Mr. S. B. Bennett, an English engineer who spent several years in Canada, but who now resides in the United States, complains very bitterly about the lack of security of tenure of office among municipal officials in Canada. In commenting editorially upon Mr. Bennett's letter, the English paper claims that similar complaints have previously been made by other engineers.

Are conditions really quite so bad as depicted by Mr. Bennett and the English editor? There have undoubtedly been a number of cases of injustice to engineers by municipal councils in this country, but on the other hand we know many engineers who have retained municipal positions for much longer than the two years which Mr. Benett intimates to be practically the absolute limit of tenure of such office.

The status of the engineer in municipal affairs throughout the Dominion is undoubtedly unsatisfactory in some ways to the profession, but is it generally so poor as to warrant the wholesale condemnation expressed in Mr. Bennett's letter? Many of our readers are in municipal positions or have had experience in such positions, and if any of them care to express their views for the benefit of their fellow engineers, either in support of Mr. Bennett's viewpoint or in refutation of his statements, we would be pleased to publish any letters upon this subject. His letter was reprinted in our last issue.

ORDER EARLY,—THE LIBRARY'S GONE!

IN an address to engineers of St. Paul and Minneapolis, Mr. Alfred D. Flinn, secretary of the Founder Engineering Societies of the United States, remarked that the most complete technical library in the world is in Berlin, Germany.

"The card catalogue of that library," said Mr. Flinn, "is so complete that any conceivable question can almost be answered from the catalogue itself." Mr. Flinn hopes that the date is not far distant when the combined libraries of the Founder Engineering Societies in New York City will eclipse even the Berlin collection.

We would suggest that Mr. Flinn be restrained from spending very much money in trying to increase his library to the size of the German one, because if the German library be really so desirable, General Pershing may find room for it among his baggage on the way home, and he might be persuaded to turn it over to Mr. Flinn some time next year for addition to the books and index cards which Mr. Flinn already possesses. However, we thoroughly approve of the timeliness of Mr. Flinn's remarks. Now is the proper moment for every one to speak up and let the boys in France know just what is wanted from Berlin. Order early,—the library has been spoken for already. It's Mr. Flinn's.

PERSONALS

A. S. CLARSON, who has acted as city engineer of Verdun, P.Q., for the past two years, has resigned.

T. J. BROWN has been reappointed chief superintendent of the Nova Scotia Steel and Coal Co. at Sydney Mines, N.S.

EDWARD L. COUSINS, B.A.Sc., chief engineer and manager of the Toronto Harbor Commission, has been appointed deputy fuel controller for the Province of Ontario. Mr. Cousins will assist the new provincial fuel controller, R. Home Smith, who succeeded R. C. Harris after the latter's resignation owing to pressure of other work. Mr. Cousins was born June 11th, 1883, in Toronto, and was educated at the Toronto public schools and Toronto University. He graduated with honors in the class of 1906, Faculty of Applied Science and Engineering. After graduation Mr. Cousins was appointed engineer of the middle and southern divisions of the Grand Trunk Railway, and remained in that position until June, 1910, having 1,200 miles of main line under his direction. He had also considerable railway experience prior to graduation from the university in the capacity of assistant engineer of the Grand Trunk Railway at Toronto for two years; also from May to October, 1905, as assistant engineer of the Central Vermont Railway on the reconstruction of the West River branch. He was also on the engineering staff of the Grand Trunk Railway in 1906. In July, 1910, Mr. Cousins was appointed as assistant city engineer of Toronto, having charge of the department of railways, bridges and docks, and retained this position until February, 1912, when he resigned in order to become chief engineer of the Toronto Harbor Commission. In the latter capacity he prepared the development plans for the Toronto water front improvements, providing for an expenditure of $25,000,000. In 1913 he was appointed consulting engineer to the Federal Plan Commission of Ottawa and Hull and prepared a very thorough report on that work in conjunction with E. H. Bennett, consulting architect. In 1915 Mr. Cousins was associated with R. C. Harris, commissioner of works of the city of Toronto, and with F. A. Gaby, chief engineer of the Ontario Hydro-Electric Power Commission, as engineer in charge of the preparation of a report on rapid transit and radial railway entrances for the city of Toronto. The report which this board made at that time is notable for the unique and striking manner in which all the statistics were presented in very ingeniously devised multi-colored charts. In 1916 Mr. Cousins was appointed a member of the permanent transportation commission of the city of Toronto, and in the same year he was given full control of the Toronto Harbor Commission work as manager. During the progress of the Toronto harbor work very serious disputes had arisen with the contractors, during the course of which Mr. Cousins showed great strength of character and a thorough grasp of his work, earning his title as manager. He succeeded in an effort to make the contractors repair, at considerable loss to themselves, alleged faulty work said to have been done by sub-contractors.

International Press Photo.

F. W. GRAY has resigned as chief clerk of the Dominion Steel Corporation to accept an appointment on the staff of the Nova Scotia Steel and Coal Co.

E. E. ESTLIN, consulting gas engineer to the Ontario Railway and Municipal Board, has been appointed Provincial Commissioner of Natural Gas for the purpose of dealing with all complaints in connection with the administration of the board's orders regarding that fuel.

CHARLES W. WEST, B.A., C.E., who was expected to read a paper on "Reinforced Concrete Construction" at the Halifax meeting of the Engineering Institute of Canada, was prevented from doing so owing to illness. Mr. West is a patient at the St. John Infirmary but is gradually recovering.

RICHARD A. SARA, B.A.Sc., sales manager of the city light and power department, Winnipeg, Man., has been appointed to an executive position by the American Cellulose and Chemical Manufacturing Co., of New York, who expect to erect a $5,000,000 plant in Maryland for the manufacture of non-inflammable maving picture films and chemicals for treating airplane wings. Mr. Sara graduated with honors in the class of 1909, Faculty of Applied Science and Engineering, University of Toronto.

ROAD WORK IN MANITOBA

(Continued from page 268)

municipality $3.25 per mile per season (up to $250 per municipality), for any road properly maintained throughout the season.

The government also provides the services of an expert dragman and grader man whose services are free to any municipality for demonstration in dragging or push grader work. For earth roads the plank-drag or steel drag is used, generally the latter. While the plank-drag probably gives better results if used at the proper time, in most cases the road is not dragged until it has pretty well dried out, in which case the steel drag gives better results. For gravel roads we have found the Minnesota planer to be by far the most satisfactory implement for maintaining a smooth surface on this type of road.

At present about fifty municipalities are building roads under the Good Roads Act and nineteen hundred miles have been accepted by the Good Roads Board. Three hundred and sixty-five miles of earth roads and one hundred and ninety-one miles of gravel roads have been constructed up to the end of 1917 and one hundred and ninety miles are under construction. One hundred and fifty concrete structures; thirty-one steel structures and forty-nine wooden structures have been built up to the end of 1917. This year about sixty-five concrete structures and fourteen wooden structures will be built. Up to the end of 1917 the government had paid $680,000 as its share of work performed under the Good Roads Act.

Announcement has been made that the Mining Society of Nova Scotia, the oldest association of mining men in Canada, is about to amalgamate with the Canadian Mining Institute.