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MISSING

The Canadian Engineer

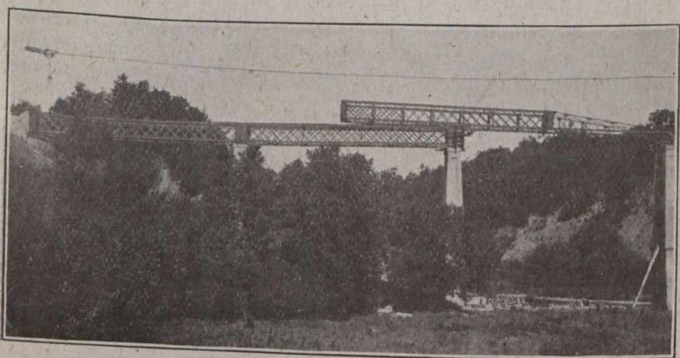
A Weekly Paper for Civil Engineers and Contractors

Construction of High Level Bridge at Tansley, Ont.

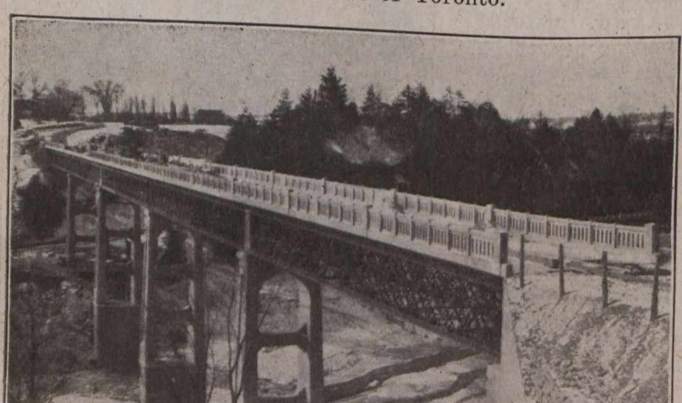
Girders Launched Without Falsework by Means of Pilot—Four Concrete Piers About 100 Feet High—Concrete Floor 542½ Feet Long and 20 Feet Wide, Curb to Curb—To Carry Provincial County Road on New Toronto-Hamilton Route

By A. W. CONNOR
Bowman & Connor, Consulting Engineers, Toronto

DUNDAS ROAD, extending westerly from Toronto, Ont., was selected in 1917 as a part of Ontario's provincial county road system because the bridging of the Twelve-Mile Creek ravine and that of Sixteen-Mile Creek would enable this road to be so improved as to provide a main route between Toronto and Hamilton (via Cooksville and the Eaton Highway), relieving the traffic on the present Toronto-Hamilton Highway; the high-level bridge over Twelve-Mile Creek has just been completed by the county of Halton, aided by a provincial subsidy. The bridge is at Tansley, Ont., about 35 miles south-west of Toronto.



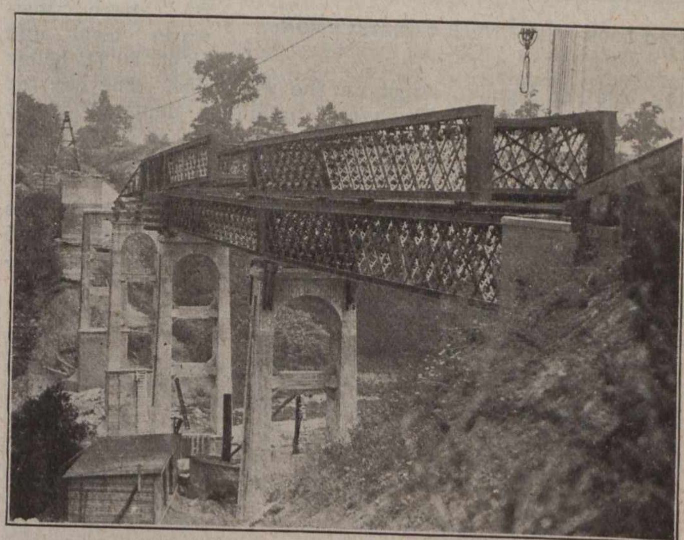
THIRD GIRDER, WITH PILOT ATTACHED, READY TO BE MOVED FORWARD



TANSLEY BRIDGE ALMOST COMPLETED

The ravine at Tansley is about 650 ft. wide and 120 ft. deep, and was formerly crossed only by a 90-ft. steel bridge, about 25 ft. above the stream, the approaches making a detour down the side of the hills. These approaches were dangerous and practically impassable in bad weather, being on a curve, with grade as high as 16½%. The steel structure, built in 1885, was badly rusted, and was also too light for the traffic at the time Dundas street became a provincial county road, so in March, 1917, the writer was instructed to strengthen this bridge, but the day tenders were being opened, a section of the old abutment fell out.

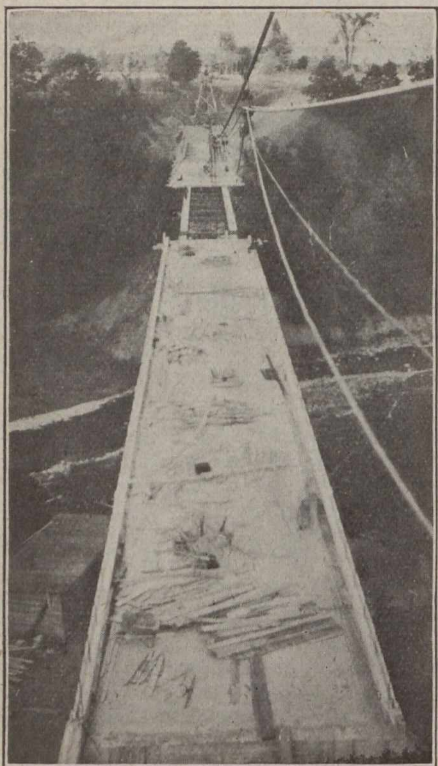
The county council then decided to build a new high level structure from the centre line of Dundas street on the east to a point about 43 ft. south of Dundas street on the west, thus shortening the required structure by avoiding the cut made for the old road. On the east the new structure was to follow an old cut which formerly led to a wooden bridge built about 90 years ago. The writer prepared plans and specifications for several designs, using steel arch, steel truss superstructure with concrete substructure, and reinforced concrete arch and pre-cast concrete beam and trestle construction. On account of war-time prices, plans were also made for a crossing at an intermediate level and on the line of Dundas street without the deviation required for the higher level.



ANOTHER VIEW OF THIRD GIRDER BEING PLACED—FOURTH GIRDER FOLLOWS CLOSELY

Very little preliminary investigation was required, as shale appears on all banks and cuts within a few feet of the surface, and on the river banks. The river is generally small and shallow, but in time of freshet fills the whole valley to a depth of 10 to 12 ft. It empties into Lake Ontario at Bronte, about 4 miles south of Tansley.

Tenders were opened June 20th, 1917, but the county council thought that they were too high, so action was deferred. Later, a proposal to use old I.C.R. deck latticed girders that had recently been replaced by heavier structures, was submitted by Norman McLeod, Ltd., engineering-contractors, Toronto, and was favorably considered. Plans and specifications for the structure now completed were then prepared, and the contract was awarded to Norman McLeod, Ltd., in August, 1917.

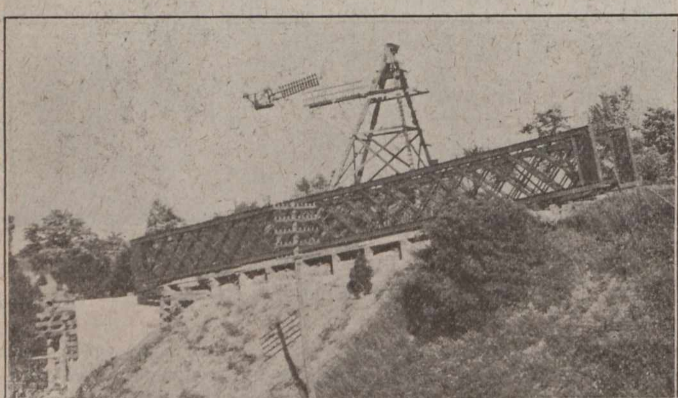


FLOOR SLAB UNDER CONSTRUCTION

The superstructure consists of five deck latticed girders of 108-ft. span, 13 ft. 6 ins. centre to centre, with concrete floor beams and a concrete floor slab 20 ft. wide from curb to curb. The curbs are 12 ins. high by 10½ ins. wide, and the concrete panel railing is 4 ft. high.

The substructure consists of concrete abutments, with reinforced slab and counterfort wing walls and four concrete piers. The floor of the bridge is about 98 ft. above low-water level and about 20 ft. below the level of Dundas street on the west side. The cut for the west approach will have a maximum depth of about 6 ft. and the approach will have a grade of 5%. This approach reaches Dundas street by a reverse curve of 253 ft. radius.

The old cut on the east side was utilized and filled to the new grade of 5%. The maximum depth of fill was 35 ft. Some of the grading and the macadamizing of the approaches will not be completed until spring, but the bridge is now open for traffic.

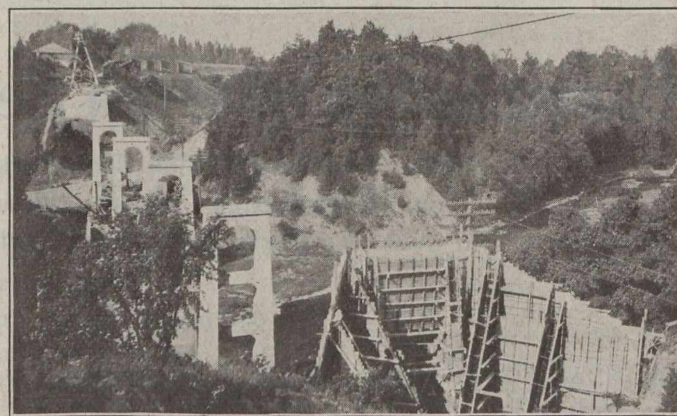


MOVING FIRST GIRDER ONTO ABUTMENT

The total length of the structure is 542.5 ft.; or, with approaches, 1,450 ft. It was designed for Class C loading of the Ontario Department of Highways (20-ton concentrated load).

The contractor's plant included a Flory 5-ton steel cableway, about 1,000 ft. long, on wooden towers. This cableway was operated from the west bank. The mixer was a steam-driven 1-yd. Smith mixer, with overload bins fed by a clam-shell bucket, and discharging into 1-yd. hopper-bottom buckets under the cableway.

The mixer and storage ground for concrete materials was immediately below the higher ground forming the approach to the original bridge. The clam-shell derrick, cement shed, tool house and office were located there. The materials were teamed to that point, down the old roadway, from the Tansley station, which was about a quarter-mile away.



PIERS BUILT—FORMS IN PLACE FOR ABUTMENT

It was found impossible to get suitable local gravel. Crushed stone was supplied by the Canada Crushed Stone Corporation, Dundas, Ont.; sand by the Maple Sand, Gravel & Brick Co., Toronto; cement by the National Portland Cement Co., Durham, Ont.; cross-frames, lateral bracings and pilot truss by McGregor & McIntyre, Toronto; and reinforcing steel by the Trussed Concrete Steel Co., Walkerville, Ont.

CLOSE VIEW OF FIRST PIER

The excavation was begun in 1917 at the west abutment, the excavated material being conveyed by the cableway to fill the deep cut at the east side of the ravine. No difficulty with water was encountered except at pier No. 4 (in the river) and pier No. 5 (on the east bank). A cofferdam of bags filled with earth was constructed for pier No. 4, which it was found necessary to excavate to 15 ft. below water level before hard shale was reached.

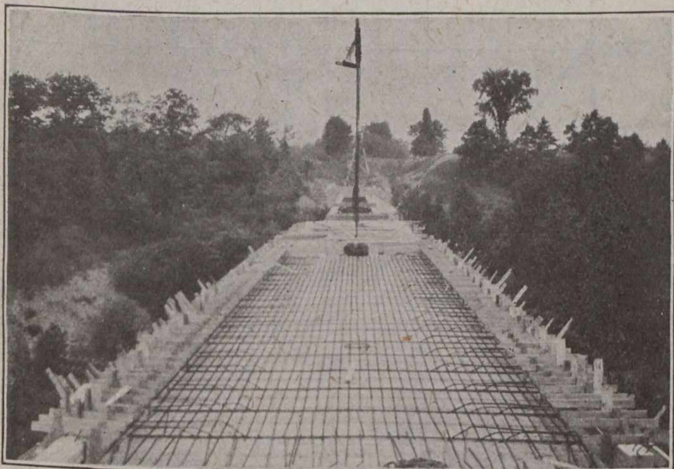
The steel railway girders were unloaded at the Tansley station. They are 108 ft. long, 9 ft. 8 ins. deep (back to back of channels), and weigh about 20 tons each. The chords consist of two 12-in. channels and 24-in. cover plates.

The web members consist of a double system of angles and bars, forming 5-ft. panels. Samples of damaged members of girders that had been subjected to similar service showed satisfactory strength. Under a uniform live load of 100 lbs. per sq. ft., the maximum stress per square inch was found to be 13,100 lbs.

The girders were hauled (from the station to the site) lying flat on house-moving trucks placed at about the quarter points. They were moved by a team with block and tackle. They were set up on the west bank and the new brace frames and laterals were then assembled and riveted.

The lower part of the piers was 10 by 20 ft. without batter, and the upper half was battered to 6 ft. by 16 ft. 8 ins., with large openings as shown in the accompanying illustrations. The upper half of the pier was cast in three sections, breaking above the struts. The piers were reinforced against temperature stresses only, except the struts and knee-braces, which were heavily reinforced against wind stress.

The launching of the girders without falsework was probably the most interesting feature of the work. A pilot (or pair of triangular trusses 60 ft. long, with cross bracing)



Reinforcing in Place for Floor Slab

was used to carry each girder across its span. The pilot was bolted onto the end of each girder in turn as they were placed, and was securely tied to the shoe plates. The pilot was handled by the cableway and connected as soon as the girder was out far enough to allow the end of the pilot to rest upon the next pier. The accompanying illustrations clearly show how the pilot was used.

A pair of 30-ton steel rollers were placed on the forward pier to reduce friction, consequently reducing strain on the piers. The girders were moved on greased rails, with shoe plates bolted under the girders, with plank between to take up the bearing of the rivet heads. The motive power was supplied by the carriage of the cableway, through a series of block and tackle.

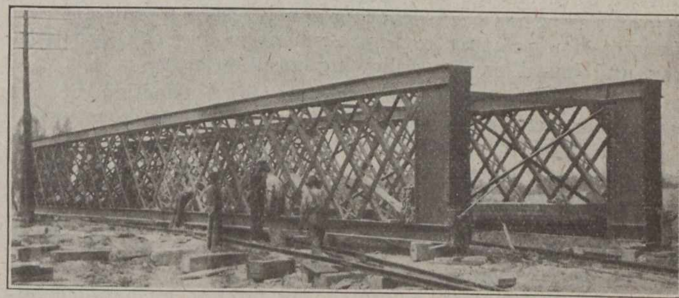
The first girder was pulled from the west abutment by passing steel cable around same, through the weep holes, the others being pulled from the forward end of the last girder placed.

The girders were moved down the slope to the west abutment on a timber skidway and rails.

On account of the proximity of the cable-tower to the west abutment, and also to avoid damaging the ballast wall, a timber bent (in concrete foundation) was built about 6 ft. in front of the abutment, on which to balance the first girder and also to turn it into the line of the bridge.

Timbers (12 by 12-in.) were placed on top of each pier to a height of about 6 ft., which reduced the slope upon which each girder moved off the preceding one. After a girder had been moved into position, it was jacked down to its final level. The next girder was then brought down, run out over those in place, and jacked down in similar manner. The illustrations show various stages of this operation. In order to provide an even bearing for the masonry plates under the uncertain camber of the girders under load, temporary bearing was taken on a 4-in. strip of steel and was afterwards grouted.

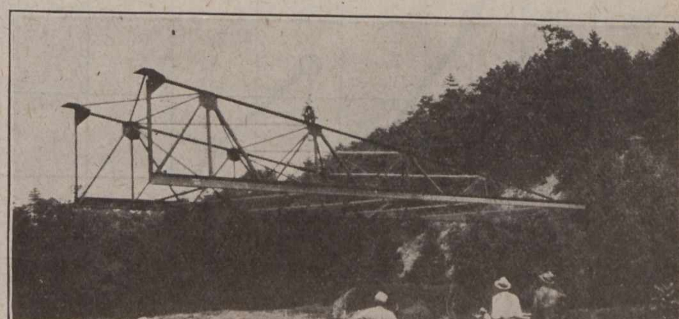
As soon as the last of the girders had passed over the west span, the form-work for the deck was commenced. The deck consists of reinforced concrete floor beams on panel points 5 ft. centre to centre, with a 7½-in. slab. The girders are at 13 ft. 6-in. centres, while the deck is 20 ft. clear of curbs. The curbs were cast with the deck, leaving a



Skidding Girder to Abutment

chase on top to take the concrete pre-cast panels of the railing. These panels were 2½ ins. wide. Reinforcing rods for the posts were left projecting. The panels were hauled up by the cableway and were set up in position, forms for posts and upper rails were clamped around them, and they were then concreted. At the ends of the girders, expansion was provided for by the panels and rails sliding in slots in the posts. In the floor, a steel plate with two angles was used.

The bridge is now open for traffic. The work was done on a cost-plus basis, and the total expenditure was about $110,000. J. F. Little is warden of Halton county, and Chas. Readhead, chairman of the bridge committee; A. S. Forster was warden in 1918, and Mr. Readhead in 1917. The Ontario Department of Highways will pay 60% of the cost. W. A. McLean, deputy minister of the department, appointed A. Sedgewick, and later Jas. A. Bell, to represent the provincial government on the work. As previously stated,



The "Pilot," which Eliminated Falsework

Norman McLeod, Ltd., were the contractors. Bowman & Connor, consulting engineers, Toronto, were the engineers for the county. The contractors were represented on the work by R. F. Smith as resident engineer.

J. C. Reilly, acting secretary of the Association of Canadian Building and Construction Industries, recently returned to Montreal after a trip to the Pacific coast. He reports a feeling of general optimism among the builders in the west, regarding the opportunities for the coming season. Even in the districts which suffered heavily from the drought, there seems to be considerable building in prospect. In Winnipeg Mr. Reilly was the guest of the Builders' Exchange at the annual banquet, 160 being present. He also addressed the exchanges in Regina, Saskatoon and Moose Jaw, and visited Vancouver and Victoria. In Calgary a new builders' association has been formed and is doing splendid work, and in Edmonton an association is being organized.

Letters to the Editor

EFFECT OF RODDING CONCRETE

Sir,—For some time the Engineering Division of the Bureau of Economic Geology and Technology of the University of Texas has been devoting considerable attention to an investigation relating to improvement in concrete construction and based on the following assumptions:—

(a) The strength of concrete is a function of the cement-concrete ratio, other factors remaining constant.

(b) For a given set of conditions there is a fairly definite water-concrete ratio which assures the greatest strength of the concrete.

(c) In practical concrete construction it is generally necessary, or at least often highly desirable, to use more mixing water than the optimum quantity, in order to produce a concrete which is sufficiently fluid to be handled advantageously and which will flow readily into the forms and between and around the reinforcing steel,—even though such concrete is weaker than it would be if less water had been used in its preparation.

During the course of our experiments we found that it was possible to prepare concrete with considerably more than the optimum quantity of water, deposit this concrete in the molds in a manner similar to that used in actual concrete construction, then "rod" the concrete, and finally secure a material which is fully as strong as it would have been had only the optimum quantity of water been used.

In other words, by this method of producing concrete it is possible to secure the advantage of economic handling and thorough filling of forms and coating of reinforcing steel, which is characteristic of concrete containing excess mixing water, and also the advantage of maximum strength, which is characteristic of concrete prepared with the optimum quantity of mixing water.

We considered this discovery of such great practical value that we published our partial results in technical journals and before technical societies whenever we had sufficient information to warrant such publication.

During the course of our investigation Prof. Abrams published his discovery that the strength of concrete can be expressed as a function of the water-cement ratio; the compressive strength of a 28-day concrete, prepared of good materials, being approximately $14,000/7^x$ lbs. per sq. in.

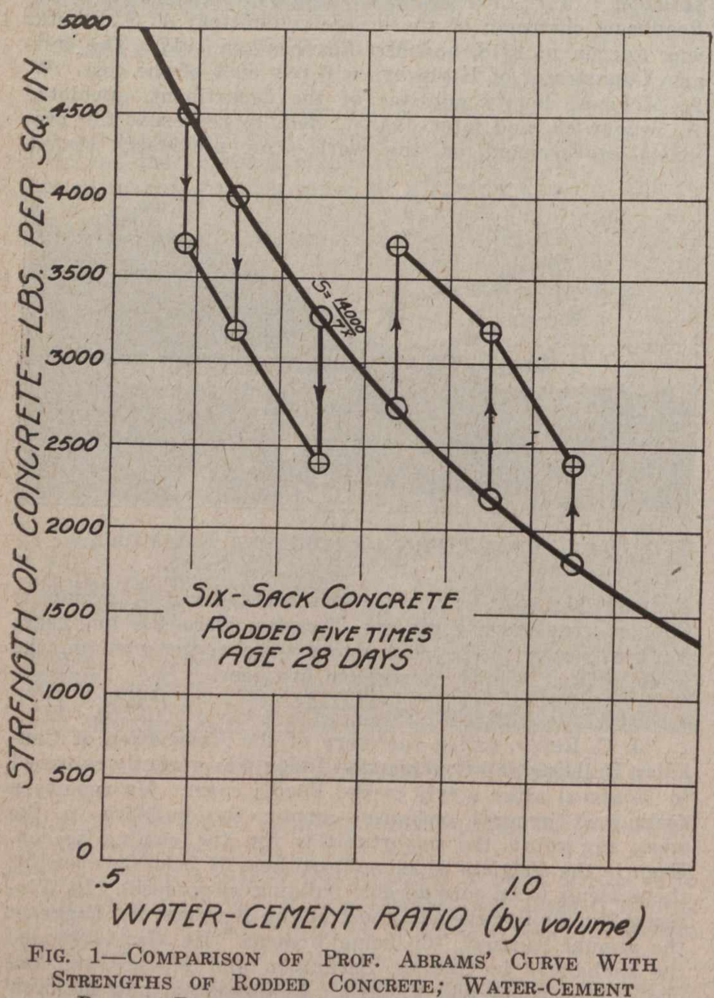


FIG. 1—COMPARISON OF PROF. ABRAMS' CURVE WITH STRENGTHS OF RODDED CONCRETE; WATER-CEMENT RATIOS BASED ON QUANTITY OF WATER IN CONCRETE BEFORE AND AFTER RODDING

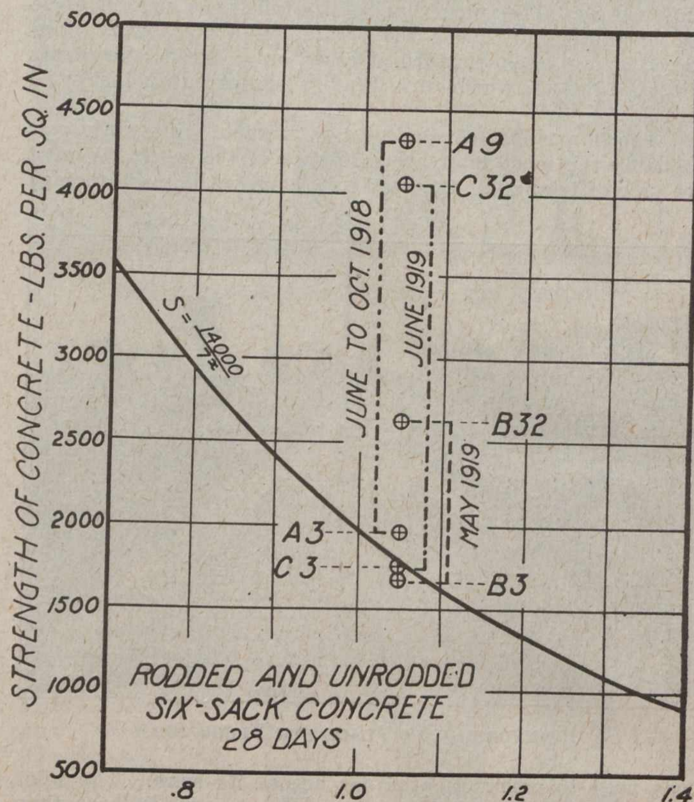


FIG. 2—COMPARISON OF STRENGTHS OF UNRODDED AND RODDED CONCRETE WITH EACH OTHER AND WITH PROF. ABRAMS' CURVE

We accepted Prof. Abrams' value as the best available basis for the comparison of the strength of rodded and unrodded concrete because Prof. Abrams had made a sufficient number of tests to convince us of the accuracy of his work, and because those of our tests which were made with unrodded concrete agreed well with Prof. Abrams' results.

Since the strengths of our rodded concrete were so much in excess of those shown by Prof. Abrams' curve, it was suggested that we repeat our tests and determine the quantity of water expelled from the concrete by the rodding, and to plot the strength against the water remaining in the concrete to see whether Prof. Abrams' expression would then agree with our results.

This was done in connection with a series of tests designed primarily to determine how the strength of "rodded" concrete varies with the cement-concrete ratio and with the maximum size of the coarse aggregate, other factors remaining constant.

We express the cement-concrete ratio in terms of the number of sacks of cement incorporated in a cubic yard of concrete; the six-sack concrete, for example, refers to concrete which, in its final condition, contains cement at the rate of six sacks of 94 lbs. of cement per cubic yard of concrete.

In the series referred to, we used three cement-concrete ratios, namely, 4-sack, 6-sack, and 8-sack; three maximum sizes of the coarse aggregate, namely, ½ in., 1¼ ins.

and 2½ ins.; and four water-concrete ratios; six specimens were made of each kind, or 216 specimens in all.

The results of the 28-day tests of the 6-sack, 1¼ ins. maximum size aggregate, are shown in Fig. 1 for three water-cement ratios; it appears from this figure that, for this particular concrete, the values shown by Prof Abrams' curve are about 28% too low when the water-cement ratio is based on the quantity of water used in mixing the concrete, and about 26% too high when the ratio is based on the quantity of water remaining in the concrete after rodding.

Our 28-day results for the 4-sack and 8-sack concretes are very similar to those for the 6-sack shown here.

In the issue of November 27th, 1919, *The Canadian Engineer* published a discussion of our work by Prof. Abrams, and I wish to offer the following corrections and additions to Prof. Abrams' comments:—

Reply to Prof. Abrams

1. Prof. Abrams states: "The author properly attributes the increase in strength (of the concrete) to the removal of the excess water by rodding." I stated in "Engineering News-Record," Vol. 82, pp. 958: "The increase in strength produced by the rodding is no doubt due to the removal of the excess water and the entrapped air and to the compacting of the aggregate. . . . To a certain extent the excess water may act as a lubricant to permit a better compacting of the aggregate."

In the same article I stated that rodding had increased the density of our concrete from 142.1 to 147.9 lbs. per cu. ft., or about 4%. This increase in density due to rodding is the same as that secured at Lehigh University by subjecting the fresh concrete to a pressure of about 2,000 lbs. per sq. in. in an experiment by Prof. McKibben.

2. Prof. Abrams believes that it is not safe for me to assume that his expression ($14,000/7^x$) gives the strength of unrodded concrete with sufficient accuracy for comparison with the strength of rodded concrete because of "differences in the quality of cement, temperature, curing conditions, time of mixing, or numerous other variations" and regrets that we did not make parallel groups of tests of unrodded specimens for comparison with rodded specimens.

Fig. 2 shows Prof. Abrams' curve and the results of three parallel groups of tests of rodded and unrodded concrete made by us. The average strength of our nine unrodded specimens made at three different times, widely separated, is 1,811 lbs. and falls almost exactly on Prof. Abrams' curve; this shows that our materials and methods must be very similar to those employed by Prof. Abrams.

Since our results with unrodded concrete agreed with Prof. Abrams' curve near the middle of that curve and for that type of concrete which is most generally used in reinforced concrete work, and since Prof. Abrams concluded from his extensive tests that "it is seen that for given concrete materials the strength depends on only one factor,—the ratio of water to cement," I see no reason for a further checking of Prof. Abrams' curve.

Water Stood on Group B Specimens

Group A of Fig. 2 consists of three unrodded and nine rodded specimens; these results were obtained June to October, 1918, and published in "Engineering News-Record," Vol. 82, p. 958.

Group B consists of three unrodded and thirty-two rodded specimens; these results were obtained in May, 1919, and have not yet been published.

Group C consists of three unrodded and thirty-two rodded specimens; these results were obtained in June, 1919, and published in *The Canadian Engineer*, August 14th, 1919.

The reason why the strengths of the Group B rodded specimens are so much lower than those of Group C, is that in the case of Group B the water which was worked out of the specimens by rodding was allowed to remain on the specimens so that the same were practically standing under water, whereas, with Group C, concrete was added as the rodding compacted the specimens, so that the molds were always practically full of concrete and the water which was rodded out of the specimens could run off over the tops of the molds, our molds being practically water-tight.

3. Prof. Abrams states that I fell into error in plotting my diagram by failing to make an allowance for the change in water-cement ratio due to rodding.

No, this was no error; Fig. 1 shows that Prof. Abrams' curve does not give the strength of our rodded concrete either when plotted with reference to the quantity of mixing water or with reference to the quantity of water remaining in the concrete after rodding; Fig. 2 shows that Prof. Abrams' curve does give the strength of our unrodded concrete very accurately, and that the strength of our rodded concrete is very much higher than that of our unrodded concrete.

However, the diagrams published in *The Canadian Engineer*, August 14th, 1919, were not intended as a study of Prof. Abrams' curve; they were intended to show that concrete prepared with excess water can be very materially improved in strength by rodding, and that consequently it is a mistake to assume that we can not use excess mixing water and still secure good concrete; the diagrams were to show that we can use enough mixing water to make the concrete so fluid that it can be handled economically and that it will fill the forms well, and then, by rodding, still make as good if not better concrete than could have been made if no excess mixing water had been used.

Greater Strength Despite More Water

Notice, for example, the series of tests described by Prof. Abrams in *The Canadian Engineer*, November 27th. 1919; he reports that he used a 1:5 normal consistency mix, with a water-cement ratio of 0.87 and aggregate grading up to 1½ ins., and that he secured, by tamping in four-inch layers, a maximum average strength of 2,810 lbs. at 28-days in 6 by 12-in. cylinders. Compare these results with those of our series shown and described in *The Canadian Engineer*, August 14th, 1919, in which we used practically a 1:6 mix, by weight, with a water-cement ratio of 1.05 and aggregate grading up to 1¼ ins. and secured an average strength of 4,073 lbs. for thirty-two specimens at 28-days in 6 by 12-in. cylinders.

In other words, we used about 21% more mixing water per unit of cement, and secured about 45% more strength, than did Prof. Abrams.

This comparison brings out the point I wish to make, namely, that by rodding the concrete it may frequently be very much better to use excess mixing water than to use a mix which contains only sufficient water to produce a workable consistency.

F. E. GIESECKE,
Professor of Architectual Engineering,
University of Texas.
Austin, Tex., December 23rd, 1919.

TRADE UNIONISM AND ENGINEERS

Sir,—I have just read, with a great deal of interest, the letter of N. C. Mills, vice-president and managing director of the Montreal Armature Works, Ltd., which appeared in your issue of December 25th, 1919. I had previously read the statement signed unanimously by the directors of the American Association of Engineers, printed on page 498, and the statement of the membership of this organization, printed on page 499 of your issue of November 27th, 1919; also the letter of Fred Christie, from Peterboro', Ont., published in your issue of December 18th, 1919.

I am inclined to think that the rank and file of the American Association is not likely to be as unanimous on this point as were the directors, and that the directors are very likely to hear from the men underneath.

I wish to voice my "amen" to what Mr. Christie and Mr. Mills have said on the subject of "Trade Unionism and Engineers," and to express my own thought that we really need more than a "trade union." Our engineering societies can, and I believe they will, gradually develop into that general form of organization, even though under some more euphonious name, and probably with loud protestations to the contrary.

Necessity is a hard taskmaster, and he is driving the rank and file of the profession very hard these days. But I also think that wherever an "industrial union" or "industrial council" operates in the industrial unit in which an engineer is employed, he should become a member of such industrial union or council, and learn to associate in a business way with the shop stewards and other "menials," who are our partners in industrial production.

"Self-Erected Mental Pedestals"

We might, and with profit, to ourselves, occasionally sit down at a table and drink a glass of "remembrance beer" with a real "labor leader" of the type common to the A.F. of L. (Some think it more appropriate to pronounce the "L" with a Cockney accent.) Or we might even dine with one of those nefarious "foreign agitators," —possibly English or Scotch, as at Winnipeg,—and absorb more than the bill-of-fare. It would do us good, professionally and otherwise, to know what these men are thinking; for the superb ignorance of most of us professionals upon a great many subjects outside of that for which we have a special training is truly marvellous. We are sometimes worse than ignorant: we are grossly misinformed through the daily press.

The sooner we engineers, and other professionals for that matter, come down from our self-erected mental pedestals and recognize the fact that we are but laborers in the common vineyard—along with the rest of struggling, sweating humanity—the better it will be both for us as a group of professionals and for the community at large.

If we are such superior humans as some would have us believe, why, may I ask, is it so seldom recognized on the payroll? The "boss" always seems to be perfectly willing to give us all the "recognition" we could possibly ask,—anywhere else. Engineers working for industrial firms have a particularly hard time gaining that form of "recognition" which the butcher and baker will accept, but consulting engineers also have a hard time securing fes commensurate with the services which they render.

There is no definite line of demarcation between mental and manual labor, the work of brain or brawn. It requires a certain amount of manual labor on the part of the best engineers in order that they may apply their mental attainments, and the efficient handling of the busy end of a shovel requires a certain amount of mental labor. The work of some professionals suffers materially because of the lack of that amount of manual labor which is requisite to make it most effective, and vice versa. The first bridge engineer probably both mentally designed and physically constructed his own bridge by cutting down a tree so it would fall across a stream.

Chanting Produced Good Concrete

Two instances will fully illustrate my point. A water works engineer, a brilliant technician, re-designed and re-built the water works of a city of about one hundred thousand inhabitants at the time I was its commissioner of public works. This man was on the job, both mentally and physically, all the time the work was in progress, and it was done just as he wanted it and at a low cost. What he accomplished certainly could not have been achieved by an armchair engineer who was afraid of the other end of the job.

The other instance is that of two concrete mixers of the continuous type which I was operating in 1907 as a contractor at two different points on the same street. One was manned entirely by a poor grade of labor, and the men shovelled into the sand and stone hoppers of the mixer without apparent rhyme or reason. The result was hoppers that were sometimes full and sometimes empty, and a very unsatisfactory product in the finished concrete was secured despite all the foreman could possibly do.

The other continuous concrete mixer was manned by a group of more efficient laborers, who soon proved their superiority by organizing themselves into a shovelling brigade, each man in his place, and all operating in unison to the notes of a "chanty." They would shovel so many "beats," then rest so many, then again shovel so many; and the shovelling and resting periods were so arranged that the hoppers would get low but never empty. This performance went forward all through the day with both rhyme and reason, which were very apparent in the quality and quantity of concrete mixture produced. Some brains at the busy end of these shovels, for fewer shovels produced more concrete of a superior quality!

It might be stated that the "trade" unions cut through the industries along "craft" or "professional" lines. That is, all the carpenters are in one organization, no matter whether they are building country bungalows, laying factory floors or erecting wooden forms for concrete bridges. This form of union organization has the better opportunity, if it will but use it, to produce, by education, a very high grade of carpenters, men with whom their trade is a profession and who are really craftsmen. By some it is not thought to be a good fighting formation when a strike becomes necessary, either for the men themselves or for the public at large; for the many small strikes which it usually engenders keep industry in a turmoil without anyone except those directly concerned knowing much of what it is all about.

Two Forms of Unions

The other form of labor organizations, the "industrial" unions, do not cut through the industries, but are co-ordinate with the industry in which they are formed, and are intended to include all the employees in that industry. They do not offer the same educational opportunities as do the "trade" or "craft" or "professional" unions, but it seems to me that they do promise to bring about finally a certain harmony in industry which is likely to be of great benefit to the workmen and to the public as well.

Under this form of organization fewer strikes occur, and, when they do, not one "trade," but the entire "industry" goes out, the issue is more clearly joined, and in such a way that everyone is likely to know the cause of the trouble. There is a "trade" strike of the mechanics at the Montreal water works now, and this is the third day of very grievous inconvenience and danger for the public; yet practically no one knew the strike was threatening, and few of us are even to-day in a position to judge the merits of the case.

There is at present a very decided trend in labor circles away from the "trade" and towards the "industrial" method of dealing with difficulties between employer and employee, even when the men are organized along "craft" lines, and I think this trend is in the right direction for the good of the employer, the employee and the public. There certainly has been much to regret in the past working out of the "craft" form of organization, some of the leaders of which were altogether too "crafty"; and nothing is more aggravating than the inability of an employer to keep peace in his own shop, or of the combined employers of an industry to keep peace in their own industry, because he or his representatives cannot get into direct contact with his own men and their directly selected representatives without dealing through some professional "labor leader." The "shop steward" is much nearer to the employer, and much more likely to understand his side of the case than is the old-time "professional" labor leader, who has particularly cursed the American labor movement.

Like Cross-Indexing a Library

There are also many labor "councils," organized on both the "trade" and the "industrial" basis, and one may fairly well judge the thought of the organization by the adjectives which it uses. Such councils may cover a nation, a province, a city, an industry, or merely one plant, but their real object is always to bring together the trades in some district, large or small, for some form of concerted "industrial" action. The largest part of the labor movement now seems to be floating around in a sort of No Man's Land between the two types of organized endeavor; and recently, purely "craft" unions, such as those of the building trades, have, through their central "councils," organized and called "industrial" strikes or entered into "industrial" agreements which promise to provide a fairly stable and productive peace.

Engineers certainly need careful organization along both "trade" and "industrial" lines. In the labor world most workmen are in favor of one type of union or the other; I am in favor of both. It seems to me the "trade" union should be principally a mutual benefit and educational or "professional" centre, while the "industrial" union should be, for the present at least, primarily the "arm" for use when "arguing" with the "boss," if anyone wants to put it that way; that is, the "economic" union, which is the only medium with which the workers can meet the employers' "economic" unions for the purposes of "collective bargaining," which, we are told, is to solve the labor-capital problem. The co-organization of the two is no more impossible or impracticable than the cross-indexing of a library; and, given the desire to do it, probably presents no more real difficulties.

Engineers in Labor Organizations

I think every engineer should be a member of his proper engineering society, and that all the engineering societies should be closely federated into a sort of central engineering council, as has already been done to some extent. They should have the same, and no more, legal recognition and protection that labor unions may have, for what we ask for ourselves we should willingly grant to others. And every engineer should, I think, also become a respected member of whatever labor organization prevails in his industry. For instance, the members of the city engineering department should be members of whatever union formation exists among the city employees, whether it is in a straight industrial form or a "craft" form, with a central municipal industrial labor "council," upon which the "crafts" are all represented. Possibly there would be less trouble with municipal strikes if such were the case, for out of mutual understanding frequently grows agreement.

If some of us who consider ourselves "free, independent, professional engineers" would not dare join a real "trade union" or a real "industrial union" for fear of being ignominiously "fired" by the "boss," just as the office boy might be, at least we could study such organizations, form independent and scientific opinions, and acquire a sympathetic understanding of them. It is time we stopped pining to be the "Little Brother of the Rich" and aspired to be worthy to become the "Big Brother of the Poor."

Besides, where are we to stand when this much-talked-of "democracy in industry" or "co-operation between capital and labor" is brought about, and capital sits on one side of the directors' table with labor on the other, as per the "Whitley" and some of the other even more promising schemes for securing that degree of harmony which is necessary if we are ever to have the "increased production" which the directors of the American Association of Engineers think so desirable? Are we engineers to be the only "menials" remaining in the industrial family, supplicating for crumbs from the festive board, while the bricklayers, plumbers, miners, trainmen, etc., all become principals?

Is Owners' Interest Different?

And if the "law of supply and demand," which the directors of the American Association hold in such reverence that they expect it, unaided, to cure all the engineers' ills, should be tardy in necessitating the services of some of us engineers, are we to sit idly by and see our wives and children want? Are we to go out and compete for the jobs of our fellow-engineers, and thereby run down the level of our "rewards" still further; or what? The "law of supply and demand" is one of the fetishes of the times which our experience during the war should have destroyed but apparently has not. This obvious, natural law has never been handled scientifically for the benefit of the public, but has been left free to lumber around our industrial structure, hurting or helping whom it may, except when the "monopolists" have deliberately prevented it from working, to the public's injury and to their gain.

The engineer is a workman; nothing else. And I have sometimes noticed that those who think they are something different are usually the engineers who "work" the hardest for the least pay. Our natural interest, as engineers, is with those who "work" in industry, not with those who "own" industry. The most of us "own" nothing but our education and skill and native ability as engineers, and we very frequently "owe" someone for the education.

Those of us who "own" something apart from our profession, and I may include myself amongst the number, should not confuse our interests as "owners" with our interests as "working" engineers. The sooner we wake up to the fact that as a professional group we are primarily "workmen," and act accordingly, the sooner we will be able to provide our wives and children with those superior luxuries enjoyed to-day by the wives and children of bricklayers, machinists, tailors, plumbers and other "workers" who do not accept "recognition" as part payment for the services they render.

To say that some of the things "labor unions" stand for and do are wrong does not seem to me to be a valid argument against engineers having or belonging to "labor unions." What other organization is there that does not at times do things which some of us think are wrong? Certainly not the governments at Ottawa or Washington, which are unions, or rather, councils of unions, of which all of us are supposed to be members and for the actions of which each of us is at least to some extent responsible.

"Engineers Creatures of Politicians"

If, as I maintain, we are but "labor," we should take our place with labor. Certainly no one will contend that, as engineers, we are capital any more than is our aristocratic friend, the neighborhood plumber, unless it is merely in a matter of degree. Had we not neglected to take our place with labor, we might have led the way to better understandings of industry than have prevailed and to better lines of industrial action than those which have sometimes been followed and of which we may rightly disapprove.

The human race advances slowly; and, apparently, seldom until its stomach prompts the march. Probably the H. C. of L. will do for us engineers what nothing else ever has: Set us moving together in our own interests, which, in the end, I believe, will be very greatly for the benefit of everybody.

There was never a time in the world's history when the services of good, conscientious engineers were more necessary. If we could but apply to the "politics" governing our engineering projects, that trained, straight thinking which we now apply to the "brick and mortar" part of those problems, I think there would soon be a happier and a better world for us all to live in.

To-day we are too frequently but the creatures of "politicians" and "profiteers," doing their bidding, or at any rate practising our professions very largely by their leave. The order should be reversed. But there is no one going to do this reversing for us; we must do it ourselves. "In union there is strength."

CHARLES A. MULLEN,
Director of Paving Dept., Milton Hersey Co., Ltd.
Montreal, Que., January 3rd, 1920.

POWER DEVELOPMENT AT ST. RAPHAEL, QUE.

CONTRACTS were recently signed by Maurice Rousseau, president of the Montmagny Power Corporation, to supply 3,450 h.p. for the rolling mill and shops of La Machine Agricole Nationale, Limitee, of Montmagny (formerly the General Car & Machinery Co., Ltd.).

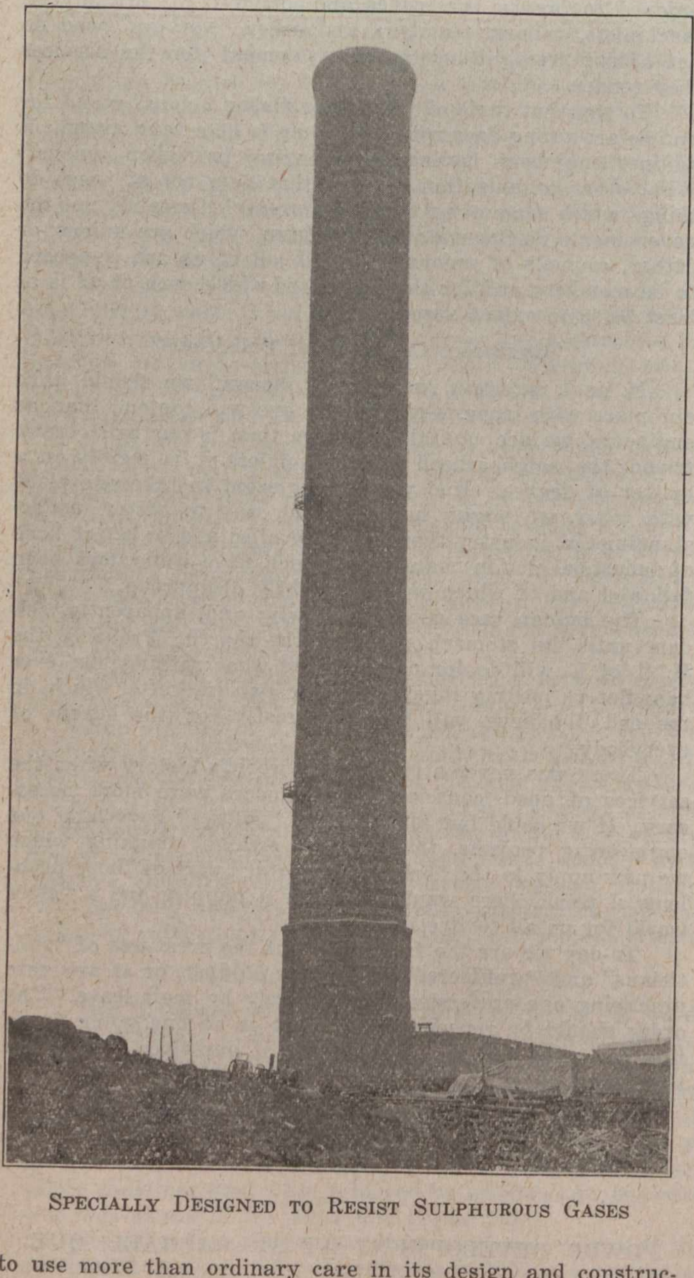
The development will be on Rivière du Sud at St. Raphael, in Bellechasse county, about 16 miles from Montmagny. Gauvin & Lessard, consulting engineers, Quebec, are revising plans, and contracts will soon be let for transmission line, penstock, water wheels, generators and concrete dam. The new plant must be in operation by January 1st, 1921.

RADIAL BRICK CHIMNEY 300 FT. HIGH

Built for the British America Nickel Corporation, Ltd., at Nickelton, Ont.—Inside Diameter at Top, 25 Ft.—Special Precautions Against Sulphurous Gases

BY J. G. MINGLE
Formerly District Engineer for Rust Engineering Co.

ONE of the largest chimneys in Canada was recently completed for the British America Nickel Corporation, Ltd., at Nickelton, near Sudbury, Ont. Owing to the hard use to which a smelter chimney is subjected, it was necessary to use more than ordinary care in its design and construction. Gases issuing from it contain from 3 to 4% of sulphurous acid. When the gases come into contact with the outside air they condense and the acid collects on the top and sides of the chimney.


SPECIALLY DESIGNED TO RESIST SULPHUROUS GASES

This chimney, which is of the perforated radial brick type, is 300 ft. in height; the inside diameter at the top is 25 ft. and at the bottom, 27 ft. 6¾ ins. The lower 50 ft., or pedestal, is built of common shale brick, laid in an acid-proof mortar, and is a hollow octagon in section. The walls of the pedestal vary in thickness from 36 ins. at the bottom to 28 ins. at the top, and are built plumb with the offsets.

The upper 250 ft., or shaft. is built of perforated radial brick and is annular in section. The wall thickness at the bottom of the shaft is 26 ins. and decreases by sections to 13¼ ins. at the bottom.

The chimney is lined throughout with a 4-in. perforated radial brick lining, separated from the outer wall by a 2-in. air space. There are two flue openings, each 22 ft. 6 ins. high by 10 ft. wide, located at right angles to each other.

Brickwork for chimneys is usually laid in a mortar composed of 1 part cement, 2 parts lime and 5 parts sand. Owing to the constituents of the flue gases, it was inadvisable to use lime in the construction of this chimney, and as a consequence fire clay was used in its stead. The entire chimney, pedestal, shaft and lining, was laid up in a mortar composed of 1 part cement, 2 parts lime and 5 parts sand. Mortar of these proportions is dense and practically impervious to acids.

Lined in Twelve Sections

The chimney is reinforced horizontally throughout its entire height with ¼-in. by 3-in. strap steel bands placed at intervals of approximately 20 ft. These bands are embedded in the walls of the brickwork to resist any circumferential stresses that may occur. There are inside and outside ladders of ¾-in. diameter U-irons embedded in the brickwork at 15-in. centres. The outside ladder is equipped with guards. The step irons were painted with an extra-heavy coat of asphaltum paint. The chimney has two testing platforms (at approximately 75 ft. and 170 ft. above the bottom) from which samples of the gases may be taken. There is also an acid-resistant lightning-rod.

The lining is supported on corbels built out from the inside of the wall, and is divided into twelve sections ranging from 15 to 30 ft. in height, so that in case any part of it becomes damaged, that part may be removed and replaced without much harm to the remainder. In order to partially seal the air space between the top of each section of the lining and the bottom of the corbels directly overhead, a lead sheet of approximately 14-gauge material was embedded in the corbel brickwork about 15 ins. above the top of each section and then bent downwards over the opening and extending an inch below the top of the lining. These lead coverings prevent the gases from collecting and condensing in the air spaces.

The top of the chimney has a heavy sectional terra cotta cap about 2 ins. thick, which prevents the acids from collecting on and doing damage to the brickwork. Terra cotta is practically acid-proof and affords excellent protection to the most vulnerable part of the chimney.

Exposed Surfaces Are Coated

The inside surface of the lining and the outside surface of the top 50 ft. of the shaft were painted with silicate of soda as an additional protection against acid.

An 8-in. baffle wall, 30 ft. high, separates the two flue openings. The brickwork over the openings is supported by six 10-in. I-beams embedded in the masonry directly above the crown of the arch. Pilasters, 72 ins. wide, are built in each side of both openings to compensate for the reduction of area due to the openings. The pilasters are tied together by 1-in. diameter tie rods. Two clean-out doors were provided at the bottom.

The chimney was built on top of a small hill of solid rock. No special footing was necessary, the top of the hill being cleared of soft rock and then levelled with concrete. The chimney was designed and built by the Rust Engineering Co., Pittsburgh, Pa.

Several changes in the requirements governing the entrance of students to the Faculty of Applied Science, University of Toronto, were announced January 1st. The new requirements are higher and are thought to be in line with the suggestions made to Dean Mitchell by the executive of the Institution of Civil Engineers of Great Britain.

Bird's-eye View of Queenston Power Development

IN the last issue of the "Bulletin" of the Hydro-Electric Power Commission of Ontario, there appeared the accompanying bird's-eye view of the Chippawa-Queenston power development, which was reproduced by courtesy of the "Popular Science Monthly" from a wash-drawing made by that magazine.

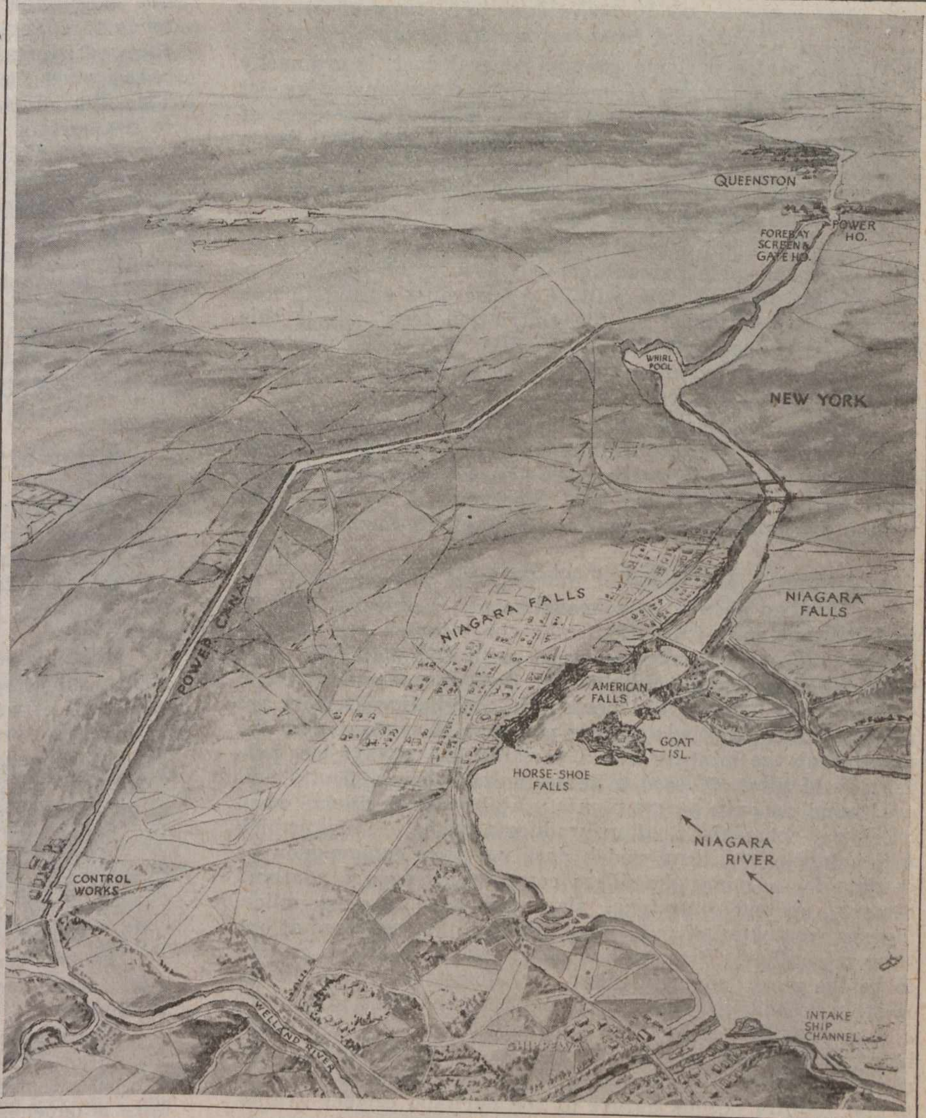
On the left of the Niagara river is Ontario; on the right, New York state. The intake at Chippawa is shown; the Welland river, which is being canalized; the control works at Montrose; and the forebay and power-house near Queenston.

Numerous construction views of this work have been shown in past articles in *The Canadian Engineer*, but this is thought to be the first accurate sketch of this kind that has been made showing quite realistically how the finished undertaking will appear. Chief among the articles on this work which have appeared in *The Canadian Engineer* are the following:—

"Progress of Queenston-Chippawa Power Canal," August 28th, 1919; article dealing with the economics and design, June 20th, 1918; description of proposed hydraulic turbines, September 26th, 1918; description of proposed generators, November 21st, 1918.

Although originally designed to develop 300,000 h.p., certain changes in the plans have been effected which will permit the drawing of 15,000 c.f.s. through the power canal, enabling the development of 450,000 h.p.

Contract was let early last year for two 525,000-b.h.p. hydraulic turbines, and specifications and call for tenders are now being issued for two more turbines of the same size. It is rumored that the prices paid for the first two machines was about $250,000 each.



AMERICAN ASSOCIATION OF ENGINEERS ENDS DRIVE WITH 10,400 MEMBERS

THE membership of the American Association of Engineers at the close of business December 31st, 1919, was in excess of 10,400, and the determination of that association to obtain 10,000 members before 1920 had been achieved with a large margin to spare. Almost 7,000 applications for membership were received during the month of December.

The results of the membership drive held during December by the association have been finally tabulated, The Buffalo chapter won first prize for clubs having a membership of more than 100, with an increase of 318.4%. For the chapter or club having less than 100 members at the close of the drive, the Ogden (Utah) club won first place with an increase of 209.09%. The prize won by the Buffalo chapter was a silk banner. A gavel for chapter use was awarded to the Ogden club. The three members of the association obtaining the highest number of individual subscriptions were F. P. Obee, of Toledo; J. W. Shera, of Chicago; and Professor Samuel M. P. Dolan, of Oregon State College; who turned in respectively 131, 100, and 66 applications for membership. The prizes awarded these three gentlemen are a life membership in the association, a $100 set of books, and a $50 watch.

The chapters which ranked after the Buffalo chapter were Lincoln, Neb., with 310%, the University of Nebraska with 301.9%, and the Toledo chapter with 194%. The largest number of applicants obtained by any chapter during the drive was 474, obtained by the Chicago chapter. The second largest in point of number of applications was the Oregon chapter, with 353. The number of applications obtained by the Buffalo chapter was 242. It is interesting to note that the Lincoln chapter and the University of Nebraska chapter are located in the same city, and that had they been consolidated, the joint chapter would have won first place. The captain of the team (in each chapter and club) which obtained the most applications, will receive a gold watch fob.

The claim of the Ontario Hydro-Electric Power Commission against the Dominion government, the amount involved being about $1,250,000, has been referred to the Dominion Power Board for report, which will receive consideration by the power sub-committee of the cabinet.

Labor shortage is held responsible for the fact that a great deal of the goods road construction anticipated in the Manitoba program for 1919 remains unaccomplished. The work done last year on Manitoba's roads was 33% less than that done in 1918.

MINERAL AGGREGATES FOR BITUMINOUS PAVEMENTS

By Wallace L. Caldwell

(Continued from last week's issue)

FILLER, which is finely ground mineral dust, is ordinarily used in all types of mixed method pavement, except bituminous concrete pavement with a mineral aggregate of crusher run stone or pit run gravel. Its use produces a dense pavement, reduces liability of displacement, enables a softer asphalt cement to be used, and causes the surface to be less susceptible to damage from water.

An ideal filler should be finely ground, not merely so that a considerable percentage will pass a 200-mesh sieve, but so that at least 60% will be a true dust or impalpable powder, as determined by the elutriation test. It is this powder which really serves as the filler and which produces the results required of a filler. The remaining portion of the filler simply serves as sand.

The grains of the filler should have a surface which will absorb a heavy film of bitumen. Very hard dense grains do not absorb a sufficiently thick film of bitumen to permit such grains to fulfil all the functions of a filler even though the material be ground to the requisite fineness.

Portland Cement Best Filler

The filler should be so constituted, chemically, that it will have no harmful action upon the bitumen and so that water will not in any way react with the material. The material should not be light and fluffy but should have a weight of at least 90 lbs. per cu. ft. Lighter materials are readily blown away when being placed in the mixer, with the result that the mixture has a variable and always low percentage of filler. Closed mixers eliminate this difficulty, but are found on only a few plants. Light-weight fillers, when used in sheet asphalt, often produce a fluffy mixture, which will not rake well and which does not take compression as it should. Among the fillers commonly used are portland cement, ground limestone, slag dust and ground silica. Nearly every kind of pulverized mineral has been used at one time or another. Practice has clearly shown portland cement to be the most successful filler, and limestone dust to be relatively second in value. Portland cement seems to produce a somewhat denser mixture than any other filler, and when heavy traffic must be provided for, its use is advisable. The reason for this is somewhat obscure, but principally is due to the slightly porous nature of the portland cement grains. This property results in each grain absorbing a certain amount of bitumen, and permits the formation, around the grains, of a tenaciously held and rather thick film of bitumen.

Limestone dust has been used with entire satisfaction. Slag dust has not been extensively used but has given good results wherever used. It would not be advisable to use the dust from an acid slag, because of the hard, glassy nature of the material, but no criticism can be made of the dust from a basic slag. Silica dust from a number of different sources has been widely used. No serious trouble has resulted from its use, but in general it has not given as good satisfaction as certain other materials.

Good filler is scarce to-day, the production having fallen below the demand. Many products which cannot be classed as a dust in any respect are being offered. Products having 50% of material passing the 200-mesh sieve but containing very little actual dust as determined by the elutriation test, are not uncommon. In several cases agricultural limestone containing 20 or 25% of 200-mesh material, with coarse grains as large as ¼ in., has been used and has been called filler. Ground stone such as this contains no true dust and simply serves as a source of fine and intermediate aggregate, with the result that the mixture contains no filler.

Stone Should Be Cubical

Limestone, dolomite, trap rock and granite are the rocks most commonly used in bituminous construction, although sandstone, gneiss and certain other rocks have been used to a limited extent. The rock should be sufficiently hard to resist the abrasive action of traffic and tough enough to withstand the impact of iron-shod hoofs and of vehicles. It should be clean and free from clay. If the rock contains fine screenings it should be freshly crushed, since the dust tends to collect on the surface of the larger pieces and, if once wet, forms a scum on the surface, which is dried and baked when the stone is passed through the heating drums. This film effectually prevents the adherence of the bitumen to the surface of the rock.

The individual pieces should be as nearly cubical as possible, since stone which crushes in slabs or slivers produces a mixture which cannot be compressed to as great a density as if a stone of cubical fracture is used.

Slabby pieces of stone are more easily fractured by traffic and thus are likely to cause the pavement to ravel. A stone having a structure and surface which will permit of absorption of a certain amount of bitumen is to be preferred to a stone with a hard, dense surface which will permit of no impregnation.

Physical Tests of Stone

Fortunately, satisfactory physical tests have been devised for rock. The U.S. Bureau of Public Roads and others have made thorough investigations of the methods and interpretations of these tests. Hubbard and Jackson, in Bulletin 370, U.S. Department of Agriculture, have tabulated a great amount of data and have given valuable interpretation of the results of their tests. Too few specifications call for these tests.

It has been the writer's experience that for city pavements, subjected to ordinary traffic, no rock having a French coefficient of wear of less than 8, or a toughness of less than 8, should be used. Under very light, residential traffic it is sometimes permissible to permit the use of a rock with a toughness of 7 and French coefficient of 6, but under no circumstances should an aggregate of lower value be used. For heavy city traffic, the requirements should be increased to a French coefficient of wear of at least 10 and a toughness of between 10 and 14, depending upon the density and nature of the traffic and the size and character of the aggregate. Binder stone should have a toughness of at least 7. Of the two tests, toughness is undoubtedly of the greater value when considering the quality of rock for a bituminous pavement.

The grading of the crushed stone is of vital importance, and in bitulithic and asphaltic concrete pavements, it is given careful attention. The density of any coarse aggregate mixture is dependent upon the proper grading of the stone. In some cases, stone as received from the quarry may be of the proper grading, but often a combination of crushed stone of different sizes must be used. In bitulithic pavement the stone is screened into various sizes, each size stored in a separate bin and re-combined in the proportion desired by weighing a definite amount from each bin.

Trailings From Ore Mines

Since their use is rather widespread, it will be well to mention chats or trailings from certain ore mines. The two materials of this class most commonly used, at least in the east, are from the zinc mines of eastern Tennessee and the Joplin, Mo., district.

The Tennessee chats are a limestone, averaging 97% calcium carbonate, are very hard and tough, and have an unusually high specific gravity and a decidedly cubical fracture. The surface of the pieces of rock is perfectly clean, washing being a part of the ore-dressing process. Most excellent results have been secured from this material.

The Joplin chats are a flint, are hard and tough, have a good cubical fracture, and are clean, but have a very smooth surface which does not hold a thick film of bitumen. However, excellent results have been obtained in many pavements with these chats. In the process of manufacture both materials are so crushed that they will pass a 2-mesh sieve. They are, therefore, used almost entirely in asphaltic concrete pavements of the Topeka type.

Crushed blast furnace slag has in the past been used to a limited extent in the wearing surface of bituminous pavements. Its use is increasing, and it has been recognized as a satisfactory aggregate material, used by a number of cities and counties, and at least one state highway department,—that of Ohio. Slag has been used in some bituminous pavements for several years, with apparently good results. The writer has had certain pavements in which slag aggregate was used under observation for the past 2½ years. No trouble which can be attributed to the slag has developed as yet.

Basic Slag Quite Satisfactory

Two general classes of slag are available: (1) Basic, containing a high percentage of lime and magnesia and a relatively low percentage of silica; and (2) acid, containing a higher percentage of silica. Basic slags are tough and hard, whereas acid slags are often brittle. Basic slags have a porous and somewhat absorbent surface; acid slags have a glassy surface, which is unsuited for bituminous pavements. Ordinarily, basic slags only should be used. The following are typical analyses of the two classes of slag:—

	Basic.	Acid.
Chemical Analyses		
Silica	35.55%	39.50%
Alumina	12.04%	14.00%
Iron oxide	.62%	.52%
Calcium oxide	41.35%	40.00%
Magnesium oxide	8.45%	4.00%
Total sulphur	1.28%	1.32%
Physical Tests		
French coefficient of wear	6.2	3.6
Toughness	14.0	6.0
Hardness	15.6	15.5

Slag is more difficult to test than rock, due to greater difficulty in securing representative and suitable samples for some tests, but usually the methods of testing used for rock meet all requirements. Slag should not be too badly honeycombed and should be clean and free from blast-furnace down-comer dust. It has been thought by some that possibly some constituent of slag is harmful to the bitumen. Sulphur is usually the constituent blamed, but it is clear that there is no sound reason for this opinion.

Gravel Not So Satisfactory

Gravel has been used as a coarse aggregate in nearly every type of bituminous pavement. Because of the nature of the material and the characteristic rounded grains, it does not give as satisfactory results as a crushed stone. When crushed stone is used, the angular fragments will key together and the results will be better than if rounded gravel is used.

Many gravel deposits contain clay, either evenly distributed or in the form of clay balls. The results will be about the same is in the case of sand containing clay.

Toughness and hardness tests are not made on gravel, but the coefficient of water is determined either by the Deval method used for rock, or by a modified method in which six cast-iron spheres, 1.975 ins. in diameter and weighing 0.95 lb., are placed in the cylinder with each charge. The French coefficient of wear on a good gravel will be above 12. The mechanical analysis of gravel is of great importance, and every effort should be made to keep the grading within the proper limits for each type of pavement.

The annual meeting of the Calgary branch of the Association of Canadian Building and Construction Industries was held last month at the Board of Trade rooms, with about fifty in attendance. The following officers were elected: Hon. president, W. H. Cushing; president, J. K. Thomas; 1st vice-president, G. E. Hughes; 2nd vice-president, W. Jones; 3rd vice-president, J. R. Estey; treasurer, Mr. Herbert; secretary, Mr. Critchley; executive—J. H. Garden, W. Callbeck, G. Silvester; general secretary, John Wilson.

BUILDING PERMITS SHOW LARGE INCREASES

Large increases are shown in building permits for the past year. In a number of cities the 1919 figure is considerably more than double that of the previous year. Some of the figures are:—

	1919.	1918.
Galt, Ont.	$ 321,101	$ 160,550
Hamilton, Ont.	5,087,462	....
Kingston, Ont.	657,680	318,943
Kitchener, Ont	1,176,662	236,062
London, Ont.	2,455.170	876,660
Moncton, N.B.	2,133,676	....
Montreal, Que.	10,033,901	4,882,873
Moose Jaw, Sask.,	590,865	567,645
Quebec, Que.	2,132,219	904,375
Regina, Sask.	1,696,520	1,006,000
Stratford, Ont.	278,829	....
St. Catharines	861,636	....
St. Thomas, Ont.	285,525	....
Toronto, Ont.	19,420,000	8,535,331
Winnipeg, Man.	2,948,000	2,050,650

CONVENTION DATE CHANGED

Association of Canadian Building and Construction Industries

February 2nd, 3rd and 4th will be the dates of the Ottawa Conference of the Association of Canadian Building and Construction Industries, instead of January 27th to 30th as previously announced.

When *The Canadian Engineer* received notice that the dates of the annual meeting of the Engineering Institute of Canada, which will be held at Montreal, had been fixed as January 27th, 28th and 29th, it was noted that these dates would clash with those previously set for the Association of Canadian Building and Construction Industries, which would mean that many engineering-contractors whose attendance at Montreal is desired that week, would be at the Ottawa conference; also many engineers who have previously taken an interest in the association would be unable to attend this conference owing to the Montreal meeting.

Recognizing that the Ottawa meeting would be the easier to postpone, on account of the many social events that have been planned for the Montreal meeting, *The Canadian Engineer* wrote to J. P. Anglin, president of the Association of Canadian Building and Construction Industries, strongly urging that the Ottawa Conference be postponed until February.

After further exchange of correspondence with the officials of the association, who had not previously known what dates had been set for the institute's annual meeting, *The Canadian Engineer* received the following telegram:—

Montreal, January 6th, 1920.

Canadian Engineer,
62 Church Street, Toronto.

Dates of Ottawa Conference of Association of Canadian Building and Construction Industries now changed to Monday, Tuesday and Wednesday, February second, third and fourth. Please give full publicity in your paper this week. President Anglin and council wish to have representative gathering of Canadian builders and contractors.

(Signed) J. C. Reilly,
Acting Secretary, Association of Canadian Building and Construction Industries.

EFFECT OF SEWERAGE AND WATER WORKS ON TYPHOID DEATH RATE*

Increased Sanitation at New Orleans Was Followed By Expected Decrease in Typhoid—Necessity of Guarding Against Other Sources of Infection

By George G. Earl
General Superintendent, Sewerage and Water Board, New Orleans, La.

It has been suggested that the experience in New Orleans, La., with the introduction of effective drainage in 1900, and of sewerage in 1907, and water purification in 1908, and the gradual increase in the percentage of premises served with the two last-named facilities, and the adoption of sanitary measures only possible with the assistance of these systems, all emphasize certain well-known effects on community health as produced by these various steps and at the same time indicate the importance of other considerations.

There is published herewith, in tabular form, for the decade 1880 to 1889 inclusive, and for the decade 1890 to 1899 inclusive, and for each year thereafter, the general death rate of the city per 1,000, and the death rates per 100,000 from typhoid and malaria.

To the end of 1899 the city of New Orleans was very poorly drained, its soil was saturated with water, and what drainage existed was entirely on the surface.

Drainage Reduced Malaria

In 1900 the new drainage system commenced to affect substantially the whole populated area, and there was at once a very marked and progressive decrease in the general death rate, and a still more marked decrease in the death rate from malaria, but no effect on the typhoid fever death rate.

The tabulation shows the rate of utilization of the new sewerage and water supply systems in percentage of premises served from 1908, when these systems started in operation, and the progressive extension of the drainage system to eliminate soil saturation to surface or water standing on surface, and to permit of the drying out of the upper soil strata in outlying areas of the city.

The combined result with all three systems shows a reduction of total death rate from 1899 to 1918, eliminating the influenza epidemic of 1918, of from 27 to about 19 per 1,000; a reduction of the death rate from malaria of from 104 to 4 per 100,000; and a reduction of the typhoid death rate of from 39 to about 18 per 100,000.

All of the above figures include deaths in the charity hospital, a very large institution which receives patients from several states surrounding Louisiana, as well as from Louisiana, and a considerable percentage of the total deaths, and probably the larger percentage of the deaths from typhoid fever, are of non-residents, at this and other city hospitals.

Gives Most Credit to Sewers

It is a fact, however, that within the city, in deaths among residents of the city, there appears to no evidence that the general water supply has now or ever has had any influence on the typhoid fever death rate, and it is with a view of emphasizing the necessity of guarding other sources of typhoid infection and other means of its dissemination that it is believed the experience at New Orleans is especially valuable.

Until 1912, when 38% of the premises of the city were served by sewers and 65% by filtered water, there was no marked decrease in the typhoid death rate, which averaged 59 per 100,000 for the decade ending 1899 and averaged over 37 per 100,000 to the end of 1912.

Since 1912, the average typhoid death rate has been less than 18 per 100,000, but it has averaged 22 per 100,000 during the last three years, when over 90% of the premises of the city were connected with the sewers and furnished with filtered water, and when in addition to especially efficient filtration, the water after filtration was sterilized with chlorine, whereas it only averaged 18 per 100,000 for 1912 to 1915 inclusive, when a less number of premises were served with water or sewerage facilities and when there was no sterilization of the water after filtration.

*From report prepared for the annual meeting of the American Public Health Association.

EFFECT OF SANITARY IMPROVEMENTS ON GENERAL DEATH RATE AND ON MALARIA AND TYPHOID DEATHS

Year.	Thousands of population.	Percentage of premises at end of year connected with: Sewers.	New water supply.	Miles of sanitary sewers in place.	Miles of water mains.	M.G.D. consumption.	Main drainage system: Thousands of acres drained.	Miles of lateral storm drains, 10-ins. to 30-ins.	Death rate per 1,000 per annum—from all causes: Max.	Min.	Av.	Deaths per 100,000 per annum From malaria: Max.	Min.	Av.	From typhoid: Max.	Min.	Av.
1880-9	219-42	..	..	...	...	....	10†	...	33.5	25.4	28.6	213	99	156	33	13	21
1890-9	242-84	..	..	...	...	....	15†	...	30.2	24.1	27.2	142	68	104	67	24	39
1900	287	..	..	...	...	....	15†	...	....	....	25.9	...	..	68	..	..	40
1901	292	..	..	...	...	....	20	...	....	....	22.2	...	..	40	..	..	48
1902	297	..	..	...	...	....	21	...	....	....	22.1	...	..	33	..	..	45
1903	302	..	..	...	...	....	21	...	....	....	22.2	...	..	27	..	..	38
1904	307	..	..	115	...	....	21	...	....	....	22.2	...	..	22	..	..	36
1905	312	..	..	160	...	....	22	...	....	....	23.5	...	..	15	..	..	32
1906	318	..	..	224	35	....	22	...	....	....	21.4	...	..	13	..	..	30
1907	323	1	..	273	160	....	22	...	....	....	23.6	...	..	12	..	..	55
1908	328	5	3	302	485	....	22	75	....	....	22.4	...	..	20	..	..	33
1909	333	13	22	322	508	....	22	132	....	....	20.3	...	..	13	..	..	29
1910	339	20	38	353	512	....	22	154	....	....	21.4	...	..	9	..	..	32
1911	345	28	50	393	518	15.7	22	170	....	....	20.4	...	..	9	..	..	31
1912	352	38	65	426	530	16.6	22	181	....	....	20.1	...	..	8	..	..	14
1913	358	55	73	462	547	19.2	23	190	....	....	19.8	...	..	6	..	..	17
1914	365	67	85	477	565	22.7	24	233	....	....	20.3	...	..	9	..	..	21
1915	372	86	90	486	581	25.1	25	265	....	....	20.8	...	..	9	..	..	21
1916	378	92	93	496	591	27.8*	25	293	....	....	18.1	...	..	7	..	..	23
1917	384	93	94	501	591	29.7*	28‡	303	....	....	19.6	...	..	4	..	..	23
1918	389	94	96	505	594	33.2*	30‡	325	....	....	25.5¶	...	..	4	..	..	20

*Water sterilized with chlorine.
†Very poorly drained.
¶From influenza, 4.5; pneumonia, 3.4; other causes, 17.6; total, 25.5.
‡Not including 18,700 acres agricultural land drained to outside drainage stations.

It is believed that the influences which have affected typhoid in New Orleans are:—

1. Importation of actual cases.
2. The spread of this infection by means of flies or similar means.

The noticeable increase in typhoid for the 1890 decade, as above the 1880 decade, was in all probability in some degree associated with the introduction in the best sections of the city of water closets which discharged into cess-pools, which in turn often overflowed to open street gutters, being more dangerous, possibly, than the old-time closed vaults which were mostly used until sewers were introduced.

The water supply in those days was unfiltered, from the Mississippi river and very muddy, but only about 8% of the population were connected with it, and only part of those who had connections used it for drinking. The rest of the population depended for their water supply upon wooden cisterns built upon foundations well above the ground surface, which caught and stored rain water from the slate roofs of the houses, and there was little possibility of the contamination of such cisterns generally, if at all, with typhoid, and no evidence that the raw river water was ever so contaminated at New Orleans.

Every agency likes to claim credit for every possible benefit toward which it contributes, but the New Orleans water and sewerage authorities do not believe that filtration of the water supply or its sterilization has been at all a factor in this direction, but rather that the elimination of vaults and especially of cess-pools receiving the flow from water closets and overflowing to open street gutters, through the substitution of sanitary sewers with an abundant water supply for the immediate removal of all contaminated matter and the adequate cleansing of all containers and other possibly contaminated articles, constitute the only factors which they have contributed toward the elimination of typhoid.

Steps in other directions, especially in action by the Board of Health authorities looking to the safeguarding of the milk and raw vegetables or other food supplies, and the prevention of flies, and the more general screening of markets and houses, and finally the searching out and remedying of local causes whenever and wherever typhoid appears, are believed to be in great measure the cause of the reduction in typhoid death rate thus far accomplished, and to constitute the main hope of further reduction.

Those cases which are contracted by people residing outside of the city and brought to the local hospitals, or by residents of the city while on vacation or business trips elsewhere, constitute a very large percentage of the total present typhoid fever death rate of New Orleans, and their chief danger is the establishment of local foci of the disease. It appears, therefore, that the present typhoid death rate of New Orleans, which has averaged about 18 per 100,000 during the last seven years, ranging from 14 to 23 per 100,000, is the result of very broad surrounding conditions and of local conditions not in any way associated with the water supply, and that the general lesson as to the importance of such broad surrounding and local conditions other than water supply, in its bearing on the ultimate eradication of typhoid, is most strongly indicated.

Smelting of tin by electric furnace has been commenced in a Brantford, Ont., plant which has an initial production of two tons of metal a day.

It has been announced that a contract amounting to $1,000,000, for repairs to 1,500 railway cars, has been awarded to the Canadian Car & Foundry Co., Ltd., Fort William, Ont., and Montreal, Que.

The Department of Mines estimates the production of coal in Canada during 1919 at about 12,500,000 short tons. The production during 1919 of the more important metals is estimated as follows: Gold, $16,267,000 in value; silver, 13,500,000 ounces; copper, 81,500,000 pounds; nickel, 43,300,000 pounds; lead, 50,000,000 pounds; zinc, 38,000,000 pounds; pig iron, 920,000 short tons; steel ingots and castings, 1,020,000 short tons.

ANNUAL MEETING OF THE ENGINEERING INSTITUTE OF CANADA, JANUARY 27TH TO 29TH, IN MONTREAL

Announcement has been made that the annual meeting of the Engineering Institute of Canada will be held January 27th to 29th, inclusive, in Montreal. The Montreal branch of the institute has been authorized to hold a professional meeting at the same time.

Following the precedent of the previous professional meetings, the one at Montreal will be devoted particularly to the engineering affairs of the province in which the meeting is held. Topics pertaining to Quebec will be brought prominently before the meeting, including the textile industry, highways (with a discussion regarding federal subsidy), the water power policy of the province, the work of the Quebec Streams Commission, the forests of Quebec, the pulp and paper industry and the Quebec Health Act.

The provincial premier and several members of his cabinet, also the lieutenant-governor, have been invited to take part in the discussions.

The social side of the program will receive more attention than at any previous annual meeting, and the Montreal branch will act as host to the members and guests from other cities.

The meeting will open Tuesday, January 27th with a registration and business session. The retiring president's address and inception of the new president will take place that afternoon. There will be a luncheon for members and ladies, and in the evening a reception and dance, with cards, and supper.

Papers on the above-mentioned topics will be presented Wednesday morning and afternoon. The members will be the guests of the Northern Electric Co. at luncheon, followed by a visit to that concern's new plant. In the evening the annual banquet will be held.

The professional program will be continued throughout Thursday, with a luncheon for members and ladies, at which a popular speaker will give an address. In the evening there will be a smoker and concert, with vaudeville entertainment and refreshments.

While all the above social events have not been definitely arranged, it is understood that the program will be practically as above stated excepting that one or more theatre parties may be provided for the ladies. Special arrangements are being made by a ladies' committee. The whole proceedings will be in special quarters which have been arranged at the Windsor Hotel.

The Montreal branch has more members than any other branch of the institute, and is planning for the coming meeting with enthusiasm. Several committees are hard at work with the intention of making this professional meeting the most enjoyable and successful that has ever been held under the auspices of the institute.

It is stated that the large irrigation project that is being planned for Grand Forks, B.C., will use concrete pipe or "gunite" flumes.

Opposition to participation by the United States in the construction of a water route from the Great Lakes to the sea, was a feature of the recent annual convention of the New York State Waterways Association.

The Marsh Engineering Works, Ltd., Belleville, Ont., call attention to the fact that they manufactured the hoisting drums which operate the large shear-legs at the plant of the Dominion Shipbuilding Co., Toronto. These shear-legs were described in an illustrated article in the December 25th, 1919, issue of *The Canadian Engineer*.

At the annual meeting of the Victoria branch of the Engineering Institute of Canada, the following officers were elected for the ensuing year: Chairman, A. E. Foreman; vice-chairman, Lieut.-Col. A. W. R. Wilby; secretary, Horace M. Bigwood (re-elected); treasurer, E. Davis (re-elected); executive committee, R. A. Bainbridge and W. M. Stokes.

ANNUAL MEETING, WINNIPEG BUILDERS' EXCHANGE

ABOUT 160 members and guests attended the annual meeting and dinner of the Winnipeg Builders' Exchange, held last month at Manitoba Hall. The retiring president, H. T. Hazelton, opened the proceedings with a speech in which he outlined the progress the exchange had made in the past year and touched upon the labor trouble that the city had experienced. The secretary, A. E. Godsmark, presented his report, in which reference was made to the opening of exchanges in Regina and Fort William.

J. A. Marion, of St. Boniface, submitted the auditor's report; J. S. Schumacher, the membership committee's report; C. M. Thompson, the entertainment committee's report; and W. A. Irish, the report of the nomination committee.

H. T. Hazleton was re-elected president; Jas. Mackie, 1st vice-president; Frank Dowse, 2nd vice-president; T. D. Robinson, treasurer; Jas. Howard, auditor; directors—F. Halls, Carter-Halls-Aldinger Co.; L. B. Dickson, McDonald Wilson Co.; W. J. Hilton, H. Hilton & Sons; J. A. Wilson, Radford Wright Co.; L. H. Sprange, Winnipeg Marble & Tile Co.; and C. D. Kirk, C. D. Kirk Co.

Mr. Hazleton introduced J. C. Reilly, of Montreal, acting secretary of the Association of Canadian Building and Construction Industries, who spoke on matters pertaining to the consolidation of the building trades and exchanges throughout the Dominion. He referred very interestingly to the ancient guilds and orders of the craft, encouraging the present master builders to emulate their practices, so far as possible, even in this age. He emphasized the necessity of action in this direction and co-operation from all sources.

Thos. Sharpe, former mayor of Winnipeg, reviewed his experiences as a member of the first building association organized in Winnipeg, giving many amusing reminiscences of his fellow-members. T. R. Deacon also spoke about the earlier organization, of which he was one of the charter members. He counselled the members to protect the exchange and take immediate steps to identify themselves with every movement in that direction.

Ed. Cass, of the J. McDiarmid Co., outlined the necessity of a Dominion-wide uniform contract, and stated that, in his opinion, the exchange should identify itself with the institution Mr. Reilly represented.

NOT OPPOSED TO ROADS, SAYS DRURY

PREMIER DRURY, of Ontario, speaking at Hamilton, said he has been criticized for alleged opposition to the good roads movement. He stated that he is not opposed to good roads, but that he is opposed to heavy expenditures on any one road while other roads are neglected.

"I concur," he declared, "with the policy outlined by Mr. Biggs, minister of public works of Ontario, and laid before me recently. It bears out my plan, which aims to improve and build while improving, and to maintain while constructing, but which condemns the policy of concentrating big sums on one highway.

"Transportation facilities are the first consideration that an improved road system affords," he continued. "A series of highways throughout the province must offer something else than an automobile speedway. Biggs' policy, as outlined, puts a proper proportion of the cost of these highways upon the townships, and the benefits and the expenses are properly apportioned."

D. B. Hanna, general manager of the Canadian National Railway, says that within a short time the terminals of all railways in Canada will be electrified owing to the advantages of electricity over steam in the handling of trains and cars in yards. Mr. Hanna states that it may be a year before the G.T.R. comes into the hands of the government, owing to delays in the negotiations.

GRANTS BY RESEARCH COUNCIL

PROVISION has been made by the Honorary Advisory Council for Scientific and Industrial Research for forty bursaries, studentships and fellowships to be awarded this year to qualified science graduates of Canadian universities who will train for service in scientific research in connection with the natural resources of Canada.

The council has also made grants to aid in the investigation of a number of special problems. Among these is a grant to F. M. Dawson for investigation of cement in relation to its hydration and physical properties. In this investigation the microscope will be used extensively to determine the physical character of cement in its various conditions.

A grant has also been made to Prof. C. W. Drury, of Queen's University, for the investigation of a suitable slag for smelting Canadian ores containing vanadium. Certain of the central Ontario ores are comparatively rich in vanadium, but extraction in an economic manner has hitherto been difficult.

Another grant has been made to Prof. Stansfield, of McGill University, for the continuance of his investigation of the reduction of iron ores by the electric furnace.

ENGINEERING INSTITUTE ELECTIONS

AT a meeting of the Engineering Institute of Canada, held December 30th, 1919, in Montreal, the following elections and transfers were announced:—

Member—G. W. Winckler, Toronto.

Associate Members—F. T. Ames, Bentley, Alta.; J. M. Anderson, Vancouver; P. H. Buchan, Vancouver; Richard Drummond, Lindsay, Ont.; Leo Gleeson, Ottawa; H. C. James, Vancouver; F. S. Jones, Cambridge, N.B.; J. E. Lionais, Montreal; J. F. Lumsden, Halifax; M. W. Maxwell, Montreal; C. H. McDougal, Niagara Falls; R. C. Moore, Halifax; N. L. Morgan, Montreal; J. M. Morton, Winnipeg; H. C. B. Nourse, Sherbrooke; F. M. Pratt, Ottawa; A. M. Ross, Winnipeg; J. E. Roy, Quebec; J. W. Smith, Toronto; N. M. Waddell, Winnipeg; G. H. Whyte, Calgary; W. B. Young, Vancouver; A. C. R. Yuill, Vancouver.

Juniors—H. M. Campbell, St. Catharines; J. M. M. Lamb, St. John, N.B.; H. P. Lancaster, St. Catharines; R. J. Maxwell, St. Stephen, N.B.; F. S. Merry, Toronto; J. B. Molesworth, Montreal; L. A. Perry, Firdale, Man.; J. M. Watson, Toronto; H. O. D. Wilkins, Norwood, Ont.; J. S. Wilson, Toronto.

Associate—R. H. Fraser, Ottawa.

Transferred, Associate Members to Members—J. G. Dickenson, Cobalt; H. F. H. Hertzberg, Halifax; E. M. M. Hill, Winnipeg; G. R. Munro, Peterboro.

Transferred, Juniors to Associate Members—James Forsyth, Winnipeg; O. G. Gallaher, Kamloops, B.C.; S. W. Shackell, Lachine, P.Q.

Transferred, Students to Associate Members—A. E. Humphrey, Chilliwack, B.C.; C. B. R. Macdonald, London, Eng.

Transferred, Student to Junior—R. E. Weeks, Souris, Man.

The Saskatchewan legislature is about to discuss the problem of a more adequate water supply for the southern part of that province and will debate the construction of the proposed pipe line from the Saskatchewan river to Regina and Moose Jaw.

In connection with the abolition of toll-gates near Ottawa, an order-in-council has been passed by the Ontario government creating a suburban road commission, on which Ald. W. Y. Dennison and Warren Y. Soper represent the city of Ottawa, F. A. Heney and Ben Rothwell representing Carleton county, with John Bingham, president of the Ottawa Board of Trade, as chairman. The commission has been collecting information regarding mileage, value and ownership of the toll roads in Carleton county.

CITIZEN CO-OPERATION IN TOWN MANAGEMENT AND TOWN PLANNING*

By Horace L. Brittain
Director, Bureau of Municipal Research, Toronto

THE problem of maintaining citizen interest in government is hoary with age, and an adequate solution of it has never been reached. Although we are told by Pliny that municipalities in Italy under the early Roman Empire maintained public schools and employed physicians at public expense, he also tells us that as the emperors, for their own ends, began to encroach on the self-government of the municipalities, public interest fell to so low an ebb that frequently sufficient candidates did not offer to fill the necessary civic offices.

It is a well-known principle that interest in any undertaking varies directly as the number of points of contact therewith, and particularly it is even more true that interest varies with the number and importance of opportunities afforded to take actual part in the undertaking. Many a bad boy has been cured by giving him a responsible job to perform—a job in which he could see possible tangible results. Many a church member has been raised above the margin of uneconomic returns by assigning him a definite function in the life of the church. Interest grows with information and exercise, and atrophies with ignorance and inactivity.

What is a Citizen?

Before we can discuss co-operation between citizen and government, we must have a clear idea of what these terms mean. What is a citizen? The ready answer is, "A citizen is a man or woman born in the country or naturalized."

But is a man who doesn't pay his taxes a citizen?; or one who doesn't vote?; or one who grouches about unsatisfactory candidates, but does nothing to bring out good candidates?

Judged by standard of work, there are many alien-born citizens and many native-born aliens. A man who does not exercise the duties and privileges of citizenship, even if his family dates back to 1700 on this continent, is essentially an alien. We have before us a mighty task in Canadianizing foreign-born residents, but an even more formidable one in building up a standard of citizenship among all home-grown Canadians in order that the work of assimilating our foreign-born population may become at once more worth while and more easy. A Canadian by choice is not necessarily inferior to a Canadian by accident of birth. Both are raw material when compared with the possible Canadian citizen.

A citizen may be defined, then, as one who bears his share of the community burdens and performs his part in the effective carrying on of community undertakings.

What is a City?

What is a city? According to Webster, a city is any large, important or noted town or inhabited place. This is, of course, a purely mechanical conception of a city.

A city can be better defined by what it does. A city, in a sense, is a living, growing or dying entity which performs certain functions and possesses certain organs to perform these functions. Can we not define a city as "a large group of people living in the same locality and organized to carry on collectively activities of community value which cannot better be performed individually"?

What is a city government? A city government is simply a committee of the citizens elected to carry on those community activities which have been determined on as legitimate collective undertakings.

If this conception of government were general and clearly understood, the work of selecting the governing committees would be greatly simplified. The city wants streets, pure water, effective transportation, protection of life, protection of property, opportunities for recreation, education, etc. It needs a committee to provide these wants with the greatest effectiveness consistent with the amount of the revenues made available by the citizens. The committee necessarily must be made up of citizens at once in sympathy with the public policy of filling these community wants and capable of devising general methods and selecting men to carry out these policies. Are these the prime considerations which usually govern the selection of candidates and the election of members of the governing committee?

Information is First Essential

The first essential of citizen co-operation with government is information,—accurate, pertinent, understandable and timely. One cannot co-operate with a man who won't take one into his confidence. It is impossible for a citizen to co-operate with his civic government effectively unless he knows what policies the city has been operating under, where the city stands at present in putting these policies into practice, and what the city's plan of expenditure and work is for the current year.

The *sine qua non* of co-operation is understanding. The lack of co-operation at present is due to lack of interest, and this in turn is due to lack of knowledge. The majority of city departments in the majority of cities fall far short of their opportunities to report, not only to council, but to the citizens through council, at regular and frequent intervals in a language and form that the average citizen can understand. A description of the operations and results of any city department, if properly written, would be replete with human interest and might be made an effective weapon for securing citizen co-operation. The science of public reporting is in its infancy. No one knows how many tons of reports, full of obsolescent or valueless information at the time of their issue, and never opened, now repose in musty vaults, clutter up shelves which might be better occupied, or have been turned over to the junk man as waste paper. Too many reports benefit the printers alone. In such cases it would be better to pay the printer a bonus and save the officials' time wasted in getting out a report. It might pay a municipality to employ an official report writer to co-operate with departmental heads in getting out accurate, timely, readable official reports.

Governmental Action Without Investigation

Unfortunately, governments are not always the best critics of their own actions. Some have been known to suppress unfavorable facts and to stress others they think to be favorable. Governments have even been known on occasion to misrepresent the facts in order to further their own as distinct from the community's interest. This will be so for a considerable number of years in the future. It is probably true that no one will misrepresent the facts to another he knows to be in possession of or likely to obtain the truth. So governments are always stimulated in right action and turned aside from wrong action by knowledge that citizens either know the facts or are in a position to get them.

The rise of citizen organizations, supported by private funds, has been in response to a real need for unbiased information from unofficial sources. The best guarantee we can have of the adequacy of official policies is the existence of vigorous associations for citizen research and publicity.

The greatest single cause of governmental failure is the tendency of governments to act without thorough-going inquiry or in opposition to the results of such inquiry when held.

In this scientific age, governments must get beyond the rule-of-thumb stage. Governments must develop the habit of employing specialists in financial, educational, health, fire and police work as well as in civil, mechanical and electrical engineering. Having employed such specialists, they must have the courage to act on their advice, entirely unmoved by ulterior considerations of political and sectional expediency.

The amount which can be raised by taxation and rates each year has an upper limit. Every dollar wasted in current operations, either by paying too much for necessary

*Paper read at the Third Annual Southwestern Ontario Town Planning Conference.

services or by incurring expenditures for unnecessary services, is, therefore, potentially a dollar subtracted from a possible fund for community improvements. The proper control of current expenditures has, therefore, a very close relation to town planning. The fundamental method of such control is comparison,—comparison of the total and unit costs of the various services from year to year within the same city, and comparison of costs of similar services for other cities of a like rank. Such comparisons ncessarily demand local accounts which produce such costs automatically, and the standardization of municipal accounting throughout the country.

Must Standardize Municipal Accounting

It is impossible to compare results within the same municipality from year to year unless (a) the accounts differentiate between payments and receipts on one hand and revenues and expenditures on the other; (b) a clear distinction is made between current and capital expenditures defrayed out of current funds; (c) the accounts show the costs of objects of expenditure, such as personal services, services other than personal, heat and light and power, supplies other than heat and light and power; upkeep and depreciation of structure and equipment, etc.; (d) the accounts show the costs of the various kinds of work done by each department under general and specific headings, such as health service (general administration, accounts, records, statistics, etc.), medical and dental service, nursing service, laboratory service, hospital service, social service, food control, sanitation service, etc.; (e) the separation of ordinary services from those of public utilities.

Surveys of Community's Plant

Having established satisfactory accounts within a municipality, it is still impossible to secure the results of comparison with other communities unless municipal accounting is standardized by keeping similar accounts in cities of like rank and securing the acceptance of definite and universal meanings for accounting terms used. The standardization of accounting alone will not serve. There must be readily available also a description of the general methods of financing and departmental operations in our various towns and cities, lest we compare costs which are not comparable.

Finally, granted the existence of adequate town planning legislation, actual town planning for any particular community must begin where the community is. The first step is, therefore, to learn where the community is, and to learn this we must have thorough surveys of the community's physical plant, of the municipal finances and of the civic accounting and reporting system.

Chatham, Ont., has voted by a large majority in favor of the city-manager form of municipal government.

Last year 1,409 building permits, having an aggregate value of slightly over $5,000,000, were issued by the Hamilton building inspector.

The Andrews Constrcction Co. has been organized in Halifax, N.S., by H. A. Andrews, formerly architect and estimator for the Piercey Supply Co.

The report of the city engineer of Sarnia, Ont., for the year 1919, recommends the construction of a number of sewers and pavements, and the purchase of a municipal paving plant.

H. H. Dewart, leader of the liberal party in Ontario, has written to Premier Drury requesting the appointment of Brig.-Gen. C. H. Mitchell as a member of the Hydro-Electric Power Commission of Ontario. Lieut.-Col. Carmichael, who was recently appointed to the commission, represents the United Farmers, Sir Adam Beck is a conservative, and the liberals desire Brig.-Gen. Mitchell. The third seat on the commission is at present held by Hon. I. B. Lucas, who was formerly a member of the provincial cabinet, but who was defeated at the last election. Mr. Dewart does not necessarily request Mr. Lucas' retirement, but suggests that the commission might be enlarged in number.

UNCERTAIN OUTLOOK IN IRON AND STEEL

Much Buying, Which Was Postponed in Expectation of Lower Prices, Must Have Effect of Stiffening Market—Attitude of the Federal Government

By J. Frater Taylor

In accordance with my forecast of last year, conditions in the iron and steel trade have been erratic. The sudden suspension of the steel demand for munitions purposes and the hope, rather than the expectation, that prices would fall were the contributing factors. Those who have held off buying in the belief that lower prices would sooner or later prevail, must admit that they have miscalculated, with the result that, apart altogether from current requirements of steel and steel products, the demand has been and will be somewhat intensified through the aforesaid holding off. The general situation in Canada is very much influenced, naturally, by conditions in the United States.

Orders Ahead of Supplies

Within the last few months the steel business there has been more or less in a state of suspension on account of the strike. The consequence is, that in the States there is an accumulation of orders against a limited steel supply, so that the steel business in the United States will have busy times in front of it, also in the direction of making up arrears caused by the diversion of steel to other purposes over the war period.

Railway Situation

The railway situation has an important bearing upon the latter phase, as once the tangle is straightened out there will, of necessity, be considerable buying of iron and steel products by the railways alone, and it must be kept in mind that it is not only steel rails that are involved, but all classes of steel products, notably such as are required in the building of cars, bridges, etc. In connection with cars alone it is reported that the United States plants will be filled up with the domestic supply to the extent that, even on favorable conditions, comparatively little foreign business can be undertaken. Coming, therefore, to the situation in Canada, the last few months have shown a very distinct improvement, with the result that the steel plants, generally, have either good business booked or in prospect. It is stated, for instance, that one western steel plant is actually booked up until July next.

Should Encourage Domestic Output

To anyone interested in the steel business and in the general industrial situation in Canada, the most important element in the whole situation is the necessity for Canada becoming self-contained in the matter of its basic requirements. The writer, in his personal experience, has seen industrial and manufacturing activities held up and suppressed through dependence upon foreign sources of supply. The serious exchange situation is a factor, and notwithstanding hopes to the contrary, it cannot bring about its own solution by making imports too costly, so long as Canadian manufacturers, if they mean to remain in business, are bound to go out of the country for their raw materials. The writer has preached the doctrine of aggressive government action in this connection with a view, especially, to aiding and stimulating the development of Canada's basic industries. It is gratifying to note that, in the east there will be a modern up-to-date plate mill shortly in operation, that Ontario's central steel plant is better equipped than ever before, through its new by-product coke ovens, and that at Algoma they are actually rolling alloy steel and all classes of shapes up to 15-ins., and that they have considerable development in this direction in hand. The writer cannot refrain, in an article upon the iron and steel situation, from calling attention to the fact, once more, that if encouragement could be given to the mining and treatment of Canada's low-grade ores, the backbone of Canada's imports and dependence upon the United States for this basic of all elements would be broken.

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PRINCIPAL CONTENTS

POLLUTION FROM FIRE-PROTECTION SYSTEMS

IN the report of the Committee on Fire Protection to the American Water Works Association at the last annual convention of that association, there was a summary of cases in which public water supplies were believed to have been polluted by the entrance of water from other sources of supply, usually through fire-protection systems of plants which have been connected with the public water supply and also with some other source of supply in such manner as to permit of the possibility of the water from other sources finding its way into the general distribution system. Many cases of this kind are recorded which are known or believed to have caused outbreaks of typhoid or dysentery.

In the committee's report there is also a discussion of the regulations variously adopted to prevent pollution of this character. The minimum precaution suggested is that wherever dual sources of supply are used, one of which is from the general city supply, the connection with the city supply should be made with two successive, especially well-designed, check gates, to prevent the possibility of any back flow; these check gates to be placed in a position where they are easily accessible for inspection and repair, and to be so arranged that they can be cut off from pressure in either or both directions by positive valves on either side of them, so that each can be independently tested for tightness against back flow by means of proper pressure-gauge and tap connections; and that such tests for tightness should be made at frequent intervals.

There are many, however, who advocate that no such dual connections should exist, but that if the city supply is to be utilized at all in connection with other sources of supply, it should be drawn into supply tanks through pipe connections discharging freely into the top of the tanks, with no physical connection whatever between the city supply and other sources of supply.

There is even considerable sentiment that no possibly polluted supply should be piped into or used for any purpose about any plant, because there is always the danger that cross-connection may be made inadvertently somewhere inside of the plant, or that employees or others about the plant may use water from the wrong source.

In discussing the above-mentioned report, the chairman of the water works committee of the American Society for Municipal Improvements calls attention to the fact that local conditions should govern the treatment of this problem, and that the circumstances surrounding different cases of dual supply may be so different as to warrant fully the wide divergence of views above noted. For instance, he says, if the source of secondary supply is just as attractive in appearance or taste as the city supply, but is known to be dangerously polluted, the most extreme precautions would probably be warranted; whereas if the source of secondary supply is highly colored or very muddy, so that it would be noticed at once as compared with the city supply, even in a very small admixture therewith, and especially if the secondary source of supply is not polluted and therefore not dangerous to public health, it would appear that it would be a great hardship and most uneconomical to prohibit its use for purposes for which it may be suited or possibly even better adapted than the city supply, or to condemn those who wish to use it to the repumping of the city water whenever they desire to use the two waters together or interchangeably under a pressure not greater than the city pressure, as is often the case in a fire-protection system or in plants where it is desired to make arrangements for dual sources of supply for other uses.

PERSONALS

WM. HARDEN has been appointed manager of the civic gas department at Belleville, Ont.

A. R. CLUCAS, formerly assistant city engineer of Vancouver, B.C., has been appointed town planning engineer for Birmingham, Eng.

CHRISTOPHER J. YORATH, city commissioner, Saskatoon, Sask., has been named to succeed J. T. Steele as comptroller-general of Manitoba.

E. R. GRAY, city engineer of Hamilton, Ont., has tendered his resignation to the city council. Mr. Gray states that he intends to engage in business.

S. T. HUBBARD, chief engineer at the Edmonton power plant, has resigned. It is stated that the position has been offered to W. J. Cunningham, of Calgary.

GEO. ANDERSON, irrigation engineer, Los Angeles, Cal., has been retained by the Alberta government as consulting engineer for the big irrigation scheme which is proposed for the southern part of that province.

A. L. HUGHES, research professor at Queen's University, has been named as a member of a committee of five to meet in St. Louis, Mo., to discuss research in photo-electric work. Dr. Hughes has an international reputation in this field.

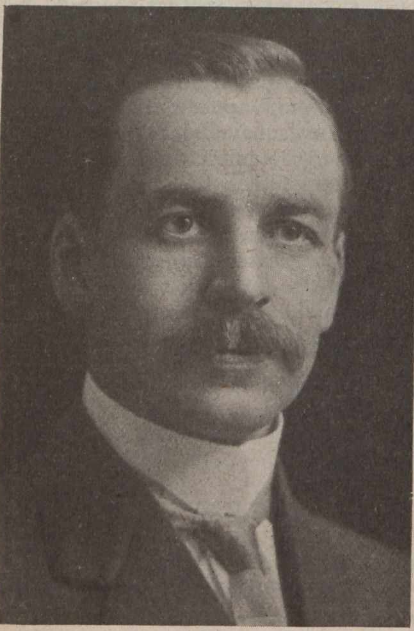
J. W. LEDOUX, who is well known in Canadian water works circles, has resigned as chief engineer of the American Pipe & Construction Co., and will hereafter devote his entire time to his consulting engineering practice, with offices in Philadelphia.

A. P. THOMAS has resigned the position of city electrician of Nelson, B.C., in order to return to Australia. He will be succeeded by D. E. MAGUIRE, chief electrical engineer for the past eight years at the smelter of the Consolidated Mining & Smelting Co., Trail, B.C.

A. L. HERTZBERG has retired from the position of district engineer, Ontario district, Canadian Pacific Railway. Mr. Hertzberg was born 65 years ago in Horten, Norway, the son of Col. L. H. Hertzberg of the Norwegian Royal Engineers. Mr. Hertzberg was educated at Horten and at

Gotheburg University, Sweden. He came to Canada in 1881 and joined the Credit Valley railroad as assistant engineer. Two years later that railroad was taken over by the C.P.R., and Mr. Hertzberg soon became division engineer at Toronto, and was later promoted to the rank of district engineer. He was vice-consul at Toronto for Norway and Sweden from 1894 until 1905. Mr. Hertzberg became a member of the Canadian Society of Civil Engineers in 1888. He has three sons, all of whom are engineers: Col. H. F. H. Hertzberg, commandant of the Canadian Engineers at Halifax, N.S.; C. S. L. Hertzberg, consulting engineer, Toronto; and O. P. Hertzberg, resident engineer, C.P.R.

ANDREW H. HARKNESS, consulting engineer, Toronto, who has just announced the formation of a new partnership, Harkness, Loudon & Hertzberg, was born in 1873 in Dundas county, Ontario, and was educated at the Iroquois high school and S.P.S., University of Toronto, from which he graduated with honors in 1895. He obtained the degree of B.A.Sc. in 1897 and returned to S.P.S. in the fall of 1898 as a fellow in civil engineering, which appointment he retained for four years. The vacations during his university course and while a fellow at S.P.S., and also the intervening years, were spent mostly in architects' offices and partly on municipal drainage work. In the fall of 1902 Mr. Harkness entered the bridge department of the Canada Foundry Co., Toronto, and during the next seven years served at various times as draftsman, checker, designer and assistant structural engineer on bridge and building design. In the summer of 1909 he was engaged as engineer of erection of the St. Andrews movable dam, near Winnipeg, and in June, 1910, he entered private practice in Toronto, confining his work almost exclusively to architectural engineering. He entered into partnership with J. M. Oxley in 1911, which continued until June, 1915, when Mr. Oxley went overseas. Mr. Harkness' practice, however, was carried on under the firm name of Harkness & Oxley until April, 1919. Among the many structures on which Mr. Harkness was retained as consulting engineer to the architect, are the following: C.P.R., Dominion Bank, Williams' Piano, Excelsior Life and Methodist Book Room buildings, Toronto; Confederation Life and Bank of Commerce buildings, Winnipeg; and the new parliament buildings and power house, Ottawa. He has also been consulting engineer for the design of many industrial plants, including the John Inglis Co.'s boiler and machine shops, Toronto; garage for the Automobile Supply Co., Toronto; Hamilton Gear & Machine Co., Toronto; the Woods Mfg. Co., Toronto; and the Herbert Morris Crane & Hoist Co., Niagara Falls, Ont. Mr. Harkness is a member of the Engineering Institute of Canada and of the American Society of Civil Engineers. For the past year he has been chairman of the Toronto branch of the Engineering Institute.



ALLAN LATORNELL, assistant engineer of sewers, department of works, city of Toronto, has been appointed engineer in charge of that section, succeeding W. R. Worthington, who recently resigned to enter private practice. Mr. Latornell graduated in civil engineering at S.P.S., University of Toronto, with the class of 1905. For a year after graduation he was engaged in municipal work in the counties of Grey and Simcoe, Ont., but in 1907 he joined the staff of the Toronto sewer section and has since occupied various positions of responsibility therein.

F. G. ENGHOLM, of the firm of F. G. Engholm & Partners, Ltd., Toronto, representatives in Canada of the Hennebique system of reinforced concrete construction, will deliver a lecture on reinforced concrete this evening (January 8th) before the Toronto branch of the Engineering Institute of Canada.

LIEUT.-COL. BLAIR RIPLEY, D.S.O., has been appointed engineer of the Ontario District, Canadian Pacific Railway, with headquarters at Toronto, succeeding Mr. Hertzberg, who has retired. Before the war, Col. Ripley was engineer of grade separation for the C.P.R. He was O.C. of the 1st Battalion, Canadian Railway Troops.

A. E. FOREMAN, public works engineer for the British Columbia government, gave an address on "Organization and Work of the Public Works Department" at the annual meeting of the Victoria branch of the Engineering Institute of Canada. He stated that the province has been divided into eight districts, with a qualified engineer in charge of each district, and that good results are forthcoming.

T. A. BARNETT, one of the superintendents in the construction department of the Hydro-Electric Power Commission of Ontario, has resigned in order to accept appointment as general superintendent for Morrow & Beatty, Ltd., contractors, on the proposed extensions to the hydro-electric development and pulp mill at Iroquois Falls, Ont., for the Abitibi Power and Paper Co., Ltd.

SIR WILLIAM HEARST, until recently premier of Ontario, has been appointed by the Dominion government as a member of the International Joint Commission, succeeding P. B. Mignault, who resigned several months ago when he was elevated to the bench. The other Canadian members of the commission are C. A. Magrath, Ottawa, who is chairman of the Canadian section of the commission, and H. A. Powell, St. John, N.B.

MARCEL PEQUEGNAT, formerly assistant city engineer of Kitchener, Ont., has been appointed to succeed Henry Hymmen as superintendent of water works of that city. Mr. Pequegnat designed the plans for the Bridgeport development, and has been in close touch with the water works commission as an advising engineer. He was for several years a demonstrator in the Faculty of Applied Science, University of Toronto.

A. W. HADDON, formerly city engineer of Edmonton, has been elected one of three city commissioners of that city and will probably be in charge of the works department. Mr. Haddon joined the Edmonton city engineer's department in 1909 as assistant to the late A. J. Latornell. He became acting city engineer in July, 1915. Early last year he accepted a lectureship in engineering at the University of Saskatchewan, but resigned in May to accept appointment as city engineer.

MAJ. ALEX C. LEWIS, who before going overseas was secretary of the Toronto Harbor Commission, has been appointed secretary-treasurer of the Canadian Deep Waterways and Power Association, and will establish an office in Windsor, Ont. Mr. Lewis will at first undertake the collection of all available information bearing upon the completion of the Welland canal and the canalization of the St. Lawrence river, and will submit the data to various municipal councils and boards of trade throughout Ontario in order to obtain their co-operation and influence in securing more speedy action by the Dominion government.

RAY R. KNIGHT has been appointed Toronto manager and engineering representative for Francis Hankin & Co., Ltd., Montreal. Mr. Knight's office will be at 609 Temple Bldg., Toronto. Mr. Knight came to Canada from England in 1911 and was designing engineer in the sewer section, department of works, city of Toronto, until February, 1913, when he became city engineer of Fort William, Ont., which position he held until December, 1916, when he obtained a commission in the Canadian Engineers. Mr. Knight was retained at the engineering training depot, St. Johns, Que., as an instructor, and was promoted to the rank of captain. For the past fourteen months he has been chief engineer for the Canadian Incinerator & Furnace Co., Ltd., Toronto.