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The Canadian Engineer

A Weekly Paper for Civil Engineers and Contractors

New Intake and Sedimentation Basin at Sarnia

Infiltration Scheme Abandoned—One of Nineteen Concrete Basins Used for Screen House and Others for Sedimentation—Wooden Form for Intake Structure Sunk to Depth of 47 Ft. and Filled with Concrete—Further Improvements Proposed

By F. W. THOROLD

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IN 1914 a large sum of money was spent by the city of Sarnia, Ont., on an infiltration scheme and pumping station at Point Edward, about two miles from the city. After the work had been completed, it was found that sufficient water could not be obtained for the ordinary needs of the city. The infiltration system consisted of 19 reinforced concrete basins, each about 25 by 25 by 25 ft., inside dimensions. The first four basins were built as units on top of the ground, and excavation proceeded inside each basin, the structure gradually settling to its final position. The walls of these basins were 2 ft. thick. The sixth basin (see Fig. 7) was placed 25 ft. away from the fourth basin, and concrete slabs were placed on edge from basin No. 4 to basin No. 6, thus forming basin No. 5. From this point to basin No. 18 this method of providing alternate basins with slabs for the sides was followed. Basins Nos. 18 and 19 were built as units. Thus there are 19 basins, each approximately 25 ft. square inside. A reinforced concrete roof was placed over the basins from end to end, but no bottom was built in the basins, the

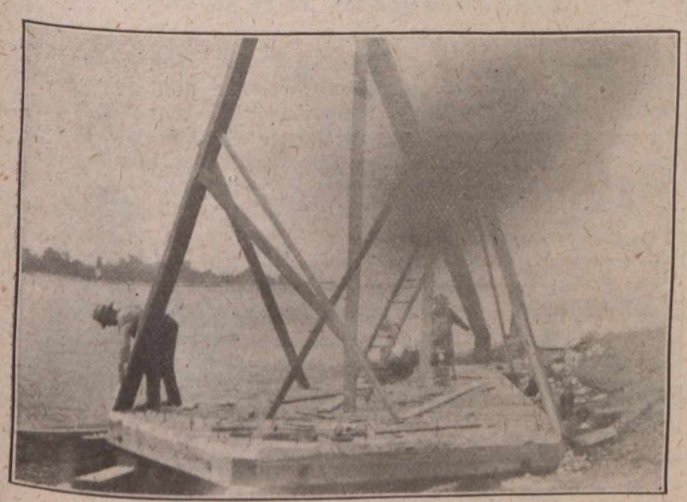

FIG. 1—HEAVY TIMBER FOUNDATION FOR INTAKE STRUCTURE

total length of which is 523 ft. The distance from basin No. 1 to the shore of the St. Clair River is about 110 ft.; from basin No. 19 to the river is but 50 ft. Fig. 7 indicates the general lay-out of the infiltration basins, pump-house, etc.

In the fall of 1918 the writer was appointed consulting engineer to report on the changes necessary to provide an adequate supply of pure water for present and future needs. He recommended that a direct intake be extended into the river opposite basin No. 14, and that basin No. 14 be converted into a screen house (provided with a superimposed building), and that openings be cut in all the cross-walls of the basins in order to convert them into a sedimentation basin, and to allow of a continuous flow from end to end—that is, from basin No. 19 to the pump-house.

Basin No. 14 was provided with a concrete floor, and was divided into compartments, as shown in Fig. 8. Two intake pipes, each 24 ins. in diameter, were laid from the

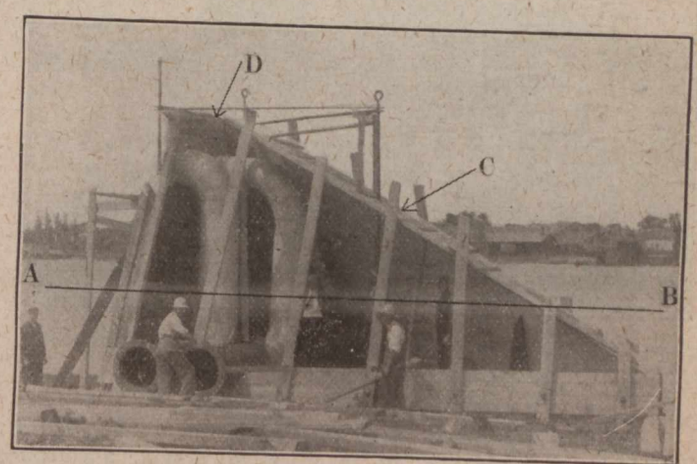

FIG. 2—SIDE VIEW OF INTAKE STRUCTURE, WITH PIPES IN PLACE

river into basin No. 14, one of these being into compartment A and one into compartment B. A 24-in. valve, with extension spindle, and provided with a pedestal on the floor above, was placed on the end of each intake pipe. Thus, by operating these valves, the water can be let direct into compartment A or B.

Coarse screens, each 4 ft. wide by 19 ft. high, were placed in steel channel gains between compartments A and C and between B and C. Both of these screens are in two sections, each section being 9½ ft. high. Duplicate gains are provided between the compartments. The screens are substantially built of channels and angle-iron frames, with ⅜-in. vertical rods at ¾-in. centres, and are interchangeable. The screens were galvanized after they were fabricated.

From compartment C the water runs through a 30-in. sluice-gate into a 30-in. reinforced concrete pipe, which discharges in basin No. 19. Openings 19 ft. wide by 6 ft. high were cut through the cross walls of all the basins except basin No. 14, thus providing a long sedimentation basin with a uniform flow from basin No. 19 to basin No. 14, and from basin

No. 14 to basin No. 1. The water runs through these openings from basin No. 19 back to compartment D in basin No. 14. Fine screens are provided between compartment D and compartment E. These screens are made of copper wire mesh, having openings one-tenth inch square. Each fine screen frame is 4 by 9½ ft. The copper mesh is fastened to separate small frames, there being three 4 by 3-ft. screens in each of the larger frames. All of the fine screens are interchangeable.

The water passes from compartment E through a 30-in. sluice-gate to basin No. 13, and flows by gravity to basin No. 1, and thence on to the well at the pump-house.

The coarse screens were placed to prevent debris or fish of any considerable size from getting into the basins. A very nice 5½-lb. pickerel—a beauty—was caught and delivered to the chairman of the Water Works Committee a few weeks ago. The fine screens were placed to prevent minnows from getting to the pump well, where chlorine gas is applied, and also to catch fine moss and grass.

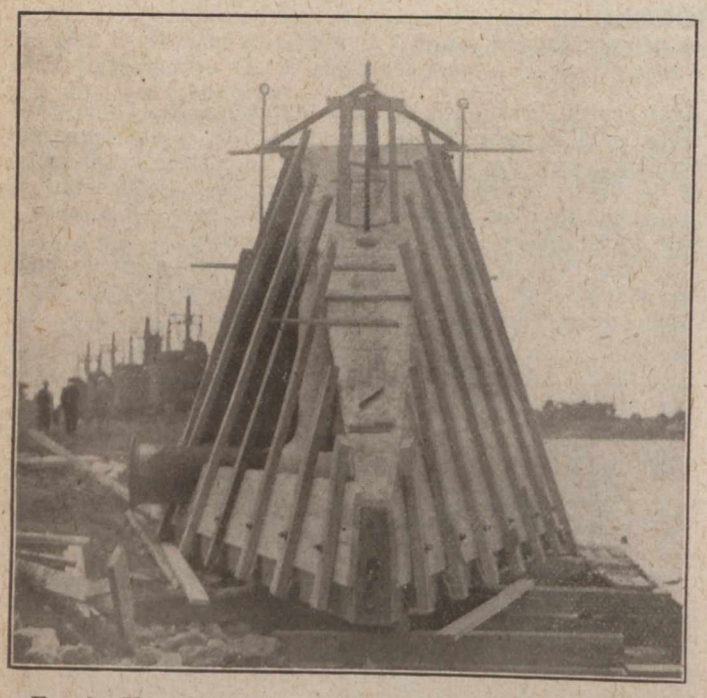

FIG. 3—UPSTREAM END OF INTAKE STRUCTURE, SHOWING FORMWORK—NOTE THREE LIFTING BOLTS

The water is taken first into basin No. 14 instead of directly into basin No. 19 in order to provide a certain amount of sedimentation before the water reaches the fine screens, and to avoid the necessity of providing two screen-houses, one for fine and one for coarse screens. A by-pass was installed so that water may be run directly to the fine screens without going to basin No. 19, thus permitting sediment to be removed at any time from basins Nos. 15-19, inclusive.

From a construction viewpoint, the matter of greatest interest is the intake pipe itself and the structure on its river end, and the methods used for placing them in the river.

The St. Clair River at the intake, which is within 100 ft. of Lake Huron, has a velocity of over five miles per hour. The authorities at Ottawa insisted that we place no obstruction to navigation in the river, and would not allow any structure that would be within 29 ft. of the surface during low water, so any kind of a tower such as used at Buffalo, Niagara Falls, Detroit or Chicago, could not be used. We also had to keep in mind the fact that large steamers might anchor at the head of the river or foot of the lake during heavy storms, and that these ships might drag their anchors directly over our intake structure. A timber crib would make an excellent hold for a ship's anchor, and, therefore, would not make a suitable structure for our intake.

Some difficulty is experienced at Port Huron, and has been met at Sarnia, with frazil. A timber structure is much better than almost anything else for keeping up a supply

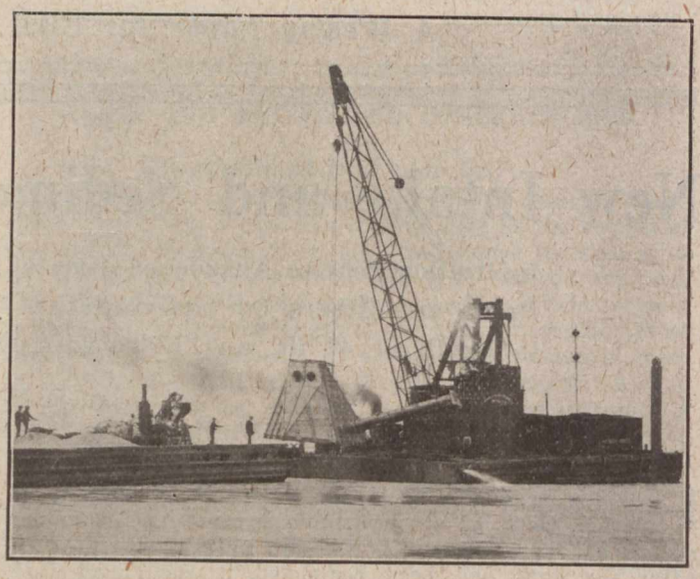

FIG. 4—DERRICK ON SCOW AT RIGHT LIFTING INTAKE STRUCTURE FROM SCOW AT LEFT—SHOWING DOWNSTREAM END OF STRUCTURE—FLEXIBLE JOINTS AND FIRST LENGTH OF THE TWO PIPES IN PLACE

of water while frazil is running, but owing to other objections to such a crib, we decided on concrete as the material for the structure. Several models were made in plasticine and in plaster of Paris. The one finally adopted was shaped like an overturned boat of the cutter type.

The accompanying illustrations show very clearly the general arrangement of this structure. The line AB on Fig. 2 shows approximately where the ground line of the

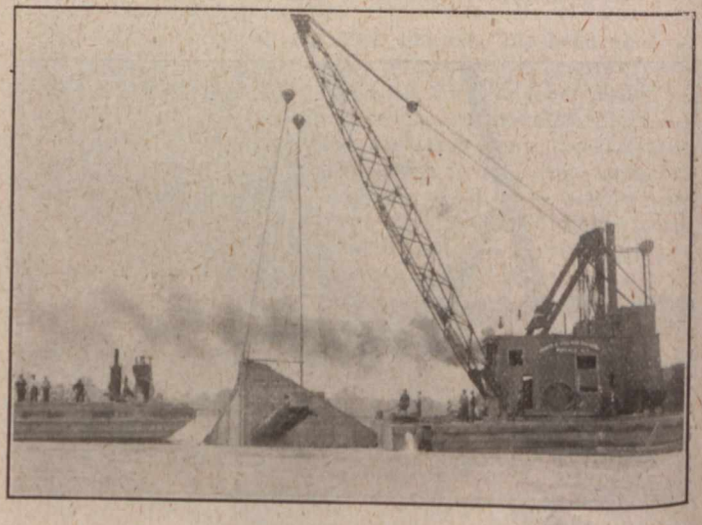

FIG. 5—LOWERING INTAKE STRUCTURE

bottom of the river is, now that the structure is in place in the river bed. This structure is 30 ft. 3 ins. long and 16 ft. wide at the bottom, which is its widest part. The "nose" points upstream, and water is taken in at the downstream end. The weight of the completed structure in air was 71 tons, and the displacement is 55 tons.

Great difficulty was experienced in getting contractors to bid on the work. The plans called for the structure being placed in an excavation 47 ft. below water level. The top of the completed structure was to be 32 ft. below water

level. After practically begging contractors to bid on this work, we finally induced Dunbar & Sullivan, of Detroit, to undertake the contract. Their tender for laying the two intake pipes, providing and placing the intake structure, and for placing 200 cu. yds. of one-man stone back in the excavation made for the structure, was $34,000, and strange to say, this part of the work was completed in practically exact accordance with the plans without one single extra.

The length of each intake pipe is 272 ft., and the minimum covering over the pipes is about 3 ft.

The original plans called for building the intake structure on the shore, with concrete walls one foot thick, towing it into position and sinking it in the river, and then filling it with concrete from scows. But the largest derrick owned by Dunbar & Sullivan could lift only 25 tons; therefore, that firm asked us to revise the plans so that the weight of the structure built on shore would not exceed that amount. The accompanying illustrations show clearly how the forms were built and the manner in which the pipes were placed inside of the forms.

A 10 by 10-in. timber foundation was first built on shore to conform to the shape of the bottom of the structure. These timbers were well bolted together, and were covered

FIG. 6—CHUTING CONCRETE THROUGH 8-IN. PIPE TO INTAKE STRUCTURE 47 FT. BELOW WATER LEVEL

with 2-in. planks and then with 1-in. T. & G. boards. The forms were built nearly water-tight. One foot of concrete was placed on the timber foundation inside the form before it was lifted onto the scow. Concrete was also placed in the "nose" of the structure for a distance of 6 ft. back from the "nose." A 10-in. nipple was placed in the form at the point marked C on Fig. 2, and another at the point marked D on the same figure. These were capped. A flexible joint and one length of steel pipe was attached to the pipes from the inside of the structure, as shown in Fig. 4. Three lifting bolts, securely fastened into the concrete base, were also placed, as shown in the accompanying illustrations.

The river-bed excavation for this structure was made with a clam, and after very little trouble good progress was made. Fortunately, the work was in fairly hard material, and there was no difficulty with the excavation "filling up." The work had once to be abandoned on account of a heavy blow down the lake, but the excavation did not fill to any appreciable extent.

When measurements taken over the excavation showed that it was at the proper depth, and when the weather was favorable, the scow—with the structure on it and with the lengths of pipe attached as shown in Fig. 4—was towed into position and securely anchored in the river. The structure itself was lifted by a cable attached to one drum on the derrick, and the pipes by a cable attached to another drum, so perfect control was obtained.

The structure was lifted at 1 p.m., Monday, August 11th, 1919. It took so long to sink that thoughts of having to fill it with water flashed through the minds of the engineers. However, by lowering very gently and giving it time to fill, everything proved to be entirely satisfactory. At 4 p.m. the structure was in its exact position, and measurements taken at various places showed it to be resting level and pointing correctly upstream.

The following morning an 8-in. pipe was placed in the lower hole, marked C on Fig. 2, the upper end of this pipe being at the side of the scow. At 11 a.m., 20 bags of neat cement, in the form of a thick grout, were poured into the 8-in. pipe. This 8-in. pipe rested on the concrete floor inside

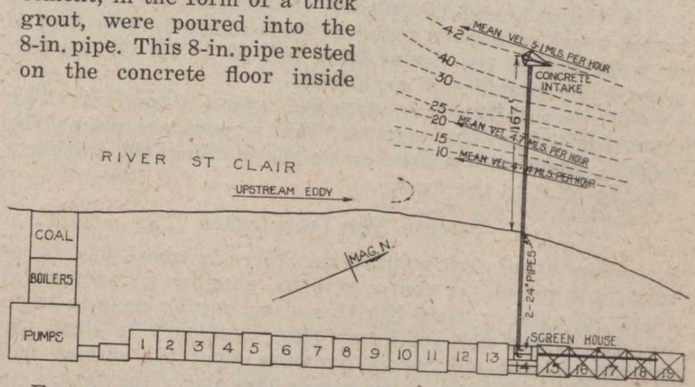

FIG. 7—PLAN OF INFILTRATION BASINS, BUILT IN 1914, SHOWING RECENT CHANGES AND NEW INTAKE

the structure. When the pipe was filled, it was lifted a little and the concrete slid into the structure. The concrete reached the top of hole C at 5 p.m. The diver then made his inspection and reported the crib full to within one foot of the form at that point. It took until 9 p.m. to have the pipe changed to hole D, and until 6 a.m., Wednesday morning, to fill the structure with concrete up to hole D. Later that same day, 200 cu. yds. of large stone were dumped in the river upstream from the structure; the clam lifted these and placed them around the structure to fill the excavation previously

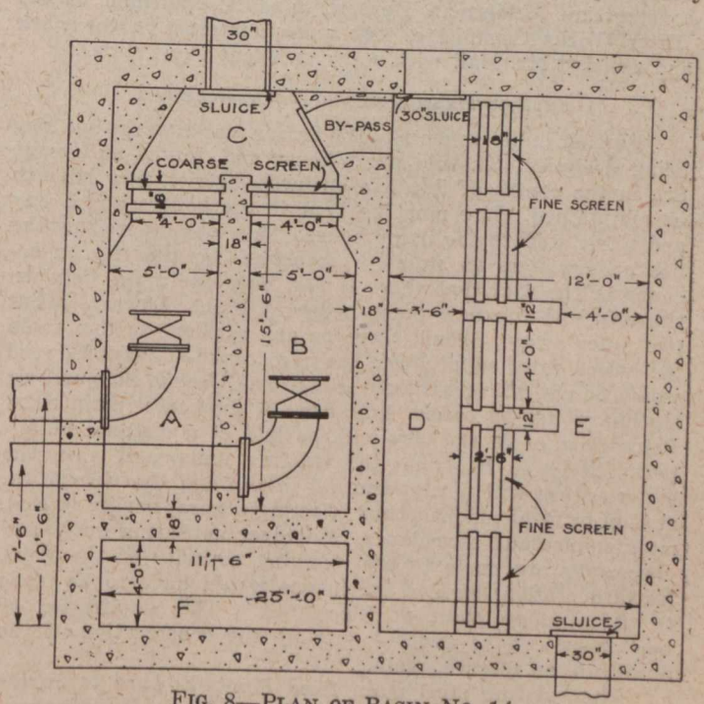

FIG. 8—PLAN OF BASIN NO. 14

made. Excavation was then made for the intake pipes, and they were laid and connected to the intake structure without great trouble. The current at the bottom was so great that the diver had to be tied to a cable anchored in the river at one end and to the scow at the other.

All this work sailed along very smoothly. It was not because it was an easy job—indeed, it was a most difficult job—but Dunbar & Sullivan had studied their problem, and they went at it in an intelligent manner, the result being that the work was carried out with complete satisfaction

to the contractors, the city and the engineers. The intake has been in continuous use since last November.

Connections are provided at the screen-house so that either water under city pressure or steam under boiler pressure can be turned into either intake pipe.

The actual loss of head in this entire system, when pumping through one intake at the rate of four million gallons per 24 hours, is about 7 ins.

A sludge pump is placed in compartment F of the screen-house to remove sediment from compartments A or B or from any of the basins from No. 19 to No. 15, suction pipes being provided in each basin.

The screen-house is provided with a 5-ton travelling crane for lifting the screens. The screens are cleaned by washing them with a hose inside the building, the washings running back to the river.

Screens Not Yet Cleaned

After about five months' use there is about 3½ ft. of sand in front of the coarse screens, possibly an average of 1½ ft. of sand in basin No. 19 and practically none in basin No. 15. It has not yet been found necessary to clean the screens. At the old Sarnia pumping plant the screens had to be cleaned during every heavy blow down the lake. No silt has reached basin No. 1 or the pumps, and only the slightest amount of discoloration has been noticed in the water at the taps in Sarnia since this new intake has been installed. Both silt and sand were pumped into the mains during every heavy blow when the old intake, two miles further down the river, was used. On Saturday, April 17th, the water in the river, appeared quite milky and turbid, while that coming through the instake was beautifully clear. Frequent analyses of the water taken during the winter months show that it is free from injurious bacteria and practically pure.

Harry Hall, superintendent of the Sarnia water works, very ably superintended the work for the engineers during construction. Alderman Herbert Sanders, chairman of the Water Works Committee, took a keen interest in the work and assisted Mr. Hall with many excellent suggestions.

Further Improvements Being Designed

Further improvements to the Sarnia water works are now being designed. The old pump-house and intake at George St., in the centre of Sarnia's business district, now have to be maintained. Fire must be kept in the boilers and a day and night staff in the pump-house. This was ordered by the fire underwriters as standby protection for the city on account of the fact that there is now only one main between the city and the new pump-house at Point Edward, about two miles away. Should there be any accident to that main the entire water supply from the new intake at Point Edward would be cut off, and the old intake and George St. pumping station would be called into use. A duplicate main from Point Edward to the city will be laid at a distance of approximately 40 ft. from the existing main, and then the underwriters will permit the old intake and the George St. station to be abandoned, thus effecting a great saving in coal, maintenance and attendance. Moreover, as Sarnia grows and extensions are made to the pumping capacity of the Point Edward station, similar extensions would have to be made to the standby plant at George St. This duplication of machinery can be avoided only by the construction of the duplicate, or reserve, main.

The existing steel main from Point Edward to Sarnia is leaking badly at the joints, which will be replaced by new flanged joints. The pumps in the Point Edward station will be rearranged so as to be driven electrically off peak; on peak they will be steam-driven as at present, and provision will be made to handle the coal by modern machinery.

Sir Adam Beck, chairman of the Hydro-Electric Power Commission of Ontario, states that the commission is now operating 61 miles of railway and that bonds have been issued to finance an additional 69 miles. Engineering reports have been made on 500 miles.

APPLICATION OF ENGINEERING PRINCIPLES TO WATER WORKS OPERATIONS TO OFFSET INCREASED COST OF LABOR AND MATERIALS

THE water works department of Lynn, Mass., has met increases in wages and cost of materials of 75 to 100% during the last four years without increasing its rates or any increase in the amount of water sold. How this was accomplished is described by Reeves J. Newsom, Commissioner of Water Supply of Lynn, in a paper read before the March meeting of the New England Water Works Association. Excerpts from the paper follow:—

The writer took charge of the water supply system in July, 1916, and found an ample field for the application of engineering principles to the methods of operation. The improvements noted are of the kind which will stop wastage and increase revenue. The improvements needed to better the service will come later.

The Lynn system is supplied by the watersheds of four artificial ponds and the Saugus and Ipswich Rivers. The combined catchment area from which water is drawn covers 58 square miles, and the available yield is about 35,000,000 gals. per day, while the present consumption of the city is approximately 8,500,000 gals. per day. Three pumping stations are used on the supply system to pump water from the rivers, or from one pond to another as it passes through them in the process of purification. A fourth pumping station, located in the city, pumps into the mains and the equalizing reservoir and standpipe. Three of the four ponds are in a chain and have a combined storage capacity of a little under four billion gallons. It requires from four to eight months for water to pass from the rivers into the distribution mains. The fourth pond, with a capacity of 350 million gallons, is used as an emergency supply to the distribution mains and can be filled from two of the other ponds.

Distribution System Partly Metered

The distribution system is about 58% metered and the per capita consumption is slightly over 70 gals. The system is valued at about $5,000,000, with a net bonded indebtedness of approximately $1,000,000. The receipts from the sale of water have varied little from $350,000 per year since 1916, of which from $130,000 to $165,000 yearly has been needed for debt requirements.

One of the first things coming to the writer's notice was the fact that the abatements, including adjustments for advance fixture assessments, amounted to about $13,000 per year. A complete reorganization of very lax office methods, and a strict enforcement of the regulations and the shut-off rule have saved $7,000 per year of this amount.

The service pipe in use by the department in 1916 was a type manufactured with a lining, was of high first cost and when used with Lynn water it did not stand up satisfactorily. After some investigation, it was decided that the most economical and serviceable was cement-lined pipe. To prevent the breakage of the lining with ordinary pipe cutters, all pipe was cut in the shop to fit the requirements by the use of a metal cutting machine, which, on a test with a single blade, cut 140 ⅛-in. discs from a piece of 1-in. lined pipe without breaking the cement. To prevent exposed threads in connections, malleable iron countersunk fittings are used, which we line ourselves with lead, leaving only six threads unlined. When this lining comes in contact with the cement lining of the pipe it makes a snug fit without danger of crushing the latter.

The saving effected by the use of this kind of service pipe is in excess of $4,000 per year.

Motorizing Department Effects Saving

In 1916 the department depended on the use of horses in all its repair work. The motorizing of this work has reduced the number of foremen from five to four, and the number of men on routine repair work about 20%.

The meter repair shop was not properly equipped to test meters over 1 in. in size and no attempt was made to test and repair meters over 2 ins., although 25% of the revenue from metered water was registered by these large meters.

A newly equipped testing plant has been built which includes a calibrated tank of 125 cu. ft. capacity. When the city has been entirely covered and all large meters repaired, indications are that revenue in excess of $5,000 per year will be added.

The Glen Lewis pumping station, which lifts water from Walden Pond to Breeds Pond, was equipped with a motor-driven centrifugal pump when it was built in 1912, but it had no meter for measuring the water pumped, and no tests had been made to ascertain the efficiency of the pumping unit. After complete tests had been made, it was discovered that the pump was running at an average overall efficiency of 42%, requiring 90 k.w. to pump 14.3 million gallons per day against a 20-ft. head. At a cost of $10,000 this unit has been replaced by a modern centrifugal unit, which delivers 16.4 million gallons against the same head, requires but 60 k.w., and operates at 72% overall efficiency. The saving in operation by this substitution is $3,300 per year, or 33% on the investment.

Improvement in Pumping Equipment

The Walden Pond pumping station which pumped water from Hawkes Pond to Walden Pond was built in 1902 and was in operation in 1916, but has now been abandoned. This was a steam station requiring the usual two men per shift to operate it. The water flowed to the suction well of the pump through an open canal about ¾ mile in length, losing about 20 ft. of head in this operation. The water was then pumped through a 30-in. pipe about ⅛ mile long against a total head of 45 ft. Two men on each shift were required to keep the screens clean in the screen house at the end of the canal leading to the suction well, and to operate the gates controlling the supply of water to the canal, making in all 12 men in 24 hours for the running of the station.

The writer has designed a new station to do this work which is so situated that the total length of 36-in. discharge pipe is 540 ft. and the suction is direct from Hawkes Pond. This station is equipped with a motor-driven centrifugal unit, pumping 20,000,000 gals. per day against a 23-ft. head with an overall efficiency of 74%. This unit is so protected by safety devices that the only attendance required is that given by the regular patrolman on the pond. This change has effected a reduction in labor from 12 men per day to none, a reduction in head pumped against from 45 ft. to 23 ft., a reduction in the cost of pumping from $5.45 to $1.75 per million gallons, and nets a yearly saving of $9,600 in the cost of operation, and required a net investment of but $35,000.

Supply to Adjoining Town

Until recently, the city of Lynn has been compelled to furnish water to the adjoining town of Saugus, on the basis that the city should furnish water, make inspections, read meters and collect the water charges. The town was to maintain its distribution system, for which it was refunded 50% of the receipts. Since the city of Lynn furnished all of the water, any wastage in the town system would yield greater returns to the latter.

The proper remedy was to meter the entire town supply, but the determination of an equitable rate was a very difficult proceeding. A thorough investigation, including a valuation of the town supply system, resulted in a charge of 5.1 cents per cu. ft. for water sold to the town.

In addition to giving up all work included under the old contract, the city of Lynn will receive over $4,000 more annually for this business than formerly.

Elimination of friction losses on the suction of the pumps in the main pumping station will eventually result in a saving of over $6,000 per year.

These improvements have resulted in a saving and added revenue in excess of what would have been obtained by a 12% increase in rates and have enabled the city to meet the necessary advance in prices.

The general office of the Standard Chemical, Iron & Lumber Co. has been moved from Toronto to the Drummond Bldg., Montreal.

Letters to the Editor

CHEMISTRY AND ENGINEERING

Sir,—In my article under the above title, of which you published excerpts in your April 22nd issue, I should have corrected the concluding sentence in the manuscript to read as follows:—

"I believe many cases in which the engineer's advice has been over-ridden, would have been settled to the better interests of the owner if the engineer had had a fellow scientist to support him."

T. LINSEY CROSSLEY.

Toronto, Ont., April 24th, 1920.

FAILURES IN CONCRETE CONSTRUCTION

Sir,—The writer was much surprised at the "Letter to the Editor" by Mr. Hagarty, published in your issue of April 22nd, regarding "Failures in Concrete Construction." It would seem from the second paragraph of his letter that he has been overawed by a mass of information into which he does not wish to delve, and that he therefore thinks it out of place in building codes, and styles as "so-called specialists" those who care enough about getting at the truth of the subject to spend time enough on it to become specialists.

There has been far too much tendency to assume that all is known about concrete that is worth knowing. For lack of better foundation, certain design assumptions are usually made, from which formulae have been evolved and are in general use. Those who have given great study to the "mass of information" piling up have begun to come to the conclusion that some of the assmuptions on which our theory is based are woefully in error, and that in consequence our methods of design may be materially changed. Reinforced concrete is a rapidly developing subject, and as our knowledge of its peculiar mechanics broadens, so does the necessity for acquiring new information.

The man who does not study the data at hand and that which is continuously becoming available, constitutes the real danger in reinforced concrete construction, whether he be the "field expert" who "knows all about concrete" and whose ten chief sins are pointed out, or the designer whose errors are headed and sub-headed.

In the case of building design Mr. Hagarty makes some remarkable statements regarding flat slab construction. Flat slab construction, when designed under any of the recognized building ordinances, does *not* "produce very high stress in both steel and concrete." If Mr. Hagarty will study the information available in the records of the American Concrete Institute, Bulletin No. 84 of the University of Illinois (Engineering Experiment Station), transactions of the Engineering Institute of Canada, or numerous other publications, he will find that the stresses recorded in extensometer tests are surprisingly low. In the case of the five buildings tested by the writer in the city of Toronto a few years ago, on not over one or two gauge lines in more than one thousand read, did the steel stress reach 16,000 lbs. per sq. in. when the floor was loaded with *double* the design load, although in design the value of 18,000 lbs. per sq. in. was assumed with the design load in place. These buildings were all of the flat slab type. The writer wonders whether Mr. Hagarty looked up all the available information before he made that sweeping statement regarding flat slab construction.

The same condition exists respecting his statements in regard to the steel ratio used, whether in tension or in shear. The recent tests conducted by the U.S. Emergency Fleet Corporation and Bureau of Standards throw great light on the subject. At the last convention of the American Concrete Institute a number of tests were reported and dis-

cussed. It might be worth mentioning in this connection that W. A. Slater, who was in charge of the tests for the Bureau of Standards, will address the Toronto branch of the Engineering Institute at 8 p.m., May 13th, when an excellent opportunity for full discussion will be given.

In connection with field work it is essential to have the best of supervision by men who are trained in the subject, and who at the same time appreciate the fact that practical considerations must be taken into account. Such a man must himself be a specialist in this line if the work under his charge is to be of the best. Until we realize that concrete buildings will not stand from force of habit, but that they must be designed and supervised by specialists, we will continue to have concrete failures.

T. D. MYLREA,
F. G. Engholm & Partners, Ltd.,
Consulting Engineers.

Toronto, Ont., April 27th, 1920.

AMERICAN WATER WORKS ASSOCIATION'S PROGRAM FOR MONTREAL MEETING

FOR the first time in 13 years, the American Water Works Association this year will hold its annual convention in Canada. The Windsor Hotel, Montreal, has been selected as headquarters. The convention facilities and arrangements at that hotel are ideal; the association will have the exclusive use of a quiet and roomy convention hall, a large exhibit room and comfortable lobbies. Arrangements have been made with the Customs Department for admitting exhibits from the United States duty free, and for the entrance of automobiles without undue trouble.

Following the past hard winter, opportunity will be afforded the members of the association to become familiar with the design and operation of water works to meet conditions due to prolonged very cold weather, a subject interesting to most members at this time. It will also give the association's United States members an opportunity to study on the spot methods of management due to Canadian conditions, differing from those governing similar administrative work in some parts of the United States, and likely to afford much valuable information to superintendents from the United States who have not previously visited Canadian water works.

Following is the tentative program announced by the executive committee of the association:—

Monday, June 21st

Registration, meetings of executive and other committees, and informal "get acquainted" meetings in lobbies and exhibit room.

Evening

Informal reception arranged by the local committee and the Water Works Manufacturers' Association at the Windsor Hotel. Dancing.

Tuesday, June 22nd

Forenoon

Opening of convention in the Convention Hall, at 9 o'clock.

Reading of papers, as follows:—

"The Municipal Water Supply of Montreal," by Thomas W. LeSage.

"The Works of the Montreal Water and Power Co.," by F. H. Pitcher.

"The Experience in Montreal in the Manufacture of Alum," by James O. Meadows.

Afternoon

"The Water Works of the City of Quebec," by Arthur Surveyer.

"Water Supply Problems in the Province of Quebec," by T. J. Lafreniere.

"The Water Works of St. John, N.B.," by Frank A. Barbour.

Evening

"Water Works Experiences," by Beekman C. Little.

"Economic Features of Pumping Station Operation," by Leonard C. Day.

"Difficulties in Building the Louisville Pumping Station," by James B. Wilson.

Wednesday, June 23rd

Forenoon

"The New Water Supply of Winnipeg," by James H. Fuertes and William G. Chase.

President's address, by President Carleton E. Davis.

Reports from sections.

Report of the association's representatives on the American Electrolysis Committee.

Report of the Committee on Private Fire Protection Services (Nicholas S. Hill, chairman).

Report of the Committee on Official Standards for Water Analysis (Jack J. Hinman, Jr., chairman).

Report of the Committee on Standard Specifications for Cast-Iron Pipe and Specials (Frank A. Barbour, chairman).

Report of the Committee on Cold Weather Troubles (Charles R. Bettes, chairman).

Reports of officers and standing committees.

Nomination of members of the Nominating Committee.

Selection of place for holding the 1921 convention.

Afternoon

Entertainment by the Water Works Manufacturers' Association; probably a trip through the rapids of the St. Lawrence River.

Evening

A smoker for the men, given by the Water Works Manufacturers' Association; and for the ladies, a theatre or card party.

Thursday, June 24th (Superintendents' Day)

Forenoon

Discussion of the selection, installation, reading and maintenance of water meters. The discussion will be opened by several papers on the subject by members of the association.

The chemical and bacteriological section is preparing a program for a separate meeting, at which a paper will be read by Col. George A. Johnson, on the quality of water. Other subjects and papers for this sectional meeting will be announced later.

Afternoon

A general discussion of the legitimate uses of water, what they are and how to estimate them. There has been much discussion on water waste and how to prevent it, but up to the present time little on its legitimate use. Some cities have been criticized because of the high per capita consumption without knowledge of the legitimate uses of water in those particular places. The discussion will embrace private sources of industrial supplies; the nature of the demand for water by different industries; and the actual demands for water for domestic consumption by families of different means.

Evening

"Damage to Deep Wells by Sea Water," by Dr. William P. Mason.

"Cost-Plus Contracts in Water Works Construction," by George W. Fuller.

"Standard Forms for Contracts," by G. W. Buchholz.

"The Trend of Prices," by Leonard Metcalf.

Arrangements are under consideration for trips about the city of Montreal, to the water works plants and other places of interest. Arrangements are also being considered for a trip by special boat leaving Montreal Friday evening for the Saguenay River.

The above program will be revised and added to, making a convention that no member should miss if it is at all possible to attend. It is estimated that the attendance will be considerably more than one thousand.

CANADIAN ENGINEERING STANDARDS ASSOCIATION

AT a meeting of the main committee of the Canadian Engineering Standards Association, held at Ottawa, April 12th, with Sir John Kennedy in the chair, the general specification for steel railway bridges, which had been submitted to the main committee by the sectional committee on steel bridges and construction, was approved for publication. This specification, the essential provisions of which are fortunately in general agreement with the practice of the American Railway Engineering Association, is not drawn up with any intention of limiting the choice of the engineer as to type of bridge, but is so framed as to indicate definite methods of work for the designer, detailer and manufacturer, with a view to thus obtaining uniform results as regards strength and utility.

The specification, as now approved, is based on that published in draft form in 1918 by the Engineering Institute of Canada, and drawn up by a committee of that institute under the chairmanship of P. B. Motley, engineer of bridges, C.P.R. The work of the C.E.S.A. upon it was undertaken at the request of the Engineering Institute.

Specifications for Wire Rope

It is announced that sub-committees have been appointed for the purpose of drafting general specifications for guidance in the purchase of wire rope, both for mining purposes and for dredging and steam shovel work. The former sub-committee is under the chairmanship of F. H. Sutherland, Inspector of Mines of Ontario, and the chairman of the latter is K. M. Cameron, Department of Public Works, Ottawa.

A report from the chairman of the sub-committee on telegraph and telephone wire, W. J. Duckworth, of the Great North Western Telegraph Co., Toronto, stated that a specification for two standard grades of this material had been drafted and was now being considered and amended by the sub-committee.

J. G. Morrow, of the Steel Co. of Canada, Ltd., Hamilton, chairman of the sectional committee on steel, reported that a special committee had commenced work with a view to co-ordinating the numerous specifications for material for carbon steel forgings now being used in Canada, and, if possible, establishing the characteristics of a comparatively small number of grades of steel which could be used to fill those specifications.

Canadian National Electrical Code

It was decided to instruct a special committee, under the chairmanship of E. G. Burr, consulting engineer, Montreal, to proceed with an enquiry into the desirability and possibility of framing a Canadian National Electrical Code. It was pointed out that such a document, so far as hazard to life is concerned, has been drawn up in the United States under the auspices of the Bureau of Standards, while fire hazard has been dealt with by the rules of the National Board of Fire Underwriters. The sub-committee is to consider the measures to be taken should it be thought advisable to draft a Canadian code for covering these subjects for wide acceptance in the Dominion.

Highway Bridges and Cement

A communication was read from the council of the Engineering Institute of Canada requesting the association to deal with a number of the specifications of the institute, considering and revising them if thought necessary, as has already been done in the case of the specification for steel railway bridges. It was decided to take up first the institute's specifications for steel highway bridges and for cement, and to organize suitable committees to report upon them.

It was announced that the Air Board had approved of the C.E.S.A., through its sectional committee on aircraft parts, as the body through which Canada is to be represented on the International Aircraft Standards Commission. This action was welcomed by the committee and it was pointed out that the approval of the Air Board gives official recognition to the work which has already been accomplished by Canadian representatives at meetings of the commission.

The International Aircraft Standards Commission was organized in 1917, primarily as a war measure, with the object of obtaining, as far as may be, international agreement regarding materials for aircraft as well as details of aircraft construction and equipment. It is, for example, obviously desirable that aero engine magnetos made in different countries should be built within certain limits of overall dimensions and should conform to general specifications which would enable a French magneto to be used in an emergency on a British machine finding itself in difficulties in France. The commission has already made gratifying progress, although it is unfortunate that the United States has so far been unable to appoint a committee to take part in its work. The countries now active on the commission are Great Britain, France, Italy and Canada.

A grant of £200 towards the funds of the association was announced from the British Engineering Standards Association, and the secretary reported that he now had in stock a supply of almost all of the publications of the B.E.S.A., which are available for distribution at a nominal charge.

A communication was read from the American Engineering Standards Committee, advising that in their opinion co-operation between that body and the C.E.S.A. should be provided for by the interchange of minutes of the meetings of the respective main committees, so that joint action can be arranged for whenever necessary. The committee heartily concurred in this suggestion, which will be adopted in future, and the hope was expressed that many opportunities for co-operation will present themselves.

CALVERT TOWNLEY ADDRESSES TORONTO ELECTRICAL ENGINEERS

FOLLOWING the annual meeting for the election of officers, Calvert Townley, president of the American Institute of Electrical Engineers, addressed the Toronto section of that institute last week at the Engineers' Club, Toronto. While largely concerning institute activities, his speech also dealt with the important part the engineering profession could and should take in bettering the conditions of society.

The following officers were elected for the coming year: Chairman, Frank Ewart, of Ewart, Jacob & Byam; secretary, Perry A. Borden, of the Hydro-Electric Power Commission.

Executive Committee: O. V. Anderson, Toronto & Niagara Power Co.; L. B. Chubbrick, Canadian Westinghouse Co; W. P. Dobson, Hydro-Electric Power Commission; S. E. M. Henderson, Canadian General Electric Co.; George D. Leacock, Moloney Electric Co.; Walter F. Wright, Eugene F. Phillips Electrical Works.

The Warren Construction Co., of Oregon, are said to have had a representative in Lethbridge for several months in an effort to obtain the construction work in connection with the Lethbridge Northern Irrigation District. A Calgary solicitor has secured a 30-day option on the bonds of the District, and it is said that he is acting for the Warren Co.

The American Railway Engineering Association has accepted an invitation from the United Engineering Society to become a member society of Engineering Council. The association has about 1,650 members and its headquarters are in Chicago. Its president is Harry R. Safford, formerly chief engineer of the Grand Trunk Railway. The excellent technical work done by the committees of this association in many branches of railroad construction and maintenance are well-known. The association has named as its representative upon Engineering Council its president, Mr. Safford, who is a member of the American Society of Civil Engineers and the Engineering Institute of Canada. The societies now represented in Engineering Council have an aggregate membership of 45,000.

DOMINION BRIDGE ENTERS HYDRAULIC FIELD

ANNOUNCEMENT has been made by the officials of the Dominion Bridge Co., Ltd., Montreal, that they are organizing a subsidiary company that will be known as the Dominion Engineering Works, Ltd., which will manufacture turbines and other hydraulic machinery in accordance with the designs of the I. P. Morris Department of the William Cramp & Sons Ship & Engine Bldg. Co., Philadelphia, Pa. The latter firm have constructed many large hydraulic turbines for use in the British Empire, aggregating 658,000 h.p., including 101,000 h.p. for the Montreal Light, Heat & Power Co., 137,000 h.p. for the Shawinigan Water & Power Co. and 120,000 h.p. for the Laurentide Co. They recently received an order for three turbines, each of 52,500 h.p., for the Queenston development of the Ontario Hydro-Electric Power Commission. Parts of these three turbines will now, undoubtedly, be manufactured in Montreal.

The Dominion Engineering Works, Ltd., will have an authorized capital of $5,000,000 in 8% preferred shares and $5,000,000 in common shares, of which $4,000,000 of each class is now to be issued.

The Dominion Bridge Co. recently incorporated another subsidiary, the Dominion Engineering & Machinery Co., Ltd., with a capital of $2,500,000, for the purpose of manufacturing pulp and paper making machinery. This company will be merged with the newly formed Dominion Engineering Works, Ltd. Extensions to the Dominion Bridge plant at Lachine will be made as necessary for the extended operations of the company.

The entrance of the Dominion Bridge Co. into the hydraulic field is a further evidence of the rapidly increasing interest among manufacturers in that field in Canada. Recently, the Canadian Ingersoll-Rand Co., Ltd., of Sherbrooke, perfected arrangements with the Wellman-Seaver-Morgan Co., of Cleveland, Ohio, similar to the arrangements which the Dominion Bridge Co. have made with the I. P. Morris concern. There are also well established and experienced plants for the manufacture of hydraulic turbines at Lindsay and Peterborough, operated respectively by the Boving Hydraulic & Engineering Co., Ltd., and the William Hamilton Co., Ltd. The John Inglis Co., Ltd., and Canadian Allis-Chalmers, Ltd., both of Toronto, have also manufactured hydraulic turbines of small and medium size, but both of these firms abandoned this line at least temporarily during the war, although they may resume operations in this field in the future. Small turbines and water wheels have also been manufactured by Charles Barber & Sons, of Meaford, Ont.; J. C. Wilson & Co., Glenora, Ont.; and William Kennedy & Sons, of Owen Sound.

The United States and foreign firms who have been most prominent in the hydraulic field in Canada are the S. Morgan Smith Co., of York, Pa., and Escher Wyss & Co., of Switzerland. Each of these two firms maintains an office and a resident engineer in Montreal.

QUEBEC HEALTH BOARD vs. HULL

TECHNICAL evidence was given last week before Judge Chauvin in Ottawa by T. Lafreniere, sanitary engineer of the Quebec Board of Health, in the suit brought by that board against the city of Hull. The officials of Hull refused to carry out a mandate issued by the provincial board requiring the city to install a filtration plant. Mr. Lafreniere was called to the stand in rebuttal of evidence given on behalf of the city by Andrew Macallum, city engineer of Ottawa, and W. J. Orchard, general sales manager of Wallace & Tiernan Co., Inc., New York City. Mr. Lafreniere agreed with Messrs. Macallum and Orchard that chlorination is a necessary adjunct to filtration in order to obtain an absolutely pure water supply, but he declared that filtration, in addition to chlorination, is necessary at Hull, stating that chlorination cannot be fully efficient unless the water is first cleansed by filtration. Judgment in the case has not yet been rendered.

ENGINEERING LEGISLATION PASSES IN ALBERTA AND NEW BRUNSWICK

TELEGRAMS have been received by *The Canadian Engineer* advising that the bill incorporating the Association of Professional Engineers of Alberta has passed its third reading in the provincial legislature and has been signed by the lieutenant-governor. The full text of this bill as introduced was published in the March 25th issue of *The Canadian Engineer*; a general discussion of some of the amendments made by the legislature appeared in the April 8th issue.

Telegrams have also been received announcing that the bill incorporating the Association of Professional Engineers of the Province of New Brunswick has been finally passed by the legislature of that province and has been signed by the lieutenant-governor. This bill follows very closely the model draft recommended by the legislation committee of the Engineering Institute of Canada. Comparatively few amendments were made by the legislature.

NEW BRUNSWICK POWER CO.

AFTER a valuation of the holdings of the New Brunswick Power Co., the Wetmore Committee has reported to the city council of St. John, N.B., that a sum of $3,300,000 has been decided upon as fair payment in case the city or the province should purchase the holdings of the company. Considerable dissatisfaction has been expressed by members of the legislature at the price reported, which they consider too high, and there is some doubt as to whether the purchase will be concluded upon those terms.

STARTS PUMPING PLANT AT HAMILTON

AS chairman of the water works committee of the city council, Adam Brown, the veteran postmaster of Hamilton, Ont., presided 60 years ago over the christening of Hamilton's first water works system, when the Prince of Wales started the first pumps in operation. Last week Mr. Brown started the new steam auxiliary pumping equipment at Hamilton, which has a capacity of 50,000,000 gallons daily. The new pumps were designed and constructed by the De Laval Steam Turbine Co., of Trenton, N.J., and were installed by the Turbine Equipment Co., of Toronto.

PROVINCIAL AID FOR WATER WORKS?

IF the Quebec government is prepared to grant aid for the construction of highways, why not for the construction of water works, asked Dr. Desaulniers, member of the Quebec legislative assembly, in addressing a public meeting at Longueil last week under the auspices of the South Shore Board of Trade. Dr. Desaulniers advocated that the provincial government should advance money to municipalities at 3%, repayable over a period of 40 years. Many municipalities need water works improvements but plead poverty, hence the need of government aid, said Dr. Desaulniers.

BRITISH EMPIRE STEEL CORPORATION

INCORPORATION of the British Empire Steel Corporation, with an authorized capital of $500,000,000, has been announced by Col. Grant Morden, formerly of Toronto, but now of London, Eng. It is said that about $250,000,000 capital stock will be issued at present and exchanged for controlling interest in the Nova Scotia Steel & Coal Co., Ltd., the Dominion Steel Corporation and Canada Steamship Lines, Ltd. It is stated that the new corporation will absorb these three companies, their subsidiaries and several other smaller concerns. The deal is being financed by English capital.

COMPENSATION OF ENGINEERS*

By O. C. Merrill†
Chief Engineer, Forest Service, U.S. Dept. of Agriculture

THERE are few questions which are being more actively agitated, to which more attention is being given by the individuals personally concerned or by official and unofficial agencies, or for which an adequate solution is more urgently needed, than that of compensation for services rendered. Our transportation activities, our industrial operations, and our social relations will remain in an unsettled condition, and the efficiency with which both business and government can function, will depend in no small degree upon the rapidity with which a satisfactory solution of this question is obtained.

A very considerable adjustment has already been made in the compensation of wage earners, particularly of organized wage earners, and in several instances special machinery has been established for the settlement of wage questions. To a much less degree has there been adjustment in the compensation of the great unorganized, or only partially organized, group of salaried workers. This is especially true of those who are in public employ, whether federal, state or municipal, and who are dependent upon legislative action for any change in conditions of employment or rate of compensation.

High Costs Not Temporary

The existing situation is not due in any material degree to any diminution of demand for services, or to any decrease in the number of dollars paid, but almost exclusively to a reduction in the purchasing power of the dollar. We speak of the "high cost of living" as if the increase in commodity prices represented an increase in real commodity costs. This confusion of cause and effect, with the attendant assumption, tacit or expressed, that the situation is merely temporary, is responsible in a large degree for the failure to take the steps necessary to restore rates of compensation to the position relative to commodity prices which they held before the war.

The three main elements in commodity prices are the real cost of production, transportation and distribution; the relation of supply to demand; and the scarcity or abundance of the various media of credit and exchange. The curve of index numbers of composite commodity prices, while showing many fluctuations, has maintained a general upward trend throughout the period during which such numbers have been compiled. Had it been possible, however, to have had an absolute standard of costs—a standard, for example, which would have represented the sum total of human effort, direct and indirect, which had been expended upon the commodities—it can hardly be doubted that the curve of composite commodity costs would have shown a constantly downward trend; for the period during which index numbers have been compiled has been a period of constantly increasing application of machinery to every stage of production, transportation and distribution.

Wars and Their Effect

Furthermore, it cannot be assumed that the general upward trend of commodity prices has been due to any progressive reduction in the ratio of supply to demand. If this is correct, the upward trend is primarily due to a more rapid increase in the media of exchange—coin, currency, and credit instruments—than in the production of commodities.

This conclusion is most apparent when we consider the periods of extreme financial inflation which characterize the prosecution of great wars. During the four years, 1861-5, wholesale prices in the United States increased 116% and in 1874 were still 33% higher than before the war. The Civil War cost $3,500,000,000, and materially affected one nation only. The present war has unsettled the financial structure of the entire world. The United States alone in the four years, 1914-8, increased its gold reserve 200% and expanded its credit instruments in the form of demand deposits and notes by $6,600,000,000. It has also issued bonds aggregating $21,400,000,000. The belligerent nations, exclusive of Russia, have increased their note circulation 447%, while the total cost of the great conflict is estimated to have exceeded 200 billions of dollars. If the depreciation in the value of the dollar was still felt 15 years after the outbreak of the Civil War, what shall we expect from a war that has cost ten times more than all the other wars waged in the world during the last 70 years?

Dollar Worth "Forty Cents"

While it is true that a world shortage of food and of raw materials, the dislocation of means of transportation and distribution, and reduced industrial production all have their effect, the primary cause, now and for many years to come, of the depreciation in the purchasing power of the dollar is and will be financial inflation. Furthermore, the possibilities of additional credit expansion through the use of the huge volume of outstanding government bonds and the probable flotation in this country of foreign securities for European reconstruction, are likely, at the least, to offset any immediate appreciation in the dollar that might otherwise be brought about by increase in production.

In an address before the conference of governors and mayors held at the White House, March 3rd-5th, 1919, Prof. Irving Fisher, a recognized national authority on matters of finance, stated: "We are on a permanently high price level, and the sooner the business men of this country take this view and adjust themselves to it the sooner will they save themselves and the nation from the misfortune which will come if we persist in our present false hope." Prof. Fisher spoke with 1918 figures before him, several months after hostilities had ceased, and at a time when it might have been expected that prices had reached their peak. On the contrary, however, the rise has continued, until in January of this year wholesale prices were 26% above the average for 1918, 2½ times greater than in 1915, and 50% greater than at any previous period in our history. In five years the purchasing power of the dollar has dropped from 100 cents to 40 cents.

This matter has been discussed at some length, because it is the factor of outstanding importance in the solution of the problem before us. Unless we realize that all the evidence of past price history indicates that we cannot hope for restoration of former price levels for many years, if ever, we are likely to satisfy ourselves with only a half measure, while leaving the real problem unsolved. . . .

Promotion Schedules Required

No properly constructed salary scale can overlook the requirements for a promotion schedule. Such a schedule should be based upon the asumption that a properly qualified individual entering any position shall have before him the possibility within a reasonable time of progressing by successive steps to the top of the service. The lack of any definite or consistent policy in this respect is one of the primary faults of public service to-day. If the services of an employee when appointed or when advanced to a new grade are at that time worth the prescribed entrance salary, and if the employee is a person who should be retained at all, it is self-evident that his services are worth more after having had experience in his new position than before he has had such experience. A certain amount of promotion in salary, based upon the very fact of experience in the position filled, should be automatically accorded to qualified employees.

As a corollary of any such promotion policy, means should be devised for disposing of the incompetent and inefficient. In the interest of the employees as a whole, as well as of the proper conduct of any public or private business, it is as necessary to get rid of those who cannot or

*Excerpts from address before the American Association of Engineers, March 15th, 1920, Chicago, Ill.

†Member of Engineering Council's committee on classification and compensation of engineers.

will not maintain satisfactory standards, as it is to secure and retain those who will and can advance such standards. The superannuated, whose efficiency is reduced on account of age and not through fault of their own, should be retired under a system which will adequately recognize their past services. Others should be transferred, demoted or dismissed as the equities of the individual case and the best interests of the service require. No one should be held on the rolls who cannot and will not render a service commensurate with the compensation received.

There is much more in the question than the welfare of individuals. The interests of the engineering profession and the integrity of the public service are involved. These services represent operations of enormous magnitude, involving hundreds of millions of annual expenditure in engineering construction alone. To attempt to execute this work with an incompetent, dissatisfied and constantly shifting personnel, because such a personnel can be secured at a merely nominal compensation, is inexcusable folly. No plan more wasteful of public funds could be devised; and yet no mere statement of this fact, not even the general acceptance of its accuracy by the engineering profession, is sufficient to effect a remedy. The organized co-operative effort of the entire profession, coupled with a definite policy of public enlightenment is necessary. The engineering societies must act not only in behalf of the individuals in their membership and in support of the standing of the profession, but also as advocates of adequate standards of performance in both public and private work. The most difficult field in which to reach a solution is the public service, for in this field final action rests with legislative bodies, and legislative bodies are moved primarily by political considerations. Not until the public at large has recognized the situation and demanded a cure, can we expect that congress or state legislatures or municipal councils will pay heed. The situation demands organization, publicity and action.

INSULATION OF CONCRETE WALLS*

By Noland D. Mitchell
Structural Engineer, Supervising Architect's Office, U.S. Treasury Department

SINCE the dawn of civilization man has made buildings to protect family and chattels from the weather and depredation. With succeeding ages or civilizations, better and better protection has been afforded. Can we continue this progress? In view of the many improvements that are being made in all our arts we can readily imagine great forward strides in building in the near future. Certainly, some forward movement is needed when the loss by fire is now approximately $300,000,000 in money and hundreds of lives each year. And incidental to this fire-cost must be added the upkeep cost of our large standing army of insurance and fire protection forces. The fire fighter comes after the fire starts, to limit it to as small space as possible, and the insurance man comes later to distribute a part of the loss money to the more fortunate. Let us, in making our improvements, not overlook this monstrous thing now exacting such heavy tolls of our energy and resources.

Another phase of the situation is the growing scarcity of fuels. We have been, and are still, very prodigal of them. Now is the time to consider in an economic way what we can do to conserve our supply. If we can make houses that do not require so much fuel for heating we should at least investigate the possibilities.

One cannot deny that our better constructed wooden houses have been comfortable and, except against fire, have afforded reasonable protection for a comparatively short time at a low first cost. While our lumber resources are by no means exhausted, it is becoming more and more uneconomical to build wooden houses. In making the change from the wooden house to types of more permanent construction, we must select some kind that will provide as much or more comfort for the occupants.

The unfortunate thing that we realize at once is that our common fire resisting materials of construction have a high rate of heat conductivity as compared with the more combustible kinds. The cold walls resulting from the use of these has had no small influence in retarding the change from the wooden house. This being the case, is it not time to make some effort at the solution of the problem?

The maintenance of an even temperature in a house resolves itself into provision of adequate heating apparatus and a construction that will satisfactorily prevent rapid dissipation of heat through floors, walls and ceilings. It is just another phase of the problem that refrigerating engineers have found to be of such importance in their work —namely, insulation.

Are Present Methods Satisfactory?

There is plenty of evidence that many builders realize the necessity of insulation against heat transference, but we are not so sure that an altogether satisfactory solution has been found. If the various improvements in cellular blocks, walls and the like that are being brought out are any criterion, then we can say not.

Let us look briefly into what has been done and the results. Wood furring with lath and plaster on the inside was probably the first effort to avoid penetration of dampness and the condensation of moisture on the inside of the wall. The result, as far as insulating against the heat loss through an 8-in. wall, was an improvement of approximately 15%. Where the wall block absorbed dampness from the weather, the result was not so good, for in general any porous material in moist or damp condition transmits heat much more readily.

The hollow block was another development in the right direction. The total result was probably not so very different from the wood furring except that it provided no lodgement for vermin and no runway for fire. The chances for dampness showing on the plaster were much higher, however, and there is no doubt that passage of dampness through the withes of hollow blocks is responsible for a large part of the long fight that advocates of concrete house construction have had to make to keep in the business.

Other builders, realizing that dampness cannot travel by capillary action across a space bridged only by thin metal ties, adopted that system and at the same time realized an improvement of about 20% over the 8-in. solid plastered wall. Hollow monolithic walls give about the same or perhaps a little better protection. The matter of detail of construction of the hollow wall is apparently more troublesome, yet with some builders they are still favorites.

Use of Cinder Concrete

A system not so much in vogue has been the building of a solid wall of lean cinder concrete, facing it with stucco on the exterior and plastering the inner face; or, where the temperatures justify it, furring has been applied.

Another use of cinder concrete has been in making furring blocks to face the inside of the walls. I have not been able to find any data on the relative merit of these. One recent system imbeds the porous block in the centre of a monolithic wall so that the inner shell may serve as the supporting wall for floors and ceilings and thereby not break the continuity of the insulating course.

Other developments, such as multiple cell blocks with offset withes, various forms of opening to allow freer circulation, etc., have been improvements in both insulating value and saving of materials.

A very popular building block is one made solid, with projections on the rear face to bond with like projections on the blocks laid up to form the opposite face of the wall. This gives a good bond and is a simple arrangement, easily

*Read at the National Conference on Concrete House Construction, February 17th-19th, 1920, Chicago, Ill.

cast and allowing a wetter mix than that generally used in block construction.

All these efforts have made an appreciable improvement over the solid wall type, but generally the air spaces provided have been unnecessarily large and allow convection currents within the closed space.

A comparison of the results obtained by some of the above with the results of refrigeration insulating, has led to investigating in a general way what might be done by using concrete as the structural member of the wall and combining with it an efficient insulating material.

As a basis, a monolithic concrete wall 4 ins. in thickness, with 1 in. of corkboard insulation, has been considered. It is not the intention to say that either the 4-in. concrete or the 1-in. corkboard is an ideal. In actual practice, the thinnest concrete that will give adequate service, and any insulating materials of the requisite qualities for the work, should be used. There are many insulating materials on the market, and if a demand is created for still different ones, then we may be sure that some resourceful manufacturer will soon be able to meet it.

No Perfect Insulating Material

There is no perfect insulating material. Of the more common ones, the heat transmission factor varies very closely in proportion to the density of the structure. The cellular ones, such as wood, pitch, cork, wool, etc., are best for house insulation. Any of these materials must be kept dry to give the best service.

The following table* from "Mechanical Refrigeration," by Prof. Macintire, of the University of Washington, gives the heat conductivity of one inch some of our common building materials:—

Common brick	4.66
Concrete (1:3:5)	4.29
Hollow tile (1 to 4 ins.)	0.625
Lumber (tongued and grooved, ⅞ in. only)	0.83
Air space (from 1 to 6 ins.)	1.66
Mineral wool	0.67
Builder's paper	0.30
Pitch	0.79
Shavings (dry)	0.67
Granulated cork	0.48
Corkboard (all cork, compressed)	0.26
Corkboard (artificial binder)	0.28
Hair felt	0.31
Indurated fibre board	0.42
Compressed mineral wool board	0.33

For thicknesses of these materials up to 8 ins., the conductivity is in almost inverse proportion to thickness. The effect of change of temperature on conductivity is very slight through the range of temperatures required in house heating.

Comparisons and an Example

As a comparison of the 4-in. insulated wall with the two usual types of furred concrete walls, the following is submitted from "Heat Transmission Tables," compiled by Wm. R. Jones, of the University of Pennsylvania. The heat transmission factors are: (1) 8-in. solid concrete wall with 2-in. terra cotta or wood furring and plaster, .53; (2) 8-in. hollow concrete wall (two 4-in. thicknesses of concrete) centre air space and furring as above, .38; and (3) from Pedet's formula the transmission factor of a 4-in. concrete wall with 1-in. corkboard, .18.

Assuming that we have a house 26 by 26 ft. in plan, two stories high, with 1,450 sq. ft. net wall area, an average difference in temperature of 35 degs. for 20 hours per day would show the following amounts of coal burned to make up for heat losses: (1) 53.65 lbs. per day; (2) 38.57 lbs. per day; and (3) 18.27 lbs. per day.

*The table indicates heat conductivity per square foot per inch thickness per degree difference in temperature per hour.

Thus it is seen that the thin insulated wall would show a saving over the other types of 35.38 and 20.30 lbs. of coal per day respectively.

Assuming that the conditions as above continue for an average of 150 days each winter, and that coal will cost $12 per long ton, the savings—capitalized at 6% for a 30 year period—would justify expenditures of $400 and $228 respectively for the insulated wall over the other types; or, to come back to the square foot unit, 27½c. and 15.7c. respectively.

The saving of materials in the thin wall can be computed readily, also the saving in space occupied by the construction. If the same outside dimensions are maintained in the house, the floor space for the thin wall type would be approximately 11% more than with the usual types.

More Comfortable Concrete Houses

The matter of increased comfort to tenant has not been given a money value, but it would be safe to assume that from a commercial standpoint this would be far more than any of the preceding. Once a builder has established a reputation for making safe, satisfactory, comfortable houses, economical in maintenance, he can be assured that his services will be in constant demand and his profits can be larger as a consequence.

Considerable progress was made in Europe before the war in insulating dwelling houses, and in this country a number of houses had been built using different types of the better insulating materials.

There are a number of insulating boards on the market now, several of which could be adapted to use in dwellings, but for general excellence and suitability, when the cost of installation and insulating service rendered are considered, the corkboard will rank near if not at the top of the list.

The objection of expense may be raised at once, but that cannot be so very much, if any, above our usual types of construction. Corkboards are selling for approximately 13½c. per board foot in quantities. When it is considered that it replaces at once the inside furring, at least half the cost of the material is offset. In the example given above the concrete saved would offset the other half of first cost.

This plea for insulating concrete walls is made for the purpose of pointing out some of the reasons why concrete houses have not been more popular in the past, and suggesting a remedy to overcome one of the serious objections.

According to a statement made by W. A. McLean, Ontario's Deputy Minister of Public Highways, there are now nearly 1,000 men at work on the Ontario provincial highway, and by June 1st there will be 5,000 men on the pay-roll.

E. R. Gray, city engineer of Hamilton, has submitted to the board of control of that city a plan for the reorganization of his department, including the appointment of James Bain, chief engineer at the Beach pumping station, to the position of general mechanical superintendent; A. Hetherington, assistant to Mr. Bain, to the position of chief engineer at the Beach pumping station; Charles Stewart, assistant to the secretary of the department, as secretary, succeeding A. P. Kappele; M. M. Anderson as assistant secretary. Mr. Gray urges that an assistant city engineer be appointed, and requests that the board advertise for a qualified engineer, not under 30 years of age, to fill that position.

Sir W. G. Armstrong, Whitworth & Co., Ltd., of London, Eng., are preparing to add civil engineering and public works contracting to their present enterprises. A civil engineering department has been formed under the control of Robert H. Mackenzie, and will commence operations immediately. The firm's recent amalgamations place them in a strong position for undertaking big contracts. In addition to their works at Elswick and Openshaw, they also have the assistance of Armstrongs & Main in construction, and of the Crompton Co. for electrical undertakings. Their recent purchase of control in the firm of Pearson & Knowles places them in possession of important supplies of raw materials.

TEMPORARY CONTAMINATION OF A DEEP WELL*

By G. H. Hazlehurst
Sanitary Engineer, State Board of Health, Montgomery, Ala.

THERE was a phenomenal rainfall in Alabama from the night of December 7th until the morning of December 10th, 1919. A precipitation of 9.6 ins. was recorded at Montgomery for this period, with like amounts for Selma, Birmingham, Gadsden, Lanett and other points. The Coosa and Tallapoosa rivers rose with unprecedented rapidity, until a flood stage of 57.1 ft. was reached on the Alabama River, the highest water recorded since 1886. The north portion of Montgomery was flooded, the water reaching the roofs of the houses in many places. Not realizing the situation, the operating engineer at the water works left at his usual time on the evening of December 9th. He was called to the plant just before the water began entering at 1.30 a.m. of December 10th. Trouble was experienced in operating, as the water was kept out of the motors with great difficulty, and it stood from 1 to 2 ft. over the north yard where there are four 52-ft. circular concrete storage reservoirs, 20 ft. deep.

Flood Water Covered Wells

Montgomery is supplied with water from 18 deep wells in the north portion of the city and two in the east portion. The northern wells draw water from depths varying from 200 to 600 ft. and are pumped by air. These wells discharge into the four circular concrete reservoirs, with a combined storage capacity of approximately 1,200,000 gals. From these basins the water is pumped to the mains, at the rate of about 3,000,000 gals. per 24 hours. The two eastern wells draw water from depths of 75 to 135 ft. respectively. These have an approximate capacity of 2,000,000 gals. per 24 hours, and are pumped by submerged, vertical multi-stage deep well centrifugal pumps, electrically driven, operating normally at 125 lbs. pressure and discharging directly into the mains.

The flood water rose above the ground level at every well. The air-lift or northern wells have well heads wherein the air exhausts and the water is collected before leaving for the collecting basins. These wells were assumed to be tight, as no water or air leaks ever showed. The well heads remained in each instance above high water level. The eastern wells were assumed to be tight, as the outside casing terminated in a concrete box, through one vertical side of which the discharge tee on the discharge pipe was run. This box was covered with the base plate of the motor, the joint being well cemented, and the stuffing box for the vertical shaft watertight.

Health Officer Was Worried

The county health officer became anxious about the water and went to the plant at noon on December 11th. The four basins are numbered consecutively from west to east. Basin No. 1 was found to contain clear water, the flood water level being above the ground level but 5 ft. below the basin rim. The water in Basin No. 2 was low, and slightly turbid. In Basin No. 3 the supply was also low, the water being very turbid. Basin No. 4 contained slightly turbid water. The depth of flood water increased from Basin No. 1 to Basin No. 4, the depth about the latter being 2 ft. or more. A slight infiltration below ground was seen in Basins No. 2 and No. 3. These were at once cut out of service and Basins No. 1 and No. 4 used for pumping.

Samples for analysis were taken from the mains and the analyses made in the State Laboratory. B. coli showed in all dilutions, with the total bacteria too numerous to count.

No pumps were operating on December 12th until 5.00 p.m., due to the water power dam having failed and the local stand-by steam plant being temporarily out of service.

*Paper presented to the American Water Works Association.

At this time the flood waters had receded far enough to permit an inspection of the wells at the pumping station. Two of these were found to be delivering a very turbid water. They were at once turned into Basins No. 2 and No. 3, which were not being used, but which had been connected with the outfall, so as to drain as soon as the river was low enough to permit it.

On December 13th, the city commission, in conference with the health officer, advised the people, through the press, to boil all water used for strictly domestic purposes. No attempt was made to sterilize the whole supply as no one connected with the water department was informed as to the practical methods.

Not until the morning of December 15th could the city health officer secure the aid of the state sanitary engineer, who had been held at Speigners by a railway washout. When he reached the city, a temporary chlorinating apparatus, consisting of two barrels, a curb cock to control the solution, and a feed pipe into the effluent was installed on December 15th so as to dose all the water from the air lift wells in Basins No. 1 and No. 4 at the pumping station. As Basins 2 and 3 were out of service, this cared for all the water delivered by the air lift wells, including the two cut out on account of turbidity, which had cleared up and been put back into service on account of water shortage. The 700,000-gal. filter plant, normally handling water from the river for the use of the railroads, had been flooded and put out of commission. This caused the railroads to draw on the domestic supply, which was to that extent short.

Temporary Chlorinating Equipment Installed

The chlorine dose was regulated by hand and controlled by the ortho-tolidine test, a residual amount of 0.2 part per million being obtained. Samples for analysis were taken from each well.

Only one of the eastern wells was in service. The water which it delivered was entering the supply untreated, under a pressure of 120 lbs. It was not possible to chlorinate this supply as no pressure apparatus was available. An examination showed the well was not water-tight. Fine straw had been sucked in large quantities towards the foundation around the discharge pipe. Upon examination it was at once seen that one side of the concrete box forming the motor base and terminating the outside casing, was gone completely, leaving the annular space between the 16-in. outer casing and the 8-in. discharge pipe open for the entrance of the flood waters.

A two-barrel apparatus for chlorine, introduced as a solution of chloride of lime, was installed. The dose was controlled chemically as at Basins No. 1 and No. 4 and the amount was held at the same standard. When the pump was not in operation, there could be heard a small stream of water splashing on the annular water surface between the outer casing and the drop pipe. This could not come from the drop pipe, as it immediately empties upon the stopping of the motor, the water running back through the centrifugal pump. This led to the belief that there was a leak in the casing which must be discovered by a mirror or by cutting the foundation, as direct sight was not possible. Any leak in this casing was doubly dangerous, as an open ditch draining a considerable area flows within 15 ft. of the well.

Samples Showed Gross Pollution

The results of the analyses made on the samples taken December 15th showed that the air-lift wells, which had furnished turbid water, had been grossly polluted, as were both of the eastern wells. A second set of samples was analyzed and the results confirmed those of the first set.

The basins at the pumping station are connected to the river through an overflow and flow-off pipe. The lower pipes are controlled by gate valves, the upper ones by check valves, with no gate valve in the line. The overflow pipe from Basins 1 and 2 enters one side of a tee, with a check valve between Basin 2 and the fitting. Basins 3 and 4 are so connected in series to the other arm

of the tee, with the check valve between Basin 3 and the tee. It was thought possible that river water backed through the check valves, the basis, and into the wells during the period the plant was shut down. An examination showed it was impossible for river water to enter the wells this way, for the well heads were above high water. The check valves were examined, however, and one was found to have a piece of 1 by 8-in. plank about 12 ins. long wedged so as to prevent the check from seating. There can be no doubt that river water entered Basin 2 through this valve.

The two air-lift wells which furnished turbid water and were found to be polluted, are dug on very low ground, which was 12 ft. under water during the flood. An examination showed their construction to be different from that of the other wells. These wells are constructed of three pipes: an outside casing, 8 ins. in diameter in one instance and 14 ins. in the other; a water-lift pipe inside a 5-in. air pressure pipe, the two being supported on the outside casings by bushings bearing on inverted bell shaped castings resting on the casing tops.

At each well there was a space between the bell and the outside casing. Cinders had floated and stuck in this space, which led to the belief that water had been sucked down. A split box, made of 2-in. kiln dried lumber, 2 by 2 by 2 ft., was bolted around the outside casing, so as to submerge any openings. A ½-in. stream of water was turned on and the water went in under the bell and around the opening at the bell so fast that the box would not fill. This demonstrated the fact that water entered the well.

To demonstrate the fact that this water was pumped out of the discharge pipe after passing down 400 ft., 12 ounces of chloride of lime were added every 30 minutes for two hours, and the effluent tested. The ½-in. stream ran for 1¾ hours, when a very strong test for chlorine was obtained on the discharged water. This demonstrated without a doubt, how and where the muddy river water entered these wells.

The four wells which showed such poor results on the laboratory tests were receiving surface water which was entering directly into the wells as described. As soon as the high water receded, the contamination ceased. No stratum has been or is contaminated, as was at first thought. This is shown by the laboratory findings on the other wells, and also a test made on the eastern wells after three days of chlorinating. The chlorine was shut off, the valve on the discharge set to waste the water, and a sample taken after the chemical test showed the water free of chlorine. The water was very low in bacteria, with colon absent.

The Corporation of Quebec Land Surveyors held their annual meeting in Quebec City last week and elected four directors as follows: Senator P. B. Casgrain (re-elected); F. C. Laberge, Montreal; D. W. Mill, Quebec; and Paul Beique, Montreal. It was decided to hold the next annual meeting in Montreal.

Controller Jutten, of Hamilton, Ont., states that tenders should be called for the construction of the fill across the Valley Inn Ravine, which Chief Engineer Cummiford, of the Toronto-Hamilton Highway Commission, has estimated will cost $280,000. Controller Jutten says that the Ottawa Construction Co. now has representatives getting data on which to base tenders.

At a joint meeting of the Ottawa branch of the Town Planning Institute of Canada and the Ottawa chapter of the Ontario Association of Architects, held last week in the Carnegie Public Library, Ottawa, Capt. W. L. Symonds criticized the plans of the Federal Planning Commission, published in 1915. He stated that there is 1,500,000 sq. ft. of floor space in Ottawa that is rented by the Dominion government at an annual cost of $1,000,000. The same amount of space could be obtained by the government for a capital expenditure of not more than $15,000,000 says Capt. Symonds, or what the government would spend in rent within 15 years.

SCHEDULES OF ENGINEERING FEES

ABSTRACTS from various proposed schedules of fees for engineering services have been compiled by Baar & Cunningham, consulting engineers, of Portland, Ore., as follows:—

American Institute of Consulting Engineers

A per diem rate of from $100 and upwards is proposed. On a percentage basis 1½% to 3% is allowed for preliminary surveys, studies, and reports. For preliminary surveys, etc., with the addition of detailed plans and specifications, 2½% to 5%. For preliminary work, plans and specifictions, and general supervision during construction, 4% to 5%, or higher on small jobs. For full professional services, including detailed inspection and management, 6% to 10% or more.

Pacific Association of Consulting Engineers

The minimum per diem rate of this association is $50 and the percentage fee for preliminary studies, working drawings, specifications and contracts, and general direction of the work is fixed at a 5% minimum. No suggestion is made for full prefessional services, including inspection.

Civil Engineers' Society of St. Paul

A percentage fee for a preliminary report with general plan and estimate of cost is fixed at three-quarters of one per cent. For complete plans and specifications, including preliminary report and survey, but exclusive of soundings and borings, the fee is fixed at 3½% for work costing less than $10,000; 3% for work costing less than $25,000; and 2½% for work costing less than $50,000. For consulting superintendence, the charge is 2½% of the cost of the work. This does not include inspection.

Mahoning Valley (Ohio) Engineers

The per diem rate is $25. Per diem rates are also fixed for the services of assistants of various classes. On a percentage basis for sewer work, including engineering and supervision, 8% is charged for the first $15,000, and 7½% for the second $15,000 of the estimate. For paving work, 7% is charged for the first $15,000, and 6½% for the second $15,000. The client is to pay for one inspector on percentage work. It would appear that the intention is that these fees are to cover simply general supervision, but not inspection.

Iowa Engineering Society

The per diem rate is fixed at $15 to $25. The percentage rate for preliminary services is 1½% for these services and in addition the preparation of drawings, specification and contracts, and letting the contract, 2½%. For all preliminary services, and also consulting supervision of the work, 5%. For full responsibility, including inspection and all engineering services, 6%.

Edmund T. Perkins' Paper before the Illinois Society of Engineers

This is an elaborate schedule, and proposes a sliding scale of charges on work of varying magnitude. The fee for full professional services, including superintendence, varies from 12½% for jobs of less than $5,000, to 4.2% for jobs of over $500,000. These percentages do not, however, include inspection. The statement is made that "a schedule rate for superintendence applies when the engineer who has designed and planned the work, or his assistant, superintends construction. All other employes than such assistant or assistants are to be paid by the owner."

Connecticut Society of Civil Engineers

The percentage fee for preliminary conferences, estimates and reports is from 1% to 1½%. For these services and plans and specifications, 2½% to 5%. For all preliminary services and general supervision of construction, from 4% to 8%. For full professional services, including inspection, from 6% to 12%.

THE VALUE OF HIGHWAY TRANSPORT SURVEYS*

By F. Van Z. Lane
Chief Transportation Engineer, Packard Motor Car Co.

TO give a concrete picture of the intrinsic wealth of the world, statisticians sometimes resort to the device of tabulating the debts that are carried by the various nations. The world war, in demonstrating the staggering total of debt which the fighting nations could shoulder and still remain economically sound, was a revelation of uncounted resources in world wealth both to the laity and to many business men who had considered themselves well informed.

In the field of highway transport there has been a colossal number of failures, and reports of new transportation companies that have failed are received almost daily. If these debts, the money losses represented by these failures—failures due in a large part to the absence of transport surveys—were the sole reason for the development of such surveys, their value would run into millions.

Greater Service to Public

Insurance against failure is, however, but a small part of the real value of highway transport surveys. Many companies in existence to-day would, if such investigations were generally resorted to, be able to render greater service to the public and make increasing profits for themselves, and these surveys would, undoubtedly, establish the desirability of highway transportation lines where as yet such lines have not even been thought of.

The prevalence of failures, paralleling the failures in the automotive industry in its early days, and the number of lines that are operating with a minimum of benefit to themselves and to their public, indicates a most cursory analysis of the territory to be served, or no analysis at all. Many firms are floundering without chart or compass, and we should all do all in our power to correct the prevalent opinion that all that is necessary is to buy a motor truck of any make you please and any capacity offered, to start it operating over any road available and during any time of the day or week when the driver feels like it, and to charge any price for his services that may come into his head just so long as it is lower than any other price charged for transportation between the points in question.

Just as long as the public has this picture of motor transport lines, just so long will the motor truck incompletely realize its effectiveness. That it can be effective has been proven beyond a doubt. As a mechanical device it has demonstrated its dependibility and durability, and we have enough experience to know that economically it can perform, and must be made to perform more and more, its function as part of the transportation system of this country.

Many Pressing Business Problems

We are considering the value of highway transport surveys at a time when many business problems of vital importance are pressing for solution. Living costs are high. Labor is scarce. The railroad car shortage is acute and the thousand problems of production are crowding in upon us daily. In all of these problems of our complex business life, there is no factor that affects every phase of economic activity more fundamentally than does transportation. It is, we might say, the very life blood of business, and everything that was can do to increase transportation facilities, decrease transportation costs and shorten the time in transit is a vital benefit. Highway transport surveys are, then, not only desirable, but at the present juncture of business conditions they are fundamentally necessary.

If we are to survey the field in the broadest and most constructive manner, we must do so in conjunction with a survey of other and longer established means of transportation, especially the steam and electric railways. As an aid to these already existing systems—extending their usefulness in many territories and even replacing them where such practice proves economically desirable, the motor truck has a tremendous field of usefulness. Just where this usefulness begins and ends, how to cover all territories thoroughly and yet avoid duplication of effort, can only be ascertained by complete and far-reaching surveys.

Traffic experts of the railroads themselves are giving deep thought to the availability of the motor truck in supplementing their present facilities. The present shortage of both track mileage and of freight cars makes the subjcet a most pressing one for the railroads and a most encouraging one for those who are interested more especially in the automotive branch of transportation.

According to figures from the Interstate Commerce Commission, the total single track mileage of the United States, January 1st, 1918, was 253,626 miles, and statistics show that the railroad mileage in that country has decreased instead of increased. Last year 689 miles of line were abandoned. This exceeds by three miles the mileage of new lines built during the year. Furthermore, 1919 was the third year in succession in which reports have shown the mileage abandoned to have exceeded the milage of new lines built. During the three years from 1917 to 1919, inclusive, operation was abandoned on 3,319 miles of lines, and in the same period only 2,386 miles in extensions, branches and new lines were completed and placed in service. Thus, during this period there has been an actual decrease of 933 miles in the mileage of railroads in the United States. It is interesting to note that this tendency to decrease railroad mileage is shown in all three railroad districts—eastern, southern and western.

Shortage of Freight Cars

These figures are taken from "Railway Age," which is also authority for the statement that the greatest freight car surplus ever recorded on the American railroads occurred in March, 1919, when there were 450,000 cars idle; that to-day there is a shortage of 570,000 cars; that the railroads are at present unable to handle all the traffic that is offered to them, and that while the present traffic is unusually heavy, further increases can be expected within the next few years. Records of past performances indicate that the future business cannot be handled without serious shortages of equipment unless a great many additional cars are acquired.

In addition to this tremendous freight car shortage, there is also a great shortage in motive power. It is estimated that nearly 8,000 units, of 60,000 lbs. average tractive effort, should be built during the next three years to take care of freight traffic alone.

Director-General Walker D. Hines of the American Railroad Administration is quoted in an address before the American Railway Guild, November 18th, as saying:—

"As well as I can estimate the situation, I believe we are likely to have a large railroad traffic in this country for some time to come. During the war many of the normal demands of the public had to go unsatisfied; there was much building which had to be postponed, and many sorts of activities had to remain in abeyance. The opportunity has now come to satisfy those demands, and the building that is beginning to develop and the other activities which are now getting back to a normal basis, create a demand for a very large railroad traffic. So I think the railroads must be prepared to handle a large business for a considerable period."

Insufficient Terminal Facilities

"Railway Age" is also responsible for the statement that:—

"Insufficient terminal facilities constitute a weak link in the American transportation system. Under government control the consolidation of forces and facilities was greatly expanded.

"The outlook for a continuance of unification is not propitious, the concensus of opinion being that it is an ex-

*Presented at the annual convention of the National Highway Traffic Association.

cellent idea, impossible of realization following the return of roads to private management.

"Solving of the problem of inadequate terminal facilities, and of needed co-ordination of their operation is imperative."

This great shortage of freight cars and motive power and the insufficiency of terminal facilities, in the face of increased traffic, indicates that the motor truck and the highway must be more extensively used than at present if business is to be kept moving in the manner that it should. That it shall be kept moving is absolutely necessary to the life of business and its continued growth.

If we compare the total highway mileage in the country with the railroad mileage, which is as ten to one, and if we also consider the flexibility of the motor truck as against rail operation, and that one method of transport is quite as dependable as the other, we can begin to realize the work that highway transport should be made to do.

In this connection it is also interesting to note that the freight car makes an average of but 15 miles a day and that the average tons per loaded car is less than 28. From this we can get an even better picture of how the motor truck can greatly assist the railroads in moving the traffic of the country.

Should Not Compete Generally

I don't believe that the motor truck should compete with the railroads as a general proposition, but I do believe that they should be operated when it can be shown that it is more economical for such operation to take place. By economical I mean where the motor truck, as compared with the railroad, can cut down the time of delivery, make such delivery more frequently and at less cost.

When we realize that the number of absolute business geniuses who have devoted their lives to railroad transportation problems, and then realize the extent to which highway transport can be employed to supplement and extend the usefulness of these same lines, we have a prospect before us broad enough to satisfy the most ambitious and those with the highest ideals.

After the steam railroads, in considering the motor truck as an aid to existing means of transportation, a highway transport survey would concern itself with the relation of highway transport to electric railway service.

The electric railway situation in the cities and suburban and rural districts of this country is in a very chaotic condition. Many lines have been abandoned; others thrown into the hands of receivers, fares raised and service curtailed—all to the great disadvantage of the travelling public. I am quite sure that local surveys would frequently indicate that highway transport in the form of motor buses can very greatly relieve this situation.

Motor Bus Permanent Factor

In a recent issue of the "Electric Railway Journal," the assistant to the president of the railway company in one of our large cities, in discussing how buses are run in that city in connection with the railway, makes the following statement:—

"It is believed the motor bus is here to stay, that its use is going to increase largely and that the logical people to handle and develop it are those who have been trained and received their experience in street railway operation. It behooves the progressive street railway manager to study the motor bus situation and be prepared to meet it and to use it as an auxiliary to his other operations, rather than have to fight it as a competitor."

The buses in the city of Newark, N.J., a city of 400,000 people, carried 16,000,000 passengers the first half of last year and statistics from several other cities indicate that the bus surely is here to stay.

Yet many operations of this kind have been inaugurated and have failed, or are not operating to the best advantage of the general public. The proper kind of survey will, in most instances, save such failures and cause the successful operators to give even better service and be more efficient and point the way to where new operations are desirable and how to inaugurate them successfully.

No general survey of the field of highway transport would be complete that left out of account its use in districts now without rail facilities. Mines, forests and quarries situated in remote sections are generally exploited by big organizations with financial backing sufficient to solve their own transportation problems, and many of them are finding their solution in the use of the motor truck.

Opportunity in Farming Districts

In the farming sections, however, where the productive unit is comparatively small, there has not been the same incentive for big business to make a thorough survey of conditions, and here there is a tremendous field of opportunity.

The same factors that affect the big manufacturing institutions in the industrial centres—rising costs, labor shortage and lack of adequate transportation facilities—affect equally the producers in the fields. The situation is serious and at any time may become acute. Every help that can be given to the producer of foodstuffs adds to the well-being of the nation.

Some one in authority has said that if the labor situation on the farms is not relieved in some manner, that in a short time, for a certain period, some of those in commercial and industrial life, will have to assist the farmer in harvesting his crops if we are to obtain a sufficient amount of farm products. One answer to this, and probably the most logical one, is to so arrange the farmer's transportation that it will be unnecessary for him to take labor from his farm to perform this function, as heretofore, and a proper use of the motor truck and the highway will go a long way toward meeting this problem.

Expensive System of Distribution

Our present system of goods distribution is probably the most expensive the world has ever known. That the motor truck can reduce such costs has been proven absolutely by the U.S. government. The savings affected by Assistant Postmaster Blakeslee in his actual demonstration of highway transport lines from some of the rural districts in Pennsylvania to Philadelphia and Washington are significant, to say the least. On an exhibit recently shown to the Committee on Post Roads and Postal Service of the House of Representatives, by Mr. Blakeslee, of 41 trips made on the motor-vehicle truck routes, a saving of $6,612 to the consumer was the result. Added to this was the time saved to the farmers, who had their produce taken from their gate to the market and who were thus enabled to continue performing actual work on their farms. Just previous to the inauguration of these routes by the Post Office Department, I helped to make a survey of part of this district which indicated the savings later affected. Yet the people there did not realize how materially they could be assisted until this investigation had been made.

The hauling and delivery problem of every business should be surveyed in order that the most efficient means of transportation can be used, particularly in reference to the highways. It is astonishing how little most concerns know about the cost of the delivery and hauling end of their business. The concern that usually knows its labor, production, accounting and selling costs, many times has no idea of what its delivery cost is. Yet the delivery and hauling part of the business usually amounts to a great deal. A survey of such a problem will often indicate that it would be more economical to ship or deliver by motor truck than by horse-drawn vehicles, railroad freight or express, or by boat or electric railway. In considering a transportation system, the nature and character of the business it serves should be considered first.

The proper kind of a survey will bring out all the items entering into the cost, which would never be brought out in any other way. For instance, I had occasion the other day to make a survey of the shipping part of a business concerned with the rolling of steel products. This was a

large concern with a railroad siding right into its plant. Its products take a very low freight rate and its deliveries are mostly to points located within 60 miles of the plant. Yet, this survey showed that the motor truck could be used to better advantage than the railroad, that it could transport material cheaper and exactly as it was wanted.

This survey developed, for example, that the average cost per box used to contain the material was $1.25 and that the average weight of these boxes was 42 lbs., something that the traffic manager of this concern had never considered before in his transport problem. Motor trucks are now being used by this company, thus releasing several freight cars for use where the railroad is the more economical means of transport.

The proper sized truck, the most adaptable kind of body, and the use of loading and unloading devices will many times serve to handle the hauling problem more economically and more efficiently.

Such a survey should take us behind the lines, so to speak—back of the loading platform into the shipping-room where we could consider such items as boxing, crating, sorting, assembling, routing, internal delivery, etc. It is here that, oftentimes, a study will show how the use of highway transport can cut down the cost of the work leading up to placing the material on the truck or on the car.

Items to be Considered

In making surveys relative to the establishment of highway freight transport lines, the following items should be carefully considered:—

All year around road conditions, including bridges; rail freight and express rates; frequency of existing service; time of delivery of existing service; amount of, and kind of, freight moving in both directions between the points in question; running time possible; sentiment of the district under consideration toward existing and proposed service; sufficient financial support; traffic laws, ordinances and regulations.

Road conditions will determine the kind of equipment that can be operated. The amount and kind of freight will determine the size of the unit and number necessary, from which can be determined the expense, to which should be added (this is most often omitted) overhead charges, by which I mean the cost of soliciting business, storing and handling of same, superintendents, etc., which for such lines runs very high. The cost of operation will determine the rate; this, compared with existing rates and services, will determine whether or not business can be secured under such costs. The possibility of promoting return loads should not be forgotten. This, it will be noted, is quite different from the usual method of arbitrarily determining a rate which is probably that charged in some other locality and without knowledge of actual conditions.

Reliability of Great Importance

In a recent survey of the possibility of establishing inter-city motor truck routes out of a certain city, we concluded that the lowest capacity truck that could be operated, considering the rate that could be obtained, would be a three-ton size. Yet the operators disregarded our advice and started in with two-ton trucks. If loaded to 80% of their capacity on every trip, in both directions, they couldn't pay—and didn't—the result being the failure of another line and the loss of much confidence.

All this information is very easy to get if gone after in the proper way. Most communities now have commercial organizations which will be very glad to assist in the accumulation of such data.

Reliability in such service is absolutely necessary. In the case of highway passenger transport, the number of passengers will determine the seating capacity desired and the frequency of operation, which, together with the length of haul, will determine operating expenses and, threfore, the fare that must be charged. Here again reliable service must be inaugurated. Reliability is important in all transport matters.

CANADIAN GOOD ROADS CONVENTION

AT least two sections of roadway will be built by experts during the forthcoming convention of the Canadian Good Roads Association at Winnipeg, which opens June 1st and will last until June 3rd, so the delegates attending will be able to have a practical demonstration of the manner in which highways are built. Offers have been received from Grain Growers, Ltd., of Winnipeg, and from the Canadian Ingot Iron Co., of Guelph, to construct sections of gravel or earth roads during the convention, supplying all the necessary men and machinery. It is also probable that other reads, of concrete, tar and asphalt, will be built during the convention, under the supervision of highway officials.

Apart from the practical demonstration, the delegates will also be shown cinematograph films of the processes of constructing waterbound macadam, earth, cement concrete, asphaltic concrete, tar macadam, gravel and other roads. The films are being loaned by the Ontario government, through W. A. McLean, the deputy minister of highways.

The tentative official program of the convention, which will be presided over by S. L. Squire, the president of the association, shows that a wide variety of subjects will be brought before the delegates. The morning of the opening day will be devoted to registration, followed by the formal opening by the lieutenant-governor of Manitoba, Sir James A. M. Aikens, and addresses by the government representatives from the different provinces.

The demonstrations of actual road building will commence at noon on the opening day, and at the afternoon session there will be an address on federal aid. The U.S. Bureau of Public Roads are sending a delegate from Washington to speak on state aid for highways.

Papers and Discussion

The important part played by gravel roads in the development of the country will be reviewed later by a provincial engineer from the east, while a minister from the same province will speak on surface and subsoil drainage, and a well-known Manitoba engineer will speak on highway bridges and culverts. The annual dinner and entertainment of the association will be held in the evening of the opening day of the convention.

On the second day, the value of roads as an aid to agriculture will be discussed, followed by a paper emphasizing the importance of foundations in road building. A prominent state highway engineer from across the border will inform the delegates on the best method of improving and maintaining earth, clay and sand roads, while broken stone roads will be the subject of another paper. At noon the annual meeting of the Canadian Automobile Association will be held, at which delegates from all the important automobile clubs of the Dominion will be present.

Some valuable suggestions on the financing of a provincial highway system will be put forward at the afternoon session by a representative of the Dominion government, followed by an address on the bituminous treatment of sand roads, and papers on road dragging and various methods of road maintenance. The annual meeting of the association will be held in the evening.

Schools for Highway Engineering

On the third day of the convention an eminent soldier-scholar from Ontario will speak on schools for highway engineering, while a well-known professor of highway engineering will give an address on road machinery, followed by a paper on asphaltic concrete pavements and one on cement concrete roads.

At the afternoon session the opening address will emphasize the importance of a central association in assisting the local good roads association, which must look after district improvements, and this will be followed by a paper on traffic matters. The remainder of the program will be devoted to papers on road oils, economical methods of transporting road materials, and the use of refined tar in construction and maintenance.

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HYDRO UNIFORM RATE ASSOCIATION

MUNICIPALITIES in Ontario have been circularized by an organization called the Ontario Hydro Power Uniform Rate Association and asked to approve of an outline of suggested legislation for securing a uniform rate for hydro-electric power for all municipalities throughout that province. The executive offices of the association are in Goderich, and the president and secretary-treasurer are residents of that city. Their proposal is that a uniform rate of $18.50 per horse-power per annum be fixed for the sale of power to any municipality in the province, and that the present rates be adjusted by increasing or decreasing them annually by one-fifth of the difference between the present rate and $18.50, so that a complete adjustment may be effected within five years.

The association also asks the provincial government to take over the hydro-electric system from the municipalities and to make it a provincial institution. They urge the appointment of a permanent provincial hydro-electric commission of three members to administer the system along the lines of a general policy to be laid down by the provincial government, and they suggest that the chairman should be a man of financial ability, that one of the other commissioners should take special interest in the development and engineering features of the work, and that the third commissioner should be specially fitted to look after the general needs of the people and the municipalities.

It is not likely that the Ontario Hydro Power Uniform Rate Association will succeed in persuading the majority of municipalities in the Hydro union to endorse such a radical program. Aside from all question of equity in the proposal to force citizens of Niagara Falls and nearby communities to pay for transmission lines to Goderich or other distant municipalities, there is an economic side of the problem that should receive the serious consideration of all municipalities before they thoughtlessly approve the association's proposals. If an electro-chemical industry, for instance, be persuaded to locate in Goderich and take, say, 10,000 h.p. at the same price at which it could buy power in or near Niagara Falls, the delivery of that 10,000 h.p. in Goderich might require the generation of 12,000 h.p., more or less, at Niagara Falls, on account of the line loss between Niagara Falls and Goderich. If the industry were to locate at or near Niagara Falls, practically no more than 10,000 h.p. would have to be generated to supply that industry with 10,000 h.p. The location of the industry at Goderich would, therefore, mean a constant loss of possibly 2,000 h.p. which might otherwise be sold to some other manufacturer who would help to build up the province along other lines.

The policy of the Hydro-Electric Power Commission of Ontario ever since its inception has been to prevent waste of water power and to secure the maximum of efficiency in hydro-electric development in Ontario. It is inconceivable that the commission would tolerate an economic loss such as that above described any more than it would construct an inefficient water power plant that would not make the best economic use of the available water.

It might be possible that on account of a favorable labor market, superior transportation facilities or advantageous supplies of raw materials, the electro-chemical industry above quoted might desire to locate in Goderich regardless of the distance from the source of power supply. That being the case, the industry should be willing to pay the proper price for its power,—a price which would include its portion of the cost of transmitting that power to its doors.

The flat rate of $18.50 which is now suggested could not be maintained for many years. Outlying districts, if able to secure power so cheaply, would demand many new transmission lines of great length, and the flat rate would constantly increase or else the balance sheet would suffer. In time the flat rate would reach a point that would be unnecessarily prohibitive in the more populous districts of the province, merely because distant municipalities had been served with cheap power,—municipalities that will probably never order "Hydro" power if they are required to pay the real cost of its transmission.

The proposal to place the "Hydro" under the direct control of the province instead of the municipalities is largely a political question and can best be discussed by the daily newspapers and by the members of the provincial parliament, but from an engineering viewpoint it would seem very unfortunate if the "Hydro" power developments are to be made the foot-ball of professional politicians.

The above-mentioned circular states that the "outline of suggested provincial legislation has been approved of by the officers and board of directors of this Association (the Ontario Hydro Power Uniform Rate Association), and also by the Legislative Section of the U.F.O., who are now busily engaged in placing the matter before the various Clubs of their Association, and we have good hopes for a final success."

Letter to the Editor

BIG DEMAND FOR ENGINEERS

Sir,—Referring to the letter in your last week's issue on "Big Demand for Engineers," the gist of which seems to be that 800 engineering students in the University of Toronto will give a supply far beyond the demand.

The future development of Canada and the United States will require an ever-increasing number of engineers, and, of course, many who graduate in engineering are en-

tirely unfit for the profession although having the ability to succeed in other directions.

In fact, many consider that the broad engineering education fits a man for many different kinds of work in addition to engineering.

We older graduates always remember the good advice given us by the late Dean Galbraith to the effect that a boy should not try to get a life job on the day of graduation, but should spend about 10 years getting as big a variety of work and experience in different lines of engineering as possible, and in different parts of the country, so that he would find out what he was best fitted for before settling down.

Almost anybody can excel in some particular vocation if he can only find out what that is, and there is nothing sadder in this world than a "square peg in a round hole," especially when it remains there.

For my part I think the more graduates in engineering turned out by the University of Toronto, the better it will be for Canada.

T. KENNARD THOMSON,
Consulting Engineer.

New York City, April 23rd, 1920.

PERSONALS

GORDON GRANT, formerly chief engineer of the National Transcontinental Railway, has been appointed chief engineer of the Dominion Highways Commission at a salary of $6,000 per annum.

HENRI ORTIZ, who was recently appointed manager and engineer of the town of Grand Mere, Que., graduated with honors in 1907 in the civil engineering course at Ecole Polytechnique, Montreal. After graduation he joined the staff of the Department of the Interior as assistant engineer in charge of the hydrographical and topographical survey of the Lake of Two Mountains. In 1909, under the direction of Commander I. B. Miles of the Royal Navy, he prepared charts of the St. Lawrence River. In 1911 he was appointed assistant to the district engineer at Quebec of the Department of Public Works of Canada, in which capacity he directed improvements to Quebec and Levis harbors. This work included the deepening of the harbors, construction of concrete wharves, etc., at a cost of over a million dollars. Mr. Ortiz resigned from this position in 1913 to engage in private practice. He designed and superintended the construction of the Quebec Arena, and was also consulting engineer to the Compagnie Generale d'Entreprises Publiques, of Levis. In July, 1913, he became chief engineer of the Dominion Dredging Co., of Ottawa, and had charge of all construction work on Section No. 1 of the new Welland Ship Canal. This contract amounted to $3,850,000 and included 360,000 cu. yds. of mass concrete, 160,000 cu. yds. of reinforced concrete, 6,000 tons of reinforcing steel, 4,000,000 cu. yds. of excavation, 3 miles of trestles, 2 miles of double track railway, 2 bascule bridges and the harbor at Port Weller. When work on the Welland Canal was abandoned by order of the government, Mr. Ortiz joined the staff of the Works Department of the City of Montreal, and successively occupied important positions in the sewer department, the bureau of designs and surveys, and the road department. Mr. Ortiz was appointed to his present position jointly by the town council of Grand Mere and the Laurentide Co., Ltd., his salary being paid by the company under an agreemcnt between the company and the town whereby the company has undertaken an expenditure of $50,000 per annum for the welfare of the town. Among other projects, a water works system will be installed in accordance with plans that have been prepared by R. S. & W. S. Lea, consulting engineers, Montreal.

A. WILLIAMS has been appointed superintendent of the Farnham Division, Canadian Pacific Railway Co.

W. J. UREN has been appointed assistant general superintendent, Quebec District, C.P.R., succeeding W. M. Neal, who has been transferred.

W. M. NEAL has been appointed assistant general superintendent, Ontario District, C.P.R., succeeding J. K. Savage, who has been promoted.

C. H. KENNEDY, New York district manager of the Kennedy Valve Mfg. Co., has been appointed general sales manager, with headquarters at the plant, Elmira, N.Y.

DR. A. G. FLEMING, who succeeded Dr. Nasmith as chief of laboratories, Department of Health, city of Toronto, is said to have been offered a similar position in the Dominion Health Department.

ALFRED S. GRAVELLE, of Levis, and BRIG.-GEN. T. L. TREMBLAY, of Quebec, have been appointed members of the Quebec Harbor Commission. Maj.-Gen. Sir David Watson is chairman of the commission.

BRIG.-GEN. C. H. MITCHELL, dean of the faculty of applied science and engineering, University of Toronto, has been appointed chairman of the Varsity Veteran's Memorial Committee, which will raise $25,000 for the erection of two war memorials.

H. J. GRISWOLD, who in May, 1918, left the staff of the Dominion Engineering & Inspection Co. to organize the Canadian branch of MacGovern & Co., Inc., of New York, will complete his two year contract with the latter firm at the end of next month, and will then resume active participation in the affairs of the Dominion Engineering & Inspection Co., in which firm he is a partner.

OBITUARIES

ALFRED SAMSON, superintendent of the Levis Dry Dock for the Department of Public Works, died suddenly last Sunday.

T. HARRY JONES, city engineer of Brantford, Ont., died last Sunday, after a brief illness, at his residence in Brantford. Mr. Jones was in his 64th year. He was a son of the late Judge Jones, of Brantford, and graduated at McGill University in 1877, obtaining B.A.Sc. degree. Six years later he was appointed head of the engineering department at Brantford, which position he retained continuously until death. Mr. Jones was a major in the Corp of Guides, and was a member of the Engineering Institute of Canada, the Canadian Good Roads Association and the American Society for Testing Materials. He was the author of a number of valuable papers on municipal engineering, particularly in connection with paving work.

JOHN CHICK, founder of the Chick Contracting Co., Windsor, Ont., and father of Thos. Chick, now president of that company, died last week at his home in Windsor. Mr. Chick celebrated his hundredth birthday seven months ago. He was born in England and came to Canada 75 years

ago. For the past 35 years he lived in Essex county, at first engaged in farming, but 22 years ago he founded the business which bears his name. Mr. Chick was unusually vigorous, both physically and mentally, considering his age, and during the national registration in 1918 he offered himself for service as a farm laborer.

COL. JOHN BOGART, a civil engineer whose activities, dating back to the civil war, extended to many cities in Canada and the United States, died last Sunday at his home in New York City, aged 84. He was formerly consulting engineer for many large power companies, including the Niagara Falls Power Co., and was consulted on the design of the old Union Station in Toronto.

J. A. L. CRAIG, who was one of the pioneers in the electrical industry in Canada, and who was said to have made the first dynamo in this country, died last week at his home in Montreal, aged 84. Mr. Craig formerly owned a central station in Ste. Cunegonde which supplied power to St. Henri and Westmount, and to the Montreal wharves. Mr. Craig superintended municipal installations at Granby, Coaticooke, St. Jerome, St. Therese, Beauharnois and other places. He retired from active business about 25 years ago.

CONSTRUCTION NEWS SECTION

Readers will confer a great favor by sending in news items from time to time. We are particularly eager to get notes regarding engineering work in hand or proposed, contracts awarded, changes in staffs, etc.

ADDITIONAL TENDERS PENDING

Not Including Those Reported in This Issue

Further information may be had from the issues of *The Canadian Engineer*, to which reference is made.

PLACE OF WORK	TENDERS CLOSE	ISSUE OF	PAGE
Brantford and Ancaster Tps., Ont., concrete culverts	May 5.	Apr. 15.	56
Calgary, Alta., transformers	May 14.	Apr. 15.	50
Clinton Tp., Ont., pavement	May 5.	Apr. 15.	56
Daly, Man., construction of bridge	May 1.	Apr. 15.	392
Dunnville, Ont., pavement	May 8.	Apr. 22.	54
Fergus, Ont., reservoir	May 10.	Apr. 22.	54
Grand Bend, Ont., work on bridge	May 1.	Apr. 22.	54
Hamilton, Ont., apparatus for fire dept.	May 15.	Mar. 18.	52
Harrington Tp., Que., bridge construction	May 31.	Apr. 15.	49
Leamington, Ont., pavement	Apr. 30.	Mar. 25.	49
Metcalfe, Ont., drainage work	May 8.	Apr. 15.	50
Moose Jaw, Sask., erection of station	May 1.	Apr. 15.	52
Moosomin, Sask., combustion engines, transformers, etc.	May 5.	Apr. 1.	58
Owen Sound, Ont., paving and curbing	May 7.	Apr. 22.	49
Pembroke, Ont., water works pumping machinery	May 12.	Apr. 15.	58
Portage la Prairie, Man., road grading	May 24.	Apr. 22.	48
Quebec, Que., concrete pavement	May 5.	Apr. 15.	49
Regina, Sask., construction of bridges	May 10.	Apr. 22.	49
Ridgeway, Ont., erection of school	Apr. 30.	Apr. 22.	52
Sarnia, Ont., erection of collegiate and technical school	May 5.	Apr. 22.	52
Scarboro Tp., Ont., laying water mains	May 3.	Apr. 27.	54
St. Canut, Que., road	May 1.	Apr. 22.	48
St. Catharines, Ont., pavement	May 11.	Apr. 22.	56
St. Jerome of Matane, Que., installation of water and sewer pipes and construction of reservoir	May 11.	Apr. 22.	49
Stratford, Ont., sewer construction	May 8.	Apr. 22.	56
Toronto, Ont., concrete culverts	May 5.	Apr. 15.	56
Weyburn, Sask., erection of mental hospital	Apr. 30.	Apr. 22.	52
Winnipeg, Man., cast iron pipe and specials, etc.	May 3.	Apr. 15.	50
York Tp., Ont., addition to school	May 5.	Apr. 22.	54

BRIDGES, ROADS AND STREETS

Beamsville, Ont.—The total estimated expenditure on the Lincoln county road system this season will be $144,499.73, including 12 miles of Tarvia roadways, $97,470.38; 22 miles of earth roads, $9,519; concrete culverts and bridges, $6,510.35. County road superintendent, Peter Robertson, Beamsville.

Brantford, Ont.—The Board of Works has been authorized to call for tenders for the construction of St. Paul's Ave. subway.

Brantford, Ont.—Johnson Bros. have secured the provincial government contract for the construction of pavement between Brantford and Cainsville.

Calgary, Alta.—City commissioners will present a five-year road improvement program to the city council, which will call for the expenditure of approximately $100,000. City engineer, Geo. W. Craig.

Chatham, Ont.—Tenders for pavements were received by the city council as follows: George H. Conibear, concrete pavements, $1.18 per sq. yd. on all streets to be paved; 25c. per ft. for the curb; George Fielder, concrete pavements as follows: Grant St., $1.25 per sq. yd.; Duke St., $1.32 per sq. yd.; Kirk St., $1.30; Seventh St., $1.27; curb, 25c. a ft. City Engineer Adams estimated the actual cost of the work this year at $1.17 per sq. yd., and 23½c. per ft. for the curb. The tenders were referred to the board of works.

Chatham, Ont.—City council passed a by-law authorizing the raising of $37,500 to provide for the city's share of the cost of construction of roads within the suburban area.

Cornwallis, Man.—Tenders for draining and grading 62½ miles of road will be received by D. W. Shaw, Secretary-treasurer, up to 12 o'clock noon, May 8th, 1920. This work includes approximately 200,000 cubic yards of earth excavation. Specifications may be obtained at the office of the Good Roads Board, Winnipeg, or from the Secretary-treasurer.

Eastview, Ont.—Town council will shortly let contract for the construction of a new bridge to replace the present Cummings' Bridge. Clerk, H. R. Washington, Cummings' Bridge, Ont.

Ellice R.M., Man.—Contract let by the rural municipal council to A. W. Barker, Russell, Man., at 30c. per yard for draining and grading two miles of road.

Fredericton, N.B.—Hon. P. J. Veniot, Provincial Minister of Public Works, announced the first plans for the construction of permanent roads this year in New Brunswick under the provisions of the Federal Highways Act. Tenders will be called at once for the construction of a tarvia road between the towns of Chatham and Newcastle. Contracts will later be awarded for permanent work on the road between Fredericton and Woodstock, and also on the road

between Fredericton and the North Shore, via Killarney, as well as the road between St. Stephen and St. John.

Guelph, Ont.—Contract for erection of new Victoria bridge awarded to G. G. Reid, 34 Victoria St., Toronto, for $32,450. Prices wanted on steel piling, reinforcing steel, hoisting machinery and general supplies.

London, Ont.—City council plans construction of sidewalks, curbs, culverts, etc., by day labor. Approximate cost, $50,000. City engineer, H. A. Brazier.

Minitonas, Man.—Tenders will be received by J. H. Cannon, Secretary-treasurer, until noon on Saturday, May 7th, 1920, for the ditching and grading of sixty-three miles of roads. Specification may be obtained at the office of A. McGillivray, Highway Commissioner, Winnipeg, or from W. H. Richardson, Municipal Engineer, Minitonas.

Montreal, Que.—By the end of May tenders will be called for by the provincial road dept. for the first sections of the new Montreal-Sherbrooke highway. The road will be constructed of asphaltic concrete, and will cost $25,000 per mile. Minister of Highways, Hon. J. A. Tessier, Quebec.

Montreal West, Que.—Tenders will be received by Chas. I. Fraser, Secretary-treasurer, up to 5 p.m., Thursday, May 20th, 1920, for the paving of certain streets with concrete bed and asphalt top, with concrete curb and gutter, also for sidewalks. Plans and specifications are on view in the town hall of Montreal West.

Ottawa, Ont.—A comprehensive report concerning the roads under the jurisdiction of the Suburban Roads Commission has been prepared and submitted by R. C. Muir, Chief Provincial Engineer of County Roads, Parliament Buildings, Toronto. Mr. Muir estimated the cost of the work to be undertaken this year at $196,500.

Portage la Prairie R.M., Man.—The municipal council voted $70,000 for good road purposes this year. Reeve, E. H. Muir, High Bluff, Man.

Regina, Sask.—City council proposes to spend $90,000 on sidewalks and pavements this year. City clerk, George Beach.

Springfield R.M., Man.—Tenders will be received by H. C. Christopherson, Secretary-treasurer, Rural Municipality of Springfield, Oakbank, Man., up to 12 o'clock noon on Saturday, May 8th, 1920, for grading. Specifications may be obtained at the office of the Good Roads Board, Winnipeg, or at the municipal office, Oakbank.

Stratford, Ont.—City council plans to pave Erie St. Boulevards may also be constructed. City engineer, A. B. Manson.

St. Mary's, Ont.—The E. A. James Co., Ltd., consulting engineers, Toronto, have been retained by the town council to report upon the cost and type of pavements for paving the main thoroughfares, the total length to be about 3½ miles.

St. Romuald, Que.—Tenders will be received until one o'clock p.m., May 19th, 1920, at the office of B. Michaud, Deputy Minister of Roads, Parliament Buildings, Quebec, Que., for the construction of concrete pavement, bituminous macadam and water-bound macadam in the municipality of St. Romuald.

St. Thomas, Ont.—Lambton and Huron county councils let contract to the Canadian Bridge Co., Walkerville, Ont., at $16,849, for the steel superstructure for a new bridge over the Aux Saubles River, on the boundary between the two counties. Engineer, James A. Bell, of St. Thomas, will supervise the work.

Toronto, Ont.—City council adopted the recommendation of the Board of Works to proceed this year with the extension and widening of Teraulay St.

Toronto, Ont.—Headed by Mayor Church, a delegation from Toronto waited on the government at Ottawa recently to urge the construction by the Dominion government of a bridge between the mainland and Toronto Island across the western gap.

Vancouver, B.C.—City council proposes to submit a by-law to the ratepayers to provide $125,000 to repair Cambie St. bridge. City engineer, F. L. Fellowes.

Victoria, B.C.—The C.P.R. has formally approved of the plans for the Johnson St. bridge. City engineer, F. M. Preston.

Victoria, B.C.—Hon. John Hart, Minister of Finance, has brought down a bill to authorize the borrowing of $5,000,000 for the construction of main roads throughout the province. Minister of Public Works, Hon. J. H. King.

Victoria, B.C.—Tenders for paving the Pacific Highway will be received by Hon. J. H. King, Minister of Public Works, up to 5 o'clock p.m., May 3rd, 1920,. Plans and specifications may be obtained at the Public Works Department, Victoria, or at the District Engineer's office, court house, Vancouver.

Victoria, B.C.—Tenders will be received by Hon. J. H. King, Minister of Public Works, Victoria, up to 5 o'clock p.m., May 3rd, 1920, for the construction of approximately 19 miles of the Revelstoke West Rd. Plans and specifications may be seen at the District Engineer's office, court house, Vancouver; at the court house, Revelstoke, and at the office of A. E. Foreman, Public Works Engineer, Public Works Department, Victoria, B.C.

Victoria, B.C.—Tenders will be received by Hon. J. H. King, Minister of Public Works, Victoria, up to 5 o'clock p.m., May 3rd, 1920, for the construction of approximately 13 miles of the Osoyoos-Nine-Mile Rd. Plans and specifications may be seen at the District Engineer's office, court house, Vancouver; at the District Engineer's office, Penticton, and at the office of A. E. Foreman, Public Works Engineer, Public Works Department, Victoria, B.C.

Walkerville, Ont.—The Canadian Bridge Co., of Walkerville, has been awarded the contract for the erection of the Pacific Great Eastern Ry. bridge over Deep Creek in British Columbia. The tender price was $330,220. Other bids ran as high as $400,000.

West Kildonan R.M., Man.—Tenders will be received by Wililam Ballard, Secretary-treasurer, up to 12 o'clock noon, Monday, May 10th, 1920, for the grading of Murray Rd., from Main St. to McPhillips St., and the construction of two reinforced concrete culverts on McPhillips St. Plans and specifications may be obtained at the office of the Municipal Engineer, or at the office of the Highway Commissioner, Winnipeg.

Wiarton, Ont.—Town council plans construction of pavement. Clerk, J. H. Fielding.

Winnipeg, Man.—Good Roads Board let contracts as follows: For a bridge across the Seine River, at St. Norbert, to A. Macaw for $33,000; for grading 30 miles of provincial highway and market roads, to J. E. Boivin for $46,000 (approximately); for the laying of pipe culverts on these roads, to D. C. McDougall, for $3,000 (approximately).

York Tp., Ont.—The township council decided to construct concrete sidewalks on Hollis St., Chisholm Ave, Cliffe St., Bushey Ave., Corby Ave., Rushton Rd. and Walford Ave. Engineer, Frank Barber, 40 Jarvis St., Toronto.

WATER, SEWAGE AND REFUSE

Brandon, Man.—W. M. Scott, consulting engineer, 188 Montrose St., River Heights, Winnipeg, will hold a consultation with the city council in regard to important changes in the water works system here.

Chatham, Ont.—City council considering construction of a sewer on College St. City engineer, F. P. Adams.

Eastview, Ont.—Town council considering installation of water mains and sewerage system. Town engineers, Patterson and Bryne, Ottawa.

Galt, Ont.—Utilities Commission plans to meter all commercial water services.

Kincardine, Ont.—The town council has been ordered by the Provincial Board of Health to chlorinate the town's water supply. Mayor, J. J. Hunter.