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The Canadian Engineer

A weekly paper for civil engineers and contractors

Storm Sewer Extensions at Toronto Harbor

Drainage Problems Arising From Waterfront Improvements and How They Are Being Solved—Description of Keele Street, Spadina Avenue and Bathurst Street Outfalls—Carlaw Avenue and Other Smaller Extensions Not Yet Constructed

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ONE of the many interesting branches of the whole scheme for the development of Toronto's waterfront, is the drainage problem. While in one sense it is not strictly a part of the development, but rather is incidental thereto, yet it afforded an opportunity for considerable study both in design and construction.

In general terms, the drainage problem consists in arranging for the extension of the various storm overflow sewers discharging at present either into Toronto Bay or into Lake Ontario between the Humber River and Woodbine Ave. Some of these extensions are now completed or are under way.

One feature which is common to all of these extensions is that of the partial or total submergence of the outlets during high water in the lake. Insofar, then, as the capacity of the storm overflow was concerned, the invert grade was not a factor in the majority of cases. In arriving at the hydraulic grade, the maximum lake level was assumed to be 248 ft. above mean sea level of New York harbor. This elevation is slightly below the maximum high water ever recorded in Lake Ontario; but the assumption was considered a reasonable one in view of the fact that this extreme lake level has been reached only once since 1887.

In regard to the hydraulic grade, the limiting head to which it was assumed the water would back up in any extension was such as not to cause flooding in any connection joined to it. In all the storm overflow sewers for which extensions have been planned, the invert grade of the present outlet has been so comparatively steep in every case, and the distance to which the water would back up so proportionately short, that in times of heavy flow, even if the storm water within the sewer rose to an elevation of from 6 to 8 ft. above high water level in the lake, there would be no danger of it backing up far enough to cause damage through flooding. These comparatively steep inverts made it possible to obtain, without difficulty, such hydraulic grades as to keep the cross sections of the proposed extensions within reasonable limits, even though they were carrying largely increased quantities in many cases.

The storm water sewers at present in use along the water front were designed and constructed to take care of

the storm water run-off from certain areas, making what was then considered ample provision for the run-off from future additions to these areas. However, the growth of the city beyond the limits was underestimated. This, together with a readjustment of the areas drained, will necessitate increasing the capacity of some of these overflow sewers at some time in the not distant future. The extensions so far designed and constructed in connection with the waterfront development are of such cross section that, with the hydraulic grade available, they are of ample capacity to take the increased flow arising from the new conditions.

The extensions of the sewers at Ellis, Roncesvalles and Sunnyside avenues presented no particular difficulty either in design or construction.

The Keele St. extension, about 400 ft. in length, has a number of interesting features. It has the same dimensions as the existing outlet and was built through sand recently placed by hydraulic dredges. This material was considered as having a more or less uncertain bearing value and it was therefore deemed advisable to carry the walls of the extension on 25 ft., round bearing piles, spaced at 5 ft. centres.

Provision had to be made for taking care of the discharge from the sewer resulting from storms occurring during the construction period. The scheme adopted is illustrated by Fig. 1. Four by twelve-inch timber sheet piling, 16 ft. long, was first driven. This sheeting formed the channel to take care of the discharge from storms, and, being left in place as part of the permanent structure, was used also as the inner form for the concrete wall.

The tops of these piles were capped with 4 x 4 structural angles, and the two walls of piling tied together at intervals of 2 ft. 4 ins. by nuts on the reinforcing bars. The outside row of sheeting was then driven and the excavation taken out to an elevation 1 ft. below the line of permanent saturation, thus allowing for 1 ft. penetration of the round piles in the concrete wall. The round bearing piles were then driven to place, after which the outer form for the wall was built and the concrete placed.

A bulkhead was then built across the end of the extension and the channel excavated to a depth of about 12 ins. below grade. To prevent scouring, which is liable to occur in the case of heavy storms unless specially guarded against, boulders were placed by hand to form the invert and the

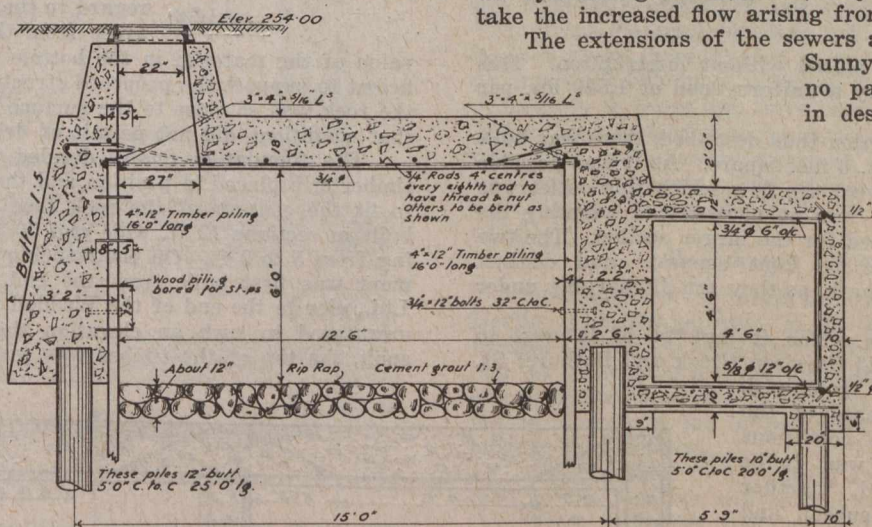


FIG. 1—CROSS-SECTION, KEELE ST. EXTENSION

interstices were filled with cement mortar. The operation of constructing this invert was interfered with once during construction by a severe storm. No lasting damage was occasioned by this flooding, as the sediment deposited was removed and the work proceeded with after a comparatively short delay.

After the invert was completed as above described, the bulkhead was removed and the water allowed to discharge freely through the channel thus formed. The top concrete

for railway purposes, it was considered necessary to design the slab to carry Cooper's E-50 railway loading. The soil on which the extension rested was considered to have a bearing value of 2 tons per sq. ft. Under these circumstances, no prepared foundations were considered necessary.

No particular constructional difficulties were encountered in this portion of the work. In a subsequent portion of this same extension which had to be carried through recently-filled ground, a foundation for the sewer was prepared as shown in Fig. 3. It consisted of three rows of round bearing piles spaced at 5 ft. centres under the two outer walls and at 2 ft. 6 ins. centres under the centre wall.

These piles are capped with 6 x 6 ins. caps; and upon the latter a 3-in. plank flooring is laid to receive the concrete. The cross section of the outlet takes the same form as in the first part of the extension, but the sectional area is increased to provide for the increased flow resulting from the tapping of the Bathurst outlet.

The Spadina Ave. outlet extension into the Spadina Ave. slip, and is time. The present outlet is a 5 x 7 ft. semi-circular section, discharging into the Spadina Ave. slip, and is being continued to the harborhead wall in the form of a 6 x 8 ft. rectangular section. Difficulties in regard to the design of this extension arose from the fact that the bearing

value of the material in the bottom of the slip was not sufficient to support the proposed structure, and the elevation of the rock was so close to the surface and the material so soft that conditions did not permit of driving bearing piles.

The foundation finally decided upon was a stone filled timber crib placed in position and the bottom timbers scribed to fit the contour of the rock (see Fig. 4). This crib was built in sections 12 ft. wide and 50 ft. long, the depth varying from 5 to 9 ft. On commencing work, an earth embankment was first built from the end of the Sand & Supply, Ltd., pier to the end of the Weddell pier. The slip was then unwatered to such an elevation that when the cribs were sunk, the top of the timber was just above the water level.

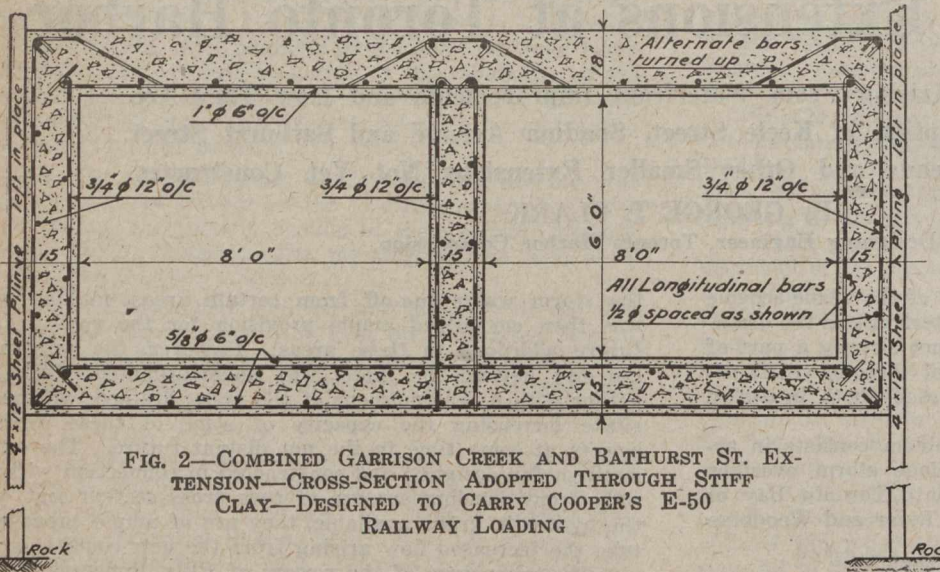


FIG. 2—COMBINED GARRISON CREEK AND BATHURST ST. EXTENSION—CROSS-SECTION ADOPTED THROUGH STIFF CLAY—DESIGNED TO CARRY COOPER'S E-50 RAILWAY LOADING

slab, or cover, was then placed without interruption. This slab was designed to carry a uniform load of 1,500 lbs. per sq. ft.

In addition to the section thus described, there was built an independent outlet 4 ft. 6 ins. square. As it was possible during construction to divert the flow which this outlet was being built to take, there was no necessity of adopting the method of construction used for the larger section. The two outlets were required to be kept separate and distinct throughout their entire length, as they are discharging under different hydraulic heads.

The second extension which it may be of interest to describe is that of the Old Garrison Creek and Bathurst St. sewers, which are now combined. Here again, as in the case of the Keele St. extension, the conditions under which the sewer was to be constructed and operated, together with the nature of the subsoil and the loading to which the top slab would in future be subjected, governed the design. But as this extension was not required to take the flow during construction, a more standard design was used.

It was deemed advisable to build the section shown in Fig. 2. The division into a twin section reduced the thickness of the top slab and made it possible to keep well within the limits available for elevation of invert so that the excavation might be reduced to a minimum and at the same time a reasonable depth of filling over the sewer might be maintained.

The soil through which part of this extension was made was stiff clay. Four by twelve-inch timber sheet-piling was first driven. The excavation was then made by clam-shell bucket, and as it progressed, the sheeting was braced with three by ten-inch walings and eight by eight-inch struts, the latter being so placed as not to interfere with the form work for the concrete.

Owing to the fact that this extension passed through property any part of which might at some time be required

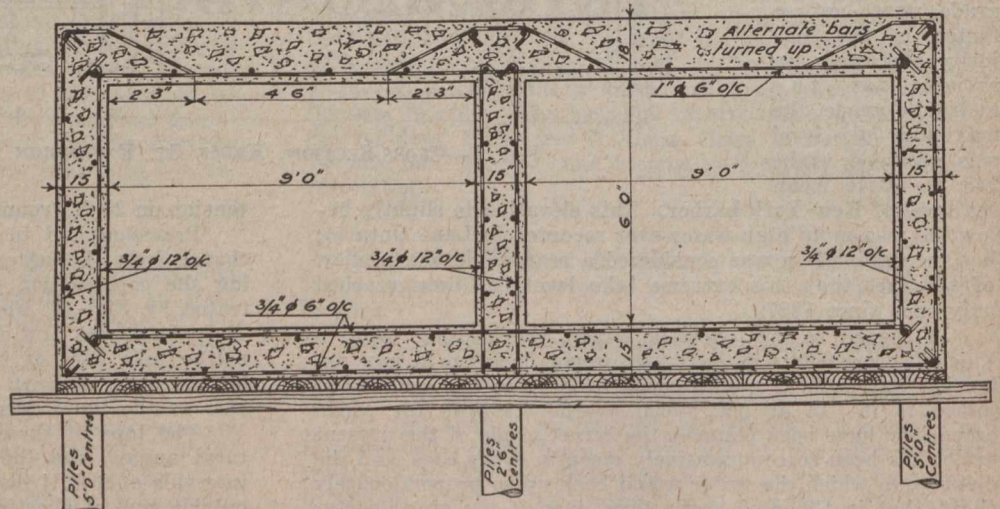


FIG. 3—SECTION ADOPTED FOR BATHURST ST. EXTENSION THROUGH FILL

After the crib had been sunk to position and allowed to settle thoroughly, a 3-in. plank flooring was laid on the crib, and any slight variations in the elevations of the top of the flooring were adjusted in the thickness of the bottom slab of the sewer section. The forms were then placed on the top of the flooring and the concrete poured in the dry.

For the present, the outlet will be constructed only up to the end of the Weddell pier. The remainder of the ex-

tension will be carried on when the filling behind the harbor-head wall is completed. The discharge from the sewer will be taken care of in the meantime by a temporary outlet.

The outlets between Spadina Ave. and Cherry St. vary in size from 1 ft. to 5 ft. As the construction of the harbor-head walls proceeds eastward, special studies will have to be made of the extension of these sewers from their present outlets to the new bulkhead line.

Cherry St. outlet emptied into the old Don Channel, and after the diversion of the Don had been completed, it had to be extended to the new channel. This extension was carried through solid ground containing very little water and presenting very few constructional difficulties. Up to the point of the old outlet, the section was an egg-shaped brick sewer, 2 ft. 8 ins. x 4 ft. The section of the extension as carried south on Cherry St. was a horseshoe section 4 ft. 5 ins. x 4 ft. 6 ins.

The only other outlet of importance now under consideration is at Carlaw Ave. This sewer, which is a concrete twin section 3 ft. 6 ins. x 5 ft. 4 ins., is now discharging into

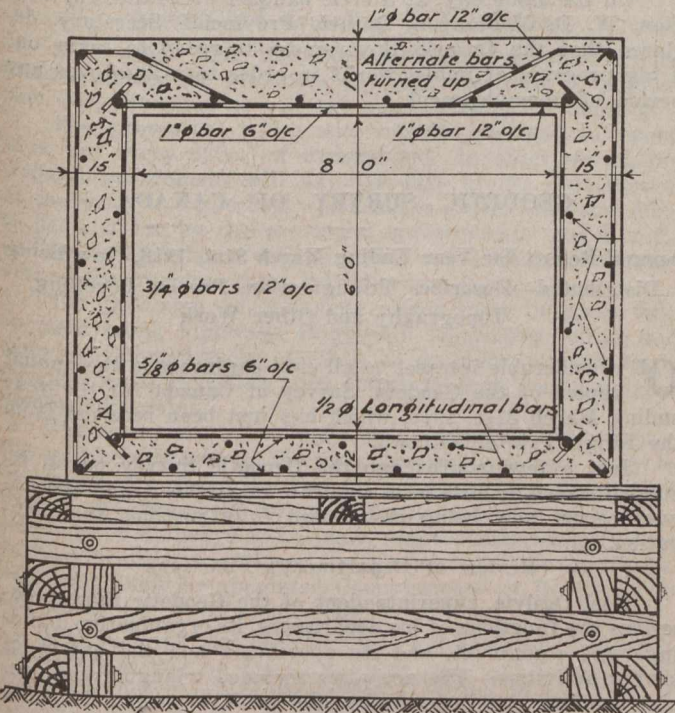


FIG. 4—SPADINA AVE. EXTENSION

Keating's Channel. In addition, there are three 18-in. outlets at Booth, Logan and Morse avenues discharging into the same channel and requiring to be provided for before the filling in this vicinity can be brought up to grade.

The plan as at present outlined is to collect the flow from these smaller outlets and carry it, together with the discharge from the larger one, to the turning basin at the end of the ship channel. The section required is a twin section 6 ft. x 8 ft. 6 ins. The type of construction proposed is reinforced concrete, similar in design to Fig. 3, owing to the fact that the bearing value of the soil is not considered sufficient to carry the estimated load.

The concrete in all cases consisted of 1 part of portland cement, 2 parts of sand, and 4 parts of 1-in. trap rock.

The design and construction of this work was carried out by the staff of the Toronto Harbor Commissioners.

In the city of Manchester, Eng., there are 42 refuse destruction furnaces and 21 boilers. Last year 3,312 tons of mortar were made from the clinker obtained from these furnaces.

The Moose Jaw Electric Railway Co. have presented a report to the city council in which they offer to sell out to the city, and state that if this offer be not accepted, it will be necessary for the city to grant certain concessions in order that an adequate service may be maintained.

TOWN-PLANNING INSTITUTE FORMED

Announcement Made at Annual Meeting of Dominion Land Surveyors—Thomas Adams Explains Its Objects—Probationary Members Only First Year

AT the annual meeting of the Association of Dominion Land Surveyors, held January 30th at Ottawa, announcement was made of the formation of a Town-Planning Institute.

The idea was conceived at the last annual meeting of the association, when a committee was appointed to form such an institute. The members of the committee were J. D. Craig, W. H. Norrish, F. J. Wight and H. L. Seymour (chairman), all of whom are also members of the topographical surveys committee of the association.

Lack of Education

The committee decided that the most pressing phase of town-planning work is lack of education in the movement, so a meeting was arranged with Thomas Adams and Noulan Cauchon and with the three members of the D.L.S. Board of Examiners, namely, Dr. E. Deville, Dr. O. Klotz and M. Tobey. The committee then decided that town-planning had assumed sufficient importance to warrant the formation of a town-planning institute.

Mr. Adams addressed the association last week, stating that the main object of the institute would be "the promotion of scientific and artistic town-planning both in town and country. The three professions that are primarily interested are architects, engineers and surveyors," said Mr. Adams. "The Town-Planning Institute will bring together the members of these three classes in one united group. To form an institute without a sufficient number of men presented a difficulty to those who have been considering the problem. It has been decided that the institute for the first year will consist of probationary members only, each of whom will undertake to prepare a special thesis or to pass an examination before a board before being qualified for full membership.

Branches in Large Cities

"A committee of ways and means, consisting of Dr. Deville, surveyor-general; R. H. Millson, president of the Ottawa Chapter of Architects; and myself, have been appointed to prepare a draft prospectus and to submit a list of prospective members to an early meeting. Local branches will be formed in the larger cities, one in Ottawa having already been formed.

"It is desirous to have legal and non-professional members, so the institute will be divided into three groups—

"First, members and associate members (architects, engineers and surveyors); second, legal members; and third, honorary members and associates (non-professional class).

"I believe that the time will come in Canada when our public authorities will appoint engineers to study engineering problems, architects as members of committees for choosing sites, and surveyors will be considered fit to sit on land settlement boards"

In conclusion, Mr. Adams drew attention to the progress made by the British Institute, formed in 1909, and exhibited a series of slides.

Comprehensive Policy of Reclamation

The association held a luncheon at Chateau Laurier at which the guests were Hon. A. Meighen, Dr. Deville and Mr. Roche. President J. M. Wallace was in the chair. Mr. Meighen told the surveyors that he had received a report drafted by the special committee of the association, outlining a comprehensive policy of reclamation, not only by drainage, but also by other means, particularly clearing by fire. He said that the government is giving this report very careful consideration.

E. M. Dennis read a paper on "Honors to Dominion Land Surveyors in the War," and J. H. MacKnight on "Light Railways," telling of their use in France, and also in the peaceful pursuits of lumbering, mining and surveying.

HUNDRED MILES OF HIGHWAYS

To Be Built This Year by the Ontario Government—Tenders Will Soon Be Called for Ottawa-Prescott Highway—Roads vs. Radials

TENDERS for the construction of the Ottawa-Prescott road, 56 miles in length, will likely be called for within a few days by the Ontario government, and, according to an announcement by Hon. Finlay Macdiarmid, Minister of Public Works and Highways, tenders will be called at an early date for another 40 miles, probably somewhere between Hamilton and Niagara Falls.

Alternative tenders will be considered for all types of road; the Department of Highways has not made any definite plans as to the type of road which it will construct. W. A. McLean is deputy minister of the Ontario Highways Department, and George Hogarth is chief engineer.

Roads Will Have Precedence

In an address last week at the annual meeting of the Hamilton Automobile Club, Mr. Macdiarmid declared that the building of public highways in Ontario is to have precedence over all other forms of provincial government expenditure which entail the outlay of large sums of the public funds. He indicated that the roadways are to have preference over the building of hydro-electric radials.

"In making his announcement," says a Toronto daily paper in reporting the meeting, "the minister of public works made it plain that he had the full endorsement of the premier and other members of the cabinet in his attitude, and that he was speaking with the full authority of the Ontario government. Mr. Macdiarmid added that he had no quarrel with any form of transportation other than roadways, but explained that, in his opinion and in the opinion of the government as a whole, it has been decided that the public highway must come first. Added to this was his assurance that the government purposes to go ahead with the work in an energetic manner this season.

Construction Soon to Start

"Following the announcement made by the minister at the annual meeting of the Ontario Motor League in Toronto last week that tenders are to be called for shortly for the construction of 100 miles of the provincial highway, Mr. Macdiarmid stated that these tenders will include the building of the Ottawa-Prescott section, this being a stretch of 56 miles. Tenders for this section, he stated, will be asked for at once. This leaves a balance of 44 miles to be constructed, according to the minister's earlier announcement, and much of this space will be taken up in the betterment of the old stone road between Hamilton and Queenston, which has been badly torn up by heavy traffic during the war.

"While the government does not propose just now to go ahead with the building of the full length of this stretch of 40 miles, Mr. Macdiarmid stated that they will rebuild the section which stands in the greatest need of repair, and that it is hoped to complete these sections this season. This will leave a few miles of the 100 to be constructed on other portions of the provincial highway."

FREDERICTON WANTS PAVING ENGINEER

City Council Decides to Spend \$200,000 Within the Next Five Years—Depends Largely Upon Engineer as to How Quickly Work Will Proceed

AT a special meeting of the city council of Fredericton, N.B., held January 28th, a paving policy was adopted which will mean an outlay of about \$200,000 during the next five years, but before commencing this work, it is the city's intention to employ a roadways engineer. In a letter to *The Canadian Engineer*, G. R. Perkins, city clerk and treasurer, says that a great deal will depend upon the engineer who is appointed as to how quickly the work proceeds.

MILLIONS FOR PUBLIC WORKS

Hon. J. A. Calder, Minister of Immigration, Says that Federal Government has Big Program—Ontario Provincial Secretary Makes Announcement

MILLIONS of dollars will be spent by the Dominion Government on the improvement of highways and in ship-building, construction of provincial highways and other public works, according to a statement by Hon. J. A. Calder, Minister of Immigration and Colonization in the Dominion Government, in a speech last Thursday before the Canadian Club of London, Ont.

"An ounce of prevention now is worth a pound of cure," said Mr Calder. "A little prevention now may save a lot of trouble three or more months from now." He urged all employers to make good their promises to men who went overseas, that their positions would be waiting for them when they came back.

On the same day, at a civic banquet at Brantford, Ont., Hon. W. D. McPherson, Ontario Provincial Secretary, declared that the Ontario Government is ready to carry out a big program of public works in order to bridge over any period of unemployment.

GEODETIC SURVEY OF CANADA

Annual Report for Year Ending March 31st, 1918, Now Being Distributed—Describes Triangulation, Precise Levelling, Topography and Other Work

OF considerable interest to all civil engineers is the annual report of the Geodetic Survey of Canada for the year ending March 31st, 1918, which has just been received from the King's Printer, Ottawa.

Just a few months ago the Geodetic Survey began issuing its own reports as a separate department and the annual report now being distributed fully justifies the innovation.

Review of Department's Functions

Noel Ogilvie, superintendent of the Geodetic Survey describes the functions of his department, its organization, buildings and equipment, and its operations and the extent of survey activities. The activities included triangulation, precise levelling and topography, the work in each field being reviewed and well illustrated with photographs of the equipment used.

Under triangulation, Mr. Ogilvie discusses astronomic work, base lines, reconnaissance and observing. A list is given of the information which was supplied during the year by his department. A brief chapter explains the adoption of the North American datum.

The work of the geodesist's office is summarized by W. M. Tobey, assistant superintendent and geodesist. W. H. MacTavish, geodetic engineer, reports on the progress of triangulation on the British Columbia coast, while L. O. Brown, geodetic engineer, reports on similar work in the country west of Port Arthur. J. L. Rannie, supervisor of triangulation and topography, describes the progress of primary triangulation in Ontario and Quebec.

Reconnaissance

A. J. Brabazon, geodetic engineer, reports on reconnaissance and observing in New Brunswick, and H. P. Moulton tells about field work in southern New Brunswick and Nova Scotia.

C. A. Biggar, assistant superintendent, presents a full report on base lines; F. B. Reid, supervisor of levelling, on precise levelling; and F. A. MacDiarmid, geodetic astronomer, on astronomic work and tape standardization.

The booklet, which is being distributed gratuitously by the Department of the Interior, includes 64 pages and cover, 6½ x 9¼ ins., and two large maps. It is well printed on coated paper and attractively illustrated.

\$25,000,000 Federal Aid for Highways? So Says Unofficial Report from Ottawa

ALTHOUGH official confirmation is lacking, a report has reached *The Canadian Engineer* from a creditable source of information that the Dominion government has decided to appropriate \$25,000,000 for Federal aid for highways, and that a bill has been prepared which will be introduced in the House soon after the opening of the next session of Parliament.

A number of provincial ministers and deputy ministers of roads are known to have been in Ottawa during the past month with the object of discussing the provisions of the bill with A. W. Campbell, who was appointed not long ago as special commissioner to report to the Dominion government regarding the advisability of Federal aid for highways.

Apportioned According to Population

It is stated that the above mentioned amount will be divided among the provinces pro rata according to population, just the same as was the appropriation for housing.

The provinces, it is said, will be required to spend \$1.50 for every dollar of Federal aid. In other words, the Federal government will pay for 40% of the construction of the roads in respect of which aid is given, the other 60% to be paid for by the provincial governments and municipalities in accordance with any plan which the various provincial governments may individually adopt.

The Dominion government's money is to be spent only on main trunk highways (highways connecting cities and carrying interprovincial traffic), or on main market roads (leading roads radiating from towns through well-populated farming districts).

The approval of the Dominion government's representative will be obtained by the provinces when naming roads to be constructed under the Federal aid plan. It is understood that A. W. Campbell, formerly deputy minister of the Department of Railways and Canals, who recently resigned that position in order to prepare the special report on highways, will most likely be appointed Commissioner of Highways to administer the government fund.

It is rumored that Mr. Campbell will likely be given rank equivalent to that of deputy minister, and that he will work under the direction of the minister of the Department of Railways and Canals, so as to keep the whole subject of

transportation of all kinds within the one department. It was expected that an announcement to this effect would be made this week by Hon. J. D. Reid, Minister of Railways and Canals, but up to the time of going to press, *The Canadian Engineer* received no notice of such an announcement.

When interviewed Tuesday afternoon by *The Canadian Engineer*, Mr. Campbell refused to discuss the matter and would not say whether the above statements are correct. He merely stated that his report to the government is not yet complete, and that he does not know just when it will be finished, and that he had not heard of the government's having voted any money as yet toward Federal aid for highways.

Other officials who are thought to be in the government's confidence, however, admitted to *The Canadian Engineer* that to the best of their knowledge, the proposed bill would be along the above-mentioned lines, and intimated that an official announcement could be expected at an early date.

Provincial Governments Are Satisfied

It is rumored that some of the provinces objected last month to various details of the proposed bill; British Columbia, for instance, believing that the distribution of the money should not be made pro rata according to population, and other provinces wanting the Federal government to pay more than 40% of the expense of inter-provincial roads. It is understood that practically all of these outstanding differences have been settled, however, to the mutual satisfaction of the various provincial governments. Quebec and Ontario are said to have given hearty approval to the distribution of the fund by population, and the statement has been made that Ontario expressed willingness to spend two dollars for every dollar that the Federal government spends.

Hon. Finlay Macdiarmid, Minister of Public Works and Highways in the Ontario government, and Hon. J. D. Reid, are among the speakers at the meeting of the Eastern Ontario Good Roads Association this week at Ottawa, and it is possible that in the course of their addresses at this meeting, some reference may be made to the above-mentioned scheme, although it is thought that the whole project is not yet in shape for any very detailed announcement.

D. H. McDougall, president of the Nova Scotia Steel & Coal Co., Ltd., announces that the Wabana Mines will be developed to such an extent that the company will be able to produce ore far in excess of its former outputs and at materially reduced cost.

At a recent meeting of the Montreal Branch of the Association of Canadian Building and Construction Industries, W. H. Irving was elected president of the branch; J. K. McNutt, vice-president; J. E. Walsh, hon.-treasurer; R. F. Dykes, secretary. The supply section elected A. W. Brenner, A. F. Daly, and John Grieve as their representatives on the executive; the general contractors elected Donald Church, E. B. Evans and John Quinlan. The trade contractors have not yet elected their representatives.

Arthur H. Blanchard, consulting highway engineer of New York City, will preside at the sixteenth annual convention of the American Road Builders' Association, which will be held February 25th and 26th at New York City. E. L. Powers, of New York, is secretary and James H. MacDonald, of New Haven, Conn., is treasurer. The board of directors includes Capt. J. Duchastel, city engineer of Outremont, P.Q., and B. Michaud, Deputy Minister, Department of Roads, Province of Quebec. W. A. McLean, Deputy Minister of Highways, Province of Ontario, is a past-president and ex-officio member of the Board of Directors.

The second and third days of the annual meeting of the Commission of Conservation of Canada, which will be held February 17th to 19th at Ottawa, will be devoted to discussion of wild life protection.

In an address before the Calgary Branch of the Engineering Institute of Canada, Dr. T. H. Blow, member of the Provincial Legislature, suggested the establishment of a university for Southern Alberta. A committee was appointed to prepare a resolution to be presented to the Alberta Division of the Institute. The doctor referred to the great importance of scientific education, both for agricultural and technical pursuits, and urged the immediate construction of a school of technology for Southern Alberta.

The total 1918 output of pig iron from Canadian blast furnaces, and also from scrap metal melted in electric furnaces, is estimated by the Division of Mineral Resources and Statistics, Mines Branch, at 1,182,000 tons, of which 29,000 tons was electric furnace pig iron. The total production of steel ingots and castings is estimated at 1,910,000 tons, which includes 125,000 tons of steel made in electric furnace plants and 1,785,000 made in open-hearth and other steel furnaces. The total production of steel ingots and castings in 1917 was 1,745,734 tons. The production of electric furnace pig iron in 1917 was 13,691 tons and that of steel in electric furnaces in the same year was 50,467 tons.

PUBLICATIONS RECEIVED

Report on Health in the City of Manchester, Eng.—By James Niven; distributed free by the city of Manchester.

Non-Bituminous Road Materials.—By L. Reinecke, of the Geological Survey of Canada, Ottawa. Reprint of paper from "Economic Geology." 42 pages and cover, $6\frac{1}{2} \times 9\frac{1}{4}$ ins. Seven illustrations.

Economizers.—By D. Brownlie, J. Compston and H. W. Royce. Reprint of an article in "Engineering," issue of November 1st, 1918, on "Exact Data on the Running of Steam Boiler Plants." Distributed by Brownlie & Green, Ltd., Manchester, Eng.

Coal Consumption.—Report issued by the Hydro-Electric Power Commission of Ontario on the rate of coal consumption in various electric generating stations and industrial establishments in Canada and the United States. Written by A. S. L. Barnes, of the Commission's engineering staff. Ten pages and cover, $6\frac{1}{2} \times 9\frac{1}{2}$ ins., accompanied by two diagrams and seven tables. Distributed gratuitously by the Commission, 190 University Avenue, Toronto. This report has also been published by the Honorary Advisory Council for Scientific and Industrial Research, Ottawa.

Heating of Houses: Coal and Electricity Compared.—By A. S. L. Barnes, of the engineering staff of the Hydro-Electric Power Commission of Ontario. Published by the Honorary Advisory Council for Scientific and Industrial Research, Ottawa, as Bulletin No. 6. Free distribution. Demonstrates the impracticability of electricity for domestic heating, excepting in a very limited and auxiliary manner, the electrical heating being too costly, and also insufficient power being available. This report has also been published by the Hydro-Electric Power Commission of Ontario.

Test of a Flat-Slab Floor.—Bulletin 106 of the Engineering Experiment Station of the University of Illinois gives the results of tests on a four-way reinforced concrete flat-slab floor of the Western Newspaper Union Building, Chicago, just before it was razed in 1917 to secure space for the present Union Passenger Station. The floor construction used in the first five floors of the building was slab and girder type, while that of the upper three floors was Turner mushroom flat-slab type with four-way reinforcement. The tests were made on the sixth floor. A test load of 913 lbs. per sq. ft. was applied over four panels, each 17 ft. $5\frac{1}{2}$ ins. by 19 ft. $4\frac{1}{2}$ ins. This load was considerably greater in proportion to the design load than had ever been used in previous tests of buildings. The information secured, therefore, which shows the action of the slab in its various parts, given by the strain measurements, has an important bearing on the design of flat-slab structures. Copies of Bulletin 106 may be had gratis by addressing the Engineering Experiment Station, University of Illinois, Urbana, Ill.

Chlorine Control Apparatus.—Handsome catalogue published and distributed gratuitously by Wallace & Tiernan Co., Inc., 349 Broadway, New York City. Sixty-four pages and cover, $8\frac{1}{2} \times 11$ ins., coated paper, printed in two colors, profusely illustrated. Relates briefly the history of sterilization of water and sewage by chlorine, and describes in a technical manner the measurement of chlorine, the chlorination of water and sewage, and the operation of the various types of chlorinators manufactured by the company. Both solution feed and dry feed machines are described. Either type can be controlled manually or automatically, and both types of control are fully explained. The automatic apparatus is either venturi, float or pito operated, and all three operations are described. Semi-automatic chlorinators are also illustrated. The publication includes a partial list of installations, some reference data regarding chlorine, and a useful summary of types and characteristics of Wallace & Tiernan chlorinators. This summary tabulates the limiting capacity of each type of chlorinator in pounds of chlorine per 24 hours; the proper ratio of minimum to maximum flow for accurate control; applicability; point of application of the chlorine; method of introducing the chlorine into the water or sewage being treated; the limiting pressure against which the chlorine can be applied, etc.

VICTORIA TELESCOPE AT WORK

IN the course of the regular program of work with the 72-inch reflecting telescope of the Dominion Astrophysical Observatory, Victoria, B.C., which has been in active operation only since May last, thirty spectroscopic binaries have already been discovered.

These stars, which visually appear as single, even when viewed with the most powerful telescope, can only reveal the fact that they in reality consist of two stars revolving around one another, by measurements of their radial velocity towards or from the earth by means of the spectroscope. If the star is always moving with the same speed towards or from the sun, then it is single; but if this speed changes, or if at one time it is moving towards us and at another time away from us, then it is a double system, a spectroscopic binary as distinguished from a visual binary, which appears double when looked at in the telescope.

Nearly 1,300 spectra have already been obtained with this telescope, of stars mostly fainter than the sixth magnitude, from a list of 800 stars to be observed at Victoria, this list being arranged in co-operation with Mt. Wilson.

About half of these spectra have been measured, with the result that 30 of the 125 stars whose velocity has thereby been obtained are shown to be binary. This gratifying record, one never before approached in such a short time after the completion of the telescope, gives promise that Canada will soon become an even more important factor than at present in the advancement of astronomical research.

DOUBLE PAGE ADVERTISEMENTS ALLOWED

FOR several years past, the Post-Office Department has refused to permit advertisers to use double-page "spreads." This ruling has now been revoked; double-page advertisements can now be published. Needless to say, *The Canadian Engineer* will now be pleased to accept all the double-page advertisements which any of its readers or advertisers may care to insert.

The Whalen Pulp & Paper Mills, Ltd., have sold \$500,000 7% notes to a firm of Chicago brokers. It is not known whether new construction is proposed or whether the money is wanted for other purposes.

To-morrow evening, at 8 o'clock, the Ford film, "Coal is King," will be shown in the Chemistry and Mining Building, University of Toronto, under the auspices of the Toronto Branch, Engineering Institute of Canada. The film shows the operation of soot-blowers and their effect upon the efficiency of a boiler plant.

In a judgment given at Osgoode Hall last month by Justice Middleton, municipalities are upheld in their right to enter upon private property for the purpose of laying sewers. A municipality should not be compelled, said the Judge, to acquire absolute title to land when all that is necessary is an underground passage that does but little damage to the property.

The Ottawa Electric Railway has offered its assets to the city of Ottawa for \$6,500,000, and has given the city an option to May 1st at that price. The company's franchise expires in five years. The city council has authorized the Board of Control to engage any engineering or other assistance that may be required to obtain a full report on the advisability of accepting the company's offer.

The Ontario Highways Department, which recently took over the Cobourg and Port Hope toll road as part of the new provincial highway, has purchased an extra 10 ft. on each side of the road, making same 86 ft. wide. It was stated in the Toronto "Globe," that it is understood that the department is paying three times the assessed value of the land taken over. Negotiations are under way for the taking over, also, of the Cobourg and Grafton toll road.

Central Electric Power Station Statistics

Analysis of Data Gathered by Dominion Water Power Branch and Bureau of Statistics—Primary Power, Kinds and How Distributed—Review of Commercial and Municipal Stations—Capital Invested, Salaries and Wages

IN last week's issue of *The Canadian Engineer*, a summary was published of the census of central electric power stations in Canada. This census was taken by the Dominion Bureau of Statistics and the Dominion Water Power Branch of the Department of the Interior, working in co-operation with the Ontario Hydro-Electric Power Commission, the Quebec Streams Commission and other provincial departments. Complete data was given last week regarding all water-power developments in Canada, whether for central station or other purposes. The census also reveals considerable interesting data regarding the central stations in Canada, other than that included in our last week's exclusive report of the hydraulic developments.

The accompanying statistics include only central electric stations, that is, stations engaged in the sale of electrical

power for commercial stations and \$183 per horse-power for municipal or publicly owned stations. This cost includes all capital invested in construction and equipment of hydraulic works, power stations, transmission and distribution system; real estate cash on hand; current assets; supplies, and all other items.

Power Installation

The primary power installation in central stations totals 1,844,571 h.p., of which 78.3 per cent., or 1,444,314 h.p., is installed in commercial stations, and 21.7 per cent., or 400,257 h.p., in municipal stations. Of the total primary horse-power installed, 1,652,661 h.p. is derived from water, 180,800 from steam and 11,710 from gas and oil.

TABLE 1—CENTRAL STATIONS IN CANADA

	Commercial	Municipal
Number of stations	323	343
With generating equipment	296	174
Revenue from the sale of power	\$ 29,135,399	\$ 15,401,449
For lighting purposes	\$ 9,610,835	\$ 8,792,804
Capital invested	\$282,818,495	\$ 73,185,673
Employees	5,135	3,712
Total wages	\$ 4,290,505	\$ 3,487,210
Total horse power	1,444,314	400,257
Steam engines and turbines—		
Number	133	118
Horse power	117,452	62,748
Water wheels and turbines—		
Number	456	163
Horse power	1,322,852	329,809
Gas and oil engines—		
Number	52	61
Horse power	4,010	7,700
Electrical generators—		
Number	627	316
K.V.A. capacity	1,086,546	300,975

energy; all other electrical establishments, such as electric railways, electro-chemical and other electrically operated industries being excluded.

Capital Invested

The capital invested in central power stations totals \$356,004,168, of which 79.5 per cent. is invested in commercial stations and 20.5 per cent. in municipal or publicly owned stations. These figures indicate that the capital cost of central electrical station systems in Canada per primary horse-power installed is \$193, averaging \$196 per horse-

TABLE 2—POPULATION AND NUMBER OF COMMERCIAL AND MUNICIPAL CENTRAL STATIONS

	Population	Commercial Stations	Municipal Stations
Alberta	521,852	23	22
British Columbia	615,680	27	21
Manitoba	572,200	12	16
New Brunswick	364,375	15	9
Nova Scotia	511,829	23	13
Ontario	2,741,691	98	204
Prince Edward Island	93,728	6	..
Quebec	2,239,276	96	26
Saskatchewan	673,945	20	32
Yukon	8,512	3	..
Canada	8,343,088	323	343

TABLE 3—TOTAL PRIMARY POWER IN CENTRAL STATIONS

	No. of units	H.P. Capacity in Commercial Plants	H.P. Capacity in Municipal Plants	Total per 1,000 Population
Alberta	82	49,312	26,105	145
British Columbia	86	219,990	12,658	378
Manitoba	41	24,888	42,449	118
New Brunswick	40	15,488	2,245	49
Nova Scotia	55	13,855	3,589	34
Ontario	352	521,396	263,269	286
Prince Ed. Island	10	1,226	.....	13
Quebec	232	586,851	19,231	271
Saskatchewan	81	1,048	30,711	47
Yukon	4	10,260	.....	1,206
Canada	983	1,444,315	400,257	221

The total primary power installed in central electric stations throughout the Dominion averages 221 h.p. per thousand and population. Yukon averages the highest with 1,206 h.p. per thousand population, British Columbia coming next with 378, Ontario 286, Quebec 271, Manitoba 118, New Brunswick 49, Saskatchewan 47, Nova Scotia 34, and Prince Edward Island 13. Population by provinces is the only feasible basis available for making a per capita analysis of the central station industry. The occupation of the population, and its varied density in different localities have a direct bearing on the market for electrical power, and consideration of these

TABLE 4—CENTRAL GENERATING STATIONS AND THEIR ELECTRICAL EQUIPMENT

	No. of Stations	No. of Units	K.V.A. Capacity	K.V.A. per 1,000 Population
Alberta	43	67	52,266	100
British Columbia	46	95	152,743	248
Manitoba	22	39	45,904	80
New Brunswick	21	40	12,757	35
Nova Scotia	34	67	14,489	28
Ontario	143	329	604,024	220
Prince Ed. Island	6	9	1,118	12
Quebec	101	215	471,969	211
Saskatchewan	51	79	26,089	39
Yukon	3	3	6,162	724
Canada	470	943	1,387,521	166

phases will assist in explaining the above variations in the per capita developments.

The outstanding position which water power takes in the central station field is one of the features disclosed by the census returns. Out of a total installed primary capacity of 1,844,571 h.p., 1,652,661 or practically 90 per cent. is derived from water.

The Yukon develops 97.4 per cent. of its primary central energy from water. Ontario develops 95.7 per cent. from

TABLE 5—WATER WHEEL AND WATER TURBINE CAPACITY IN CENTRAL STATIONS

	No. of Units	Total H.P.	H.P. per 1,000 Population
Alberta	14	32,589	63
British Columbia	52	209,025	340
Manitoba	15	64,100	112
New Brunswick	15	6,878	19
Nova Scotia	14	3,354	7
Ontario	298	751,003	274
Prince Edward Island ..	5	170	2
Quebec	204	575,551	257
Saskatchewan .....	..	.....	.....
Yukon	2	10,000	1,176
Canada	619	1,652,661	198

water, indicating markedly the commercial adaptability of water power for central station work, even where in competition with convenient and reasonably cheap coal supplies.

Manitoba develops 95.2 per cent. of its central station energy from water, Quebec 94.9 per cent., and British Columbia 89.9 per cent.

Alberta develops 43.2 per cent. from water, although an abundant supply of coal is available.

New Brunswick develops 38.8 per cent. from water power, Nova Scotia 19.2 per cent.

Coal vs. Water Power

The percentage of water power used in central electric stations in Nova Scotia is low, although the province is ex-

TABLE 6—STEAM, GAS AND OIL POWER IN CENTRAL STATIONS

	STEAM		GAS AND OIL	
	No. of Units	Total H.P.	No. of Units	Total H.P.
Alberta	57	41,862	11	975
British Columbia	22	21,808	12	1,815
Manitoba	15	2,575	11	662
New Brunswick	20	9,790	5	1,065
Nova Scotia	39	13,950	2	140
Ontario	43	31,740	11	1,917
Prince Edward Island	2	425	3	631
Quebec	22	30,245	6	286
Saskatchewan	29	27,540	52	4,219
Yukon	2	260	.....	.....
Canada	251	180,200	113	11,710

ceptionally endowed with available water-power resources. An abundant coal supply indicates the reason for this condition. The city of Halifax is served from a steam-driven plant, the largest central electric station in the province. The present tendency in the province is, however, towards the increased use of hydro power.

In Prince Edward Island only 13.9 per cent. of the central station power is derived from water. Topography and

TABLE 7—COMPARISON OF STEAM TURBINE AND STEAM ENGINE CAPACITY IN CENTRAL STATIONS

	ENGINES		TURBINES	
	No.	H.P.	No.	H.P.
Alberta	47	12,162	10	29,700
British Columbia	16	3,308	6	18,500
Manitoba	15	2,575	..	.....
New Brunswick	17	5,890	3	3,900
Nova Scotia	36	7,830	3	6,120
Ontario	37	8,845	6	22,900
Prince Edward Island ..	2	425	..	.....
Quebec	16	4,745	6	25,500
Saskatchewan	20	7,472	9	20,068
Yukon	1	60	1	200
Canada	207	53,312	44	126,888

area of the island province explains the lack of water-power resources.

In Saskatchewan no water power is developed. Here the topography of the province is solely responsible, the entire settled portion being located in prairie country which is not naturally endowed with attractive water-power sites.

Every Important City Served

The fundamental reason underlying the great use of water power in central stations in Canada lies in the fact that, with but one or two exceptions, every city of importance in Canada is served with central station power from hydro-power stations. In other words, practically all the commercial and industrial centres of the Dominion are within

TABLE 8—CAPITAL INVESTED IN CENTRAL STATION INDUSTRY

	Total per Primary H.P. Installed	In Commercial Stations	In Municipal Stations
Alberta	\$147	\$ 5,634,479	\$ 5,468,141
British Columbia	187	41,255,719	2,292,773
Manitoba	179	3,460,220	8,617,953
New Brunswick	194	2,941,569	502,279
Nova Scotia	194	2,776,101	600,304
Ontario	182	96,538,585	46,238,794
Prince Edward Island ..	173	211,900	.....
Quebec	215	126,080,992	4,132,478
Saskatchewan	176	257,564	5,332,951
Yukon	357	3,661,366	.....
Canada	\$193	\$282,819,495	\$73,185,673

easy transmission distance of ample supplies of economically developed hydro-electric power.

The accompanying tables provide a more detailed analysis of the statistical data above mentioned.

In considering these statistics it should be borne in mind that they have reference solely to central electric stations; that is, to stations which are engaged in the distribution and sale of electrical energy. Where central stations are interwoven with other activities, such as the operation of electric railways, mines, pulp mills, or other industrial enterprises, the central station equipment, capitalization and other statistical data has been wholly divorced from the allied industry. This line of severance has been drawn through the

TABLE 9—CAPITAL INVESTED IN CENTRAL STATIONS DEVELOPING POWER HYDRAULICALLY

	Turbine H.P.	Amount	Per Turbine H.P.
Alberta	32,580	\$ 2,293,537	\$ 70
British Columbia	209,025	41,045,100	196
Manitoba	64,100	11,493,274	179
New Brunswick	6,878	1,315,723	191
Nova Scotia	3,354	686,705	205
Ontario	751,003	129,342,065	172
Prince Edward Island ..	170	48,400	285
Quebec	575,551	120,516,166	209
Saskatchewan .....	.....	.....	.....
Yukon	10,000	3,363,688	336
Canada	1,652,661	\$310,104,658	\$188

entire statistical analysis. Central stations purchasing power in bulk for purposes of re-sale are included in the financial and staff statistics.

The total number of central electric stations recorded is 666, of which 323 are commercial and 343 are municipal. The excess of municipal stations is attributable to the non-generating stations. Of the stations with generating equipment, 296 are commercial and 174 are municipal. Of the stations without generating equipment, 27 are commercial and 169 are municipal. The Hydro-Electric Power Commission of Ontario is largely responsible for the municipal stations purchasing power in bulk.

The accompanying statistics in general represent the situation at the end of 1917, the figures having been gathered at various times during the past year. A similar census has been taken in the United States covering the same period, but the results are not yet available. While it may be misleading to compare Canada's 1917 statistics with the 1912 (the last available) statistics in the United States, yet it is interesting to note that at that time in that country, only

TABLE 10—SALARIES AND WAGES PER ANNUM IN CENTRAL STATIONS

	No. of Employees	SALARIES AND WAGES—	
		Total	Per H.P. Installed
Alberta	438	\$ 458,423	\$ 6.08
British Columbia	453	496,081	2.13
Manitoba	405	433,262	6.44
New Brunswick	215	155,164	8.75
Nova Scotia	288	227,874	13.07
Ontario	4,147	4,063,060	5.18
Prince Edward Island	23	17,402	14.19
Quebec	2,476	1,514,186	2.50
Saskatchewan	363	348,952	10.98
Yukon	39	63,311	6.17
Canada	*8,847	†\$7,777,715	\$4.22

*Of whom 3,712 are employed in municipal stations.

†Of which \$3,487,210 is paid by municipal stations.

30 per cent. of the power used by central stations was developed from water, whereas in 1917 in Canada, about 90 per cent. of the central station power was hydro-electric. The installed hydro-electric power per thousand of population was 24.7 h.p. in 1912 in the United States, compared with 198.0 h.p. in 1917 in Canada.

AUTO CATCH-BASIN CLEANING TRUCK*

BY LEWIS M. HASTINGS
City Engineer, Cambridge, Mass.

FOR the purpose of cleaning out and removing the material from its street catch-basins, the city of Cambridge, Mass., has constructed an auto catch-basin cleaning machine which has now been in service for over six months.

The city first purchased a 3½-ton auto truck, equipped with a special steel body of 3 cu. yds. capacity and a wood auto dump hoist for dumping the load by power obtained from the truck engine. This power hoist has been found of very great service in the saving of time and labor in dumping heavy loads.

The excavating and loading of the material from the basins is done by means of an orange-peel excavating bucket, 18 ins. in diameter and about 16 ins. deep, holding about 1½ cu. ft. of material. This bucket is opened and shut by a piston and cylinder attached to the head of the bucket, and operated by compressed air at a pressure of about 100 lbs. per sq. in.

Compressed air is obtained by an Ingersoll-Rand air compressor located at the left side of the chassis frame. Power to drive the compressor is obtained from the main engine shaft or propeller by a sprocket and chain drive to the shaft of the compressor. The compressed air is led to the bucket by two lines of ¾-in. armored rubber hose. Underneath the platform on which the operator stands in a sliding valve or controller with which the two hose lines are connected and by which the air is put into one hose line to open, and into the other hose line to close, the bucket, by pressing down or releasing the valve with the foot.

The two hose lines are passed over pulleys on the crane and move back and forth with the hoisting chain as the

*Excerpt from paper presented to the Boston Society of Civil Engineers.

"HYDRO" SENDS REPRESENTATIVES TO ENGLAND

E. T. Brandon and E. V. Buchanan Will Also Visit Sweden and Other Countries—To Investigate British and European Methods

NEXT week, E. T. Brandon, electrical engineer of the Hydro-Electric Power Commission of Ontario, accompanied by E. V. Buchanan, local manager of the system at London, Ont., will leave for England to interview British manufacturers, to study their methods, to let them know just what class of electrical material is required in Ontario, and to find out to what extent the British manufacturers are prepared to compete in that province.

Mr. Buchanan will represent the municipalities in a business way, while Mr. Brandon will be his technical adviser, handling all engineering matters.

While on the other side of the Atlantic they will also visit certain European countries to investigate the latest practice in hydro-electric work and to review manufacturing conditions in those countries. Among other countries that will be visited will be Sweden and Holland.

It has been rumoured that one of the principal objects of the trip is to induce the Swedish General Electric Co. to bid on any additional generators that may be required for the Queenston plant besides the two for which contract was let last Saturday, but this is denied by officials of the commission, who state that no undue importance is to be attached to the trip to Sweden, and that the principal object of the trip is entirely in relation to conferences with British manufacturers and in connection with the supply of small machinery and apparatus of every description as well as of larger equipment.

PROPOSE POWER CONTROL IN BRITAIN

CONTROL of the generation and distribution of electricity throughout the United Kingdom is proposed by a bill now being prepared by the British government. Authority over electric supply, which is now vested in the Board of Trade and other government departments, would be transferred by the bill to a very small board, having probably only five members.

The United Kingdom would be divided into districts, the board members having in mind, first of all, the requirements of industrial sections. In each district a subsidiary board would be appointed to take direct charge.

All electric power stations would be purchased and placed in the hands of the local boards, each of which would be held responsible for the supply of electricity in its district and for the establishment of new generating stations and transmission systems.

If private companies wish to enter the electric business, they would be compelled to buy their current from the local board and their earnings would be under control. It is suggested the local boards would only meet all expenses and pay no profits. The financing of the plan would be in the hands of the government, except where it is practicable and advisable to finance the plan locally.

This plan is brought forward as a compromise between public and private control. The report upon which the bill is based was made by a committee which conducted a careful investigation. It points out that the electric system of the country is inadequate, and recommends the adoption of some plan which will meet the requirements of the country.

Capt. J. A. Duchastel and G. A. McNamee, president and secretary respectively of the Canadian Good Roads Association, this week interviewed Hon. F. B. Carvell, Minister of Public Works, to urge that work on the Laprairie dyke be continued and completed. The dyke has been under construction spasmodically for the past ten years.

The accompanying statistics in general represent the situation at the end of 1917, the figures having been gathered at various times during the past year. A similar census has been taken in the United States covering the same period, but the results are not yet available. While it may be misleading to compare Canada's 1917 statistics with the 1912 (the last available) statistics in the United States, yet it is interesting to note that at that time in that country, only

on streets and highways naturally has not yet reached the proportions anywhere in Canada that it has in some parts of the United States, but the time will soon come when Canadian authorities will have to make more stringent rules and will have to pay more attention to training the public in their observance.

One of the most needed innovations is legislation placing the full risk upon the pedestrian for any accident that may occur as a result of his or her crossing a street or highway at any point excepting a recognized crossing, or as a result of taking a diagonal route across a street intersection instead of following the traffic both ways.

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LET THERE BE LIGHT!

SIR HERBERT HOLT, president of the Montreal Light, Heat and Power Co., has challenged Sir Adam Beck to wager \$10,000, the loser to send his cheque to any hospital named by independent parties. Sir Adam says that the prices of power in Montreal are much higher than in Toronto, and submits data to prove his case. Sir Herbert says that his company sells the cheapest power in the country, taking taxes into account. Hence the challenge to Sir Adam to put up his money. Sir Herbert suggests that the wager he referred to a board of electrical engineers to be appointed by the Engineering Institute of Canada. As one of our daily contemporaries suggests, this dispute should generate light but not heat.

CENTRAL STATION STATISTICS

VALUABLE work has been performed by the Dominion Water Power Branch and the Bureau of Statistics in compiling such thorough information about the central electric stations in Canada. The four motives for the compilation of the data were as follows:—

First, a stock-taking of Canada's present central station facilities and provisions for expansion.

Second, an analysis of the statistical data collected, for the purpose of noting the characteristics and trend of the industry.

Third, the preparation of a complete directory of the central station industry, covering concisely and systematically the principal features of the commercial and publicly owned stations in operation throughout the Dominion.

Fourth, the preparation for those interested of information regarding the locations where blocks of electrical energy are for sale, the prices at which this power is obtainable and the transportation facilities available in the vicinity.

START PUBLIC WORKS!

SECRETARY WILSON, of the United States Department of Labor, says: "Whenever it is possible to utilize public means, wherever it is possible to undertake public work that is valuable for peace-time purposes, it should be undertaken as promptly as possible. It may not be needed, but it ought to be provided so that it can be utilized if it is needed.

"Personally, I am opposed to the creation of work solely for the purpose of giving employment to somebody. I look upon that as being so much waste; wasted intelligence, wasted energy, and wasted material. But the same argument cannot be made against employing labor for useful purposes. And this should always be borne in mind: That if you have millions of men out of employment and by virtue of their being out of employment, unable to supply food and clothing and shelter for their families, they are going to insist upon the opportunity of earning a livelihood.

"I am not one of those who take the ground that a country or a government owes every man a living. But all government, all organized society, is man-created, and, consequently, more or less artificial because of the restrictions that must of necessity be imposed for the purpose of enabling

us to live in harmony with each other. And because of those restrictions, men have not always the opportunity of working for themselves, and I am one of those who believe that all good governments will see to it that every man has the opportunity to earn a living. In other words, the government does not owe him a living, but it owes him the opportunity to earn a living."

CONTRACT FOR "HYDRO" GENERATORS

For Queenston Plant Has Been Awarded to Canadian Westinghouse Co., Ltd.—Only Two Units Will Comprise Initial Installation

JUST two units will comprise the initial installation in the Queenston power house of the Ontario Hydro-Electric Power Commission. The proposition submitted by the Canadian Westinghouse Co., Ltd., for the supply of two generators, was accepted last Saturday.

It is said that the price was in the neighborhood of \$425,000 per machine. The only other known bidder was the Canadian General Electric Co., Ltd., whose price was a little higher.

The contract for the water turbines will be awarded within the very near future either to the I. P. Morris Co., Philadelphia, or the Wellman-Seaver-Morgan Co., Cleveland, the competition having narrowed down to these two firms.

The lowest quotation on the turbines is in the neighborhood of \$250,000 each. Therefore each unit will cost about \$675,000 for the water turbine and generator alone, exclusive of any auxiliary apparatus.

Each of the two generators, for which contract has been awarded, will have an output capacity of 45,000 k.v.a. at the terminals.

Each turbine will have a mechanical horse-power of 52,500 at the generator coupling. The normal speed will be 187.5 r.p.m., and the frequency, 25 cycles per second.

The rated capacity is to be delivered at a normal potential of 12,000 volts.

A review of the generator specifications appeared in *The Canadian Engineer* for November 21st, 1918, and of the water turbine specifications in *The Canadian Engineer* for September 26th, 1918.

PERSONALS

HON. H. H. WICKWIRE, K.C., M.P.P., has been appointed minister of roads for the province of Nova Scotia.

HERBERT T. ROUTLY, of the Routly Road Co., Toronto, has been engaged by the Ontario government as superintendent of construction of provincial highways.

ERNEST OLIVER has been prominently mentioned in newspaper despatches emanating from Ottawa as the probable manager of the Toronto Suburban Railway, which has been purchased by the Canadian National Railways, and of any other suburban electric lines that may come under the jurisdiction of the National Railways System.

CORRECTION

IN the list of firms mentioned in the January 16th issue of *The Canadian Engineer* as having supplied material for the extension to the Ontario Power Co.'s plant at Niagara Falls, the author accidentally omitted mention of the Nova Scotia Steel and Coal Co., Ltd., New Glasgow, N.S., who supplied a portion of the steel bands for the wood stave pipe line.

U. Richardson, M.P.P., recently headed a deputation that asked the Deputy Minister of Highways to include a road from Guelph to Southampton in the Ontario provincial-county highway system.

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 projected, contracts awarded, changes in staffs, etc.

▲—Denotes an item regarding work advertised in *The Canadian Engineer*.

●—Denotes contract awarded. The names of successful contractors are printed in CAPITALS.

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
Edmonton, Alta., administration building, etc.	Feb. 24.	Jan. 30.	46
Halifax, N.S., school building	Mar. 1.	Jan. 23.	46
Pembroke, Ont., waterworks pumping unit	Mar. 7.	Jan. 30.	44
Sherbrooke, Que., highway	May 5.	Jan. 23.	44
Winnipeg, Man., telephone poles	Feb. 10.	Jan. 23.	48
Winnipeg, Man., five factories	Feb. 15.	Jan. 30.	48

BRIDGES, ROADS AND STREETS

Aylmer, Ont.—Improvements to streets and construction of pavements are contemplated by the Town Council.

Bridgewater, N.S.—The construction of macadam pavements is contemplated by the town council. J. A. Curl, clerk.

Barrie, Ont.—At a recent meeting of the Simcoe County Council an appropriation of \$150,000 was made for the improvement of the county road system. It was as follows: \$17,000 for bridges, \$33,000 for towns and villages, \$30,000 for county-provincial highways and \$70,000 on the remainder of the county good roads.

Cornwallis, Man.—Tenders will be received by the undersigned until March 5th, for the construction of a bridge. D. W. Shaw, clerk, Brandon, Man.

East Zorra Township, Ont.—An appropriation has been made to construct and repair highway bridges and culverts in the township. Amount, \$4,500.

●—Elora, Ont.—The contract for raising Victoria Bridge was awarded by the County Bridge Committee to REUBEN ROGERS, Guelph; and the cement work and strengthening of the bridge and flooring to CHARLES MATTAINI, Fergus.

Fort William, Ont.—Extensive repairs will be necessary for the pavements throughout Fort William.