

PAGES

MISSING

THE CANADIAN ENGINEER

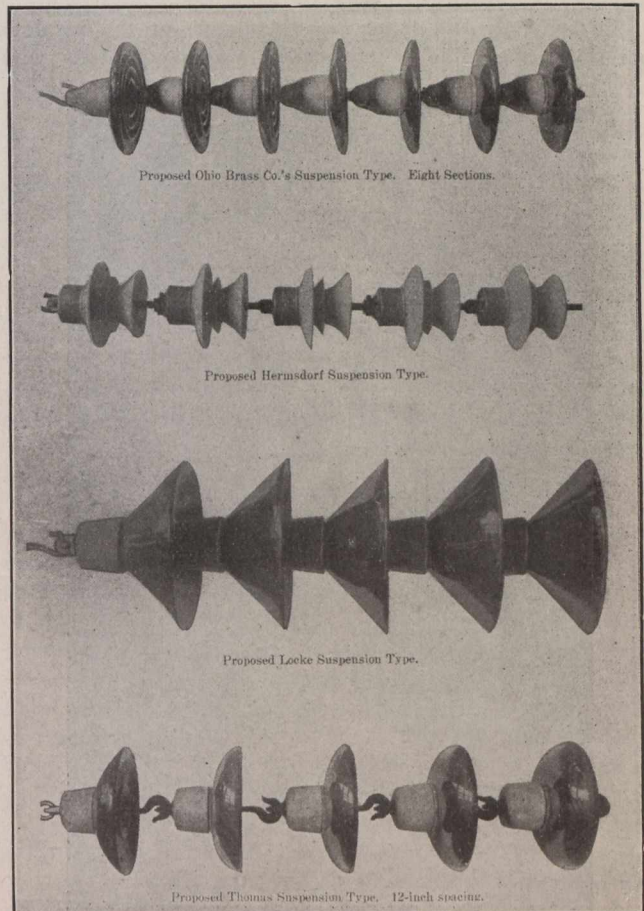
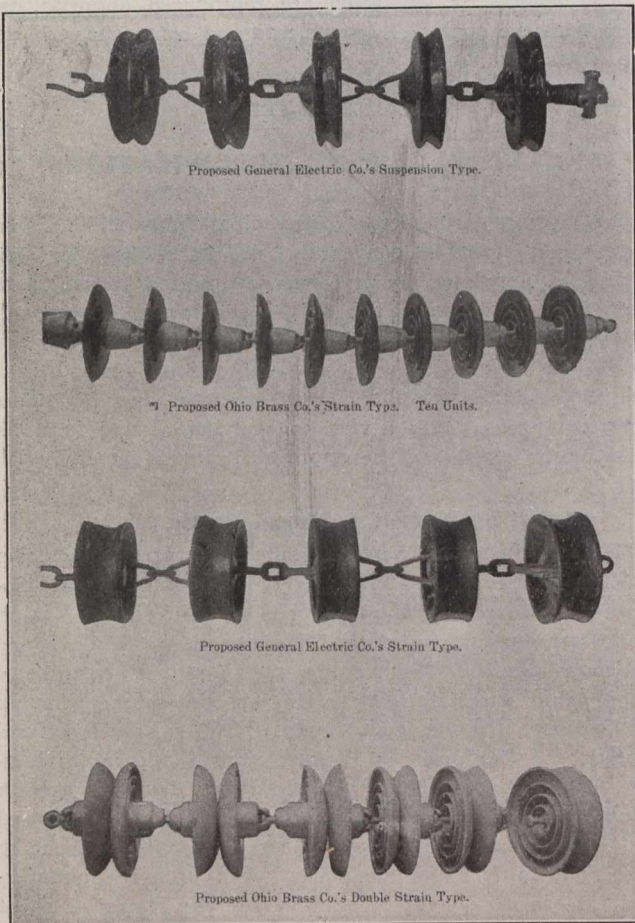
An Engineering Weekly.

HYDRO-ELECTRIC COMMISSION, TEST ON INSULATORS.

When the Hydro-Electric Power Commission decided to transmit power at 110,000 volts, it was also decided to adopt the suspension form of insulator in preference to the pin type, which had been the standard for all lines up to 60,000 volts. Before specifications were prepared, all insulator factories were visited, in order to collect data regarding the insulators themselves, to become acquainted with the method of their manufacture, and also to inspect the factories and determine their respective facilities, size, organization, etc. Tests performed at these factories showed such different

occupying the greater part of the time from February 8th, 1909, to May 18th, 1909, with the object in view of comparing the performance of the different makes, when subjected to exactly the same conditions. The most important condition was the application of artificial rain. The apparatus for this test was so arranged that all insulators were affected alike. The precipitation and direction of flow of water representing rain could be controlled as could also the voltage to which the insulators were subjected.

As a means of comparison of the different results, characterized by a more or less vivid luminous display, a large number of photographic records were taken, the test being performed in absolute darkness.



results and performances that it was decided to have our own engineers make comparative tests on all insulators submitted under exactly the same conditions. With this object in view, the specifications called for the submitting of three complete sample insulators with each tender.

The Ontario Power Company, of Niagara Falls, in a very amiable manner placed all apparatus and machinery used in these tests at the disposal of the Commission, furnished all the power gratuitously, and assisted the Commission's Engineers in their work in a most willing and disinterested way.

After the samples of insulators accompanying tenders were received, they were submitted to very exhaustive tests,

In addition to the electrical tests, the mechanical features of the different insulators were thoroughly investigated. A great number of breaking tests were performed to ascertain the strength and rigidity of the insulators and their connections.

This investigation did not take the prices of the insulators into consideration. It was only after arriving at a definite conclusion as to the best-suited insulator that prices were taken into consideration and final selection of type was made.

The specifications for high tension insulators called substantially for an insulator to withstand electrically a potential of 330,000 (three times normal) volts, dry, and of 220,000 (twice

TENDERS FOR HIGH TENSION TRANSMISSION LINE INSULATORS.

Tenderer.	Delivery 1st 1,000 Insulators in Weeks.	Suspension Type.				Strain Type.					
		Price per 100 F.O.B. R'y.		Price per 100 F.O.B. Cars Dundas.		Price per 100 F.O.B. R'y.		Price per 100 F.O.B. Cars Dundas.			
		First Order, 13,350.	Extra, 1,000—10,000.	First Order, 1,650.	Extra, 100—1,000.	First Order, 1,650.	Extra, 100—1,000.	First Order, 1,650.	Extra, 100—1,000.		
		Car Load Lots. \$ c.	Less Car Lots. \$ c.	Car Load Lots. \$ c.	Less Car Lots. \$ c.	Car Load Lots. \$ c.	Less Car Lots. \$ c.	Car Load Lots. \$ c.	Less Car Lots. \$ c.		
General Electric Co., Schenectady, N.Y.....	12	5	870.00	870.00	870.00	870.00	5	1,053.00	1,053.00	1,053.00	1,053.00
Locke Insulator Mfg. Co., Victor, N.Y.....	8	5	1,065.00	1,065.00	1,065.00	1,065.00	7	1,491.00	1,491.00	1,491.00	1,491.00
R. Thomas & Sons, East Liverpool, Ohio	23	5	1,148.13	1,148.13	1,148.13	1,148.13	6	1,377.75	1,377.75	1,377.75	1,377.75
Hermisdorf (Watson-Jack & Co., Montreal, Que.)...	10	5	868.00	880.00	868.00	880.00	5	868.00	880.00	868.00	880.00
Ohio Brass Co., Mansfield, Ohio	10	8	700.00	710.00	700.00	710.00	10	965.00	977.00	965.00	977.00

normal) volts under a rainfall of half-inch of water per minute, combined with a wind strong enough to direct the flow of the rain at an angle of 45° towards the insulator. This was accomplished by means of a number of spray nozzles directed at an angle of 45° towards the insulator and the flow of water regulated until a precipitation of half-inch per minute was obtained.

Mechanically the suspension insulator, or the insulator from which the cable is suspended, was required to with-

different styles of insulator under consideration, the photographs of which are herewith reproduced.

The Ohio Brass Company's insulators, after a few changes, were finally selected for both suspension and strain type, eight sections being used for the suspension type and ten reinforced sections being used for the strain type.

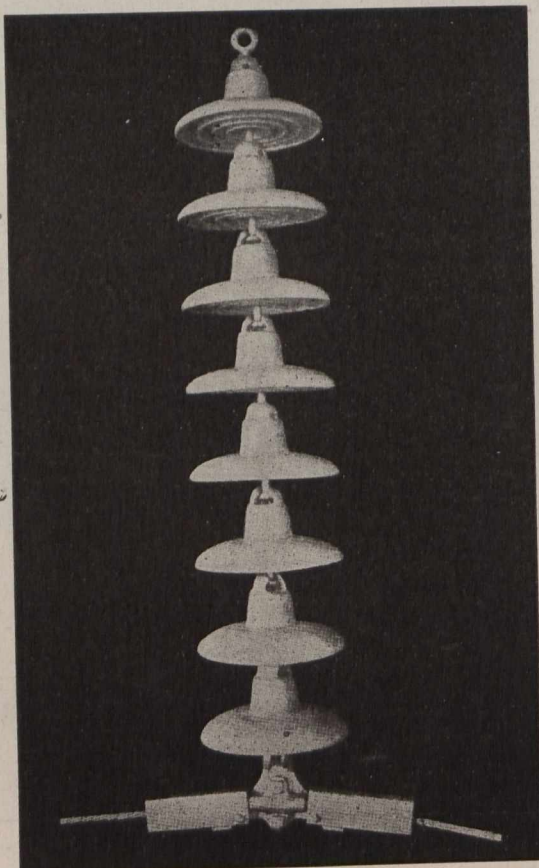
The tenders as submitted are reproduced herewith, together with the copies of agreements and contracts with the Ohio Brass Company.

ASPHALT PAVEMENT SPECIFICATIONS.

The American Society of Municipal Improvements received, at its October convention, reports from four sub-committees appointed by it to submit forms for standard paving specifications. That of the Committee on Asphalt Paving, of which Mr. F. P. Smith was chairman, was as follows. It is hoped that these specifications will be criticized, not only by members of the society, but by others interested therein, with a view to evolving a final form of specifications which will be approved and adopted by all cities.

Report on Asphalt Pavement Specifications.

The specifications herewith submitted practically cover the same range and materials as those adopted by the Society for Standardizing Specifications at Chicago last winter, but the arrangement is quite different and, we think, somewhat more logical. We have also attempted to clear up some of the points which have been left obscure in the Chicago specifications. Under our specifications, so-called natural asphalts, the California oil asphalts and a number of mixtures of different asphalts are permitted, but no greater latitude has been allowed in this respect than was allowed by the Chicago specifications. There is ample evidence to prove that California oil asphalts, when properly manufactured, are in every respect suitable for the laying of sheet asphalt pavements. Numbers of very excellent pavements have also been laid with mixtures of asphalts such as the following: Trinidad and California "D" grade, Bermudez and California "D" grade, Cuban and California "D" grade, California "D" grade and Texas, Gilsonite fluxed with asphaltic flux; and in many instances the mixture has been preferable to the hard natural asphalt alone. For this reason it is believed that mixtures of proper materials should be permitted when their composition is known and approved. Mixtures laid under various trade names should also be admitted under the same restrictions; but, surely, it is not wise to purchase mixtures sold under a trade name alone without any assurance as to the ingredients contained in them or that these ingredients or proportions will not be changed in the near future.



Accepted Ohio Brass Company's Suspension Insulator Provided with Cable Clamps and Guards.

stand a pull of 8,000 pounds without injury to any of its parts. The strain insulator, or the insulator which is used to take up the horizontal strain of the cable, was required to withstand a pull of 10,000 pounds.

Tenders were sent in by the General Electric Company, Schenectady, N.Y.; the Locke Insulator Company, Victor, N.Y.; the Ohio Brass Company, of Mansfield, Ohio; and the Hermisdorf Company, of Hermisdorf, Germany, through their Canadian representative in Montreal. In all there were seven

Where mixtures of this kind are permitted, it is absolutely essential that the different asphalts used should be carefully examined and tested by a competent laboratory. Many of the larger cities now have such laboratories established, and smaller cities adopting these specifications should unquestionably employ competent expert advice in connection with them, as no city engineer is competent to decide upon the chemical and physical points involved in the examination of the different bitumens admitted under these specifications.

Some of the tests in the Chicago specifications which are of no value whatever have been cut out. It will be noted that the ductility requirements for asphalts produced by the distillation of asphaltic oils are higher than those called for in so-called natural asphalts. This is not intended as a discrimination against oil asphalts, but is due to the fact that, when properly prepared, they naturally possess a higher ductility than most of the so-called natural asphalts. Their ductility can be reduced by blowing during the process of distillation, but it is questionable whether this does not deleteriously affect the quality of the asphalt; and for this reason it was deemed best, for the present at least, to specify a minimum ductility such as would readily be complied with by asphalts of this class produced by the ordinary methods of distillation.

An attempt has been made to define asphaltic residuums and semi-asphaltic residuums, as without some such definition the terms themselves are meaningless.

SHEET ASPHALT PAVEMENT SPECIFICATIONS.

General Description.

Upon the foundation prepared and laid, as elsewhere herein specified, shall be laid the pavement proper. This shall consist of:

Binder—1. A binder course . . . inches in thickness when compressed.

Wearing Surface—2. An asphalt wearing surface . . . inches in thickness when compressed.

Materials.

The materials used must comply with the requirements of the specifications and be suitable for use upon the street or streets to be paved. They shall be mixed in definite proportions by weight, depending upon their character and the traffic upon the street and upon the character of the materials used, and such materials and proportions must be satisfactory to the engineer.

Definitions—Crude Natural Asphalt shall be construed to mean any natural mineral bitumen, either pure or mixed with foreign matter, from which, through natural causes in the process of time, the light oils have been driven off until it has a consistency harder than 100 penetration at 77° F.

Asphaltic Petroleum shall be construed to mean those petroleums which, when treated in the manner specified below, will give a residue having a ductility at 77° F. of 25 cms. or over.

Semi-asphaltic Petroleums shall be construed to mean those petroleums which, when treated in the manner specified below, will give a residue having a ductility at 77° F. of between 5 cms. and 25 cms., and this residue after being maintained at a temperature of not over 77° F. for 48 hours, must have a bright and glossy surface which shows no signs of crystallization.

Method for Examination of Petroleums—Two hundred grams of the petroleum is to be placed in an open dish and subjected to a temperature in an air bath of not to exceed 500° F. until the residue so obtained has a penetration at

77° F. of 50. This residue is then to be tested for ductility at 77° F.

Refined Asphalts—Asphalts whose value for making pavements has not been established in the judgment of the engineer by sufficient practical experience will only be accepted under such special bond and guarantee provisions as the engineer may prescribe.

The preparation and refining of all asphalts admitted under these specifications shall be subject to such inspection at the paving plants and refineries as the engineer may direct.

Subject to the preceding conditions and definitions, the following types of refined asphalts will be admitted under these specifications, provided that when made into asphalt cements by the use of such materials and methods as are described in these specifications they will produce an asphalt cement complying with the requirements elsewhere set forth herein for asphalt cements.

All tests herein specified must be conducted according to official methods on file in the office of the engineer. All penetrations at 77° F. are expressed in hundredths of a centimeter and are to be taken (except where otherwise specified) with a No. 2 needle acting for five seconds under a total weight of 100 grams.

Kinds Admitted—1. Refined asphalts prepared by heating crude natural solid asphalts without the addition of any other material to a temperature not exceeding 400° F. until all water has been driven off. Such asphalts must melt readily upon the application of heat.

2. Refined asphalts produced by the careful distillation of asphaltic petroleum until the resulting asphalt has a consistency not harder than 20 penetration at 77° F. Combinations of asphaltic and semi-asphaltic residues will also be admitted under this section. Such asphalts and combinations must comply with the following requirements:

a. They shall contain not less than 98.5 per cent. of bitumen soluble in cold carbon disulphide.

b. When 20 grams of the asphalt are heated for 5 hours at a temperature of 325° F. in a tin box 2½ inches in diameter after the manner officially prescribed, it shall not lose over 5 per cent. by weight, nor shall the penetration at 77° F. of the residue left after such heating be less than half the penetration at 77° F. of the original sample before heating.

c. When the asphalt is brought to a penetration at 77° F. of 50 by the use of the flux with which it is to be used, and then made into a briquette having a cross section of one square centimeter, it shall have a ductility of not less than 25 cms. at 77° F.

3. Refined asphalts produced by combining crude natural solid asphalt with either or both of the following:

a. Residuums obtained by the distillation of petroleum oils as specified under fluxes.

b. Asphalts obtained from the distillation of asphaltic petroleums as specified under paragraph 2 of this section.

Where more than 5 per cent. of flux is used in the preparation of refined asphalts of this class, only such fluxes shall be used as, when mixed with the solid asphalt or combination of asphalts employed, will produce an asphalt cement complying with the requirements hereinafter set forth under that head.

Fluxes—These shall be the residues obtained by the distillation of paraffine, asphaltic or semi-asphaltic petroleums, and shall be of such character that they will combine with the asphalt to be used to form a suitable asphalt cement complying with the requirements of these specifications.

All residuums must have a penetration greater than 350° with a No. 2 needle at 77° F. under 50 grams weight for one

second, and must remain soft after heating for five hours at 400° F.

Kinds Admitted—*a.* Paraffine residuums shall have a specific gravity of .92 to .94 at 60° F. They shall not flash below 350° F. when tested in a New York State closed oil tester, and shall not lose more than 5 per cent. by weight when heated for 5 hours at 325° F. in a tin box 2½ inches in diameter after the manner officially prescribed. The residue after heating shall flow at 77° F.

b. Asphaltic residuums shall have the same general characteristics as paraffine residuums, except that they shall have a specific gravity between .98 and 1.04 at 60° F. When tested according to the method elsewhere herein prescribed for the examination of petroleum, the residue so obtained shall have a ductility at 77° F. of 25 cms. or over.

c. Semi-asphaltic residuums shall have the same general characteristics as paraffine residuums, except that they shall have a specific gravity between .94 and .98 at 60° F. When tested according to the method elsewhere herein prescribed for the examination of petroleum, the residue so obtained shall have a ductility at 77° F. of between 5 and 25 cms., and must have a bright and glossy surface which shows no signs of crystallization.

d. A natural Maltha may be used if it passes the heat and flash tests specified under "a."

Binder Stone—This shall be clean, hard stone, free from any particles that have been weathered, or otherwise soft material. It shall all pass a 1¼-inch screen. Not less than 85 per cent. of the stone shall pass this screen in its largest dimensions, and of the remaining 15 per cent. no piece shall have a larger dimension than 2 inches. The stone shall be so graded from coarse to fine as to have the following mesh composition (sieves to be used in the order named):

Passing			
10 mesh	10 to 35%	} Total, 25 to 50%	} Total passing 1
2 "	10 to 35%		
1-inch mesh	20 to 60%	} Total, 50 to 75%	
1¼ " "	15 to 55%		
			mesh, 45 to 85%

The above limits as to mesh composition are intended to provide for such permissible variations as may be rendered necessary by the available sources of supply and the character of the work to be done. The mesh composition and character of the stone may be varied, within the limits above specified, at the discretion of the engineer, depending upon the kind of asphalt used and the traffic conditions upon the street or streets to be paved.

Sand—The sand shall be hard, clean grained and moderately sharp. On sifting it shall have the following mesh composition (sieves to be used in the order named):

Passing		
200 mesh	0 to 5%	} Total passing 80 mesh and retained on 200 mesh, 20 to 35%
100 "	10 to 25%	
80 "	6 to 20%	
50 "	15 to 40%	
40 "	10 to 30%	
30 "	8 to 25%	
20 "	5 to 15%	
10 "	2 to 10%	
8 "	0 to 5%	

On very light traffic streets, a coarser sand may be used with the approval of the engineer, but in no case shall a sand be employed that contains less than a total of 15 per cent. passing an 80 mesh sieve, such total to contain not more than 5 per cent. (calculated on the original sand) passing a 200 mesh sieve.

The above limits as to mesh composition are intended to provide for such permissible variations as may be rendered necessary by the available sources of supply and the character of the work to be done. The mesh composition and character of the sand may be varied, within the limits above specified, at the discretion of the engineer, depending upon the kind of asphalt used and the traffic conditions upon the street or streets to be paved.

Filler—This shall be thoroughly dry limestone dust or Portland cement, the whole of which shall pass a 30 mesh per linear inch screen, and at least 66 per cent. of which shall pass a 200 mesh per linear inch screen. The surface mixture shall contain from 6 to 20 per cent. of this filler, depending upon the kind of sand and asphalt used and the traffic conditions upon the street or streets to be paved.

Samples—Samples of the refined asphalt, petroleum flux and asphalt cement that the contractor proposes to use in his work, together with a statement as to the source, character and proportions of the materials composing them, must be handed in with his bid and no contract shall be awarded to any bidder whose samples do not comply in every respect with these specifications. No asphalt other than that specified in his bid shall be used by any contractor except with the written consent of the engineer.

In addition to the samples submitted with the bids, other samples taken from and actually representative of the refined asphalt, petroleum flux, sand and filler to be used upon the street shall be submitted to the engineer before the use of such materials in the work is permitted. Except at his option, no work on binder or surface shall be commenced within three weeks from the date when such samples were submitted and in no case shall they be used until they have been examined and approved by him. Whenever, during the course of the work, new deliveries of paving materials are received by the contractors, samples of these shall at once be submitted to the engineer and their use in the work will not be permitted until they have been examined and approved by him.

Asphalt Cement.

Preparation—The asphalt cement shall be composed of refined asphalt or asphalts and flux, where flux is required, of the character elsewhere herein specified and must be of a suitable degree of penetration. The proportion of the refined asphalts comprising the cement shall in no case be less than 40 per cent. by weight. Only an asphaltic or semi-asphaltic flux shall be used in the preparation of these asphalt cements in which more than a total of 25 pounds of flux to every 100 pounds of solid natural asphalt are required

(Continued on page 630).

Dutcher, Maxwell & Gregory

ENGINEERS AND SURVEYORS.

319 Pender Street,
Vancouver, B.C.,

Canadian Engineer, Toronto. Nov. 8th, 1910.
Gentlemen,

Inclosed please find our check for () to cover advertising card in Canadian Engineer up to October 9th. Your journal is becoming so useful, full of valuable and practical engineering information, that we could hardly do without it.

Yours sincerely,
H. K. DUTCHER

THE SANITARY REVIEW

WINNIPEG: ITS SEWERAGE SYSTEM.

A proposal recently made to concentrate the sewage outfall of the city of Winnipeg by means of intercepting sewers at a point on the Red River, in the municipality of Kildonan, has raised a storm of indignation in that quarter. The Selkirk Board of Trade held a meeting on November 8th last, at which a lengthy resolution was drawn up. It was pointed out by the Medical Health Officer for the district that a beautiful body of water was threatened with cesspool conditions.

It can not be tolerated that the city of Winnipeg be allowed to continue the discharge of raw, untreated sewage as it does at present, or that it can assume a new location of discharge outside its own city limits, unless some efficient method is adopted of rendering the sewage innocuous and removing its objectionable qualities.

The time has most certainly arrived when the Provincial Legislature of Manitoba must take immediate measures for the prevention of stream and lake pollution by sewage. With the examples of the other Western Provinces, it is difficult to understand the lack of practical interest which has been taken in this most important subject.

Time after time, the public and the press of Winnipeg have taken up the subject of the serious pollution of the Red and Assiniboine Rivers. There is not an enlightened citizen of that Western metropolis but feels and acknowledges this blot on their civic administration.

The last annual report of the Medical Health Officer of Winnipeg referred to the objectionable and serious amount of unnecessary pollution. In spite, however, of every representation which can be made, the civic reply is logical, if somewhat stale, that there is no provincial law requiring municipalities to treat sewage before discharging it into streams and lakes.

Why should Winnipeg (simply because of its size) be called upon to purify its sewage discharge when Portage la Prairie and Brandon cities may continue legally to send their untreated sewage to Winnipeg? The only answer to this clear and logical assertion is that a Provincial Legislative Act is absolutely necessary in Manitoba, making it compulsory to treat all sewage effluents.

We understand that the Provincial Board of Health are taking certain steps to bring the matter before the Provincial Government. We know that Dr. Simpson, the chairman, is fully wise to the serious aspect of the want of efficient legislation, and, whenever the Government is ready to provide the legal sinews of war, he is also ready to provide efficient administration, which will place Manitoba on a level with the other Canadian Provinces, which are looking to the conservation of the purity of natural waters.

MEDICINE HAT WATER SUPPLY.

A recent report upon the quality of the filtered Saskatchewan River water as supplied at Medicine Hat is of an entirely favorable nature. The filters in use are the mechanical type, supplied by the Roberts Filter Company, of Philadelphia.

The report shows an efficient reduction both in bacteria and in suspended matter; this in spite of the fact

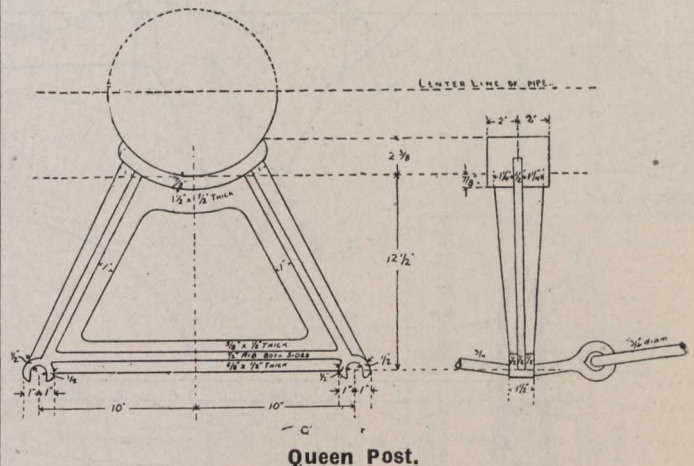
that the river is polluted with the sewage of several up-stream cities.

The bacteria counts per c.c. on agar are as follows: River water, 400; sedimented water, 80; filtered water, 10. Total reduction of bacteria, 97.5 per cent.

EXPOSED SEWERS AT LEAVENWORTH.*

By Joseph O'Neil, City Engineer.

In designing main trunk and lateral sewers for sanitary Sewer District No. 9, at Leavenworth, Kansas, the latitude of the design was limited by a great many natural conditions. The district consists of several minor drainage areas and contains numerous creeks and "draws," making the topography of the district very rough and broken. At points where creeks cross alleys and streets are located culverts and bridges, the crossing of which controlled the grades of the sewers almost absolutely. In addition to this, the several additions to the city comprising the district were poorly platted when originally laid out, and the arrangement of streets and alleys is bad. In some cases there are two and three alleys in one block, platted as "T" and "H" alleys; in other cases there are no alleys and it was necessary to condemn right-of-way for sewers. In order to lay out the



main trunk sewer so as to provide for lateral sewers in each block, the alignment was controlled entirely by these requirements, and the topography had to be disregarded for the most part.

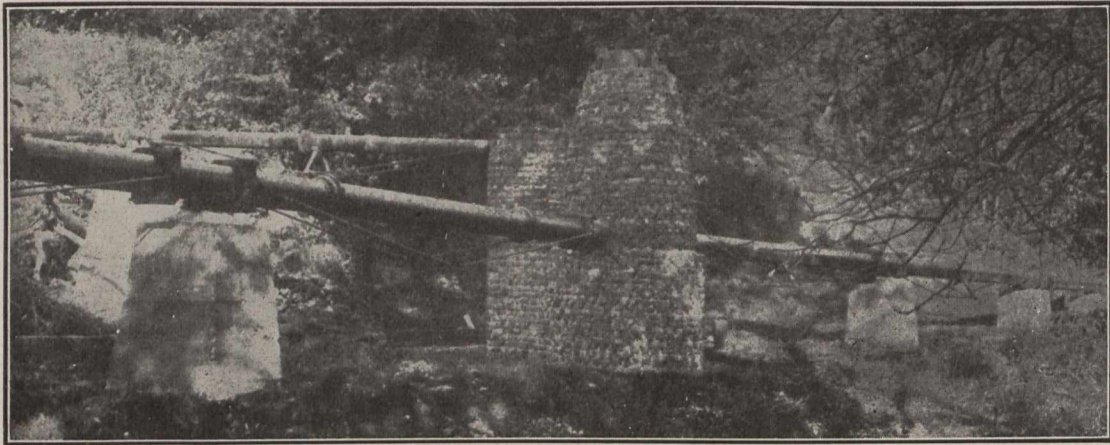
Being thus controlled in grade and alignment, the depth varied from every shallow to exceedingly deep work, sometimes through twelve to fifteen feet of rock. In crossing creeks and ravines, it was often necessary to have the sewer above ground. These "exposed" sewers will be discussed in this paper.

It was deemed best to use light weight, bell and spigot cast-iron pipe supported on concrete piers, and to provide for the free expansion of the pipe. To attain this end, it was provided that the piers be mounted with cast-iron pier plates anchored into the concrete; on these plates were to be placed several lengths of round bar iron at right angles to the line of the sewer to serve as rollers and fitting over the top

*Paper before American Society of Municipal Improvements.

of the plate and rollers in such a manner as to secure the rollers from falling out, but at the same time to permit them to roll on the plate with the expansion and contraction of the pipe, a saddle to fit the outside diameter of the pipe.

While the expansion in an iron pipe with a flow of sewage would be very small, owing to the almost constant temperature of the sewage, and might be taken care of by the "giving" of the lead in the joints, at the same time the

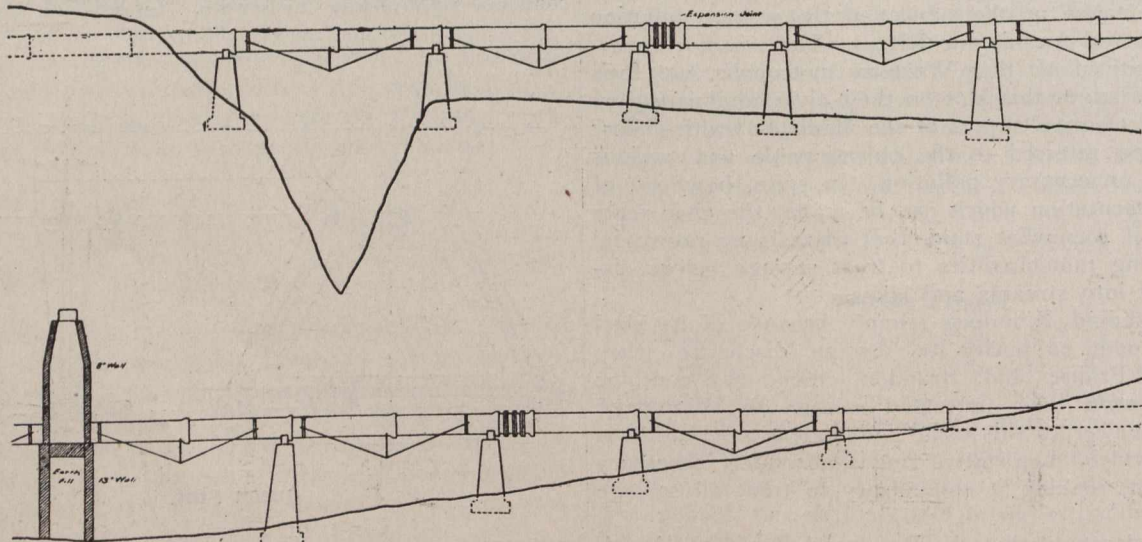


Exposed Sewer and Drop Manhole, Leavenworth, Kansas.

To avoid placing piers in creek channels where they would obstruct the flow, it was necessary to get a wider panel than 12 feet, and a truss was designed to support the intermediate joint. The truss consists of clamp bands to fit the circumference of the pipe and hold the truss rods in

loosening of the lead from expansion and contraction would cause leaks that would require attention later on, and it was considered necessary to install expansion joints.

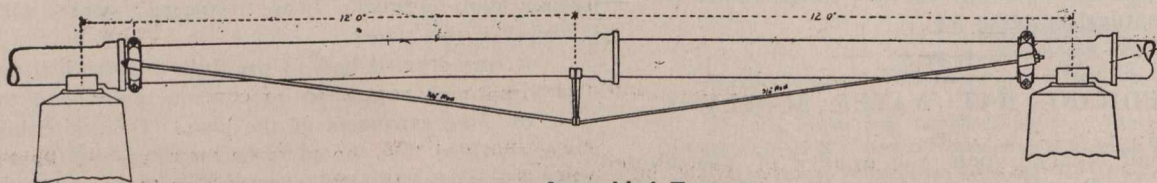
In designing the special castings required for this work, every effort was made to have them simple, yet strong. To



Typical Profile of Exposed Cast-iron Sewer.

place, a queen post and a set of rods, as shown on the details. In estimating the cost of the work, it was found that the complete truss was less expensive than the pier with its necessary castings, so it was decided to make the panels 24 feet instead of 12 feet, and to use a truss between each set

provide for different sizes of pipe, bushings were used where possible, or one casting only of a set was altered. This reduced the number of patterns required for the castings and kept the castings standard as far as possible. The castings required for the work were made by local foundries.



Assembled Truss.

of piers. To provide further for expansion, it was decided in cases where there was more than 75 feet of exposed pipe in a span to place an expansion joint. The regular type of iron body, brass sleeve expansion joint was specified.

The unit contract prices for this class of work were as follows:

10-inch light weight cast-iron pipe, in place..	\$ 1.50 per ft.
8-inch " " " " " " " " " " " "	1.00 " "

Trusses for 10-inch pipe complete and in place	16.50 each.
“ “ 8-inch “ “ “ “	18.00 “
10-inch expansion joints complete and in place at	55.00 “
8-inch expansion joints, complete and in place at	45.00 “
Concrete piers 5-feet high or under, fully equipped with castings	22.00 “
Additional height of piers, per vertical foot...	3.00

The accompanying photograph shows a section of exposed sewer and a drop manhole entirely above ground, a complication arising from the conditions before mentioned.

PROPOSED SEWAGE TANK AT GUILDFORD, ENG.

The tank now in course of construction is what is known as the "Fieldhouse Patent Tank," the advantages of which in comparison with square or rectangular tanks are as follows:—

(1) That the whole of the sewage in the tank is obliged to travel from the centre to the circumference.

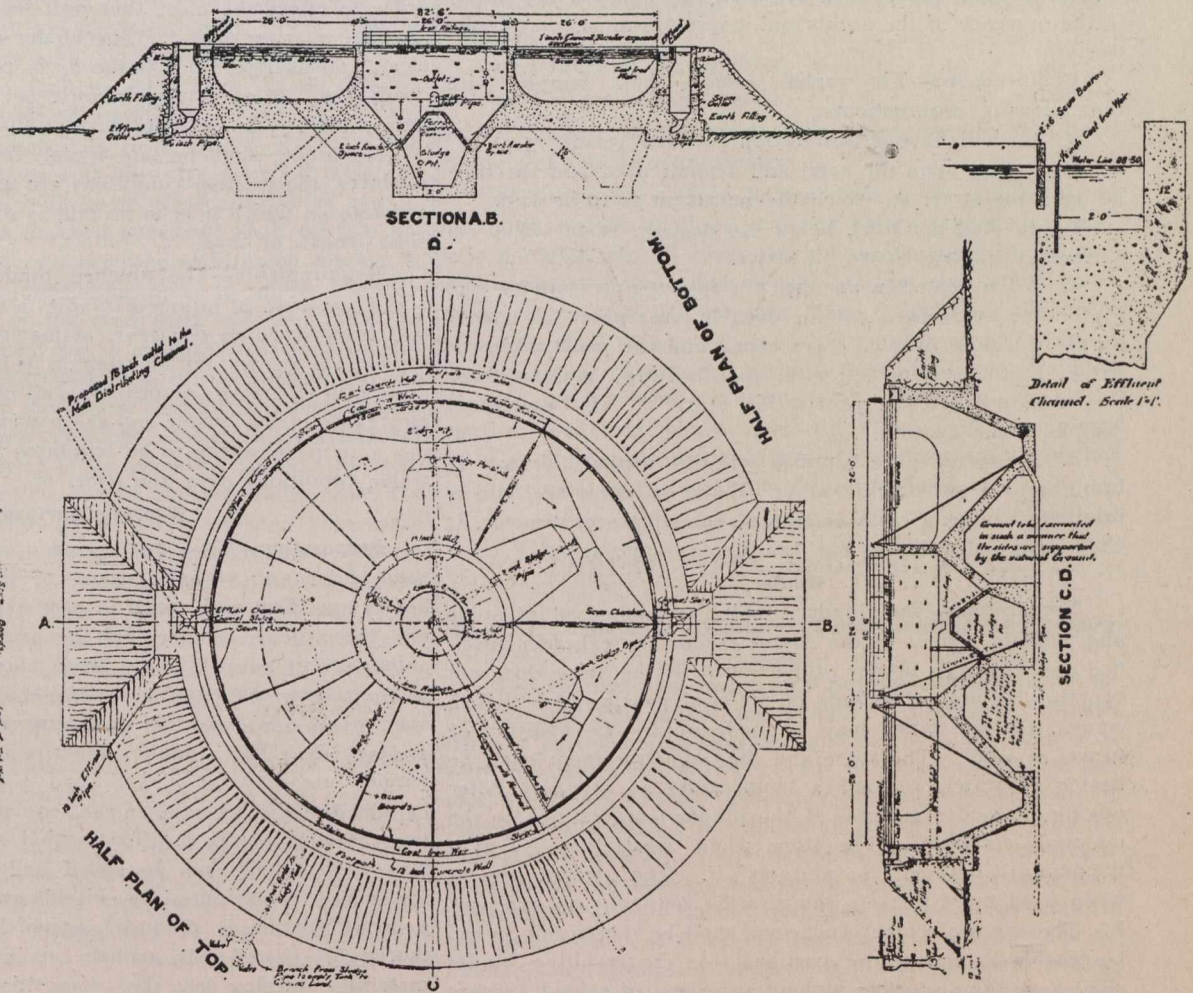
(5) That the surface of tank being divided into seventeen parts prevents the scum being broken up by the wind, and at the same time allows the removal of small portions without disturbing the remainder of contents.

(6) That the tank has always the same capacity, owing to the facilities included for the periodical removal of sludge and scum.

(7) That the large weiring surface aerates the effluent, and, owing to the slowing down of the velocity, allows largely increased volumes of sewage to be dealt with without disturbance of the scum or solids. (The ratio of the inlet to the outlet is as 1 to 66).

(8) That no aerial nuisance is created owing to the tank never requiring to be emptied.

The following is a short description of the manner in which it is proposed to deal with the sewage in this tank. The flow enters the central tank through a 15-in. diameter pipe and discharges over an inverted cone, the sludge falling through a small annular space at foot of cone, and the effluent passing through some small openings in the wall of central tank to six outside compartments. Small particles of sediment escaping from the central tank slowly settle in the



Guildford: Proposed Additional S Wage Sedimentation Tank.

(2) That perfect sedimentation takes place.

(3) That the solids are not disturbed by the inflow, but deposited in sludge pits, where they can be regularly and easily removed.

(4) That the flow of sewage over the inverted cone in the centre of tank directs the solids to the bottom, any particles escaping being impelled to sludge outlets down the sharply inclined walls.

outer compartments, while the sewage quietly approaches a weir, 260 ft. in circumference, over which it passes to the effluent channel and thence to the effluent pipe. The solids may be removed periodically by opening the penstocks in sludge pits, the weight of the sewage forcing the sludge through a cast-iron pipe into the sludge tank. The scum may also be removed, at convenient times, from small portions of the surface (which is divided up by boards fixed in

grooves) into effluent channel, sluices being arranged to direct the scum into scum pit and from thence to sludge tank. A contract has been accepted by the Corporation for the construction of this tank for the sum of \$10,500.

ASPHALT PAVEMENT SPECIFICATIONS.

(Continued from Page 626.)

in order to produce an asphalt cement of the proper consistency.

The proper proportion of the refined asphalt or asphalts and the flux shall be melted together and thoroughly agitated by suitable appliances until they are completely blended into a homogeneous asphalt cement. The asphalt cement must never be heated to a temperature exceeding 350° F. If the asphalt cement contains material that will separate by subsidence while it is in a molten condition, it must be thoroughly agitated before drawing from storage and while in use in the supply kettles. Approved methods of agitation, which will not injure the cement, must be used.

The refined asphalt or asphalts and flux comprising the asphalt cement shall, when required, be weighed separately in the presence of the authorized inspectors or agents of the engineer.

Requirements—The asphalt cement shall comply with the following requirements:

a. It shall have a penetration between 45 and 75 at 77° F., depending upon the sand and asphalt used and the traffic upon the street on which the pavement is to be laid.

b. It shall not flash below 350 deg. F. when tested in a New York State closed oil tester.

c. When heated in an open tin at a temperature of 325° F. for five hours in a hot air oven it must not show a loss by volatilization of over 5 per cent., and the penetration at 77° F. of the residue left after such heating, must not be less than one-half the penetration at 77° F. of the original sample before heating.

d. When the pure bitumen of the asphalt cement is brought to a penetration at 77° F. of 50 and made into a briquette having a cross section of one square centimeter, it shall have a ductility of not less than 15 cms. at 77° F.

Binder.

Preparation—The binder shall be composed of stone and asphalt cement of the character elsewhere herein specified and mixed in proper proportions. If the stone does not contain the proper amount of material passing the ½-inch screen, the deficiency may be made up by the addition of gravel or sand. The stone and the asphalt cement shall be heated separately to such a temperature as will give, after mixing, a binder mixture of the proper temperature for the materials employed. The stone when used must be at a temperature between 200 and 325° F. The asphalt cement when used must be at a temperature between 250 and 350° F. The asphalt cement and stone shall be thoroughly mixed by machinery in such proportions that the resulting binder shall have life and gloss without an excess of asphalt cement and the mixing shall be continued until a homogeneous mixture is produced, in which all the particles are thoroughly coated with asphalt cement.

Laying—The binder mixture prepared in the manner above described shall be brought to the street in wagons at a temperature between 200° F. and 325° F. and shall be covered with canvas covers while in transit. The temperature of the binder mixture within these limits shall be regulated according to the temperature of the atmosphere and

the working of the binder. On reaching the street it shall at once be dumped on the concrete and then be deposited roughly in place by means of hot shovels, after which it shall be uniformly spread by means of hot iron rakes and then at once be thoroughly compacted by tamping or rolling. The depth of the finished binder shall at no place be less than 1 inch or more than 3 inches, and its upper surface shall be parallel to the surface of the pavement to be laid. The surface, after compression, shall show at no place an excess of asphalt cement, and any spot covering an area of 1 square foot or more showing an excess of asphalt cement shall be cut out and replaced with other material. Smaller spots may be dried by the use of stone dust and smoothers. All binder that shows lack of bond or that is in any way defective or which may become broken up before it is covered with wearing surface must be taken up and removed from the street and replaced by good material properly laid, in accordance with these specifications at the expense of the contractor. No more binder shall be laid at any one time than can be covered by two days' run of the paving plant on surface mixture. Binder when laid, shall be followed and covered with wearing surface as soon as is practicable, in order to effect the most thorough bond between the binder and the wearing course. The binder course shall be kept as clean and as free from traffic as is possible under working conditions. If necessary, it must be swept off immediately before laying the wearing surface upon it.

No binder shall be laid when, in the opinion of the engineer, the weather conditions are unsuitable or unless the concrete on which it is to be laid is dry and has set a sufficient length of time.

Requirements—The finished binder must contain from 5 to 8 per cent. of bitumen soluble in cold carbon disulphide, and from 10 to 30 per cent. of material passing a 10 mesh screen, the percentage of bitumen to be regulated in accordance with the mesh composition and character of the mineral aggregate of the binder and the percentage of material passing a 10 mesh screen to be regulated in accordance with the traffic conditions upon the street or streets to be paved.

Wearing Surface.

Preparation—The wearing surface shall be composed of sand, filler and asphalt cement of the character elsewhere herein specified, and mixed in proper proportions. The sand and the asphalt cement shall be heated separately to such a temperature as will give, after mixing, a surface mixture of the proper temperature for the materials employed. The sand when used must be at a temperature between 250° F. and 375° F. The asphalt cement, when used, must be at a temperature between 250° F. and 350° F. The filler shall be added to the hot sand in the required proportions and the two thoroughly mixed. The asphalt cement in the proper proportions shall then be added and the mixing continued for at least one minute in a suitable apparatus, until a homogeneous mixture is produced in which all the particles are thoroughly coated with asphalt cement. The weights of all materials entering into the composition of the wearing surface shall be verified in the presence of inspectors as often as may be required and the engineer or his representative shall have access to all parts of the plant at any time.

Laying—The surface mixture prepared in the manner above described shall be brought to the street in wagons at a temperature between 230° F. and 350° F., and shall be covered with canvas covers while in transit. The temperature of the surface mixture within these limits shall be regulated according to the temperature of the atmosphere and

the working of the mixture. On reaching the street, it shall at once be dumped on a spot outside of the space on which it is to be spread. It shall then be deposited roughly in place by means of hot shovels, after which it shall be uniformly spread by means of hot iron rakes in such a manner that, after having received its final compression by rolling, the finished pavement shall conform to the established grade and have a thickness of not less than . . . inches. Before the surface mixture is placed, all contact surfaces of curbs, manholes, etc., must be well painted with hot asphalt cement. After raking, the surface mixture shall at once be compressed by rolling or tamping, after which a small amount of cement shall be swept over it, and it shall then be thoroughly compressed by a steam roller, weighing not less than 200 pounds to the inch width of tread, the rolling being continued until a compression is obtained which is satisfactory to the engineer. Such portions of the completed pavement as are defective in finish, compression or composition, or that do not comply in all respects with the requirements of these specifications, shall be taken up, removed and replaced with suitable material, properly laid, in accordance with these specifications, at the expense of the contractor. Whenever so ordered by the engineer, a space of 12 inches next the curb shall be coated with hot asphalt cement, which shall be ironed into the pavement with hot smoothing irons.

No wearing surface shall be laid, when, in the opinion of the engineer, the weather conditions are unsuitable, or unless the binder on which it is to be placed is dry. The finished pavement must be well protected from all traffic by suitable barricades until it is in proper condition for use.

Requirements.—The finished pavement shall contain between 9.5 per cent. and 12.5 per cent of bitumen soluble in cold carbon disulphide, depending upon its mesh composition and the character of the sand used and the traffic to which it is to be subjected, but in all cases sufficient asphalt cement must be used to properly coat all the particles of the mineral aggregate. It must also contain not less than 1 per cent. of mineral matter passing a 200 mesh sieve and not less than a combined total of 25 per cent. passing the 200, 100 and 80 mesh sieves. On streets of light traffic, when the engineer has approved the use of a coarser sand than that specified for general use, the surface mixture must contain not less than 6 per cent. of mineral matter passing a 200 mesh sieve, and not less than a combined total of 18 per cent. passing the 200, 100 and 80 mesh sieves. The maximum amount of 200, 100 and 80 mesh material in the pavement will be regulated according to the kind of sand and asphalt used, and the traffic upon the street on which the pavement is to be laid, subject to the maximum requirements elsewhere herein specified under sand and filler.

The above limits as to mesh composition and per cent. of bitumen are intended to provide for such permissible variations as may be rendered necessary by the raw materials used and the character of the work to be done. The composition of the wearing surface may be varied within the limits above specified, at the discretion of the engineer, depending upon the kind of sand, filler and asphalt used and the traffic conditions upon the street or streets to be paved.

Condition at Expiration of Guarantee.

In addition to the proper maintenance of the pavement as provided for elsewhere herein, the contractor shall, at his own expense, just before the expiration of the guarantee period, make such repairs as may be ordered by the engineer and as may be necessary to produce a pavement which shall:

a. Conform substantially in grade to the pavement as first laid.

- b. Be free from cracks more than 3 feet in length.
- c. Contain no disintegrated surface mixture.
- d. Not have been reduced in thickness more than $\frac{1}{4}$ inch in any part.
- e. Have a foundation free from cracks or defects.
- f. Be in substantial accord with the specifications under which the pavement was laid, except as otherwise provided for in this section.

Repairing.

Whenever the repairs made at any one time shall amount to more than 50 per cent. of the surface of any one block, the entire pavement on that block shall be taken up and relaid. These repairs, except as provided for below, shall in all cases be made by cutting out the defective binder and wearing surface down to the concrete and replacing them by new and freshly repaired binder and wearing surface made and laid in strict accordance with these specifications.

Whenever any defects are caused by the failure of the foundation, the pavement, including such foundation, shall be taken up and relaid with freshly prepared material, made and laid in strict accordance with these specifications.

The surface heater method of repairing may be used only in those cases where the repairs are not rendered necessary by:

- a. Failure of the concrete.
- b. Failure of the binder.
- c. Failure caused by the disintegration of the lower portion of the wearing surface.

Whenever the surface heater method is employed, all defective surface shall be removed before replacing it with new material. In all cases the old surface shall be removed to a depth of not less than $\frac{1}{4}$ -inch and the new surface must, when compressed, be not less than $\frac{1}{2}$ -inch in thickness. The heat shall be applied in such a manner as not to injure the remaining pavement. All burned and loose material shall at once be completely removed and, while the remaining portion of the old pavement is still warm, shall be replaced by new and freshly prepared wearing surface made and laid in strict accordance with these specifications.

FOREST FIRES AND RAILWAYS.

By R. H. Campbell, Dominion Superintendent of Forestry.

The vicinity to a forest of a railway either in construction or operation makes the danger of fires more intense. This is partly due to causes connected with the railway itself, and partly due to the crowds of land-seekers, prospectors, freighters, tramps and other people equipped more or less generally with a fine bump of irresponsibility who accompany or follow it. The record of each year's conflagrations shows the railways well up in the list of the causes of forest fires. If they do not lead they always follow close in the black array. It is of interest, then, to consider the relation of the railways to forest fires. In doing so the subject will be confined to the fires which are due directly to the railways.

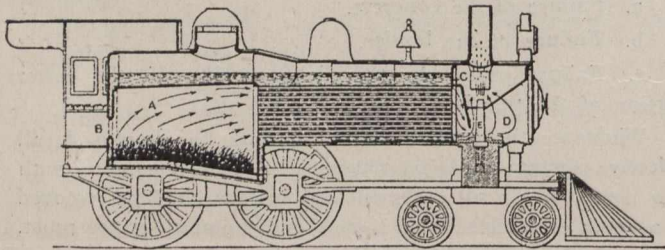
Railway Construction.

In the construction of the railway it is necessary that the right-of-way should be thoroughly cleared. If dead tops, limbs and stumps are left scattered over the right-of-way or piled just outside of it, as has usually been done, they become a veritable fire-trap, and the destruction of the surrounding forest is an inevitable consequence sooner or later. The regulations for clearing the right-of-way adopted by

the Transcontinental Railway Commission are now being generally followed. They provide as follows:—

"The whole, or as much of the right-of-way as the engineer may direct, shall be entirely cleared of all trees, logs, brush and other perishable matter; all of which shall be burned or otherwise disposed of as the engineer may direct, unless specially reserved to be made into timber, ties or cordwood. Unless directed in writing by the engineer, trees and brush must not be thrown on adjacent lands, but must be disposed of on the right-of-way. Trees unavoidably falling outside the right-of-way must be cut up, removed to right-of-way and disposed of."

But the establishing of a regulation is not the carrying of it out, and in order to ensure the carrying out of such regulations as these thoroughly it is necessary to place a fire patrol along the line of construction. This has been done along the line of the Grand Trunk Pacific Railway through Dominion territory west of Edmonton with good results. Fire from the right-of-way has not burned forty acres outside its limits, although the right-of-way has been cleared and burned thoroughly in that district. But the ranger in charge had to use authority and judgment. Some contractors were allowing debris to gather close against the edge of the right-of-way where, when burned, it would lead fire into the forest. These contractors were stopped and made



Longitudinal section of Locomotive. (A, fire-box; B, cab; C, front head of boiler; D, smoke-box or front-end; E, pipe from which exhaust steam escapes. Baffle-plate may be seen just below C and behind E.)

to clear a space between the brush heap and the forests. In the dry and dangerous season of the year the ranger prohibited burning altogether. The engineers of the railway company, the contractors and the forest rangers all worked cordially together to attain the desired object.

With such regulations and with a good fire patrol to supervise their enforcement the danger should be largely obviated. The uncertainties of handling fire are, however, well illustrated by an incident which occurred in the clearing of the right-of-way on the construction of the Canadian Northern Railway north of Prince Albert. The refuse was being burned on the right-of-way and the clearing gang was watching the fire. A small whirlwind came down the right-of-way, lifted the fire and threw it into the bush over the men's heads and, before it could be stopped, nearly a square mile of bush was burned. In dry, windy weather such a danger is always present, and it gives pause to those who are responsible for the administration when the promiscuous use of fire for clearing land after lumbering operations or on other occasions is advocated.

Clearing Right-of-way.

After a railway has been constructed and is in operation there will still be danger if the right-of-way is not kept cleaned up and the Railway Act of the Dominion provides (as do most of the provincial railway Acts in almost similar terms) that:

"The Company shall at all times maintain and keep its right-of-way free from dead or dry grass, weeds and other unnecessary combustible matter."

This provision of the Act has, at least in the newer districts, been more honored in the breach than in the observance, and yet it is one of the most critical and important measures in the prevention of forest fires in those newer districts. The Canadian Pacific Railway Company, in accordance with representations made by the Department of the Interior, are clearing up the right-of-way through British Columbia and the Rocky Mountains by contract, and are burning the debris at safe seasons. The failure of the Canadian Northern Railway to respond to similar representations was a contributing cause to the fires which did so much damage along the Prince Albert branch of that railway during the past spring.

The necessities of the case left no choice but an appeal to the Railway Commission to have the provision of the Act in this respect enforced. The question was brought to the attention of the Commission, and on the 15th August, 1910, an order was issued by the Board to the desired effect. After quoting the provisions of the Railway Act in regard to clearing the right-of-way of noxious weeds and combustible material, the order continues:

"Complaints continually come to the Board that these sections are not observed by some of the companies, casual observation in some parts of the country shows that Section 297 (in regard to the removal of combustible material) is being entirely overlooked. It is clear that many fires are communicated to adjacent lands by reason of companies not complying with these provisions of the law, entailing enormous loss. The Board deems it to be its duty to see that these sections are enforced, and to that end has given instructions that all railway lands shall be periodically inspected and full reports made of the conditions found to exist.

"This is a matter of vast moment in the preservation of timber lands as well as the protection of property of all kinds along railway lines and steps will be taken to enforce the law unless voluntarily complied with."

The immunity from fire of the forests along the lines of railway in Europe is partly due to their hauling lighter trains and using a better quality of coal, but it is largely due to the careful clearing and keeping clean of the right-of-way. In addition, however, the forest is kept clear of dead material, and on each side of the railway a path is kept cleared even of leaves and grass, and the surface is broken up so as to provide a fire-break for ground fires.

It will be necessary to clear the dead timber from lands outside the right-of-way in Canada if safety is to be assured, and when a permanent policy of forest reserves has been established the public interest will make it profitable to do so. Where the railway lines run through reserves, as in the Rocky Mountains Park, steps are being taken to carry out such work. With the vast stretches of forest land along railways in Canada and our uncertain forest policy it is futile to advocate the general adoption of such a plan.

There should be no confusion as to the position in regard to the railway right-of-way. The present right-of-way of usually one hundred feet is sufficient for forest purposes, if it is sufficient for railway purposes, and nothing better can be done than to bring the green timber up to the edge of the right-of-way, but the right-of-way and a considerable space on either side of the right-of-way should be thoroughly cleared of dead timber and combustible material.

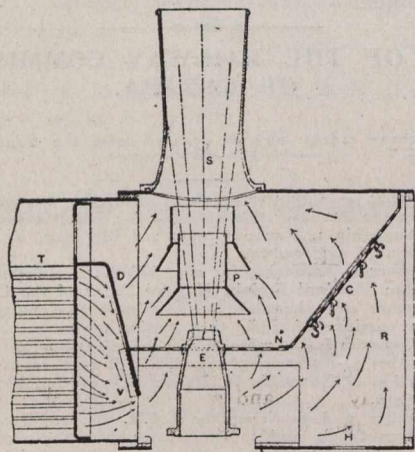
The burning of old ties along the right-of-way in a dangerous season is a frequent source of trouble and should be covered by regulation so that the burning should not be done in a time of danger. Most of the railways are regula-

ting this better now than they have in the past, but it is still a not infrequent cause of damage. Fires starting from such a cause would, however, be considered as caused by negligence and would render the company subject to action for damages under the common law.

Locomotive Equipment.

Sparks from the locomotives are the most frequent cause of fires along the railways. These may be caused by the use of inferior fuel. Wood or lignite coal will, with any screen or device, almost certainly throw fire from the smoke-stack, and it is in the newer districts back in the bush that railway companies are most likely to use such fuel. The regulations of the Dominion Railway Commission provide that no railway company subject to the legislative authority of the Parliament of Canada shall burn lignite coal on its locomotive engines as fuel for transportation purposes. Lignite coal is defined as including all varieties of coal the properties of which are intermediate between wood and coal of the older formations. The penalty for violation of this rule is a fine of twenty-five dollars, which hardly seems adequate.

The construction and equipment of the locomotive have much to do with the tendency to throw sparks. In England



Smoke-box or front-end of locomotive. (T, boiler-tubes; D, baffle-plate or diaphragm; N, netting, dividing smoke-box into upper and lower chambers; S, stack; E, exhaust-pipe. Arrows show direction of draft.)

the inclination has been to depend more on the plan of construction of the locomotive than on the arresting screens. In Canada and the United States screens are considered a necessity and are provided for by statutes and regulations. In the modern locomotive there is an extension smoke-box at the front end. Sparks passing through the boiler tubes forward toward the smoke-stack strike against a plate inclined downward, called a baffle plate, and are thrown to the bottom of the smoke-box whence they rise against the netting stretched across the smoke-box to divide it from the smoke-stack and are again thrown back, and so are dashed around until they are finally worn down small enough to pass through the openings of the nettings. The regulations of the Dominion Railway Commission provide that every locomotive engine having an extension smoke-box shall be equipped with netting mesh, the mesh to be not larger than 2½ x 2½ per inch of No. 10 Birmingham wire gauge, and to be placed in the smoke-box so as to extend completely over the aperture through which the smoke ascends,—the openings of the said mesh not to exceed a quarter of an inch and one-sixty-fourth of an inch to the square inch. When the diamond stack, the old style, is used, the mesh required is 3 x 3 per

inch of No. 10 Birmingham wire gauge and it must be placed across the stack so as to entirely cover it. The opening allowed in this case is three-sixteenths and one-sixty-fourth of an inch to the square inch.

The openings of the ashpan must be covered with iron dampers or net screens securely fastened, and the outflow pipes from the injectors must be put into the ashpans from April to October inclusive.

With these precautions and equipment it would appear as if the question of fires from locomotives was solved, but fires caused by locomotives still continue. Is it that the equipment is not sufficient, or that it is not used and kept in proper order?

The regulations of the Dominion Railway Commission provide that the locomotives shall be inspected by an official of the railway company at least once in every week to see that the equipment is in proper order. Yet fires occur, and when the fact that a locomotive is throwing sparks is brought to the attention of the railway company the invariable reply is that an inspection has been made and the locomotive and equipment are found in proper order. From this it would appear as if the equipment were not sufficient, and as the Railway Commission are satisfied that any decrease in the openings of the netting mesh would seriously interfere with operation, the efficiency of the equipment probably cannot be increased. And it may be frankly admitted that the evidence goes to show that, even with the best equipment, a heavily loaded locomotive on a steep grade or with an unskilful driver will throw dangerous sparks.

But is an ex parte inspection by the railway officials sufficient to show that the locomotives are properly equipped? It would seem as if an impartial inspection applied when the case of fire-throwing by a locomotive occurs would be the surest way and the most convincing to the public for determining this question. The Railway Commission has a force of qualified inspectors, but the smallness of the force compared with the extent of the Dominion makes it simply impossible to have a close or quick inspection. To assist towards a closer government inspection the Railway Commission has arranged to give authority to some of the permanent forest rangers in the Dominion service at divisional points on the railways to make inspections of locomotives so that inspections may be made immediately when a locomotive is reported to be throwing sparks. With this closer inspection and careful study of the equipment it may be possible to reach a solution of the problem which will give comparative safety.

The penalty for violation of the regulations in regard to equipment and inspection of locomotives is twenty-five dollars as against the company and fifteen dollars as against an employee.

Damages.

The Railway Act did not until 1903 contain any specific provision in regard to damages for fires caused by railway locomotives. It was apparently considered that the matter was governed by the common-law principle that no person should be permitted to use his property in such a way as to result in injury to his neighbor, and decisions in various Canadian cases were given on this principle. On this point being carried on appeal to the Imperial Privy Council in the case of the Canadian Pacific Railway Company vs. Roy, it was decided in 1902, in accordance with previous decisions in the English courts, that inasmuch as Parliament had given the railway companies authority to run locomotives they would not be liable for damages for doing so, provided no negligence was proved. It may be pointed out, however, that the wording of the Railway Act is to the effect that the railways may operate "by the power and force of steam" and

does not in so many words make lawful the running of locomotives, as the English Act does. The running of a locomotive without statutory authority or the running of a traction engine along a roadway would come under the common-law principle.

As the Railway Act requires the right-of-way of the railway to be kept clear of combustible material the failure of a railway company to keep its right-of-way cleared would amount to negligence at common-law and would make the company liable for the full amount of damages sustained. This would be the case whether the fire was set by a locomotive or otherwise, so long as it originated on the right-of-way. It might be caused by burning of the combustible material on the right-of-way for the purpose of clearing, but the company would still be liable for full damages.

But in cases where no negligence of this or some other nature was shown the railway company was not, according to the decision given, responsible for damages.

In 1903, therefore, the question was brought before Parliament by Mr. L. Philippe Demers, M.P., for St. John's and Iberville, who proposed a provision to make the railway responsible for damages caused by sparks from locomotives under the common-law principle, whether or not negligence was shown. The provision proposed was, however, modified into the following, which has also been included in most of the provincial railway Acts:

"Whenever damage is caused to crops, lands, fences, plantations or buildings and their contents by a fire started by a railway locomotive, the company making use of such locomotive, whether guilty of negligence or not, shall be liable for such damage and may be sued for the recovery of the amount of such damage in any court of competent jurisdiction: provided that if it be shown that the company has used modern and efficient appliances and has not otherwise been guilty of any negligence, the total amount of compensation recoverable in respect of any one or more claims for damage from a fire or fires started by the same locomotive and upon the same occasion shall not exceed five thousand dollars."

The company was also given an insurable interest in property along its route.

While this section does not expressly include forests and timber, damages have been obtained under it for timber and cordwood destroyed, so that it may be considered as sufficiently comprehensive though it would be better if made clearer on this point.

While the railways are a great public convenience, there does not seem to be any valid reason why they should not be subject to the common law in regard to damages in all particulars the same as any other company. It has been decided by the courts that the Dominion Parliament has authority to make enactments in regard to railways acting under Dominion charters, even in matters affecting property and civil rights, which under other circumstances would be wholly in provincial jurisdiction. If the Dominion statute withdraws these railways from the common law it would seem only right that the Dominion Parliament should supply the defect through its own jurisdiction.

It may be added that the Railway Commission has decided that it has no jurisdiction in damage suits.

Penalties.

It is expressly provided in the Railway Act that the imposition of penalties does not affect claims for damages. As has been noted previously, the penalties for infractions of the regulations of the Railway Commission in regard to equipment and inspection of locomotives and the quality of fuel are fixed by the Board at twenty-five dollars as against the company and at fifteen dollars as against the employee

These penalties are fixed under authority given the Board to provide penalties for offences against the regulations in cases where not already provided for in the Act, but not to exceed one hundred dollars. These penalties seem small, but if rigorously enforced under a close system of inspection may be sufficient as a deterrent, which is the object desired.

Where the regulations of the Commission do not provide penalty, as, for instance, in case of failure of the company to clear its right-of-way of combustible material, section 427 of the Railway Act will probably apply. This provides for a penalty of not less than twenty dollars and not more than five thousand dollars for any contravention of, or failure to comply with, the provisions of the Act or regulations by the company or any person acting for or employed by the company; and is intended to cover any case not otherwise provided for in the Act.

The burning of ties or the clearing of the right-of-way by fire at a dangerous time are not covered by the Railway Act or the regulations, and apparently would not be covered by any penalty.

There is room for improvement of the Act in the matter of penalties, as well as of damages, to make the penalties sufficient as a deterrent and to make them cover all possible items of danger.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

Copies of these orders may be secured from the Canadian Engineer for a small fee.

12178—November 4—Authorizing the C.P.R. Co. to construct an industrial spur for the Excelsior Coal Mining Co., Ltd., in southwest quarter of Section 30 Township 1, Range 5, west 2nd Meridian, at mileage 153.46, Portal Subdivision of said railway.

12179—November 4—Approving for a period of six months from the date of this Order, the Standard Freight Mileage Tariff of the C.P.R. Co.

12180—November 4—Authorizing the Esquimaux & Nanaimo Railway Co. to open for the carriage of traffic that portion of its line of railway from Wellington to Cameron Lake, mileage 77.3 to mileage 107.6.

12181—November 5—Authorizing the G.T.P. Branch Lines Co. to divert the road in Section 13, Township 12, Range 16, west 2nd Meridian, District of Assiniboia, Sask.

12182—November 5—Authorizing the C.P.R. Co. to divert and change the level of Silver Creek, and to construct across the right-of-way lands of the G.T.R. a six-foot concrete arch culvert, the existing culvert to be filled in.

12183—November 5—Authorizing the C.P.R. Company to cross with the line and tracks of its Moose Jaw North Westerly Branch, the located line of the C.N.R. in Section 17, Township 30, Range 14, west 3rd Meridian, Saskatchewan, at mileage 159.65, on said Moose Jaw North Westerly Branch.

12217—November 3—Authorizing the C.N.O.R. Company to construct its railway across the public road on Lot 410, East North River Range, Parish of St. Andrews, County Argenteuil, station 695.50.

12218—November 8—Authorizing the corporation of the city of Peterboro' to lay a sewer under the G.T.R. where the same crosses Smith Street, Peterboro'.

12219—November 9—Authorizing the Ottawa Electric Company to erect electric wires across the C.P.R. at its engine house near the Rideau River.

12220—November 7—Approving of revised location of part of the C.P.R. Company's Regina, Saskatoon and North Saskatchewan Branch from mile 26.35 to mile 28.56, Province Saskatchewan.

12221—November 9—Approving amended location of the G.T.P. Branch Lines Company's Regina-Boundary Branch from mile 0 to mile 10.407, Province of Saskatchewan.

12222—November 9—Authorizing the C.N.O.R. Company to construct a bridge over the Moira River, Belleville, Ontario.

12223—September 27—Authorizing the C.N.O.R. to connect its lines and tracks, temporarily, with the lines and tracks of the G.T.R. Company (Midland Branch) at Port Hope, Ontario.

12224—November 7—Approving the character of the work, as well as specifications of the "Parrott Drain" to be constructed under the tracks of the Pere Marquette Rd. Co. in the Township of Harwich, County Kent, Ontario.

12225-26—November 9—Authorizing the corporation of the town of Walkerton, to lay a water pipe under the track of the Walkerton & Lucknow Railway Company, where the same crosses Orange Street, Walkerton, Ontario.

12227—November 9—Authorizing Joseph Auclair, of St. Hilaire, to lay a water pipe across the G.T.R. in Lot 130, Parish of St. Hilaire.

12228—November 10—Authorizing the Tilsonburg, Lake Erie and Pacific Railway Company to change, deviate, and alter its branch line of railway as located along Victoria Street, Ingersoll, Ont.

12229—November 9—Authorizing the Georgian Bay & Seaboard Railway Company to construct its railway across five highways in Township of Medonte; one highway between Townships of Medonte and North Orillia; eight highways in Township North Orillia; and six highways in the Township of South Orillia, Ont.

(Continued on Page 643.)

ROADS AND PAVEMENTS

QUEBEC PROVINCIAL TREASURER DISCUSSES GOOD ROADS.*

Good roads are absolutely necessary to agricultural life; bad roads are a brake on the wheels of progress, and if the actual loss could be computed, the farmers would be appalled if they could be shown the figures of their losses through bad roads, and the money lost to the municipalities in consequence of making and maintaining them by crude and defective methods.

The various governments of the province had attended to the creation of great commercial arteries, but the time has come when the question of improving the rural highways must be considered. No government can be expected to assume the entire burden, as the making of roads must be regarded as purely a municipal undertaking, but the government can encourage the municipalities and stimulate them to undertake the work and improve their methods.

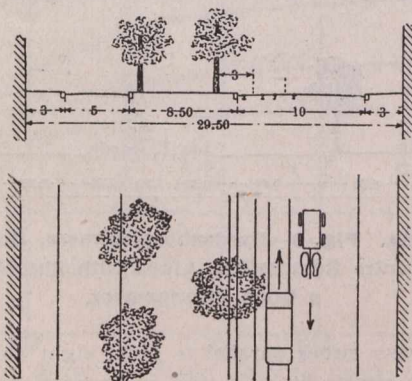
The day is within measurable distance when this community and all other communities will be relieved from the incubus of tall bridges, turnpike trusts—these relics of a primitive civilization.

*Extracts from an address by Hon. P. S. G. Mackenzie, Treasurer for Quebec.

CITY DESIGN AND TRANSPORTATION.*

By M. Wattman, Manager of the Municipal Tramways of Cologne.

One of the marked characteristics of the last few decades, both in Europe and America, is the rapid growth of city population in contradistinction from country population. The attractions which a city affords to those of leisure in the way of pleasure and intellectual pursuits, the opportunities which it offers to the working classes in the diversity and extent of



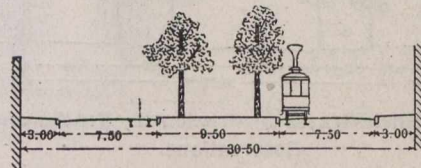
City Planning. Fig. 1—Centre Reservation with Tracks on One Side.

employment, and the advantages which it provides to manufacturers in the way of shipping facilities and to the public in general in the conveniences of shopping, are making city residence very desirable to all classes. In fact, this has be-

*Abstract of a report presented at the meeting of the International Street and Interurban Railway Association, Brussels, September 6-11, 1910.

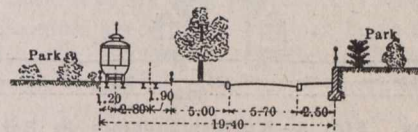
come so distinctly the case that municipal questions are among the most important sociological problems of the age.

The most serious of these problems is the housing of the inhabitants. Even the well-to-do can afford to occupy only a small expanse of the ground area and are obliged to live in most cases in apartments rather than in individual houses. The congestion in the poorer sections of the city is necessarily far greater and in the poorest districts municipal authorities are often unable to secure the thorough enforcement of even



City Planning. Fig. 2—Centre Reservation with Tracks on Each Side.

the most elementary laws of health and sanitation. The impossibility of lateral expansion has forced an expansion upwards, with the inevitable deprivation to a large proportion of the population of the amount of light and air which the laws of health require. The ultimate effect of this, especially upon children, cannot be negligible. An environment of narrow courts, dark stairways, small and crowded rooms, must be detrimental to the physical and moral development of the rising generation.



City Planning. Fig. 6—Street in Königsberg Alongside of Parks.

The greatest need of our large cities is in the reduction of this evil through lateral expansion, which is made possible only by means of adequate and rapid transportation. With horse cars but little relief could be afforded, but the development of electric railways during the past 20 years provides

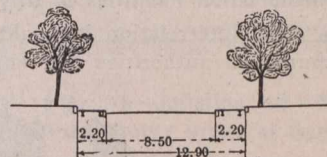


Fig. 4—Street in Dusseldorf; Tracks on Side Reservations.

a possible solution of this problem because it increases enormously the space available for city expansion.

Dependence of Community on Electric Cars.

It is difficult to determine the proportion of people who use the electric cars to go from one point to another within the city in preference to other means of movement, but a few figures which have been compiled will be of interest. These figures were obtained by making a record of the number of persons travelling in tramway cars, in other vehicles, by bicycles and on foot, on typical days, past different important points in the cities mentioned.

A record taken at two important points in Copenhagen during November, 1907, shows: number in vehicles, 3,181;

on bicycles, 4,153; foot passengers, 22,289; in tramway cars, 12,000. In other words, the tramway cars carried 29 per cent. of the total number of the persons passing the two points considered. At Aix-la-Chapelle during a fête on July 19th, 1909, a record was made at ten different points and it was found the number of persons travelling in the tramway cars was 259,574, or almost 50 per cent. In Dresden a similar record was made in 1908 at one of the principal bridges connecting the two parts of the city, and over 50 per cent. were

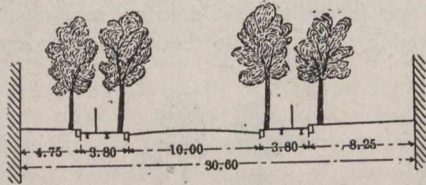
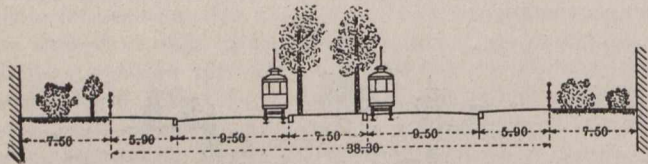


Fig. 5—Rheinstrasse in Friedenau; Tracks on Side Reservations.

found travelling by electric cars. A record made September 18th, 1908, in Lucerne showed 20 per cent. In Cologne a count made on two bridges crossing the Rhine showed only 12 per cent. foot passengers and 88 per cent. tramway passengers.

In general it can be stated that the number carried in the tramway cars is between 20 and 50 per cent. of the entire circulation, and this percentage under special conditions will become much larger, as in the case cited in Cologne. It is safe to say, therefore, that in large cities the tramway system

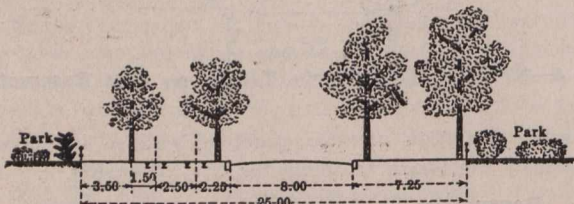


City Planning. Fig. 3—Kurfurstendamm in Berlin; Track Too Near Trees.

occupies a preponderating position in local communication and that its proper and logical development and extension not only have a most important bearing on the development of the city which it serves, but that the expansion of the city is directly affected by the layout of the transportation system, the service given and the speed attained on these cars.

Relation of Transportation Facilities to City Planning.

Owing to this close interrelation it would seem almost self-evident that municipal authorities and engineers would

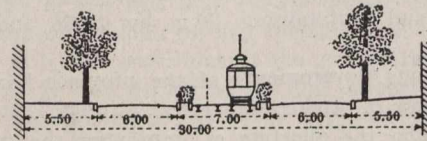


City Planning. Fig. 7—Wide Street in Königsberg Alongside of Parks.

obtain the collaboration and advice of the representatives of their local railway systems whenever new portions of the city are laid out so as to determine the best way of serving these sections by tramways. Somewhat strange to say, this is rarely done. Of the 73 companies which have replied to the data sheet of the committee on this subject, 60, or 70 per cent. stated that they possess no influence with the municipal

authorities in regard to this matter, and are never consulted when new streets are laid out. Twelve companies reported that they are consulted in regard to the transportation features in work of this kind when it is supposed that they have an interest in furnishing the service. Finally the officers of 10 tramways, for the most part municipal enterprises, are asked regularly to assist in the establishment of plans of this kind.

This condition of affairs undoubtedly explains the very grave errors made in the offices of municipal architects when it comes to providing transportation facilities in new districts.



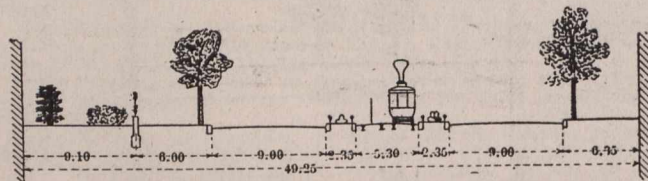
City Planning. Fig. 8—Agnes-Bernauerstrasse in Munich; Tracks in Reservation, Lined with Shrubbbery.

Undoubtedly the intentions of these architects are the best, but by ignoring what in a sense is the most important and vital part of city planning they make mistakes which forever handicap and hamper the district which they have laid out.

An unfortunate feature of the entire situation is that in older portions of the city all transportation has to be furnished under conditions originally designed for animal traction. It is impossible materially to alter this situation, but in the newer portions of the city full advantage could and should be taken of the great flexibility and adaptability of design possessed by the electric railway system. As will be explained later, among the points which municipal architects through ignorance of the practical conditions of electric railway operation are apt to overlook are the following: width of roadway; position of tracks in the streets; facilities for the establishment of car houses so as effectively to serve the different lines operated by them; facilities for turn-outs and cross-overs; locations of crossings; number of railway lines required to serve the communities of different size, etc.

The Modern Science of City Planning.

Modern ideas in city planning, very wisely, no longer favor the old idea of the rectangular arrangement of a city



City Planning. Fig. 9—Hardenbergerstrasse, Berlin; Tracks on Centre Reservation, Lined with Shrubbbery; a Good Arrangement.

with all streets either parallel to or at right angles to each other. Such streets not only give an impression of monotony but their busy corners constitute serious obstacles to the circulation of traffic. Two streams of pedestrians, carriages, bicyclists, electric cars, etc., one on the cross street, the other on the longitudinal street, are forced into the narrow confines of a crossing no broader than each of the streets which meet at that point. The result is not only danger but a cause of delay to all.

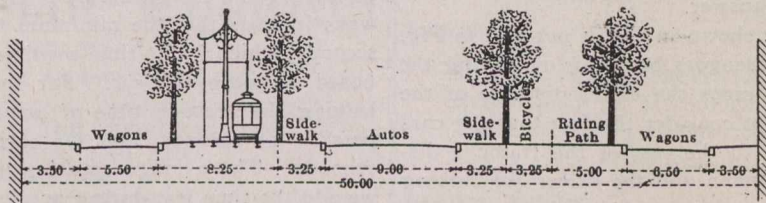
Modern city architects seek not only to give their creations a picturesque appearance by avoiding so far as possible the interminable perspective presented by a long and straight street, but also to arrange the crossings of the important

thoroughfares in such a way as to avoid congestion. The former effect is accomplished by interrupting the straightness of the streets by angles or turns, and by the introduction of squares and plazas, and the latter by providing broad thoroughfares at intervals, still further widening them where they cross other important streets. These broad thoroughfares naturally become the commercial streets of the city, whereas the cross streets are naturally better suited for residential purposes. In the latter greater liberty can be taken in departing from straight lines, whereas the business streets

better, however, to have the space on each side of the track wide enough to admit the passage of two vehicles side by side or the passage by one carriage of another standing close to the curb. This means a width of street of from 50 ft. to 55 ft., and if the vehicle traffic does not trespass too frequently on the space reserved for the cars the latter can operate at from 12 to 15 m.p.h.

Reservations.

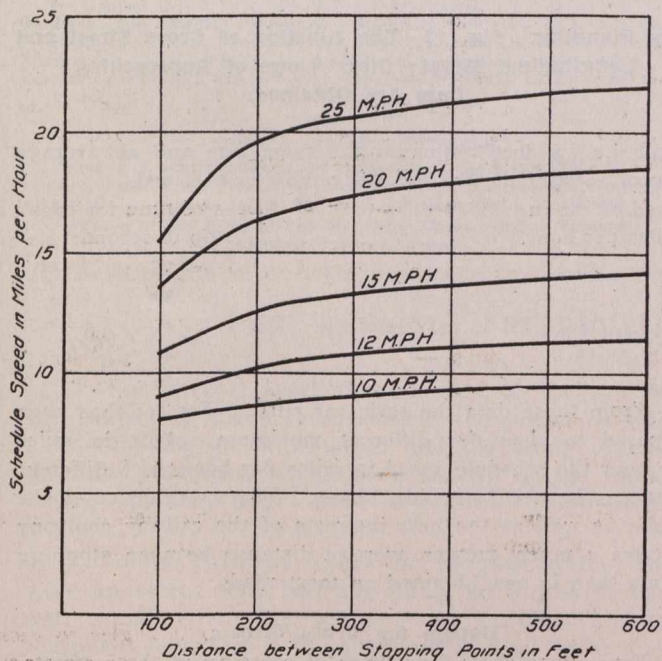
The next step is to provide more or less of a reservation for the cars. This plan will greatly reduce collisions be-



City Planning. Fig. 10—Boulevard Between Lille, Roubaix and Tourcoing, with Roadway, Riding Path, Sidewalk, Auto Road and Trolley Tracks.

should be arranged so as to facilitate traffic as far as possible. It is indispensable, however, in all work of this character for the engineer or commissioner in charge to realize that the new city or portion of the city which he is designing is not merely a work of art. It is primarily an object of utility and will lose its value if its artistic features hamper or obliterate its useful qualities. Some of the more important of these points, so far as they concern transportation by electric cars, will now be discussed.

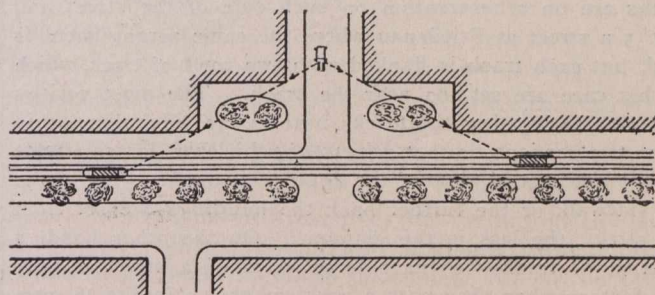
tween cars and vehicles. Accidents of this kind can be divided into two classes; one in which the vehicle is crossing the track from a side street and the other in which the vehicle is struck from behind by the car. Of these, the former is not only much less common, because the driver of the vehicle is in a position to see an approaching car, but the consequences are apt to be less serious because the driver is less liable to be pitched forward onto the tracks. A collision between a carriage and a car going in the same direction is impossible if the tracks are on a reservation. When laid in this way, the maximum speed of the cars can be 20 m.p.h., and if the precautions described later are adopted there is no reason why the speeds cannot be raised to 25 m.p.h. with no more danger than at present. Such reservations can be paved, as on Bismarckstrasse in Berlin, or turfed, as on Hartenberger-



City Planning. Fig. 11—Diagram Showing the Relation Between Schedule Speeds, Distance Between Stopping Points and Maximum Speeds.

Width of Streets.

The first consideration is the width of the streets. With tracks in the middle of the street and room on each side for one line of carriages the street should have a width of from 33 ft. to 35 ft. when the width of the car is about 7 ft. Cars can make a maximum speed of 10 m.p.h. on such streets even if there is considerable traffic, and if the street was slightly wider could make from 11 to 12 m.p.h. It is much



City Planning. Fig. 16—Junction of Cross Street and Longitudinal Street; Views of Cars Hidden by Shrubbery.

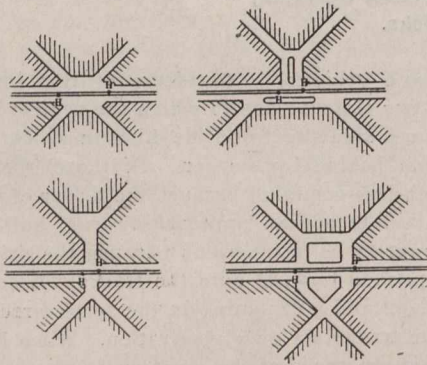
strasse. The cost of track construction and track maintenance on reservations of this kind is, of course, less than in paved streets because T-rails on wooden ties can be used. Typical sections of streets, some with reservations, are presented. The dimensions in all cases are in meters.

Fig. 1 shows a very common construction in which the area in the centre of the street is reserved for pedestrians and the two tracks are at one side of this reservation. The chief objections to this plan are that access of passengers to the cars operating on the right-hand track is not easy. It will also be noticed that the cars on one track travel in an opposite direction to the traffic.

Fig. 2 shows an arrangement in which there is a track on each side of the reservation. When these trees are lindens,

maples, elms or chestnuts, the maximum distance between the nearest rail to the trees should be not less than 10 ft. Otherwise it will be necessary to trim the trees so much as to injure their appearance. Access to the cars from the sidewalks is rather difficult and the separation of the tracks makes the installation of cross-overs awkward. Fig. 3 shows a section of Kurfurstendamm, in Berlin, where the reservation was so narrow that the trees had to be trimmed excessively. When the two tracks are placed on the same side of the reservation the width of the roadway should be 33 ft. to allow carriages to pass. When they are separated by the reservation 23 to 24 ft. will answer.

Neither the arrangement shown in Fig. 1 nor that in Fig. 2 is very satisfactory for passengers boarding or leaving the cars, as they are obliged to cross the entire distance of the roadway. The writer does not consider the fact that the cars run in an opposite direction to the rest of the traffic a disadvantage, because the motorman and the driver are looking toward each other and collisions are much less liable to occur than if they were going in the same direction.



City Planning. Figs. 12 to 15—Incorrect and Correct Methods of Planning Plaza; the Points Marked H Show the Proper Stopping Points for the Cars.

Fig. 4 shows a section of a street at Düsseldorf where the tracks are on a reservation on each side of the street and Fig. 5 a street at Friedenau where the same arrangement is used, but each track is flanked with two rows of trees, which in this case are set too near the track. The most serious objection to locating the tracks next to the sidewalks, as in these two sections, is that drivers of vehicles on cross streets cannot get a good view of the approaching car. The wider the sidewalk or the further back the buildings are set from the street, the less is this danger. On the other hand, a location of tracks on the side or sides of a street is very satisfactory when they pass a park, as shown in Fig. 6, provided the shrubbery in the park is not so high as to conceal a view of the approaching car. The arrangement shown in Fig. 6 is used in Königsberg. The objection has been raised that the location of the track next to the sidewalk interferes greatly with the operation of wagons delivering merchandise to residences. Personally the writer does not think this objection serious as he has seen this system of construction used satisfactorily even in commercial streets.

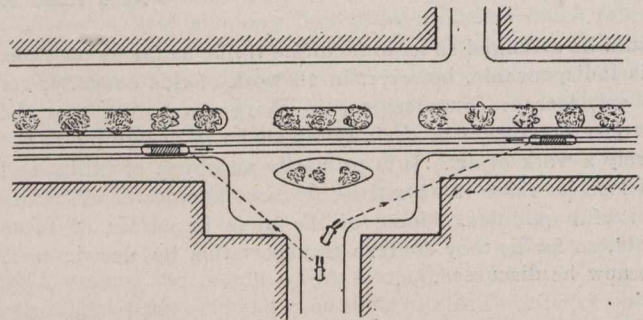
Fig. 8 shows a system of centre reservation used in Munich. Here the vegetation on the reservation is limited to grass and shrubbery. A somewhat similar arrangement in Berlin is shown in Fig. 9. These plans are admirable from every point of view because the reservation is broad enough to admit of aisles of safety. From an esthetic standpoint also the arrangement is an attractive one.

A most elaborate system of reservation is that adopted on a boulevard 165 ft. wide between Lille, Roubaix and Tourcoing

(see Fig. 10). Separate portions of the roadway are reserved for wagons and other vehicles, for pedestrians, for bicycles, for persons on horseback, for automobiles and for the electric railway cars. The boulevard is about 12 miles long and in the form of a Y.

The Effect of Stops on Maximum and Schedule Speed.

The time required to make a stop can be divided into the time lost while braking, the time lost while accelerating and the actual time during which the car is not in motion. The latter in turn varies with the number of passengers boarding or leaving the car. Observations made on the Cologne tramways indicate that the minimum length of absolute stop is 5 seconds, which is the time required for only one passenger to board or leave the car. For two passengers boarding or leaving the average time of actual stop is 9 seconds, for 3 persons 12 seconds, and for each additional person 2 to 3 seconds. The average actual stop is 10 seconds. If to this we add the time lost during accelerating and braking as compared with that of the car if it had made no stop, we obtain the total time lost by a stop. Assuming an acceleration of 1



City Planning. Fig. 17—The Junction of Cross Street and Longitudinal Street; Clear Views of Approaching Cars Are Obtained.

m.p.h.p.s., a deceleration at the same rate and an average stop of 10 seconds, the following table is obtained.

Speed of car in miles per hour.	Loss of time for each stop in seconds.
25	35
20	30
15	25
12	22
10	20

From these data the series of curves, Fig. 11, has been prepared to show for different maximum speeds in miles per hour the schedule speed in miles per hour, with different distances between stopping places. The convenience of the public as well as the best interests of the railway company dictates a much greater average distance between stopping points than is now obtained on most roads.

Design for Cross Streets.

Figs. 12-15 show four types of crossing of three streets. Fig. 12 is the old method of designing a crossing of this kind. The streets meet in a plaza, but the plan is objectionable from a transportation standpoint, because a car can cross the plaza only at reduced speed. The designs shown in Figs. 13, 14 and 15 are much superior. The proper points for stopping the car in each case are marked H in the drawings.

Fig. 16 shows an undesirable method of making a junction of a cross street with a main street, because the approaching cars are concealed by the shrubbery. Fig. 17 is a much better arrangement.

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FIRE RANGING: PRESERVATION OF NATURAL RESOURCES.

For several years the question of the preservation of Canada's natural resources for the nation has been the subject of much discussion in the press, in technical societies and before especially appointed commissions. The compiling of information and the study of existing conditions were doubtless necessary, but we do think that the provinces, which have control of the forest wealth of Canada, have had information enough so that before this they might have successfully disposed of that perennial problem—the organization of a fire ranging staff.

In the past the forest fire ranging system has been almost altogether a patronage organization. Men were appointed who had absolutely no fitness or experience or knowledge of the country. The rangers who were appointed for the few summer months were not selected because of their qualifications, but for political reasons solely, and it is commendable that in at least one province, Ontario, the Minister of Forests recognizes that the timber areas are too great an asset to be so lightly dealt with and inefficiently protected.

To those who spend part of their summer months in the woods it is well known that many of the fire rangers leave their regular beats for pleasure trips, and on other occasions do not leave their lodge at all, but fill in their daily reports after imaginary inspections. Too often these season appointments are grasped by young fellows, who expect to have at the expense of the province a pleasant summer's holiday, and it is gratifying to know that from this out the Department will treat these appointments as appointments of trust and responsibility, and that under the plans for remodelling of this Department experienced bush rangers with a sense of duty and responsibility will be selected, and it is to be hoped that in addition to patrolling the forests in the summer to put out fires the system will be extended to patrolling of licensed areas in winter to enforce the piling and burning of brush and to prevent the unnecessary slashing of the young forest.

A preservation that prevents waste will be much more popular and efficient than a policy that attempts to preserve natural resources by withdrawing them from useful commercial purposes.

DEVELOPMENT IN MECHANICAL EXCAVATORS.

The increasing cost of labor, the difficulties of securing navvies for excavation work, and the demand for the early completion of contracts have rendered impracticable the methods in use twenty years ago on excavation work.

Necessity has been the mother of invention, and, as the cost of labor has increased, the development of steam, gasoline and electric-propelled excavating machinery has been very marked.

A dozen years ago the steam shovel was welcomed by the railroad and canal builders because of the rapid work it would accomplish by the aid of the minimum laborers, but the steam shovel of to-day is such a highly perfected machine that it has over double the capacity of the steam excavators of ten years ago.

In America perhaps the greatest influence on the development of this machine has been the excavation work on the Panama Canal. Located on this work there are fifteen 105-ton machines and thirty-two 95-ton machines. Working under the one management, competition in the design and operation has developed the efficiency of the operator and improved the methods of working and of the design. The Canal Record reports the loading of three hundred and thirteen 10-cubic-yard cars in 370 minutes.

The tendency of late years in the design of excavators has been to specialize. For cramped work, such as cellars, tunnels and narrow cuts, excavators which can make a complete circle have been designed in many types. Here quickness of operation has been sacrificed at the expense of large dippers. On canal work, wide-cut work and dredging the dippers have been increased from a yard and a half to two and a quarter, and now we find the largest shovels with five-yard dippers. Of course, these large dippers require heavy parts and immense bodies to the machine, that consideration must be given to the quantity of the material or roadbed for which the machine operates.

The great industrial developments of the last few years, the difficulty of persuading laborers to leave the cities, where they hive like bees, and the number of large strikes that have delayed work, have all had a tendency to encourage the contractor in the purchasing of excavating machinery.

THE COST OF CIVIC GOVERNMENT.

The probable cost of operating the affairs for New York city during 1911 will be almost \$172,000,000. An analysis of the distribution of this cost is rather interesting, and it is surprising the small amount that is spent out of each dollar on public health, streets and such public utilities as water, gas, and electric light.

Taking a dollar as the unit over a quarter, or, to be more accurate, twenty-nine cents out of each dollar goes towards paying off the sinking fund and interest on the public debt.

Seventeen cents is spent for education, while police and fire protection require fourteen cents.

For street cleaning it requires four cents of every dollar. Water, gas and electric light take another four cents, parks two cents, and Board of Health two cents.

From this it will be seen that twelve cents out of every dollar is spent, directly or indirectly, by the Works Department.

EDITORIAL NOTES.

Very interesting decision has been given under the Municipal Act by which Dr. J. S. McCallum, mayor of Smith's Falls, Ont., has been dismissed from office and ordered to pay court costs because he sold four hundred bags of cement to the contractors who had the contract from the corporation to lay granolithic sidewalks. It is not claimed that there was any intention of fraud, but simply that the transaction was contrary to the clear meaning of the Municipal Act.

* * * *

The fifty-fourth annual report of the Water and Sewerage Department of St. John, N.B., together with the city engineer's report for 1909, contains in addition to the information of local interest a report by William Murdoch, Mem. Can. Soc. C.E., on the organization and administration of a number of Canadian and American cities which he visited during the early part of 1909.

* * * *

The Canadian Cement and Concrete Association are arranging to hold their third annual convention and exhibition in the city of Toronto on January 16th, 17th, 18th, 19th and 20th, 1911. Effort is being made to secure exhibits much more general than those that have hitherto been arranged for. Further details may be expected shortly from the officers of the association. Mr. R. E. W. Hagarty, of 662 Euclid Avenue, Toronto, has charge of the details of this convention.

PRECIPITATION FOR OCTOBER.

Precipitation was in excess of the average, except in a very few localities, from Algoma eastward to the Maritime Provinces, and also throughout British Columbia, while from Lake Superior westward to the Mountains there was a very general deficiency. Light snowfalls occurred on several dates in the Western Provinces, and about the 27th to 30th in parts of Ontario.

The table shows for fifteen stations included in the report of the Meteorological Office, Toronto, the total precipitation of these stations for October.

Ten inches of snow is calculated as being the equivalent of one inch of rain:—

Station.	Depth in inches.	Departure from the average of twenty years.
Calgary, Alta.	0.50	+ 0.01
Edmonton, Alta.	0.50	— 0.26
Swift Current, Sask.	0.40	— 0.31
Winnipeg, Man.	0.80	— 0.72
Port Stanley, Ont.	4.70	+ 1.92
Toronto, Ont.	2.23	— 0.47
Parry Sound, Ont.	4.80	+ 1.14
Ottawa, Ont.	4.10	+ 1.85
Kingston, Ont.	5.20	+ 2.50
Montreal, Que.	4.80	+ 1.70
Quebec, Que.	4.70	+ 1.61
Chatham, N.B.	3.80	+ 0.71
Halifax, N.S.	8.60	+ 3.03
Victoria, B.C.	5.10	+ 2.84
Kamloops, B.C.	0.70	+ 0.17

FILING LOCATION PLANS, SECTION 159.

The Board of Railway Commissioners state that hereafter with every application by a railway for approval of a location, or deviation of a location, there shall be filed with the Board an affidavit by a competent engineer that the proposed location or deviation is not at any point more than one mile from the route approved by the Minister of Railways and Canals.

RURAL TELEPHONE COMPANIES IN SASKATCHEWAN.

The following rural telephone companies were incorporated in Saskatchewan during 1909-1910.:

Name of Company.	Incorporated.
Florence Rural Telephone Company	Jan. 13, 1909
South Antler Rural Telephone Company.....	Jan. 13, 1909
Silverton Rural Telephone Company.....	Jan. 18, 1909
Stoney Beach Rural Telephone Company....	Feb. 4, 1909
Wascana Rural Telephone Company.....	Feb. 20, 1909
Tregarva Union Rural Telephone Company..	Feb. 23, 1909
Victoria Rural Telephone Company.....	Mar. 2, 1909
American-Canadian Rural Telephone Company	Mar. 5, 1909
North Regina Rural Telephone Company...	Mar. 10, 1909
The Foster Rural Telephone Company.....	Apr. 2, 1909
North Carievale Rural Telephone Company.	Apr. 20, 1909
Boggy Creek Rural Telephone Company....	Apr. 22, 1909
Thunder Creek Rural Telephone Company..	Apr. 22, 1909
The Foam Lake Rural Telephone Company.	Apr. 30, 1909
Wall Lake Rural Telephone Company.....	May 12, 1909
Riverside Rural Telephone Company.....	May 15, 1909
The Alameda Rural Telephone Company....	May 19, 1909
The Hay Creek Rural Telephone Company..	May 19, 1909
The North Portal Rural Telephone Company.	May 25, 1909
The International Rural Telephone Company.	May 25, 1909
Eastview Rural Telephone Company.....	May 27, 1909
Allan Rural Telephone Company.....	June 1, 1909
The Bee Line Rural Telephone Company...	June 1, 1909
Moosomin East Rural Telephone Company..	June 1, 1909
Golden Flat Rural Telephone Company....	June 9, 1909
Moosomin Rural Telephone Company.....	June 9, 1909
The Fairview Rural Telephone Company...	June 15, 1909
Central Rural Telephone Company.....	June 18, 1909
Ellisboro Rural Telephone Company.....	June 18, 1909
Rose Plain Rural Telephone Company.....	June 18, 1909
Pheasant Hills Rural Telephone Company...	July 13, 1909
The Condie Rural Telephone Company.....	July 13, 1909
The Oxbow Farmers' Rural Telephone Company	July 13, 1909
South Regina Rural Telephone Company....	July 17, 1909
Bienfait Rural Telephone Company.....	July 20, 1909
The Lac qui Parle Rural Telephone Company	July 24, 1909
The Hanley Rural Telephone Company.....	July 28, 1909
The Elmore Rural Telephone Company.....	July 28, 1909
The McTaggart Rural Telephone Company.	July 28, 1909
The Govan Rural Telephone Company.....	Aug. 18, 1909
Kenlis Rural Telephone Company.....	Aug. 19, 1909
Spring Coulee Rural Telephone Company...	Aug. 24, 1909
Cobourg Rural Telephone Company	Aug. 31, 1909
The Glen Ewen Rural Telephone Company.	Sept. 17, 1909
The Sedley Rural Telephone Company.....	Oct. 27, 1909
Capital Rural Telephone Company.....	Nov. 24, 1909
The Sunny South Rural Telephone Company.	Jan. 24, 1910
The Wide Awake Rural Telephone Company.	Jan. 24, 1910

The Rose Valley Rural Telephone Company. Jan. 24, 1910
 The Broadway Rural Telephone Company.. Jan. 27, 1910
 The Rough Bark Rural Telephone Company. Feb. 14, 1910

VANCOUVER BRANCH, CANADIAN SOCIETY OF CIVIL ENGINEERS.

At the annual meeting of the Vancouver branch of the Canadian Society of Civil Engineers, held on November 7th, protest was made against the appointment by the civic authorities, for a term of five years, of an American firm of consulting engineers. It was stated that, so far as the local society was aware, the finance committee of the city council had made no enquiry as to the appointment of Canadians. The committee reported that it had not been permitted to address the city council on the subject, although the chairman of the finance committee had said that full opportunity would be given to address that body, and the matter was referred back to it by the council. This notice was so short that the committee could not be got together, so the recommendation was tabled for a future meeting. It was suggested at this meeting of engineers that even if a consulting engineer could not be had in Vancouver to meet the requirements of the council of the city, there were certainly many in eastern Canada who would be thoroughly acceptable.

This same firm of American engineers is also engaged to submit plans for the bridge to be built by the Provincial Government across the Thompson River at Walhachin, near Kamloops, and a protest was also entered in this instance. The statement was made at the meeting that when Premier McBride and Attorney-General Bowser were acquainted with the fact they expressed surprise, and were decidedly not in favor of it.

The design for the bridge to span Burrard Inlet at the second narrows is also by the same firm, and it was cause for some jocularity that the design was one for a style that is considered out of place. It is for a lift bridge, and in Mr. G. H. Webster's opinion, this type is not suitable for the heavy traffic, such as will take place at the narrows. He only knew of two such bridges on this continent, and one had been dismantled and replaced by a bascule bridge. The other was over the Chicago River at Halstead Street, and had been found inadequate for the purpose. After discussion, it was decided that the subject should not be agitated until the society is in possession of fuller information regarding the proposed bridge. A committee was appointed consisting of Messrs. C. E. Cartwright and C. E. Cooper, to secure data in the matter.

Mr. William Dart read a scientific paper entitled, "The Influence of Light on Concrete Pipe." It was of a technical nature and submitted considerable evidence to the effect that the solar rays have a very noticeable detrimental effect on the crystallization of the cement. In the course of his address, Mr. Dart exhibited some remarkable effects in photography which had been done with the solar rays of the ultra group, with the visible spectral rays entirely excluded. Skies were black, foliage white, and shadows which appeared in corresponding photographs of the ordinary kind, disappeared entirely. In a subsequent second section, Mr. Dart will take up the commercial aspects of concrete manufacture.

Officers appointed at the meeting were: Chairman, Mr. George H. Webster; secretary and treasurer, Mr. H. K. Dutcher; executive committee, Messrs. C. E. Cartwright, J. C. Kennedy, and H. Bayfield.

ENGINEERING SOCIETIES.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—413 Dorchester Street West, Montreal. President, Col. H. N. Ruttan; Secretary, Professor C. H. McLeod.

Chairman, A. E. Doucet; Secretary, P. E. Parent. Meetings held twice a month at Room 40, City Hall.

TORONTO BRANCH.

96 King Street West, Toronto. Chairman, A. W. Campbell; Secretary, P. Gillespie, Engineering Building, Toronto University, Toronto. Meets last Thursday of the month.

MANITOBA BRANCH.

Chairman, J. E. Schwitzer; Secretary, E. Brydone Jack. Meets first and third Fridays of each month, October to April, in University of Manitoba, Winnipeg.

VANCOUVER BRANCH.

Chairman, Geo. H. Webster; Secretary, H. K. Dutcher, 40-41 Flack Block, Vancouver. Meets in Engineering Department, University

OTTAWA BRANCH.

Chairman, A. A. Dion, Ottawa; Secretary, H. Victor Brayley, N. T. Ry., Cory Bldg.

MUNICIPAL ASSOCIATIONS.

ONTARIO MUNICIPAL ASSOCIATION.—President, Mr. George Geddes, Mayor, St. Thomas, Ont.; Secretary-Treasurer, Mr. K. W. McKay, County Clerk, St. Thomas, Ontario.

UNION OF ALBERTA MUNICIPALITIES.—President, H. H. Gaetz, Red Deer, Alta.; Secretary-Treasurer, John T. Hall, Medicine Hat, Alta.

THE UNION OF CANADIAN MUNICIPALITIES.—President, W. Sanford Evans, Mayor of Winnipeg; Hon. Secretary-Treasurer, W. D. Light-hall, K.C., ex-Mayor of Westmount.

THE UNION OF NEW BRUNSWICK MUNICIPALITIES.—President, Mayor Reilly, Moncton; Hon. Secretary-Treasurer, J. W. McCready, City Clerk, Fredericton.

UNION OF NOVA SCOTIA MUNICIPALITIES.—President, Mr. A. E. McMahon, Warden, King's Co., Kentville, N.S.; Secretary, A. Roberts, Bridgewater, N.S.

UNION OF SASKATCHEWAN MUNICIPALITIES.—President, Mayor Hopkins, Saskatoon; Secretary, Mr. J. Kelso Hunter, City Clerk, Regina, Sask.

CANADIAN TECHNICAL SOCIETIES.

ALBERTA ASSOCIATION OF ARCHITECTS.—President, E. C. Hopkins, Edmonton; Secretary, H. M. Widdington, Strathcona, Alberta.

ASSOCIATION OF SASKATCHEWAN LAND SURVEYORS.—President, J. L. R. Parsons, Regina; Secretary-Treasurer, M. B. Weeks, Regina

ASTRONOMICAL SOCIETY OF SASKATCHEWAN.—President, N. McMurphy; Secretary, Mr. McClung, Regina.

BRITISH COLUMBIA LAND SURVEYORS' ASSOCIATION.—President, W. S. Drewry, Nelson, B.C.; Secretary-Treasurer, S. A. Roberts, Victoria, B.C.

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.—President, Charles Kelly, Chatham, Ont.; Secretary, W. A. Crockett, Mount Hamilton, Ont.

CANADIAN CEMENT AND CONCRETE ASSOCIATION.—President, Peter Gillespie, Toronto, Ont.; Vice-President, Gustave Kahn, Toronto; Secretary-Treasurer, R. E. W. Hagarty, 662 Euclid Ave., Toronto.

CANADIAN CLAY PRODUCTS' MANUFACTURERS' ASSOCIATION.—President, W. McCredie; Secretary-Treasurer, D. O. McKinnon, Toronto.

CANADIAN ELECTRICAL ASSOCIATION.—President, N. W. Ryerson, Niagara Falls; Secretary, T. S. Young, Canadian Electrical News, Toronto.

CANADIAN FORESTRY ASSOCIATION.—President, Thomas Southworth, Toronto; Secretary, James Lawler, 11 Queen's Park, Toronto.

CANADIAN GAS ASSOCIATION.—President, Arthur Hewitt, General Manager Consumers' Gas Company, Toronto; J. Keillor, Secretary-Treasurer, Hamilton, Ont.

CANADIAN GAS EXHIBITORS' ASSOCIATION.—Secretary-Treasurer, A. W. Smith, 52 Adelaide Street East, Toronto.

CANADIAN INDEPENDENT TELEPHONE ASSOCIATION.—President, W. Doan, M.D., Harrietsville, Ont.; Secretary-Treasurer, Francis Dagger, 21 Richmond Street West, Toronto.

CANADIAN MINING INSTITUTE.—Windsor Hotel, Montreal. President, Dr. Frank D. Adams, McGill University, Montreal; Secretary, H. Mortimer-Lamb, Montreal.

CANADIAN RAILWAY CLUB.—President, H. H. Vaughan; Secretary, James Powell, P.O. Box 7, St. Lambert, near Montreal, P.Q.

CANADIAN STREET RAILWAY ASSOCIATION.—President, D. McDonald, Manager, Montreal Street Railway; Secretary, Acton Burrows, 157 Bay Street, Toronto.

CANADIAN SOCIETY OF FOREST ENGINEERS.—President, Dr. Fernow, Toronto; Secretary, T. W. H. Jacombe, Ottawa.

CENTRAL RAILWAY AND ENGINEERING CLUB.—Toronto. President, J. Duguid; Secretary, C. L. Worth, 409 Union Station. Meets third Tuesday each month except June, July, August.

DOMINION LAND SURVEYORS.—President, Thos. Fawcett, Niagara Falls; Secretary-Treasurer, A. W. Ashton, Ottawa.

EDMONTON ENGINEERING SOCIETY.—President, Dr. Martin Murphy; Secretary, B. F. Mitchell, City Engineer's Office, Edmonton, Alberta.

ENGINEERING SOCIETY, TORONTO UNIVERSITY.—President, A. D. Campbell; Corresponding Secretary, A. H. Munroe.

ENGINEER'S CLUB OF TORONTO.—96 King Street West. President, C. M. Canniff; Secretary R. B. Wolsey. Meeting every Thursday evening during the fall and winter months.

INSTITUTION OF ELECTRICAL ENGINEERS.—President, Dr. G. Kapp; Secretary, P. F. Rowell, Victoria Embankment, London, W.C.; Hon. Secretary-Treasurer for Canada, Lawford Grant, Power Building, Montreal, Que.

INSTITUTION OF MINING AND METALLURGY.—President, Edgar Taylor; Secretary, C. McDermid, London, England. Canadian Members of Council:—Prof. F. D. Adams, J. B. Porter, H. E. T. Haultain, and W. H. Miller, and Messrs. W. H. Trewartha-James and J. B. Tyrrell.

MANITOBA LAND SURVEYORS.—President, George McPhillips; Secretary-Treasurer, C. G. Chataway, Winnipeg, Man.

NOVA SCOTIA MINING SOCIETY.—President, T. J. Brown, Sydney Mines, C.B.; Secretary, A. A. Hayward.

NOVA SCOTIA SOCIETY OF ENGINEERS, HALIFAX.—President, S. Fenn; Secretary, J. Lorne Allan, 15 Victoria Road, Halifax, N.S.

ONTARIO PROVINCIAL GOOD ROADS ASSOCIATION.—President, W. H. Pugsley, Richmond Hill, Ont.; Secretary, J. E. Farewell, Whitby.

ONTARIO LAND SURVEYORS' ASSOCIATION.—President, H. W. Selby; Secretary, Killaly Gamble, 703 Temple Building, Toronto.

ROYAL ARCHITECTURAL INSTITUTE OF CANADA.—President, F. S. Baker, F.R.I.B.A., Toronto, Ont.; Hon. Secretary, Alcide Chausse, No. 5 Beaver Hall Square, Montreal, Que.

ROYAL ASTRONOMICAL SOCIETY.—President, Prof. Alfred T. de Lury, Toronto; Secretary, J. R. Collins, Toronto.

UNDERGRADUATE SOCIETY OF APPLIED SCIENCE, MCGILL UNIVERSITY.—President, H. P. Ray; Secretary, J. P. McRae.

WESTERN CANADA IRRIGATION ASSOCIATION.—President, Wm. Pierce, Calgary; Secretary-Treasurer, John T. Hall, Brandon, Man.

WESTERN CANADA RAILWAY CLUB.—President, Grant Hall; Secretary, W. H. Rosevear, 199 Chestnut Street, Winnipeg, Man. Second Monday, except June, July and August, at Winnipeg.

AMERICAN TECHNICAL SOCIETIES.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS (TORONTO BRANCH).—W. H. Eisenbeis, Secretary, 1207 Traders' Bank Building.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—President, John P. Canty, Fitchburg, Mass.; Secretary, T. F. Patterson, Boston & Maine Railway, Concord, N.H.

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE OF WAY ASSOCIATION.—President, L. C. Fritch, Chief Engineer, Chicago G. W. Railway; Secretary, E. H. Fritch, 962-3 Monadnock Block, Chicago, Ill.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—Secretary, C. W. Hunt, 220 West 57th Street, New York, N.Y. First and third Wednesday, except July and August, at New York.

AMERICAN SOCIETY OF ENGINEERING-CONTRACTORS.—President, George W. Jackson, contractor, Chicago; Secretary, Daniel J. Hauer, Park Row Building, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—29 West 30th Street, New York. President, Jesse M. Smith; Secretary, Calvin W. Rice

WESTERN SOCIETY OF ENGINEERS.—1735 Monadnock Block, Chicago, Ill. J. W. Alvord, President; J. H. Warder, Secretary.

COMING MEETINGS.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Ottawa Branch, 177 Sparks Street, November 23rd, 1910, Programme, Geo. B. Hull, A.M., Can. Soc. C.E. Subject: Irrigation and Western Canada. Secretary, H. Victor Brayley, N. T. Ry., Cory Bldg.

NEW YORK CEMENT SHOW.—December 14-20, 1910. First annual convention in Madison Square Garden, New York. Under the management of the Cement Products Exhibition Company, 115 Adams St., Chicago.

CHICAGO CEMENT SHOW.—February 15-23, 1911. Fourth annual exhibition, at the Coliseum, Chicago, Ill. Under the management of the Cement Products Exhibition Company, 115 Adams St., Chicago.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—Toronto Section, regular monthly meeting, November 18th, 1910, at 8 p.m., 96 King Street West. The following paper will be presented: "Electric Vehicles, Their Development And Use," by Mr. J. H. Vail, Gen. Equipment Company, New York. W. H. Eisenbeis, Secretary.

ENGINEERS' CLUB OF TORONTO.

At the meeting last Thursday evening the proposed by-laws of the new Club were considered. Mr. C. M. Canniff, chairman, announced that the Provincial Government had granted a charter to the Club. This charter provides for all the privileges of the social Club. The Club proposes to limit the membership to five hundred resident members, two hundred non-resident members, twenty-five life members, and seventy-five associate members. The Club will have among its members, engineer surveyors and architects.

The provisional directors are: Messrs. A. B. Barry, C. M. Canniff, Willis Chipman, John Galbraith, J. G. Sing, J. B. Tyrrell, and A. J. Van Nostrand.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

(Continued from page 634).

- 12230—November 9—Directing that the C.P.R. Company comply with the terms of Order No. 7969, dated September 1st, 1909, made upon application of the municipal council of Whitton, Province of Quebec, to provide highway crossings on the line dividing Range 1, north-east, and Range 1, south-west, at mileage 2.9, and 3.5, from Megantic, and at its own expense provide and construct the highway crossing at mileage 3.5, from Megantic, within thirty days from the date of this Order.
- 12231—November 9—Reporting to the Governor-in-Council, for sanction, By-law No. 24 of the Quebec, Montreal and Southern Railway Company.
- 12232—November 9—Reporting to the Governor-in-Council, for sanction, By-law No. 24 of the Napierville Junction Railway Company.
- 12233—November 10—Authorizing the Canadian Light and Power Company to erect transmission lines across the wires of the Bell Telephone Company at Chateauguay River Crossing, Chateauguay, Que.
- 12234—November 10—Authorizing Emile Albert, of the Parish of St. Hilaire, County of Madawaska, N.B., to lay a water pipe under the Temiscouata Railway in the said parish.
- 12235—November 10—Authorizing Donat Sirois, of Parish of St. Hilaire, County Madawaska, N.B., to lay a water pipe under the Temiscouata Railway in the said parish.
- 12236—November 10—Authorizing the C. W. & L. R. Railway Company to open for traffic portion of its line running from a point on the main line opposite the Blind Line of the 4th Concession, Township of Dover East, to village of Pain Court, said township, provided that the company's trains over the said line be limited to a speed of 18 miles an hour.
- 12237—November 10—Authorizing the C.P.R. Company to construct an industrial spur for the Superior Fuel & Coal Company, in the city of Winnipeg, Manitoba.
- 12238—November 11—Authorizing the C.P.R. Company to construct an additional track across the road allowance between the south-east quarter of Section 29, and the south-west quarter of Section 28, Township 22, Range 23, west of 4th Meridian, at St. Bart, Alta.
- 12239—November 11—Authorizing the Government of the Province of Saskatchewan to construct a highway across the track of the C.P.R. Company in Section 25, Township 20, Range 11, west 2nd Meridian.
- 12240—November 11—Authorizing the Saraguay Electric & Water Company to erect its wires across the track of the Montreal Terminal Railway Company, on Prefontaine Street, Montreal, Quebec.
- 12241-42-43—November 11—Authorizing the corporation of the town of Maisonneuve, Quebec, to lay a gas pipe under the track of the C.N.Q.R. Company at Third Avenue, Maisonneuve, Quebec; at Fourth Avenue, Maisonneuve, Quebec; and at Fifth Avenue, Maisonneuve, Quebec.
- 12244 to 12248 Inc.—November 11—Authorizing the corporation of the town of Maisonneuve, Quebec, to lay water pipes under the C.N.Q.R. at five different points in Maisonneuve, Quebec.
- 12249—October 12—Authorizing the T. H. & B. Railway Company to construct branch lines or spurs from a point a short distance west of Grant Avenue, on its main line of railway, and running thence easterly across Grant Avenue, Wentworth Street, Sanford Avenue, and Sherman Avenue, to a point on the easterly limit of the east side of Wentworth Street, and south of said main line across Sanford Avenue, to a point a short distance west of Sherman Avenue, to a point a short distance west of the westerly limit of Prospect Street, Hamilton, Ontario.
- 12250 to 12254 Inc.—November 11—Temporarily approving the agreements entered into by the Bell Telephone Company, and the Brompton Pulp and Paper Company; the Bell Telephone Company, and the Tarentorous Telephone Company, Limited; the Bell Telephone Company and J. H. Rogers and Jos McLaughlin, of Norwich, Ont.; the Bell Telephone Company and the Urban and Rural Telephone Company, Limited; the Bell Telephone Company and the Metcalfe Rural Telephone Association.
- 12255—November 11—Authorizing the C.N.O.R. Company to construct its lines and tracks across the lines and tracks of the Thurlow Railway running from the Grand Trunk Railway to the Lehigh Valley Cement Works, Township of Thurlow, County Hastings, Ontario.
- 12256—November 11—Authorizing the C.P.R. Company to construct an industrial spur for Messrs. Perrault, Audy Co., Ltd., at mileage 8.64, from Place Viger Station, Montreal, Quebec.
- 12257—November 11—Authorizing the C.P.R. Company to construct and operate an industrial spur across Jarvis Street, and across Block 52, in the city of Winnipeg, Manitoba.
- 12258—November 11—Authorizing the G.T.P. Branch Lines Company to close the road allowance between Sections 24 and 25; and between Sections 25 and 30, within the right-of-way limits, Township 31, Range 24, west 4th Meridian.
- 12259—November 11—Authorizing the C.P.R. Company to construct an industrial spur for the Wilson Box Co., Ltd., at mileage 2.9, from St. John, N.B.
- 12260—November 11—Authorizing the C.P.R. Company to construct its main line tracks across the highway known as "Rama Road," in Lot 30, Concession 11, Township of Mara, County of Ontario.
- 12261—November 11—Authorizing the C.P.R. Company to construct an industrial spur for Charles I. Kilburn, Saskatoon, Sask.

RAILWAY EARNINGS: STOCK QUOTATIONS.

The following table gives the latest traffic earnings it is possible to obtain at the time of going to press:

Road	Wk ended	1910	Previous week	1909
C. P. R.	Nov. 7	\$2,267,000	\$3,117,000	\$2,113,000
G. T. R.	Nov. 7	902,420	1,302,043	902,197
C. N. R.	Nov. 7	357,200	556,200	340,300
T. & N. O.	Nov. 7	20,837	38,014	33,458
Hal. Elec.	Nov. 7	3,816	5,403	3,322

Figures showing the earnings of Canadian roads since July 1st, this year and last, are appended:

Road.	Mileage.	July 1st to	1910.	1909.
C. P. R.	10,326	Nov. 7	\$39,024,000	\$27,003,000
G. T. R.	3,536	Nov. 7	16,235,912	15,236,254
C. N. R.	3,180	Nov. 7	5,583,000	4,451,900
T. & N. O. ..	264	Nov. 7	843,175	632,251
Hal. Elec.	13.3	Nov. 7	82,803	78,235

Stock quotations on Toronto, Montreal and London exchanges, and other information relative to the companies listed in the above tables, are appended. The par value of all shares is \$100.

Co.	Capital	Price	Price	Price	Sales
	000's	Nov. 11	Nov. 3	Nov. 10	last
	Omitted.	1909.	1910.	1910.	week.
C. P. R.	\$150,000	-184	-199	-196	868
Mtrl. St. ...	18,000	208-206	229½-229	224-233½	240
Hal. Elec. ..	1,400	120-119	130-129½	130-	...
Toronto St. .	8,000	123½-123	-120½	-120	85
G. T. R.	226,000	1st pfd. 107½; 2nd pfd. 51½; com. 24½.			

CALGARY STREET RAILWAY.

Report for October and First Ten Months of This Year. Estimated Revenue for the Year, \$170,500.

Street railway gross revenue for October, \$9,642.53; street railway earnings for October, \$20,418.15; street railway earnings for first ten months of this year, \$170,500; estimated revenue for the year, \$170,500.

The figures given above show just what the revenue for the month of October, for the first ten months of the year, and the estimate that was made for the year.

Line Earnings Compared.

The detailed figures for each particular line of cars for the month:—

Line	Net Earn.	Pass'gers Carried	Miles Run	Earn. per Car Hour
Red	\$9,020.24	221,089	24,057	\$3.15
Blue	8,118.86	198,440	30,260	2.45
White	3,183.05	78,757	8,490	2.90
S. C.	96.00	356		
General	\$20,418.15	498,642	62,807	\$2.81

Revenue and Expenses.

The statement of the revenue and operating expenses for the month shows the former to be \$9,642.53 and the operating expenses, \$10,858.77. The total earnings were \$20,501.30. The operating expenses totalled \$398.99, maintenance of way and structure, \$398.99, of equipment, \$1,731.80. transportation, \$7,947.10, general expense, \$780.88.

The totals—Estimated operating expenses (12 months), \$115,400; operating (10 months), \$89,436.37; estimated profit (12 months), \$55,100; profits (October 31st, ten months), \$61,462.50; less fixed charges (ten months sinking fund and interest at \$2,715.88 per month), \$27,158.80; less 5 per cent. gross revenue (reserve account), \$8,345.04; net clear profit to credit of city council account, \$45,958.66.

C.P.R. SHOWS STEADY INCREASE IN SPITE OF HAVING TO MEET WITH DISADVANTAGE OF WESTERN WHEAT TRAFFIC.

Although the earnings of the C.P.R. are still under the disadvantage of having to meet reduced western wheat traffic as compared with last year, they are showing heavy weekly increases, as may be seen in the above weekly table. These increases are so much greater than those of any railroad operating in Eastern Canada, that it is plain the smaller harvest in the West, this season, has not affected business conditions to any extent. This position is the more marked in that the earnings of the road at this time last year were the greatest for last year, and also frequently made new records for the company, running well above the two million a week average. The heavy earnings now are due to the rush of goods to the West during the last period of lake navigation, and the large movement of western wheat to get to Montreal before the St. Lawrence closes for the winter.

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 and projected, contracts awarded, changes in staffs, etc.

Printed forms for the purpose will be furnished upon application.

TENDERS PENDING.

In addition to those in this issue.

Further information may be had from the issues of The Canadian Engineer referred to.

Place of Work.	Tenders Close.	Issue of.	Page.
Burke's Head, N.S., breakwater..	Nov. 22.	Nov. 3.	600
Chapel Cove, N.S., breakwater ...	Dec. 5.	Nov. 10.	622
Lorneville, N.B., breakwater ...	Nov. 23.	Nov. 3.	600
Maccan, N.S., timber supply....	Dec. 5.	Nov. 10.	622
Nanaimo, B.C., public buildings..	Nov. 28.	Nov. 10.	622
Nelson, B.C., public buildings..	Nov. 28.	Nov. 10.	622
Stratford, P.Q., landing pier ...	Dec. 5.	Nov. 10.	622
St. Louis du Mile End., Que., post-office	Nov. 24.	Oct. 20.	537
Walhachin, B.C., steel bridge ...	Nov. 28.	Oct. 27.	560
Winnipeg, Man., pole and line supplies	Dec. 1.	Nov. 3.	56
Walhachin, B.C., bridge	Nov. 28.	Nov. 3.	600

TENDERS.

Wolfville, N.S.—Tenders will be received until December 1st for the erection of a brick and stone church. C. B. Chappell, architect, Charlottetown, P.E.I.

Grand Falls, N.B.—Tenders will be received until November 30th for the erection of a public building. R. C. Desrochers, secretary, Department of Public Works, Ottawa.

Rigaud, Que.—Tenders will be received until Dec. 5th for the construction of a public building. R. C. Desrochers, secretary, Dept. of Public Works, Ottawa.

St. Joseph de Letellier, Que.—Tenders will be received until December 6th for the construction of a wharf. R. C. Desrochers, secretary, Department of Public Works, Ottawa.

Ottawa, Ont.—Tenders will be received until Dec. 12th for the supply of 550,000 tons of bituminous coal for the Intercolonial Railway, and 14,700 tons of bituminous coal for the Prince Edward Island Railway. Louis Lavoie, Purchasing Agent, Dept. of Railways and Canals.

Port Arthur, Ont.—Tenders will be received until December 12th for the construction of a new church. The Rev. J. A. Grenier, S. J.

Toronto, Ont.—Tenders will be received until November 22nd for electrical measuring instruments. G. R. Geary (Mayor), Chairman Board of Control.

Toronto, Ont.—Tenders will be received until November 22nd for one ten-ton hand-operated travelling crane, at the high-level pumping station, and one fifteen-ton hand-operated travelling crane, at the main pumping station. G. R. Geary (Mayor), Chairman Board of Control.

Winnipeg, Man.—Tenders will be received until November 19th for the supply of 75,000 telephone poles. Telephone Commission, Winnipeg.

Winnipeg, Man.—Tenders will be received until December 15th for 500 K.W. motor generator sets. M. Peterson, secretary, Board of Control. (Advertisement in the Canadian Engineer).

Lethbridge, Alta.—Tenders will be received at the office of the Chinook Coal Co., Ltd., in the Canadian Bank of Commerce Building, Lethbridge, until Monday, 21st, for the sinking of one hoisting shaft and one airshaft on the company's property near Diamond City. The Chinook Coal Co., Ltd. J. C. Reid, Manager.

Point Grey, B.C.—Tenders will be received until Nov. 26th for the construction of a covered concrete service reservoir. H. Floyd, clerk, Municipal Council, Kerrisdale. (See official advertisement elsewhere in this issue.)

CONTRACTS AWARDED.

The Department of Public Works for Canada recently awarded the following contracts:

Hartland, N.B.—Public Building: Messrs. J. W. and Chas. J. Smalley, River Bank, N.B., \$16,700.

Campbellton, N.B.—Public Building: James Reid, Sackville, N.B., \$28,592.

Strathcona, Alta.—Public Building: Wm. Garson, Calgary, Alta., \$46,975.

Moncton, N.B.—Public Building: O. J. Dunham and P. N. LeBlanc, Moncton, N.B., \$5,739.

Bic, P.Q.—Wharf: Théophile Beaumont, St. Thomas de Montmagny, P.Q., \$33,810.

Great Salmon River, N.B.—Breakwater: C. A. Huntley, Parrsboro, N.S., \$10,740.

Pelee Island.—Extension to wharf: Donald McDermid, 43 Avenue Road, Toronto, Ont., \$13,000.

Hamilton.—Wharf and retaining walls: Joseph Battle, Thorold, Ont., \$60,844.

Lakeport, Ont.—Reconstruction of wharf: Samuel Gowan, Brockville, Ont., \$16,430.

Goderich, Ont.—Breakwater: Michael Connolly, 91 Crescent street, Montreal, P.Q., \$140,417.

Barrington's Cove, N.S.—Wharf: J. W. Dobson, Sydney, C.B., \$29,900.

Riviere des Prairies, Que.—Piers: Morrow & Beatty, P. O. Box 782, Peterboro, Ont., \$8,520.

St. Andrews, Que.—Wharf: Bridge and Wharf Builder Co., 362 Notre Dame St., Montreal, Que., \$3,245.

L'Assomption, Que.—Concrete Ice Pier: Jos. Renaud, St. Paul de Joliette, Que., \$4,910.

Aylmer, Que.—Wharf: Thos. Moran and John Moran, Arnprior, Ont., \$8,974.

New Edinburg, N.S.—Breakwater; J. E. and H. Bigelow, Canning, N.S., \$11,900.

Dipper Harbor, N.B.—Breakwater and wharf extension contract was given to Thomas P. Charleson.

Cainsville, Ont.—The Hamilton Bridge Company has received the contract for the supply of material for the T. H. & B. Railway Company's new steel bridge. Work will begin immediately.

Smith's Falls, Ont.—R. N. F. McFarlane has been awarded the contract for the erection of the Collegiate Institute building, which will be brick, at \$38,050.

St. Thomas, Ont.—The Monarch Knitting Company awarded the contract for their new factory here to A. E. Ponsford, who has the work en bloc. Green & Company will do the carpenter work. The block will have a frontage of 187½ feet and depth of 50 feet and will be three storeys high.

Toronto, Ont.—The property commissioner recommended to the Board of Control that the contract for a thirty horsepower Cadillac automobile, to seat four, be awarded to Hyslop Bros., whose price was \$2,375, and for a Chalmers 40-horsepower to seat seven, to the T. Eaton Company, their price being \$3,880. Some of the other figures being lower Controller Ward wanted further information, and was supported by Controller Church, a deadlock resulting, and the awarding of the contract was allowed to stand.

Winnipeg, Man.—Tenders for wire and cable were awarded as follows: Copper wire and cables, Eugene & Phillips, Electrical Works, Ltd., Montreal: 200,000 lbs. wire at 16¼c. per lb; 100,000 lbs. cable at 17c. per lb. The Wire & Cable Co., Montreal, rubber covered wire, total \$1,260.40.

Winnipeg, Man.—The Canadian Rubber Co. received the contract for the supply of 600 ft. of 2½-inch double jacketed,

cotton, rubber-lined fire hose, at \$1.10 per foot (Keyston's brand).

Winnipeg, Man.—The tender of T. D. Robinson & Sons, of Winnipeg, was accepted for the supply of one million feet of B. M. lumber, at total of \$25,575.00.

Winnipeg, Man.—Siemens Bros. of Toronto, were the successful bidders for the supply of one 15-h.p. 60-cycle induction motor, at \$330.00. The tender of Jones & Glassco, of Montreal, was accepted for silent chain drive, at \$66.11.

Winnipeg, Man.—For supply of 25,000 carbons for series alternating enclosed arc lamps, the Northern Electric and Manufacturing Co., of Winnipeg, received the contract, of total \$419.50.

Swift Current, Sask.—The Carter-Jones electrical firm of Fort William, secured a large contract, which calls for the installation of motors, dynamos, and outside equipment for an electrical light and power plant, a gas producer and a motor and pump for a modern sewage disposal plant at this place.

Calgary, Alta.—Contracts for about \$11,750 worth of aluminum and copper wire for street car extensions, was accepted by the commissioners. Fifty thousand pounds of copper wire was also purchased for \$16.62 per 100 pounds, and 16,000 pounds of aluminum wire was purchased at prices ranging from 21c. to 22c. a pound. A car-load of copper wire was purchased from each of the following companies: Northwest Co., General Electric, and Phillips Co., of Montreal. The prices were the same. The aluminum wire was purchased for power transmission purposes, it being light, strong and lasting.

Edmonton, Alta.—Foley, Welsh & Stewart have been awarded the contract of the Alberta Great Waterways Railway.

Prince Rupert, B.C.—The following is the average price submitted by many contractors for grading work in city section I, but contracts have not yet been awarded: Section D, rock \$2.19; E, \$2.95; G, \$2.45 per cu. yd. Earth, sections D, E, and G, \$1 per cu. yd. Grubbing \$150 per acre all three sections. Close cutting \$100 per acre. Building retaining wall \$2 per cu. yd. in each section. Taking up 16-ft. plank road per lineal foot, \$1. Relaying same, 75 cents per lineal foot.

South Vancouver, B.C.—Harrison & Hall received the contract for the new school building at Mountain View. Price \$1,645.

Vancouver, B.C.—The local firm of Irensidies, Ramsie & Campbell, have received the big contract for the cleaning of the Hastings townsite, which comprises 112 city blocks, at a figure of \$250,000. This will employ a great many men and will be practically completed in one year.

Vancouver, B.C.—For repairs to the reservoir the following three tenders were received, but as it was stated in the advertisement that the specification of the successful bidder would require to be approved of by the city engineer, it is improbable that any of them will be accepted: The tenders were from the C. J. Betts Company, Spokane, who agreed to do the work at 30 cents per square yard, making a total sum of between \$4,000 and \$5,000; Newton & Greer, Victoria, \$7,900; S. Rutter, Lampson street, Esquimalt, \$32,000. In their offer the Spokane firm mention "waterproofing." Newton & Greer in their specifications propose to employ waterproof paints very largely, and the bidder from Esquimalt would do a lot of heavy concrete work.

Victoria, B.C.—The Worswick Paving Company have received the contract for paving with asphalt, portions of Fernwood Road, Rockland Avenue and Richardson Street.

The problem with which one is most frequently confronted, when putting in permanent floors in fire halls, drill sheds, or any place where such a flooring is required, is to get something which is durable, not affected by atmospheric changes, and yet keeps its smooth surface. In such places as this, one of the most satisfactory is a floor made of asphalt blocks. Such blocks are being used extensively throughout the United States in this connection, and there is every indication that they will become quite common in Canada for the purposes indicated.

RAILWAYS—STEAM AND ELECTRIC.

Fredericton, N.B.—The extensions and improvements costing \$35,000 at the C.P.R. station, at McAdam Junction, will be completed in the course of a few weeks and the new portions of the building will be immediately occupied. The addition at the other end of the building will provide 13 bedrooms with 5 bathrooms and a new luncheon and dining room for the C.P.R. hotel, the old dining room being used for a kitchen under the new arrangements. The work has been done by Joseph McVay & Sons, of St. Stephen. The concrete work there has been completed and the filling in will be done under a sub-contract by James Cunningham.

Montreal, Que.—The Canadian Engineer is informed that the rumors to the effect that The Canadian Car & Foundry Company has secured control of The Crossen Car Company at Cobourg, Ontario, are without foundation. The merger has made no attempt to buy one dollar's worth of Crossen stock.

Montreal, Que.—Mr. Duncan McDonald, manager of real, will return to Canada from Australia to occupy a high position in the C.P.R.

Montreal, Que.—Mr. Duncan McDonald, manager of the Montreal Street Railway, at a meeting of the Metropolitan Parks Commission in the city hall, stated that the Montreal Street Railway stands ready to begin the construction of a belt line rapid transit underground railway as soon as the corporation of the city will give them the necessary legislation. The general scheme for the tunnel is to cut through under Cote des Neiges Hill, starting in with the entrance near Guy and Sherbrooke Streets and coming out near Shakespeare Road, making a total underground distance of some 5,500 feet. Three tunnels have been suggested on this route, a double-track one in the middle for rapid transit service and a wide one on either side, about 30 feet, for vehicular traffic going in alternate directions. For Notre Dame Street, from McGill Street to Jacques Cartier Square, his proposition is to build a subway along St. James Street from near the low level at Gosford Street west along the course of the first-named street and part of Notre Dame Street to the west of Bonaventure Station. Mr. McDonald said that the increasing capacity of the unit of transport would help greatly in relieving the troublesome congestion.

Montreal, Que.—It has been practically decided that the Grand Trunk Pacific trains which will come into Bonaventure Station from Prince Rupert will come over the rails of the Canada Atlantic Division from a junction which will be formed with the connecting road near Carp, about twenty-five miles west of Ottawa. This main line division from the National Transcontinental would come down west of the Grand Victoria Lake, striking away from the road that goes to Quebec and the Maritime Provinces, about 140 miles east of Cochrane. The junction with the Temiskaming and Northern Ontario road over the G.T.P. will be given running powers for its trains for Toronto and Western Ontario by the Ontario Government.

Montreal, Que.—Active operations in the clearing of the right-of-way for the extension of the E. and N. from a point near Duncan to Cowichan Lake will be commenced this week. Contractors Janse and McDonnell have transferred sufficient of their force from the Wellington-Alberni road to enable the initial work on the new enterprise to be undertaken without further delay. They will establish an office at Duncan this week, and it is understood that sub-contracts will be let for sections of the project.

Brantford, Ont.—Although nothing has been done this year towards building the electric road between Brantford and Port Dover, it is now reported that the project will be pushed in the spring. It will cost some \$900,000 to build the road, and it is thought that the city would find it a good business deal to guarantee part of the bonds.

Cornwall, Ont.—Dr. P. J. Moloney, mayor of Cornwall, has received a communication from the mayor of Alexandria inviting co-operation of the town council in a project to induce the Canadian Pacific Railway to build a line from Hawkesbury on the Ottawa, to Cornwall on the St. Lawrence, running Vankleek Hill, Alexandria and Martintown. It is proposed to call a meeting of representatives of the municipalities along the route at an early date with a view to securing concerted action.

Fort William, Ont.—In addition to the \$100,000 expended in the construction of a new passenger station in this city, the C.P.R. is having plans prepared for outbuildings which

will entail the expenditure of a sum estimated at \$25,000. The list of outbuildings include an ice-house, a building for the accommodation of trainmen and housing of train equipment, and a boiler-house.

Ottawa, Ont.—Several more applications for extension of time of construction of railways are to hand. Among them are the Ontario, Hudson Bay and Western Central, Athabasca Northern, Canadian Western, and Alberta Central and Hudson Bay. Applications for incorporation are: Saskatoon and Hudson Bay Railway, from Saskatoon via Melfort to Pas Mission; Pacific and Peace Railway from Bella Coola, B.C., via Teta Chuck, Cheslatta and Fraser Lake to Dunvegan, Alta.; Skettle River Valley Railway, from Pentyton, B.C., to Ogoyoos Lake to Allison or Princeton and from Coldwater River to Fraser River and to Steamboat Mining Camp; Southern Central Pacific, from North Saskatchewan to Dunvegan, Peace River, Parsnip River and Nechiaco River, and from Elk River via Waterton River to Coumts.

Ottawa, Ont.—The Railway Commission met in Ottawa on November 15th. Among the applications is one from the Marconi Wireless Telegraph Company for approval of its tariff of tolls. The C.P.R., G.N.W., C.N., North American, Western Union, and Anglo-American Companies, the White Pass and Yukon route, and the Marconi Wireless Telegraph Company ask for approval of the forms used by them in transmitting and receiving messages.

Ottawa, Ont.—The proposal of the special committee of the board of trade and city council for the appointment of another expert engineer to act with the city engineer in preparing a comprehensive plan on the entrance and departure of railways in Ottawa has been approved. The Minister of Railways may be asked to name a third engineer.

Ottawa, Ont.—The Alberta Railway has given notice of application to Parliament for an Act, authorizing the usual powers. The project as outlined in the application includes a railway from Saskatoon easterly to Hudson Bay, with terminals at both Fort Churchill and Nelson.

Ottawa, Ont.—Only one tender has been received at the Department of Trade and Commerce for the Pacific mail service, which expires on August next. It is that of the Union Steamship Company, of Australia, which has submitted a number of alternative proposals as to routes and sailings. The Union Steamship Company will get the contract, but just which of the various proposals made will be accepted cannot be decided until there have been negotiations with the Government of Australia. Sir James Mills, head of the Union Steamship Company, is at present in Ottawa consulting with the Government in reference to the service.

Ottawa, Ont.—Mr. J. L. Armstrong, chief engineer of the Hudson Bay Railway survey parties, is in Ottawa conferring with the Minister of Railways. Mr. Armstrong states that surveys for the first two hundred miles of the road from the Pas are now practically completed, and active work of construction on this section could be undertaken next year, pending final decision as to the alternative routes proposed to Fort Churchill and Port Nelson. The reports of the hydrographic surveys made this year, of the harbors at Fort Churchill and Port Nelson are not completed, and the question of the location of the line for the second half of the whole distance from the Pas will depend on the decision of the government, as to which is the best terminus. In any event, it is expected that a good start will be made next year on the construction of the first two hundred miles.

Toronto, Ont.—The Canadian Northern Railway main line from Montreal to Toronto is expected to be completed and trains running between the two cities by next fall, according to an announcement by Mr. William Mackenzie, the president.

Edmonton, Alta.—At a meeting at Frank, of the Crow's Nest Pass Improvement League, representatives were present from all the principal towns in the Pass. Delegates were appointed to see the Minister of Public Works at Edmonton, regarding better railway facilities in the Pass.

Edmonton, Alta.—It is believed to be most probable that the C.P.R. will be the first railroad to build through to Peace River. It is thought that this railway could build a line within two years, whereas any other road would require four or five. Surveys are said to have already been made by the C.P.R.

Edmonton, Alta.—The Alberta Central Railway Company has entered into the field as one of the competitors for the construction of a line of railway to Hudson Bay, and has given notice of application to Parliament for an Act,

with the power, among other things, to construct, operate, etc., a line of railway in common or as may be defined by the proposed Act from Saskatoon easterly to Hudson Bay, with termini at (both) Fort Churchill and Nelson. The Alberta Central Railway Company is now constructing its line of railway, and 70 miles westerly of Red Deer and 40 miles easterly are under construction, while the road easterly has been approved to Moose Jaw. The company is authorized to build westerly as far as the Yellow Head Pass, and, in addition to its line to Moose Jaw, has power to build to Saskatoon or Warman. The present application is to obtain authority to build several branch lines, to project its line from Moose Jaw easterly and southerly to a point on the international boundary, and to extend the Saskatoon branch to Hudson Bay, and, if necessary, construct the latter railroad by agreement with the Government or other lines of railway as a general road in common.

Victoria, B.C.—The Canadian Pacific Railway has ordered a new steamer for the night run on the ferry service between Victoria and Vancouver. Next season there will be three sailings daily each way.

Victoria, B.C.—Plans have been filed with the Provincial Government locating the station grounds of the Grand Trunk Pacific Railway on the Indian reservation at Fort George, adjoining the Fort George townsite. The British Columbia and Alaska Railway's survey traverses the Fort George townsite, and station grounds for that railway have been reserved on the townsite.

Victoria, B.C.—The Board of Valuers appointed to decide upon an equitable sum for which the Kettle River Valley Railway Company should purchase the old midway and Vernon right-of-way, has decided upon a figure in the neighborhood of \$62,000. The valuers went thoroughly into the accounts of the road and have notified the Kettle River Valley Railway Company of the award.

Spokane, Wash.—Mr. C. Hungerford Pollen, president of the Central Railroad Company, while in Spokane, announced that work on the line needed in the development of the headwaters of the Kootenay and Columbia Rivers, will be rushed to completion. Steel has been laid for 25 miles north of Fort Steele, and work will be continued until the construction gangs meet. Ten miles of line has been built up the Columbia River from Golden, on the main line of the Canadian Pacific Railroad. The total length of the line is 176 miles from Golden to Fort Steele, the latter town being on the Crow's Nest branch of the Canadian Pacific, not far north of the international boundary. The contract for construction has been awarded to Bruant and Jordan, of Spokane.

CURRENT NEWS.

St. John, N.B.—A report from Ottawa says that if private companies do not undertake the work of construction of the dry docks at Levis and St. John under the provisions of the Act relating thereto, the government will probably construct them. Government works are needed in connection with the navy.

Montreal, Que.—Pavement work here is being rushed to a close. Extra gangs of workmen are speedily completing the work on Douglas and Yates Streets.

Montreal, Que.—Notice was given at the meeting of the city council of the city's intention to borrow \$10,000,000 for the carrying on of public works next year. The city is already empowered by the Legislature to do the borrowing. The expenditures are: For the enlargement of the water works, \$1,000,000; for a filtration plant, \$1,500,000; for execution of public works, \$4,500,000; for a municipal lighting plant, \$1,000,000; for underground conduits, \$1,000,000; for working capital, \$1,000,000. All these sums are for expenditure on public works, except that for working capital. Included in the list are important projects concerning the progress of Montreal, foremost of which is the filtration plant for a pure water supply, and then follows the conduits for placing underground all wires except trolleys. The largest sum is for streets and permanent sidewalks.

Fort William, Ont.—The firms of the J. R. Turnby & Son and Stenhouse Bros. have amalgamated and will trade under the name of Turnby-Stenhouse, Limited, the capital of the company being \$40,000. Work on the site for the foundry has been commenced and foundations and floor are to be completed before winter sets in. All kinds of machinery will be dealt with.