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The Canadian Engineer

ESTABLISHED 1893.

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THE PURPOSE OF ADVERTISING TENDERS.

It is generally understood that the purpose of advertising for tenders is to secure competition and the lowest prices. Engineers in the employ of the corporations and municipalities have another purpose, namely, to make it clear that they are not playing favorites, but that contractors and supply houses having the material to dispose of may have equal opportunities to secure the contract, and thus remove from the engineer any semblance of awarding the work to friends at inflated prices.

The engineering department that refuses to advertise work or would make it impossible for any but the initiated to tender, will, sooner or later, find themselves the subject of public inquiry. It is not necessary that the department be corrupt, or that their purpose and method be other than honorable. All the public mind will grasp will be the blunder, and gossip will add the rest.

Several examples of refusing to advertise work, making the time limits so short that only those "in the know" can tender, have been brought to our attention recently. One of the most prominent of these has been the steel rail contract on the Transcontinental Railway. Under date of August 23rd the Commission called for tenders for supplying approximately 7,500 gross tons of 80-pound steel rails. The tenders in question are to be in the hands of the Commission by September 14th. The time allowed for the prospective tenderers to secure copies of the specifications is too short; in fact, the conditions limit the contract to three mills. A further condition requires that the quantity be delivered within sixteen days. This again narrows down the number who are apt to compete to those who would have on hand 5,700 tons of 80-pound rails.

This is just one illustration of many where the engineers have no doubt unintentionally made it appear as if they were anxious to limit the competition.

The engineers should be the first to encourage, in a matter of this kind, full publicity. It pays the client, and it will pay the engineer from a professional standpoint.

STREET LIGHTING.

Fundamentally, street lighting is a protective measure, and a street lighting system which meets the requirements of the chief of police usually answers the lighting conditions required by the average citizen and the man of moderation.

Street lighting not only discloses dangers of the road and footpath, but it checks and prevents crime. The saying that one arc lamp is as good as one policeman is not new, and when applied to populated districts is true.

Uniformity in street lighting, while possible, is not always wise from an economic standpoint. Certain districts require heavy lighting in the early evening. Other sections, because of the brilliant store lights, are sufficiently lighted by the ordinary street lighting, and when the traffic ceases automatically the street lighting regulates itself.

Any system of street lighting which is based upon a fixed number of lights per mile of street or upon a uniform kind of light will not give the best results. So many things regulate the necessity for lights at certain distances and the presence of trees, etc., so vary conditions that public lighting requirements are essentially non-uniform.

ROOSEVELT AND SEWAGE DISPOSAL.

Theodore Roosevelt, speaking before the members of the Ellicott Club at Buffalo on August 25th, stated:—

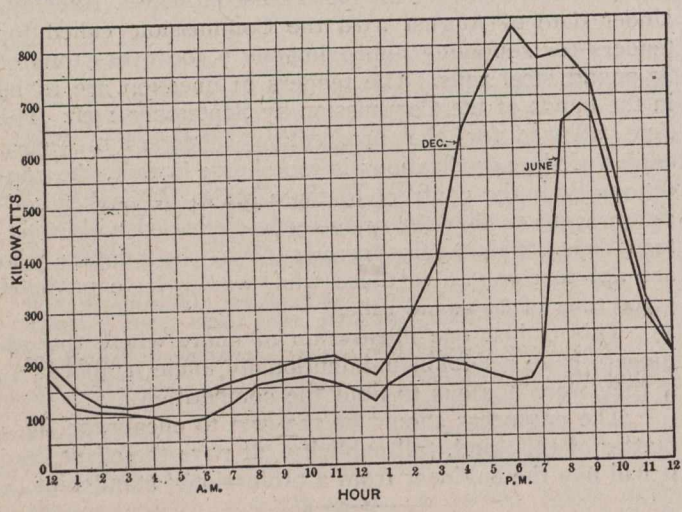
"We claim to be a civilized people. As such we ought to be able to dispose of our sewage without putting it into our drinking water. State and Nature must combine in preventing further contamination, and in making the purity of lake water as absolute as possible."

DIVERSITY FACTOR.*

By H. B. Gear.

In the distribution of electricity for lighting and power purposes over a large city, the maximum demand of the day upon the distributing system varies from day to day during the week, and from month to month during the year. The varying length of the day due to changing seasons, the habits of the population served, and the character of the district, whether residence, mercantile or manufacturing, combine to produce this situation.

In residence districts, for instance, the use of light is such that the maximum demand comes at about 7.00 p.m.



in winter, and at 8.30 p.m. in mid-summer, as shown in the load curves in Fig. 1. In outlying business districts in the large cities and in the central business districts of the smaller cities, the maximum demand comes from 5.30 to 6.00 p.m. in winter, or at 8.30 p.m. in summer. It is usually heavier Saturday than other nights of the week. In the central business districts of cities like Chicago the maximum demand comes from 5.00 to 5.30 p.m. in winter, and at various other hours in summer. Here the Saturday load is less than that of other days because of the early closing of offices and shops that day. This is also true of manufacturing districts, where the load is chiefly power. In a purely manufacturing district, the maximum load occurs at about 10.00 a.m., the afternon load being from 15 to 20 per cent. less than the maximum of the morning. The load curve in Fig. 2 is that of a power circuit which carries some lighting and so has a 5.00 p.m. maximum.

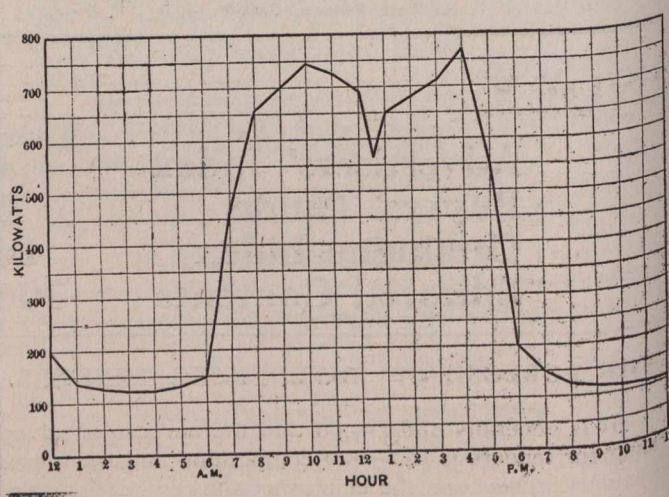
In the larger cities the conditions vary in all of these classes of service more or less with the character of the population. The habits of the people in the foreign populated wards are different from those bordering on the boulevards, and the requirements of dwellers in apartments are different from those living in houses. In the outlying districts of Chicago, stores are closed Wednesday and Friday evenings, while in downtown districts very few stores are open evenings at all and the use of electricity is limited largely to show window and display lighting. During the summer the loss of demand in residence districts is partially made up by the requirements of the pleasure parks. The combined curve for these various classes of service is shown in Fig. 3.

The combined effect of all these influences is to produce a smaller maximum demand at the generating station than elsewhere in the system. That is, the sum of the maximum demands of the transformers and distributing mains is greater than that of the feeder. The sum of the feeder maxima is greater than that of the substation, and the sum of the substation maxima is greater than that of the generating station.

The ratio of the sum of the maxima of the subdivisions of the distributing system to its actual maximum demand as observed at the point of supply is called the diversity factor. Thus, if the sum of the individual maximum loads on the ten feeders of a substation is 1200 kw. and the coincident maximum of the feeders is 1000 kw., the diversity factor is $\frac{1200}{1000}$ or 1.20.

The study of diversity factors is of great importance from a commercial point of view as well as being an interesting engineering problem. The investment required by the central station company in the various parts of its operating system for each kilowatt of maximum demand, determines the fixed charges which must be considered in determining costs and in making an equitable system of rates.

The existence of a diversity factor between the demands of a large number of consumers permits the central station company to supply their demands with a much smaller investment in generating capacity and at a lower cost of production than would be possible if these consumers were operating individual generating plants. This difference must be sufficient to enable the central station to add the financial burden of a distributing system and yet have a margin upon which to sell its product economically to its consumers. The effect of the diversity factor is therefore a subject of interest to both producer and consumer of electricity.



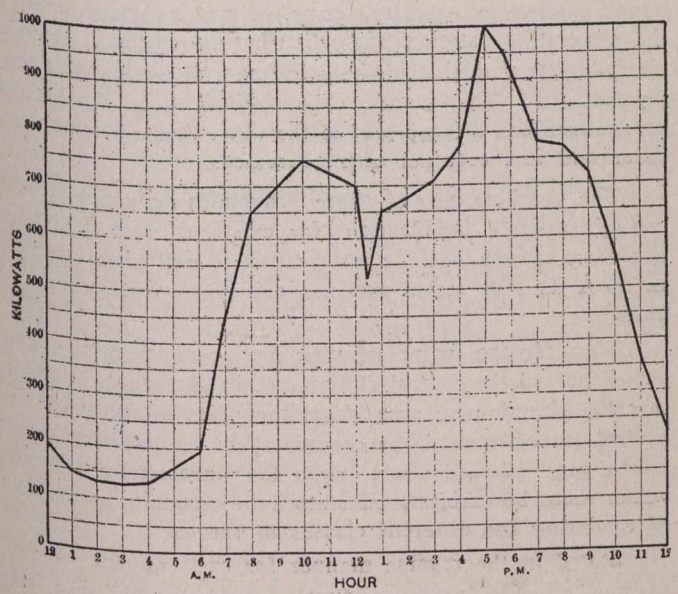
The larger the system the greater the diversity factor and our study will cover an alternating current system supplied by substations, feeders, mains, transformers, etc., as shown in Fig. 4. An alternating current system has been selected for analysis as it is somewhat easier to observe than a direct current low tension system because of the presence of transformers whose load may be measured. The loads on the distributing mains of a low tension feeder are not so easily measured, and observations, therefore, cannot be readily made.

The consumer being the originator of the demand for electricity, the development of the diversity factor logically proceeds in the reverse direction from the flow of energy.

*A paper presented at the Chicago Section of the American Institute of Electrical Engineers.

Observations made in residence districts supplied by overhead lines indicate that the sum of the maximum demands of individual consumers is from two and one-half to three times the co-incident maximum demand on the transformer, the ratio being lower where there are less than ten consumers on a transformer and higher where there are more than thirty.

In commercial districts with numerous small stores supplied by overhead lines, as illustrated in Fig. 5, the co-incident demand is much higher in proportion to the consumer's demands.



The ratio of the sum of consumers maxima to the co-incident demand in this class of lighting is found to be from 1.5 to 1.7, it being lower where there is considerable display of lighting, show-windows, etc., and higher where the shops are of such a character that not all the lighting is needed continuously.

In the block of commercial lighting shown in Fig. 5 there are fifty-five customers, twenty-six services and 1,200 lights connected. The measured demand on the transformer at 7.00 p.m. Saturday is 34 kw. while the sum of the readings of the demand meters is 55 kw. The diversity factor is therefore $\frac{55}{34} = 1.6$. The sum of the demand meter readings is 55/60 of the connected load.

In a densely populated residence block in Chicago the connected load is 2100 50-watt lamps or 105 kw. The consumers' maximum demands aggregate about 63 kw. and the co-incident maximum, as measured at the transformer, is 18 kw. There are over 175 consumers connected to the transformer. In this case the diversity factor is $\frac{63}{18} = 3.5$, and the consumers' demands are 63/105 of the connected load.

This probably represents as dense a condition as would be found anywhere in a residence district. It is due in this case to the fact that the block supplied by this transformer consists entirely of three-story apartment buildings, in which about 90 per cent. of the tenants are using electric service.

Power consumers are not often grouped so that any considerable number can be supplied from one transformer installation. They must be kept separate from lighting customers and therefore usually require a separate set of transformers for each consumer where the load is 2 h.p. or more. In large installations advantage is taken of the diversity between meters to reduce the transformer capacity installed. This cannot be done with small consumers except in the occasional situations where several power consumers are located within a radius of about 500 feet.

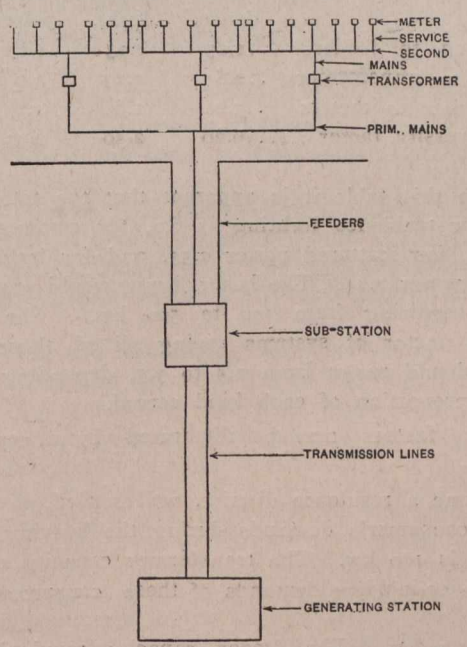
The diversity factor between meter and transformer on power customers is therefore very small and probably does not average over 1.1 for all power installations.

Advancing toward the substation, the next point at which diversity may be conveniently observed, is at the feeder switchboard. There is a considerable diversity factor between the sums of the transformer maxima and the maximum feeder load.

The factor varies with the character of the territory served and with the density of the load. In scattered residence territory where there are many one, two and three-kw. transformers, and few larger than 15 kw., the ratio of maximum feeder load to total transformer capacity is from 45 to 50 per cent. In territory where transformer units vary from 5 to 30 kw., or larger, the ratio is 55 to 60 per cent. In commercial districts with transformers from 5 to 50 kw., the ratio is from 75 to 85 per cent. or higher.

Assuming that each transformer carries its rated load at some time during the year, the diversity factor for a feeder in scattered territory is from 2 to 2.2 In denser territory the factor is 1.6 to 1.8 while in commercial districts it is 1.2 to 1.3.

On circuits carrying a scattered power load in units of 5 to 100 h.p., the ratio of maximum load to transformer capacity is from 45 to 50 per cent., which makes a diversity factor of 2 to 2.2 Where a few large power customers rang-

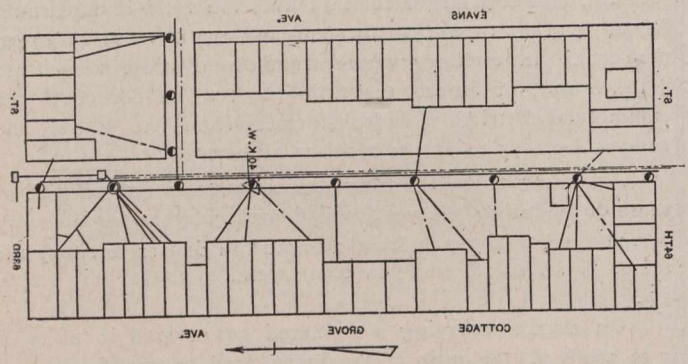


ing from 100 to 500 h.p. or more are on a separate feeder, the ratio is from 75 to 85 per cent., making a diversity factor of 1.2 to 1.3. These ratios shift somewhat in a growing system, the tendency being to reduce the diversity factor as the territory becomes more densely built up. They are also modified somewhat by the losses on feeders and mains which may be as much as 15 to 20 per cent.

In the substation, there is a diversity factor due to the difference in the character of the load carried by the different feeders. The maxima on the power feeders occur during the daylight hours, while the maxima on lighting feeders vary from 5.30 p.m. in commercial lighting to 7.00 p.m. in residence lighting.

With three-phase distribution, there is a diversity factor between phases where the lighting is carried single-phase. The net result is that in a substation with ten or more feeders the diversity factor averages about 1.15. In the substation supplying power feeders and general lighting it is likely to be as high as 1.2 while in a residence district with little power load, it is about 1.1.

Having thus analyzed the diversity between the various elements of the distributing system it is of interest to derive the total diversity factor from substation to consumer for various classes of business. For convenient reference the following table of diversity factors will be useful.



	Residence.	Commercial light.	Scattered power	Large users.
Substation to feeders	1.15	1.15	1.15	1.15
Feeders to transformers	1.8	1.25	2.0	1.25
Transformer to meters	3.0	1.6	1.1	....
Total diversity factor	6.20	2.30	2.53	1.44

From this table it is apparent that the total diversity factor for residence lighting is 6.2, for commercial lighting 2.30, for scattered power 2.53, and for large users of light or power 1.44. The latter figure would apply to consumers requiring from 100 to 500 kw. The combined diversity factor of systems giving all of these kinds of service should range from 2.5 to 3.5, depending upon the relative proportion of each kind served.

These factors may be illustrated by a concrete example:—

Assume a residence district, well settled, in which the sum of consumer's demands during the heaviest month of the year is 100 kw. The transformer capacity required to carry the co-incident demands of these consumers will be $\frac{100}{3} = 33.3$ kw. The feeder capacity required, will be $\frac{33.8}{1.8} = 18.5$ kw. The sub-station capacity required will be $\frac{18.5}{1.15} = 16.0$ kw.

Similarly, the capacity required for a commercial lighting district in which the sum of the consumer's demands is 100 kw. will be 43.5 kw., for scattered power it is 39.5 kw., and for large light or power consumers, it is 69.5 kw.

This reduction in the amount of capacity required in generating and distributing equipment makes a corresponding reduction in fixed charges which form a large part of the cost of producing electricity. The investment cost is further reduced by the ability to use large generating units which cost less than half as much per kilowatt as the cost of generating machinery in the sizes commonly used for independent plants.

The merging of all these demands has also a pronounced effect on operating costs, in that the load factor of the generating station and distributing systems is very much higher than that of the consumers who take their supply from it. This permits the station to be run at an economical load a large part of the time, thus reducing both labor and fuel cost per unit generated.

The combination of these economies constitutes the central station's justification for existence, and it is unnecessary to add that the justification is well nigh complete in these days of steam turbines and 20,000-kw. generating units.

Thus far the point of view has been from the consumer toward the central station. It is important, however, that the situation be seen from the point of view of the central station toward the consumer, as the diversity factor has a very marked effect upon the investment accounts which must be carefully considered in determining the cost of rendering the different classes of service.

Stated in the reverse manner for each 100 kw. of substation capacity used to supply residence lighting, the central station company must provide 620 kw. of meter capacity, 207 kw. of transformer capacity, and 115 kw. of feeder capacity. In serving large light or power customers it must provide 144 kw. capacity in meters and transformers and 115 kw. in feeder capacity for each 100 kw. of substation capacity.

The diversity factor for small and scattered consumers is higher than these figures and they require more equipment and a larger investment than is required for the consumers in thickly settled districts.

The investment required per kilowatt varies considerably with the type of construction, and the geographical situation of points of supply and delivery. It is considerably more for underground lines than for overhead, and no figures can, therefore, be given which will have great value for other systems than the one to which they apply.

It may, however, be instructive to give some figures to show in a general way how the investment is distributed between various parts of the system under a set of assumed conditions, which are fairly representative.

Assuming the average cost of a meter at $10, line transformers at $7 to $10 per kw., transformer substations and transmission lines at $35 per kw., and generating station capacity at $150 per kw., the investment is divided approximately as shown in the following table.

It is apparent from these figures that as far as that part of the cost of electricity supply which depends upon investment is concerned, small and scattered consumers are the most expensive to serve. This is due chiefly to the high investment in meters and distributing mains. For instance, the cost of meters in residence lighting is about 25 per cent. of $820 or $205 per kw. of station demand. This means that

(Continued on Page 296.)

THE

Sanitary Review

SEWERAGE, SEWAGE DISPOSAL, WATER SUPPLY AND WATER PURIFICATION

FORT WILLIAM WATER SUPPLY.

A detailed history of the many and somewhat exceptional struggles experienced by the city of Fort William in order to obtain a good and adequate water supply forms an interesting and very instructive paper, recently laid before the Canadian Society of Civil Engineers.

The subject matter (compiled by an associate member, H. Sydney Hancock, city engineer of Fort William), presents a careful study of the many difficulties in connection with water supply which are particularly found in Canadian Western towns isolated from manufacturing centres, and accompanied by the difficulty of procuring capable and skilled labor.

The past four years have witnessed an expenditure of over $500,000 in the fulfilment of a scheme to lead to the city by gravitation an ideal potable water from a lake, situate six miles from the city, 332 feet above Lake Superior, and which, because of its hilly and rocky environment, has received the familiar name of Loch Lomond in preference to the original Indian name, which resembles a series of unpronounceable sneezes.

It is calculated that the lake will be capable of supplying the city, in a maximum dry year, with 9,000,000 gallons per twenty-four hours, or sufficient, at sixty gallons per head, for a population of 150,000 people. It certainly looks as if the citizens of Fort William need have no anxiety as to their near future water supply.

The most costly feature of this water supply has been the construction of a tunnel about a mile in length; and, although the citizens have long recognized that Loch Lomond would eventually form their permanent source of water supply, the mining of this topographical barrier proved "a stumbling-block to the small population for many years." June of last year, however, witnessed the opening of the valve which allowed Loch Lomond to flow through the newly-constructed tunnel, and so into the city mains.

In spite of the fact that bids were first obtained for the tunnel section, the Water Board determined to do the work by day labor under Mr. Hancock's direction. Details of all costs and methods of construction have been noted, and form not the least valuable part of Mr. Hancock's contribution.

Before the tunnel could be constructed the city made use of a small lake, called Crescent Lake, about midway between the city and Loch Lomond, and it is in connection with the use of this water, that we have presented the history of a series of difficulties and failures, in the use of wood stave pipes for pressure main purposes, which eventually led to litigation between the firm supplying the pipes and the city. Fourteen pages of the paper are devoted to the "wood pipe" difficulties.

Approximately 10,000 feet of 18-inch wood pipe was laid under a total head of 300 feet, the wire spacing on the pipes being increased as the head diminished.

In October, 1906, the city paid the pipe company $5,000 of the total charge of $9,500 for 7,000 feet of the pipe purchased by the city. The company entered action against the city for the balance. The reason for the retention of the balance was, "as alleged," the impossibility of obtaining tight joints, and that leaks were no sooner repaired than others at once appeared. Mr. Hancock states that altogether 3,000 leaks were stopped, or, approximately, an average of three leaks for every joint. Mr. Keating, who was called in as an expert in connection with the trial, reported that the main showed a total leakage at the rate of 15,400 gallons per hour, or 369,600 gallons per day.

The result of the trial was judgment in favor of the city, the Chief Justice stating in part: "I find that the defendants relied on the plaintiffs' skill and judgment to supply pipes fit for the purpose required, and that the pipes were purchased by the defendants relying upon statements and warrantees made by plaintiffs that such pipes would give satisfaction, and would fill all requirements. I find that the pipes have not filled such requirements."

The points stated by the company in their action were briefly as follows:—

1. The pipe was well made and delivered in good condition.
2. That in numerous other cases it had proved successful for similar purposes at equal or greater pressure.
3. That it had been exposed to the atmosphere for too long a period.
4. That the pipe had been mishandled.
5. That it was not perfectly laid.
6. That the excavation was largely through solid rock, and the pipe insufficiently protected from jagged edges.
7. That the backfilling was carelessly done, and large boulders had been thrown on the bare pipe.
8. That it had been backfilled while empty, and was left too long in the trench before being filled with water, causing it to flatten out and lose its circular shape.
9. That the expert sent from the factory was an employee of the contractors, and the company were in no way responsible for his actions.

The case for the city was based primarily on the guarantee contained in the various letters leading up to the purchase. It was also stated that 90 per cent. of the trouble was experienced at the joints and not in the pipe itself. As to exposure to the atmosphere, it was pointed out that the company had shipped the pipe on flat cars from Vancouver, involving a journey of from three to five weeks through a variety of climates, totally unprotected from climatic conditions, and that evidently they did not consider exposure injurious. As to the injurious effect of solid rock, it was demonstrated that less than 200 feet of solid rock trench was encountered on the line, and that

the leaks on the solid rock sections were below the average.

The most significant point in connection with the above is the alleged deterioration due to exposure to the atmosphere. We are inclined to agree with Mr. Hancock when he states that "he cannot do otherwise than surmise that the change from the humid coast atmosphere at the point of manufacture to the comparatively dry climate east of the Rockies might have an important bearing on the distortion of some of the staves. This view would seem to be borne out by the fact that west of the divide success has attended almost every installation, whilst in the Canadain prairie Provinces wood pipe has left a marked trail of trouble and disappointment, although there may, of course, have been special local contributory causes."

Mr. Arnold, the city engineer of Lethbridge, Alta., has had considerable experience with wood pipe, and has had little or no trouble with it, although he appears to prefer the continuous-built stave type. Mr. Whitmore, late city engineer of Moose Jaw, reports that he has had considerable trouble with the wood pipe main from the spring supply to that city, and his experience is very similar to that of Fort William. Mr. Clarke, city engineer of Saskatoon, who previously was resident engineer at Maple Creek, where wood pipes were installed for a gravity system, reports that he has no confidence in them under pressure. Mr. Creighton, city engineer of Prince Albert, lately pointed out to us a section of wood pipe which he had replaced with cast-iron, and observed that he would never advise its use in the future.

There must certainly exist some very good and defined reason why the use of wood pipe should meet with success on the Pacific slopes of the Rockies and should generally prove a failure in the prairie towns. This journal would welcome correspondence on this subject, as it is strongly felt that, if efficiency could be guaranteed, the use of wood piping for water supply would prove a boon in economy to many of the smaller prairie towns where long lengths of cast-iron main almost make water supply prohibitory.

Mr. Hancock is to be congratulated upon the concise, yet inclusive, manner in which he has laid the particular experiences of Fort William before his brother engineers. It is certainly by the recording of actual difficulties, successes and failures that the sum total of engineering knowledge is increased relative to Canadian conditions.

SEWAGE DISPOSAL IN SASKATCHEWAN.*

By T. Aird Murray, M. Can. Soc. C.E.
Consulting Sanitary Engineer, Toronto.

The problem of sewage disposal is a new one in Canada. In the middle Northwest, that is, in the Provinces of Manitoba, Saskatchewan and Alberta, there exist no plants which attempt to deal with the problem of sewage purification. There are isolated cases in which the so-called septic tank has been adopted. Two cities in Saskatchewan, viz., Regina and Moose Jaw, have enjoyed the more or less questionable benefits of septic tank treatment for a number of years. These septic tanks were installed in the first instance as a measure to prevent stream pollution. In neither case have they fulfilled that purpose. While it is acknowledged that the tanks have kept back a proportion of the grosser solids, it is also apparent that the liquid from the tanks has been the cause of much nuisance in both cases, the streams below the tanks for a considerable distance being very foul as the results of organic putrefaction.

Dr. Seymour, the Commissioner of Health, called me in on June of 1909 to advise with him as to the best measures which might be taken to prevent stream pollution from sewage discharges; since that date my services as a consulting expert have been retained. Dr. Seymour has asked me to put together a few notes explaining as shortly as possible the various factors which have guided me in advising him to adopt, as far as possible, certain defined lines in connection with this important question.

The term "important" as applied to sewage disposal is a very significant one in the Province of Saskatchewan. Water for domestic purposes, apart from the two great rivers of the North and South Saskatchewans, can only be obtained from small creeks and shallow underground sources. The greater part of the rainfall percolates the soil and is found in sand and gravel layers which exist generally immediately below the soil layer and above the boulder clay. This sand and gravel layer is at times very near the surface and is seldom found at greater depths than 200 feet; beyond this depth, once we enter the boulder clay, no water is found of any consequence. The creeks, for the most part, run dry in times of drought, and surface water generally must be conserved by storage reservoirs. Although the country is only yet sparsely populated, even the two large rivers at times show signs of intestinal contamination by the presence of B. Coli. Dr. Seymour has, therefore, wisely seen fit to adopt strong measures to prevent the limited sources of water supply from being contaminated with sewage discharges.

The Provincial Legislature in the fall of 1909 passed a revised Public Health Act which contains the following enactments dealing with the question of sewerage and sewage disposal:

The passing of this enactment gave efficient powers to the Commissioner to insist on some method of sewage disposal. The question which the Commissioner then put to me was simply this: What form of and how much of sewage purification shall I insist upon?

Now I do not intend on the present occasion to go into any detail in the question of sewage purification in general. I simply wish to give my reasons for advising a particular line of policy in this particular province.

I think it will be acknowledged that all the various factors appertaining to sewage disposal processes can be crystallized under certain heads, viz.:

(a) Removal of suspended solids.

(b) Removal of tendency to putrescibility of organic compounds and organic solids in solution.

(c) Removal of pathogenity.

I think it will also be acknowledged that while A and B will provide a liquid discharge which is chemically stable and will prevent what may be termed an aesthetic nuisance to a stream, the two processes may be useless from a pathogenic point of view, unless followed up by C.

I think it will also be acknowledged that there may be occasions when the completion of the processes A, B and C may not be required and where either the one or the other may meet special requirements. I have therefore recommended that no fixed standard either as to non-putrescibility or removal of pathogenity be insisted upon, but that each particular case be treated on its merits with reference to location and particular conditions.

It is obvious, however, that, when it is a question of any chance of a water supply source being affected, the three complete processes must be insisted upon.

*Paper read before the American Health Association, Sept., 1910.

The processes A and B, viz., removal of suspended solids and removal of tendency to putrescibility, cannot be relied upon by any of the ordinary processes to remove more than 80 per cent. of the total bacteria in the raw sewage. A raw sewage giving the low count of 1,000,000 bacteria per C.C. will at an 80 per cent. removal still show 200,000 bacteria per C.C. and would require a dilution of 1,000 times with pure water to bring the count down to 100 per C.C., the German standard for filtered drinking water.

There are many sanitary engineers who hold that it is more especially the duty of those responsible for water supply to look after the removal of pathogenity, than for those responsible for sewage purification. While this may be true in certain countries where the rivers have become hopelessly impure and where sewage disposal has become uncontrollable, I do not think it holds good in a new country where there is a possibility of early preventive measures for the retention of the original purity of streams as far as possible. However, I have advised the Commissioner of Health to insist as far as possible on the removal of pathogenity by means of simple disinfection of the non-putrescible liquid effluents, with a view to, as follows:

(a) Prevention of intestinal contamination of streams by means of typhoid or other germs.

(b) Making it easier for municipalities to treat surface water by means of rapid filtration for removal of turbidity.

(c) Defending the small communities and individual farmers who cannot possibly afford to put in expensive filter plants to guard their water supply against pathogenic contamination.

The adoption of the principle that disinfection or removal of pathogenity has led some to conclude that the older systems for the removal of putrescibility require reconsideration, and that we are entering on a new era with reference to sewage disposal methods. I do not think that this conclusion is warranted; but, that any method of disinfection employed, depending upon the liberation of nascent oxygen, depends for its efficiency upon the removal of solids in the first instance, and removal of putrescibility in the second. It is difficult and expensive, and almost practically impossible to disinfect the solids in sewage, when treated in bulk, because of the length of time required for penetration by the disinfectant.

It is difficult and expensive to disinfect sewage from which most of the suspended solids have been removed because of the affinity of unstable organic matter for nascent oxygen.

Putrescible sewage, even if disinfected, still remains putrescible. Sterilization only delays putrescence for a time.

It would, therefore, appear that even granting the necessity of pathogenic disinfection, the processes A and B are still quite necessary.

When the suspended solids are removed and the liquid solids are rendered stable, it is an easy and inexpensive operation to disinfect sewage effluent. From 1 to 2 parts per 1,000,000 of available chlorine, obtained cheaply in the form of hypochlorite from ordinary bleach, is all that is necessary. The cost of the apparatus for applying the disinfectant is hardly worth consideration.

The writer has lately disinfected the Toronto water supply, 36,000,000 gallons a day, at an outlay of $100 and operating expenses of 40 cents per 1,000,000 gallons treated with the total elimination of B. Coli. with .33 parts of chlorine per 1,000,000. I do not consider that disinfection of sewage effluents will in any radical way affect the present methods employed for removal of solids and putrescibility, but will simply form a useful and efficient adjunct.

The question of the best method to employ for removal of solids and putrescibility in the Province of Saskatchewan at first appeared a difficult one, because of the severe frosts experienced in the winter months. It was at once recognized that although nitrification may act efficiently in certain climates, it would not act at all at temperatures below zero. Here, in Saskatchewan, we have temperatures which may reach between 40 and 50 below. This factor of the interference by frost affects every known system which relies upon nitrification for the production of a stable effluent. It affects equally land intermittent filtration and the modern methods of so-called biological filtration, either by use of contact beds or trickling filters. The writer knew of no efficient method of rendering a putrescible sewage non-putrescible except either by land filtration or the newer and more compact processes. It became a question, therefore, of accepting either the one or the other, and fighting off the frost. We can keep the frost out of our dwellings, therefore we can keep it out of our filters.

Protection from frost is required. The amount of protection is simply a question of cost. This is an extra cost which must be faced in the middle Northwest of Canada, and will make sewage disposal works just so much dearer than in the milder situated countries.

Protection from frost being admitted, it then became necessary to determine upon the system which could be the most easily protected. Obviously the system which was most compact, occupying the least area, requiring a minimum of covering and space to be heated, was most suitable to the province. Land intermittent filtration, which otherwise because of the nature of the land, might have given good results, was out of the question because of the great area required. Everything pointed to covered-in sedimentation tanks for the removal of solids followed by trickling filters for the removal of putrescibility, as providing the least area necessary for the works. The conclusion which I have come to is, therefore, that the best interests in sewage purification can be met by

(a) Sedimentation tanks (covered), allowing the removal of solids by gravitation.

(b) Trickling filters (covered and heated when necessary), allowing of the removal of putrescibility by means of nitrification.

(c) Disinfection of the non-putrescible liquid by hypochlorite in tanks which allow of the settlement of the humus from the trickling filters.

Several plans of schemes promoted on the above lines for some of the towns and cities in the province are on view. Results have not yet been obtained, but it is anticipated that in spite of the severity of the winter climate such results will prove satisfactory with careful and efficient management.

LOCOMOTIVE ENGINEERS' REQUEST.

At the recent session of the Dominion Legislative Board of the International Brotherhood of Locomotive Engineers, held in Ottawa, March 29-April 2nd, the following resolutions were unanimously adopted and the Legislative Representative instructed to place them before the Dominion Railway Board for their consideration.

The matter will be considered by the Board on November 1st, 1910.

No. 1. That sign-boards be placed at the side of the railway track defining the limits of cities, towns and villages, for the guidance and information of the men in train service.

No. 2. That owing to the liability of accident and the exposure to the severe cold during our winter season that a law be enacted preventing the running of locomotive's tender first beyond a distance of ten (10) miles, except in cases of emergency.

No. 3. That a law be enacted requiring all railway companies in Canada to equip their locomotives with power headlamps and air bell-ringers.

No. 4. That recognizing the many dangers and the liability of accident in running over portions of the railway unknown to the engineer, that a practical and competent engineer familiar with the road about to be run over be placed upon the locomotive in addition to the regular engine crew.

No. 5. That owing to the very fatiguing nature of our occupation and the constant demand for vigilance necessary for the faithful performance of our duties as locomotive engineers in handling the commerce of the country and the lives of its citizens, it therefore follows that we would be provided with clean, comfortable and sanitary quarters where we may be assured of uninterrupted repose and quiet in order to prepare ourselves for our important duty.

Many terminals, we regret to say, are absolutely unprovided for in this respect. As a class we do not desire to patronize or frequent places where intoxicants are sold, and we therefore ask that the railway companies be required to establish suitable quarters at all terminals as above mentioned.

No. 6. That owing to the absence of land marks in many of the localities in which our men are employed and as a guide to inform them of their exact whereabouts in approaching stations, it was unanimously decided to recommend to your honorable body that a large sign-board be placed one mile outside of yard limit.

No. 7. That the matter of the removal of all snow-cleaning devices which was referred to your honorable body in 1908 be again brought to your attention, as we are firmly of the opinion that such devices should have no place on a locomotive, with the exception of the steel pilot plough now used by the C. P. R. in the mountain districts of British Columbia. These ploughs do not project above the buffer-beam nor do they touch the rail, and are considered a reinforcement to the pilot.

No. 8. That we respectfully request the Board of Railway Commissioners to take such action as they may deem advisable to have suitable inspection supplied for all wooden bridges.

No. 9. That the attention of the Board of Railway Commissioners be called to the fact that many of the modern engines now being built and used in Canada are totally devoid of any sense of comfort or convenience for the men who are obliged to spend the greater part of their time on them. Everything is apparently sacrificed in order to make them as huge and powerful as possible. As most of them carry at least 200 lbs. pressure per square inch, it means that the men who handle them are separated by only a few inches from a temperature of 387 degrees of heat.

To get into position to handle these monsters, the engineer is obliged to climb over obstructions in the shape of different parts of the equipment and wedge himself in the narrow space between the side of the cab and the boiler. Should the engine run off the track and turn over the engineer has not the slightest chance of escape and would likely be crushed and scalded to death.

Further, that we respectfully ask the Board that they give this matter their most earnest consideration and endeavor to place some limit on the size of boiler and cab that will allow for ample room and breathing space. The appliances for operating the engines are not infrequently placed in such very awkward positions that the engineers are at a disadvantage in cases of great emergency.

Water-glasses, steam-gauges, air-gauges and lubricators, which require almost constant observation, are often found so inconveniently located that the engineer's attention is too long diverted from the track and signals.

No. 10. That owing to the unclean condition of the working parts, especially that portion under the boiler and between the frames, and the liability to accident by the engineer in attempting to crawl under the engine, between the wheels, to inspect his locomotive, the Board recommends that the engineer be held responsible only for such defects as may be reasonably detected from the outside, and in addition to the inspection by the engineer the engines shall also be inspected by a competent inspector at all railway terminals, and the engineer not held responsible for any defects which the inspector may find.

No. 11. The Board was of the opinion that as the safety of life and property depends upon the sight and judgment of the men who guide the traffic and having practical knowledge of the inability, under certain conditions, to obtain more than a partial view of the track and signals, such protection should be afforded as would enable the engineer to, at all times, have a clear and uninterrupted view ahead. Having examined a model of the "Quirk Storm Guard or Protector," and heard the endorsement of one who had used it, they were unanimous in the proposal of recommending to the management of the several Canadian railways a trial of the "Protector."

The patentee, Mr. T. J. Quirk, 183 East Front Street, Dunkirk, N.Y., will be glad to furnish sketches or any information desired.

No. 12. That owing to the fact that not infrequently an employee of the railway company is injured through no fault of his own, and the railway company's officials eventually refer him to their claims agent, who usually requests the employee to wait until such time as he is completely recovered before making a settlement, thus requiring him in many cases to become indebted for the necessities of life for himself and family. The Board therefore agree unanimously to request that monthly payment of a sum at least equal to that which he would have earned, should be made to injured employees.

REDUCING THE COST OF TELEPHONE SERVICE.

Anything that means the throwing open to the general public of first-class telephone service at rates which the general public can afford to pay, is of more or less immediate interest to telephone users, and to non-subscribers who would like to be users, all over the country. From this point of view the scheme of rates and the basis of rate regulation adopted by the Massachusetts Highway Commission, and made public on August 24 as its official recommendation for the Boston and suburban telephone district is of much more than local importance. The investigation by the Massachusetts Commission has occupied three years and a half, and the result has been to demonstrate that in the Boston district, and presumably in many other cities and towns, the small user of the telephone has been overcharged for the service he receives in order to balance on the company's books the waste caused by excessive use on the part of subscribers under various flat rates for unlimited calls.

The question of rates in the Boston district was brought up by various complaints filed with the commission nearly four years ago. In order to eliminate innumerable questions of fact which were in dispute, it was agreed by all parties that it was desirable to have the books of the telephone company examined by an impartial, disinterested and reliable accountant. Following this examination of the books, it became clear that an inventory and appraisal of the telephone company's entire property must be made before there could be any adequate basis for the adjustment of rates. This appraisal, which was most minute, showed that the replacement value of the company's property was nearly 20 per cent. in excess of the par value of all the certificates of indebtedness outstanding. This result disposed of the charges that the company was overcapitalized. After referring to this and other of the earlier steps in its investigation, the Commission in its finding of last week says:

"The preliminary studies indicated that a reduction of from $300,000 to $400,000 could be made in the net yearly in-

come of your company from the metropolitan and suburban districts with entire fairness to your company, and without impairing the efficiency of the service. This would amount to a horizontal reduction of only a small percentage per telephone if applied upon each individual rate.

"The traffic study showed conclusively that the rates per call collected from individual subscribers in different classes varied from 10 cents per call to less than 1 cent per call; certain of the larger users securing calls at a cost of less than half a cent.

"Such variation is manifestly unjust and inequitable.

"The gross collections of your company for exchange service in the entire metropolitan and suburban district was slightly less than 3½ cents for each completed call.

"It is plain, therefore, that the larger users having unlimited rates covering the whole of the suburban area, who pay from one-half a cent to 2 cents per call, are paying less than cost, and this has to be made up by the smaller users paying from 6 to 10 cents per call.

"This latter collection was necessary to enable your company to secure an adequate revenue from the subscribers in the district as a whole, but was necessary only because a proportionately few subscribers obtained their service at this extremely low and unprofitable rate, sometimes so low that it does not even pay the wages of the operator, to say nothing of the much larger expenses required for interest, maintenance, taxes, etc. The evident injustice of this condition the Commission has sought to abate.

"The Commission, therefore, instructed its experts to report a schedule of rates which would not only reduce the net yearly income in the metropolitan and suburban districts from $300,000 to $400,000 yearly, but which would be founded upon a rate for small users of a maximum charge of 5 cents a message for a minimum number of guaranteed calls.

"This resulted in the experts reporting a recommendation for the establishment of zones and a new schedule of rates therein as the only practicable way by which rates can be secured to this district which are fair, proportionate and equitable.

"The establishment of zones seems the only practicable means of securing the lowest possible rates for the moderate user of calls, who only needs a limited territory.

"It is the only possible way by which any unlimited telephone service can be properly retained and an adequate revenue secured from the district without charging the loss to the smaller users, or by which the maximum rate per call can be reduced to 5 cents.

"The toll charges recommended cover as long a distance at as low a rate as seems, even in such a densely populated district, compatible with securing for the company an adequate revenue."

POWER PLANT OF THE BIGELOW CARPET COMPANY.

Until recently the Bigelow Carpet Co., at Clinton, Mass., consisted of two separate mills, one known as the Spinning Mill, where wool scouring, spinning and preparation of the yarn is done, and located on the Worcester & Nashua Division of the Boston & Maine Railroad; the other mill, known as the Axminster Weaving Mill, where the dyeing and hacking of the yarns and weaving of rugs and carpets is accomplished, was an eighth of a mile distant. Each mill contained its independent power plants, while all current for lighting was furnished from the weaving mill. The company decided, after careful investigation by their engineer, Mr. Chas. T. Main, of Boston, that a very material economy of operation could be secured by concentrating their power generating units into one plant. Mr. Main was consequently instructed to proceed with the design and erection of a new power plant. A further consideration concerning the erection of a central power plant was the anticipated extension of the weaving mill.

The new plant is located in a lot about half way between the two mills above mentioned, where advantage was taken of the slope of the ground for the arrangement of the coal pocket. A spur track from the railroad was laid on the top of the embankment, and a trestle extended from the end of the same. The railroad tracks enter the coal pocket 18 ft. above the level of the floor, the coal is dumped from the railroad cars to the bunker floor and thence loaded by hand into industrial cars and run through doors in the 20-inch fire wall which separates the coal pocket from the boiler room firing floor. Each opening is equipped with a vertical rolling steel door and in front of each opening is a pair of two-ton industrial scales with the registering device enclosed in a dust-proof case. The coal pocket is built of reinforced concrete with structural steel columns, brick walls and steel trusses to support the roof. Its dimensions are 71 ft. by 197 ft., and it has a total capacity of about 5,000 tons and is divided in the middle by a reinforced concrete fire wall to the height of the tracks.

The chimney for the entire power plant, located in the coal pocket on the side next to the boiler room, is built of red brick, has a 10 ft. diameter flue, and rises 200 ft. above the boiler room floor. The boiler house, which adjoins the coal pocket, is 50 ft. wide by 197 ft. long, with a clear height of 23 ft. 6 in. to the bottom of the trusses. The boilers face the coal pocket, there being a firing floor between the boiler front and the dividing wall of 20 ft. in the clear. All the firing is done direct from the industrial cars, no coal being upon the boiler room floor. All the coal is accurately weighed on being brought from the coal pockets.

The buildings are of red brick with granite trimmings, steel trusses to support the roofs, which are wood, covered with tar and gravel. The floors are of vitrified brick embedded in concrete.

The boiler equipment consists of eight old boilers, which were removed from the Axminster Mill power plant, and six new boilers, there being available space for two additional boilers to be installed later. The boilers are of the horizontal, return tubular type, 84 in. in diameter, with 180 three-inch tubes nineteen feet long.

There are two steam pressures in the plant—a high pressure system of 125 lbs. gauge, to provide steam for the main engines and auxiliaries and to the dye house, and a low pressure system of from five to ten pounds gauge supplying steam to the feed water heaters and the heating system of one mill. There is also a vacuum system in which the vacuum is kept at the proper point to maintain the desired temperature of the overflow water going to the dye house. All the boilers were built by the D. M. Dillon Water Works, Fitchburg, Mass.

The pump room equipment consists of two International Steam Pump Company's fire pumps of 1,500 and 1,000 gallons capacity; of three 14x8x12 in. Duplex Outside and Packed boiler feed pumps for regular service, and one 8x5x12 in. Duplex Vertical Piston Pump for night and Sunday service, manufactured by the Warren Steam Pump Co., of Warren, Mass., of an 8x7x12 in. Duplex Piston Service Pump for supplying cold water to the plant. The boiler feed and fire pumps are equipped with Locke Regulator Company's pump governor, and the service pump with a Fulton tank governor. The 3,000 h.p. Kelley-Berryman Feed Water Heater is also located in the pump room. The boilers are provided with Williams Feed Water Regulators, a very necessary appliance in this plant, owing to the irregular demand for steam in the dye house. All the hot water supplied to the boilers is measured by Hersey water meters, there being one meter for each battery of boilers.

As the supply of water is limited, the economical use of same for condensing and manufacturing purposes was very

carefully considered by Mr. Main in the design of the plant. The suction of the boiler feed pumps is connected to the overflow line from the condenser, the water herein being heated to about 95 degrees F. This line also connects with the dye house—also has an overflow through an elevated loop, through which any excess water is discharged to the pond from which it was drawn to the condenser.

A test was recently conducted on boilers Nos. 7 and 8 by Mr. F. M. Gunby, of Mr. Main's staff of engineers, a description of which follows:

Boiler Test.

Made at the new power plant of the Bigelow Carpet Company, Clinton, Mass.

Test made on two 84 in. Dillon H.R.T. boilers with shaking grates, Dillon make, Lamprey mouth-pieces, and dry pipes in boilers.

Test made on ordinary mill load to determine evaporation of boilers.

Kind of fuel, New River coal.

Kind of furnace, brick with Dillon shaking grates.

Weather, clear and warm.

Method of starting and stopping test, alternate.

Date of trial, June 20, 1910.

Duration of trial, 7.10 a.m. to 5.30 p.m.—10 hrs. 20 min.

Dimensions and Proportions.

Grate surface, 6 ft. 7 in. wide by 7 ft. 1 in. deep=46.7×2=93.4 sq. ft.

Boilers set with shell 30 in. above grates.

Grate bars, Dillon shaking type.

Water heating surface, 2×2,741=5,482 sq. ft.

Superheated surface, none.

Ratio of water heating to grate surface, 58.7:1.

Total Quantities.

Weight of coal as fired	23,404 lbs.
Per cent. of moisture in coal by analysis	1.28
Total weight of dry coal consumed	23,104 lbs.
Per cent. of ash and refuse in dry coal	6.85
Total weight of water fed to boilers	217,360 lbs.
Water actually evaporated. Corrected for moisture at 2.66 per cent.	211,580 lbs.
Factor of evaporation	1.1657
Equivalent water evaporated into dry steam from and at 212 degrees F.	246,638 lbs.

Hourly Quantities.

Dry coal consumed per hour	2,235 lbs.
Dry coal per sq. ft. of grate surface per hr.	23.9 lbs.
Water evaporated per hr. Corrected for quality of steam	20,470 lbs.
Equivalent evaporation per hr. from and at 212 degrees F.	23,860 lbs.
Equivalent water evaporated per hr. from and at 212 degrees F. per sq. ft. of heating surface	4.35 lbs.

Average Pressures, Temperatures, etc.

Steam pressure by gauge	109.1 lbs.
Temperature of feed water entering boiler	93.2 deg. F.
Temp. of escaping gases from boilers	388 deg. F.
Force of draught at main flue of No. 7 boiler	8¼ in.
Percentage of moisture in steam	2.66

Horse Power.

Boiler h.p. developed, 246,638 divided by 34.5	715 b.h.p.
Builders' rating on 10 sq. ft. heat. surface per h.p.	548.2 b.h.p.
Percentage of builders' rating developed	1.30

Economic Results.

Water apparently evaporated under actual conditions per lb. of coal as fired	9.28 lbs.
Equivalent evaporation from and at 212 degrees F. per lb. of coal as fired	10.52 lbs.
Equivalent evaporation from and at 212 degrees F. per lb. of dry coal	10.68 lbs.
Equivalent evaporation from and at 212 degrees F. per lb. of combustible	11.45 lbs.

Efficiency.

Calorific value of dry coal per lb	14,829 b.t.u.
Efficiency of boiler and grate, based on dry coal— $\frac{10.68\times(966)}{14,829}=$	69.5%

Analysis of Coal.

	As Received.	Dry Basis.
Moisture	1.28%	
Volatile	20.47%	20.74%
Fixed carbon	72.79%	73.73%
Ash	5.46%	5.53%
	100.00%	100.00%
Sulphur	0.82%	0.83%
B.t.u. bomb calorimeter	14,639	14,829

Analysis of Ash.

Combustible	39.63%
Ash	60.37%
	100.00%

Flue Gas Analysis.

No orsat apparatus was used, but continuous readings were taken on a CO_2 recording machine. The CO_2 ranged from 6% to 15% averaging for test 12%.

CANADA IS GIVING AWAY

A Birthright in the Shape of Free Power for the United States, Says Mayor Williams, of Fort Frances.

A subject of much importance to Canadian municipalities with undeveloped water-powers is the export of power. The experience of Fort Frances, Ont., will prove of interest to other municipalities. The accompanying photograph shows the present condition of affairs in that town. On the United States side of the falls stands a large paper mill. The endeavors of Fort Frances are now directed towards obtaining a similar mill, to be operated in Canada with Canadian power. Mr. H. Williams, mayor of Fort Frances, read an instructive paper on the subject of power exportation at the Canadian Municipal Convention this week, in which he described the experience and difficulties of his town with regard to water power.

First Agreement was Equitable.

He stated that "in 1904 an agreement was made between a development company and the province of Ontario which was fair and equitable, and fully protected Canadian interests. In 1905, by misrepresentation, this agreement was changed, and this without our municipality being given an opportunity to present their side of the case. This change was much to our disadvantage. In 1908 the agreement was once more modified, and, as regards the interests of Fort Frances, made much worse. Not satisfied with getting nearly all of our birthright, the power company attempted to get all, and then we came to the conclusion that we had to fight for our existence. With the aid of our Federal member, the support of the press, the assistance of the Conservation Committee and the Canadian Union of Municipalities, and many of the Boards of Trade throughout the country, we eventually secured a partial recognition of the justice of our claim to retain the Canadian share of the power for use in Canada; and, as the Hydro-Electric Commission has in hand the settling of the price and conditions at which the power must be furnished to Canadian users, we hope to soon be one of the growing and prosperous communities of New Ontario.

Must Have Joint Action by Municipalities.

"From our experience in trying to put our claims before the Federal and Provincial Governments, we realized that Canada is too large for our Ministers to be in touch with local conditions until same are brought to their attention by the municipalities directly interested, or by concerted action, such as the union of same makes possible, and the assistance of the press of the country, which, in nearly every instance, we have found willing and anxious to assist in a good cause.

"The press of the United States has for some time past called the attention of the public to the fact that a powerful combination has, and is now endeavoring to secure control of all available water-power, whether at present in demand or otherwise, as the improvements constantly being made in transmission of electrical power may commercially make available water-powers which in the past would not be considered a paying proposition.

What Municipalities Should Insist On.

"Recent application for water-power development privileges should awaken municipalities to the fact that organizations with a similar objective have crossed our border, and, therefore, every municipality wherein lies water-power or natural gas should insist:—

"Firstly—That no right to export either of these natural assets be given without the consent of the municipality directly interested.

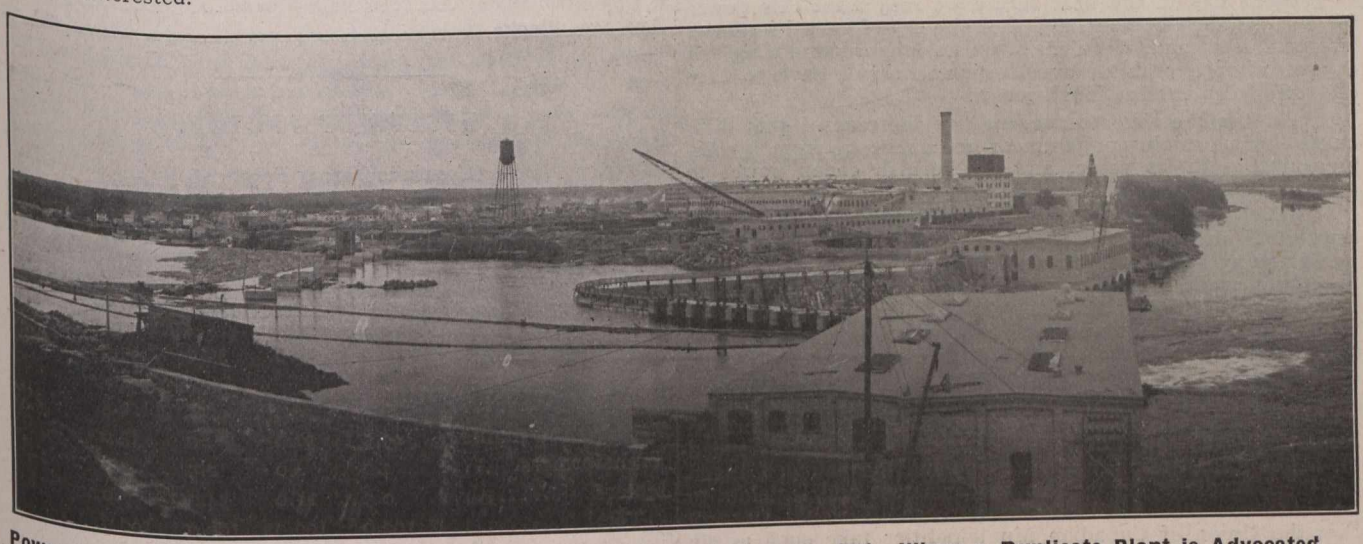
Should Thoroughly Investigate.

"The third danger is the tendency of central authorities to dispose of natural assets without thoroughly investigating the bona fides of the applicant company—to take for facts engineering reports prepared in the interests of the promoter. The Fort Frances water-power is a good example. When applying for this power an acknowledged authority made a report for the applicant company that there was available only from eight to twelve thousand horse-power, and the government of the day sold on this basis for $5,000—a power which to-day has 30,000 horse-power developed, and which the same engineer, two or three years after his first report, declared would develop a maximum of 43,500 horse-power, and which engineers of recognized standing have since placed as high as 65,000 horse-power.

"It is now conceded that water-power is a public utility, and that the public have the right to obtain use of it (even if developed by a private corporation) at as low a price as possible consistent with allowing the development company a fair return on their actual expenditures.

Statements Should be Scrutinized.

"Therefore, all statements of costs and expenditures should be carefully scrutinized, so that the price of power to the consumer shall be made on a basis of actual cost and not on an alleged expenditure backed up by special book-keeping.



Power Plants and Mill, International Falls, Minn., Opposite Fort Frances, Ont., Where a Duplicate Plant is Advocated.

"Secondly—That should local conditions justify export, then a charge should be made that would add to the revenue of the province, and a certain portion of this revenue should go to the municipality directly interested.

"I cannot serve the purpose of this article better than to point out some of the dangers to which a small municipality is liable when asked to consent to the development of any of its natural assets.

Some of the Existing Dangers.

"(1) Over-eagerness to secure industrial development at any price.

"(2) Giving heed to specious and plausible arguments and modifying protective clauses in the agreement.

"(3) Disposition of central authorities to ignore local conditions and representations where vote is a small factor.

"(4) Excessive apparent cost of development.

"The greatest danger is the over-anxiety of the people themselves in a young community to get industries established. As a rule, the electors are tumbling over each other to give away the solid future prosperity for a little present gain, and anyone who advises them 'to make haste slowly' is designated as a 'kicker' and becomes unpopular.

"If this first danger is avoided, the promoter will generally give a fair agreement to start in with, and later on plead conditions are too onerous to enable him to finance the project; and, little by little, modifications are granted until some day the municipality awakens to the fact that they have gradually parted with all their protective conditions.

"These four instances show clearly:—

"Firstly—That municipalities cannot be too careful in closely scanning any proposition put before them for parting with their rights in any natural asset.

"Secondly—That they should fully investigate its present and future possibilities.

"Thirdly—That in season and out of season they should be insistent on central authorities giving heed and weight to local representations as to the effect of the exporting of a natural asset would have on the future prosperity of their community. No central authority in such a large country as ours can possibly be as conversant with local conditions as the people living on the ground. It is the duty of each municipality to furnish as far as possible all the information available from local knowledge, so that those who finally decide the question may give their decision intelligently, and not on ex-parte representations of the promoter.

"Fourthly—Once having secured a fair and equitable agreement, no modifications should be permitted that in any degree reduce the protection of municipal interests.

A Necessary Clause.

"Where the power to be developed is so situated that there is a home market at a fair price, and also an export market at an increased price, the clause inserted by the Hon. E. J. Davis, while Minister of Crown Lands, in the agreement dated 1904 between the Province of Ontario and the power company at Fort Frances cannot be improved upon, viz.:—

" 'The power company further covenant and agree that they will at all times retain and reserve for use on the Canadian side of the said international boundary line one-half

of the total power capable of development from said water-power (including any increase thereof by storage works) as determined by the Government engineer, and that they will not at any time divert or use any portion thereof elsewhere.'

"With regard to power for which there is not a reasonable expectation of a home market, I cannot see any good business reason why this country should allow any of it to be exported and used for the building up of a neighboring State without contributing to our revenue. It is manifestly in the interests of any power company to market its power where it will produce the best net profit. It is also equally apparent that, no matter what the power company might contribute towards our revenue, if the power was used in the country that produces it, that country would receive more general benefit therefrom than from any rental that could be charged. It is, therefore, plain that all power legislation should create an incentive for power companies to utilize the power in the country which produces it; and this can only be done by regulations and conditions that will make it more valuable for home consumption than for export.

The Past and the Future.

"In this connection it is to be noted, on the authority of the Department of Inland Revenue, that, of all the power in use developed by the Canadian Niagara companies, 85 per cent. is exported and nothing paid to the country that produces it.

"Some day in the near future we may want this power for our own development, and then the cry of vested interests will be raised, and, if we insist on no longer permitting the export, what a problem our Government will have to face and still keep international peace!

"Now is the time to prevent any increase of this difficulty. Let us retain our power or get a revenue from it commensurate with its value, and not furnish cheap power to stop our own industrial progress.

"It will be of interest and encouragement to those who supported and assisted Fort Frances in its up-hill fight against a powerful corporation to know that arrangements have been made that will result in a large part of the Canadian share of the power at Fort Frances being used in Canada in the manufacture of Canadian raw material. So it would seem that at the eleventh hour our joint efforts have convinced the powers that be of the merits of our claims, or that the policy of ignoring municipal rights and giving away our natural assets for the up-building of a foreign community was something which could not be well defended on a public platform. When we applaud the policy, Canada for the Canadians, let us also be consistent and legislate to conserve our resources for that purpose. I would suggest that the Union of Canadian Municipalities take such action as may result in an Act being passed at the next session of the Legislature, declaring it the policy of this country that all power exported must contribute to the revenue of the country that produces it."

HIGH EFFICIENCIES WITH LOW-GRADE FUEL.

The question of burning low grade bituminous coal economically under steam boilers is one which is of great interest to combustion engineers and power producers. The low price of this kind of fuel would often be the determining factor in deciding upon the type of coal to be used if the engineer could be assured of economics comparable with those obtained with higher grades.

In this connection the results obtained in a recent acceptance test at the Viaduct Power Station of the Cleveland Railway Co. are significant.

The boiler under test was a 512 h.p. B. & W. unit fired by a Taylor Gravity Underfeed Stoker. The coal used was a low grade of bituminous slack with a heating value of 12350 B. T. U. per lb. of dry coal. Its proximate analysis was as follows:

Moisture, 4.5 per cent.
Volatile, 34.4 per cent.
Fixed Carbon, 49.8 per cent.
Ash, 15.8 per cent.

In spite of the nature of the fuel and its high percentage of ash, an overall efficiency of nearly 80 per cent. was obtained, and, furthermore, the coal was burned almost smokelessly.

Following is an abridged table of the results obtained:

Boiler Test Report.

Viaduct Power Station, Cleveland Railway Co.

Weight of coal as fired in lbs.	20,000
Total weight of dry coal consumed	19,291
Equiv. water evap. into dry steam F. & A. 212 F.	196,669
Dry coal per sq. foot grate surface per hour	31.02
H.P. developed	712.57
H.P., Builders' rating	512.
Per cent. of Builder's rating developed	139.16
Equiv. water F. & A. 212 F. per lb. of dry coal	10.20
Calorific value per lb. of dry coal	12350 B.T.U.
Boiler efficiency	82.37%
Stoker efficiency	96.79%
Combined efficiency	79.72%

Gas Analysis.

Carbon Dioxide	CO_2	Last pass	13.33%
Oxygen	O	Last pass	6.37%
Carbon Monoxide	CO	Last pass	.22%
Average Smoke			6.1 %

DIVERSITY FACTOR.

(Continued from Page 288.)

if all the consumers were of this class that the company would have as much money invested in meters as in generating plant.

	Scattered power per cent.	Scattered residence per cent.	Dense residence per cent.	Commercial light per cent.	Large users per cent.
Generating capacity.	37.0	18.5	30.0	44.5	60.0
Trans. line and sub-station	9.0	4.5	7.5	10.5	14.0
Feeders and mains..	49.5	52.0	26.0	35.0	23.0
Transformers	4.0	4.0	2.5	3.0	3.0
Meters	0.5	21.0	34.0	7.0	negligible
Total	100.0	100.0	100.0	100.0	100.0
Investment per kw. of annual maximum demand on generating station	$ 410.00	$820.00	$500.00	$350.00	$250.00

The commercial lighting and power business where the diversity factor is smaller and the size of consumers larger, requires less meter investment and more in generating and substation capacity.

The maintenance cost of a large meter and distributing equipment and the general expense items of meter reading, billing etc., are correspondingly high for small consumers, so that it is probable that the outlying parts of the distributing system are served at a loss during the earlier stages of development.

The study of diversity factors has not been carried out in as much detail heretofore as is desirable. These deductions are presented as a tentative contribution to a subject which has many angles and must submit to revision as experience and more careful observation may demand.

They should in no wise be considered as the last word on the subject as parts of them have been necessarily drawn from sources that could not be thoroughly verified.

It is believed, however, that as a whole, they are sufficiently near the facts to form the basis of intelligent discussion.

A GROWING FIELD FOR THE ENGINEER.

In these days of extraordinary engineering achievement it is not strange that the public, in its admiration of the tremendous tasks accomplished by engineering science, backed by millions, loses sight, in a large measure, of the less showy but none the less important work that the engineer is doing, in the realm of economic management of industrial and public service enterprises.

From the status of a designer and constructor, pure and simple, the engineer is developing in many instances into a financier with engineering knowledge. Although his entrance into this field is of comparatively recent date, the importance of the work already accomplished leads to the belief in a bright future for the engineer along this line.

An example which, although comparatively unimportant in itself, is nevertheless sufficiently typical to be of interest in this connection, is the rehabilitation of the Janesville Electric Company. Six or seven years ago this concern generated power in two small plants—part water power and part steam—of low capacity, with apparatus which had outlived its usefulness and which was in consequence most inefficient. In a recent statement, the company shows that it now supplies energy to over 75 per cent. of the manufacturers of Janesville, a city of 15,000 inhabitants, in addition to having a healthy lighting load. This remarkable transformation has been brought about by the far-sightedness and judgment of the new owners who had acquired control of the company at that time. Realizing the field for the sale of power presented by Janesville and its environs, the latter obtained nearly exclusive rights to two additional dams on the Rock River as the first step in a proposed campaign of expansion. Upon securing these water power sites, it was decided to place the development of a suitable electrical generating plant in the hands of the engineering firm of D. C. & Wm. B. Jackson, of Chicago and Boston. After a survey of the situation Messrs. Jackson recommended a nearly complete reconstruction of the existing system as well as the exploiting of the additional power sites already acquired and consequent increase in the company's current output.

The recommendations of the engineers were adopted and they were placed in charge of the work. An old mill at one of the dams acquired by the Electric Company was demolished and forebay and penstocks constructed at the site and 800 h.p. in water wheels and generators installed. New machinery was placed in the other two plants of the company to secure efficient operation and various other changes instituted. The distribution system was of a complicated order, being made up of both A. C. and D. C. circuits at several different voltages. It was decided that a change to a simpler system would entail too great a cost in view of the small size of the whole investment, so the old system is retained with certain minor alterations tending toward simplicity.

Upon the completion of the construction work, Messrs. Jackson were retained to supervise the operation of the system. Under efficient management the progress made has been remarkable. In 1903, before the reconstruction had been undertaken, the yearly output aggregated less than 1,000,000 kw. hrs., while in 1905, after the new system was in operation, the output amounted to nearly 2,000,000 kw. hrs. The company's recent report of progress already mentioned, indicates the growth of the business, and is a striking commentary on the ability of the trained engineer to meet successfully the economic and financial requirements of a situation.

ROADS AND ROAD-MAKING.

Engineering for July 15, 1910, has an editorial on roads and road making which will be read with interest by those specially concerned in the improvement of our own country roads. After touching on the history of road making, mentioning such pioneers as M. Tresaguet, appointed Inspector-General of the French Department of Roads and Bridges in 1775, followed by Telford and Macadam in England, whose names are inseparably associated in any discussion of road making, it refers to the changed conditions since the days of the old stage coach and proceeds as follows:

> The growing use of commercial motor-vehicles of all kinds (in England alone there are nearly 9,000 traction engines in use), has called attention, in a way possible of evasion, to the unsatisfactory construction of many of our roads, and the present motor touring season and the forthcoming International Congress on the subject make it opportune to consider now the state of the case from the engineering point of view, as well as from the standpoint of ways and means.
>
> Many main roads have been constructed without proper foundations. Experience has shown that 10 inches of consolidated material is sufficient for practically any load, but in very many English counties the thickness is under 6 inches, although there is no foundation. Of course, much depends upon the character of the subsoil. Quite a thin layer of metal will often wear better where the subsoil is gravel than a much thicker one where the metalling rests in clay. A thick metalling is especially advantageous when the road is traversed by heavy commercial vehicles. There is every reason for believing that the load per inch of wheel breadth is but a very inefficient criterion of the liability of a vehicle to break through the road surface. One reason for this lies in the fact that a broad wheel does not bear evenly over a deep cambered road, and it has also to be remembered that the material stressed by the wheel load has probably the form of a truncated pyramid. Doubling the width of a wheel, will, therefore, in general, not double the base of this pyramid, so that the stress per square inch on the foundation for a given load per inch of wheel width is greater the wider the wheel. On the other hand, the base of this supporting pyramid increases with each addition to the metalling, much faster than does the thickness of the road.
>
> The great difficulty in restoring our roadways to an efficient state lies in the capital expenditure involved. There are nearly one-quarter of a million miles of highways and streets in the United Kingdom. Of these one-half may be classed as rural roads, which cost for maintenance over 3¾ millions sterling per annum. The nearly equal mileage of urban roads costs much more.

The above figures represent a cost of about 30 pounds per mile per annum.

> At a recent meeting of the Surveyors' Institution, Mr. H. T. Wakelam estimated the cost of reforming the roads of the country as £287,000,000. Fortunately, however, it is not every road which is traversed daily by large traction engines, and heavy cart traffic, so that less heroic methods than a reconstruction ab initio will probably suffice to render satisfactory 80 per cent. or more of the total mileage of rural roads.
>
> The motor-car has commonly been credited with creating dust, and it has been stated that the pneumatic tyres exercise a peculiar suction on the road

surface, which not merely rises dust, but loosens the metal. Probably this suggested "vacuum process" is imaginary, as careful experiments have shown that the dust is raised almost wholly by the driving-wheels, and cannot, therefore, be due to the creation of a vacuum between the tyre and the road surface, or the leading wheels would be equally great offenders. Steel studs and other metallic non-skid devices certainly do have a disintegrating effect; but it is difficult to institute a really satisfactory comparison between the damage so done and that occasioned by horse traffic, as the character of the injury differs greatly with different kinds of road surface.

Fortunately, however, experience seems to indicate that the best remedy for the dust nuisance is also the best for the preservation of the road. On the other hand, watering, though effective as a dust preventive, is extremely bad for the road structure. In fact, the efficiency of a road as a "floor" is mainly dependent on its efficiency as a roof. Corrugations, which are so marked a feature of macadamized urban roads, disappear at the borough boundary, beyond which the water carts do not ply. Further, they are generally absent on hills, where the slope prevents the lodgment of water after rain. This fact has been advanced as an argument in favor of the excessive camber so popular in certain districts; but with such cambers, traffic hugs the crown, localizing wear, and impeding the ready passage of one vehicle by another. Mr. Maybury, who has of late years done such excellent work in reconstructing many of the Kent country roads, advises that the camber should not exceed one-fiftieth of the width of the carriageway.

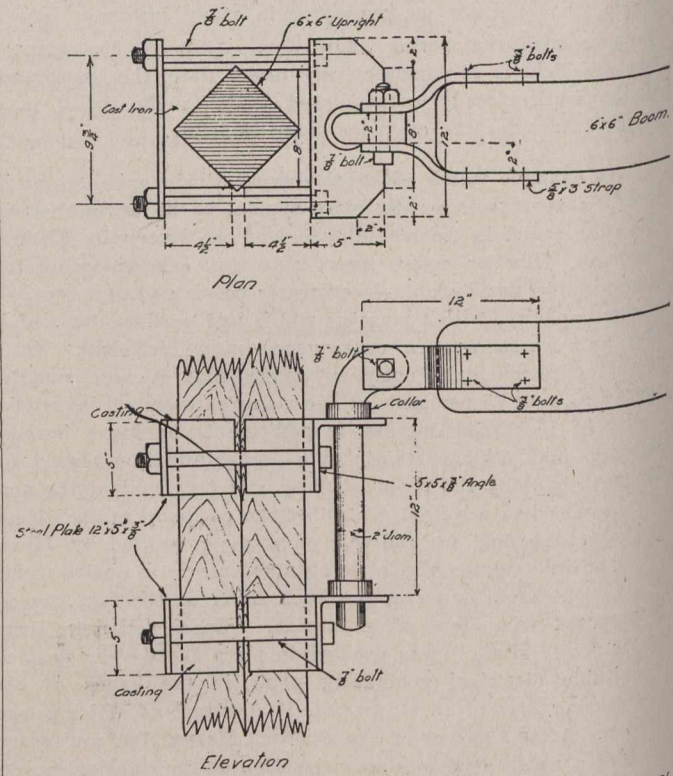
In the above paragraph the striking statement, "the efficiency of a road as a floor is mainly dependent on its efficiency as a roof," is to be noted. Drainage as combining the drainage of the surface and the subdrainage of the foundations forms a main and essential item in any system of road building and one to which great importance is being attached in recent years.

There is now a pretty general agreement that the roads of the future must be tarred. Were the funds immediately available, it would probably pay in the end to entirely reconstruct the principal main roads with tar-macadam or tar-mac, though such roads will not remain dustless, unless tar-painted at least once a year. As a palliative tar-spraying and tar-painting have given good results and by protecting the foundation of the road from wet have in some cases led to very substantial savings in the matter of maintenance. In towns this saving is increased by the reduction in the cost of watering and scavenging. A notable example is the road from Wandsworth to Kingston, which is traversed daily by some fifty heavy commercial motor vehicles bringing produce up to Covent Garden Market, and being part of the main road to Portsmouth, carries also a large traffic of ordinary motor cars. Since the adoption of tar-spraying, at a cost of 1d. per square yard per annum, the cost of scavenging has been reduced from 6d. to 2½d. per square yard, and that of watering from 1d. per square yard to 0.3d. At the same time the life of a 3 inch layer of metalling has been increased from 2½ to 3¾ years.

The article concludes with reference to further use of tar-macadam and tar-spray, and reference is made to a paper on suitable qualities of tar for this purpose by Mr. Wynne-Roberts, M. Ins., C. E.

BOOM SEAT OF DERRICK ON A CONSTRUCTION ELEVATOR TOWER.

The accompanying illustration shows the boom seat of a derrick attached to an upright of a construction elevator tower, designed and used by the Aberthaw Construction Co., of Boston, Mass. The elevator was used for hoisting concrete and the derrick for handling reinforcing steel and forms to the various floors of a reinforced concrete building. The seat consists of two pairs of castings 8 inches wide by 5 deep by 4½ inches thick, cast to fit a 6x6 timber diagonally. Each pair of these castings is tightly clamped to an upright of the elevator tower



by two ⅞x11 in. bolts, a 12x5x⅜ in. steel plate and a 5x5x⅜ in. angle 12 in. long. The two pairs of castings are spaced so that there is a distance of 12 in. from top to top of the outward flanges of the angles. In the horizontal flanges are holes through which passes a 2 in. steel pin held in place by a collar resting on each angle. The head of the pin is bent slightly out from the upright, upset and drilled for a ⅞ in. bolt. This bolt holds a ⅝x3 in. strap to either side of the head of the 2 in. pin, and the 6x6 in. boom is tightly bolted to these straps by four ⅜ in. bolts.

PROGRESS IN ELECTRIC POWER USE.

Summarizing the main feature of progress in the use of central station electric power in manufacturing, Professor Dugald C. Jackson, the newly-elected president of the American Institute of Electrical Engineers, says in a recent paper:

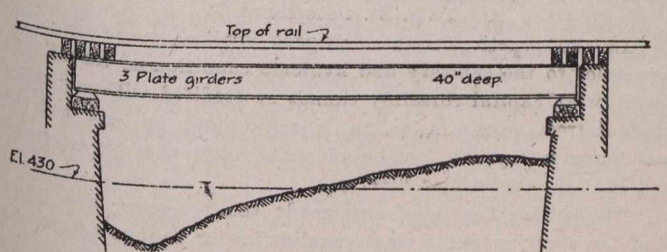
"Electrical distribution of power has made its way in factories of all kinds of product, on account of its adaptability to diverse requirements; that is, on account of what we commonly refer to as its flexibility. It has proved particularly advantageous on account of its ready adaptation to delivering power wherever and in whatever position the best interests of getting out product demands; on account of its joint properties of steadiness of speed and controllability of speed, which have contributed to increasing both the quan-

tity and quality of product; on account of cleanliness, reliability and safety, which have also strongly commended its use. Its use has also ordinarily proved economical from the standpoint of cost of horse power applied to the machine shafts. The advantages of flexibility and speed-control are being constantly widened by wiser designing of motors and their appurtenances, as experience extends. Economy and reliability are being additionally provided in the improved designs and more substantial construction of new power houses."

AN UNUSUAL SEWER OUTLET STRUCTURE.

Among the very large sewers of this country the "Southern Outfall" of the new Louisville, Ky., sewerage system is of unusual interest because of the very peculiar conditions which had to be met in the design and construction of its outlet structure upon a very steep and unstable bank of the Ohio River. The details here presented are drawn from the report of J. B. F. Breed, chief engineer, and Harrison P. Eddy, of Boston, consulting engineer.

It is worth while to point out, before taking up the details of the outlet structure, that the question of hydraulic grades that had to be settled involved some nice judgment on the extent to which it was necessary and possible to build a system that should take care of any storm-flow, no matter how extreme the conditions. The situation of Louisville with regard to the extreme high water level in the Ohio River is such that at this highest level it is nearly impossible to prevent a flooding of the sewerage system by the back up of the water from the river. In the case of the outlet of the Southern Outfall, a hydraulic grade was assumed from the top of the sewer at the

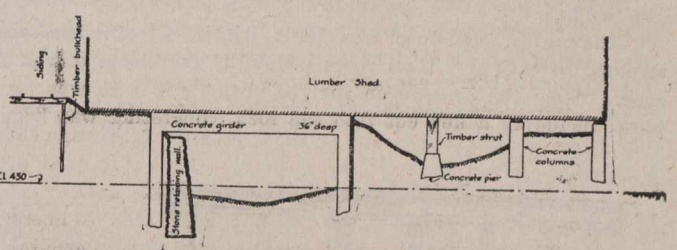


L. & N. R. R. Bridge North of Broadway
Looking downstream.

upper end of the drop chamber to the surface of the water in the river when at elevation 415. This elevation is exceeded during the freshets in the winter, but only very rarely between the 1st of May and the 1st of January. In the month of June, for example, the height of the water has exceeded this elevation only twice in thirty-five years, and on those occasions the river remained above this elevation only for a very short period of time.

Storms of great intensity are not frequent in Louisville except during the months of June, July and August, and are very infrequent during the winter months. The possibility of the occurrence of rainfalls of such high intensity as to tax the capacity of the sewer, occurring at a time when the river is above elevation 415, appears to be very remote, and for this reason it is believed to be safe to base the design of the drop and outlet structures upon the hydraulic grade assumed. The outlet structure will generally be submerged by water in the river and occasionally, at times of extreme floods, the entire drop chamber, and even the Southern Outfall itself, will be submerged for its entire length. Had this sewer been in existence it would have been thus flooded on three occasions—in 1883, 1884 and 1907. Obviously, it is impossible to provide for the adequate drainage of the city during storms of great severity occurring at a time when the river is at an extreme flood stage. All of the sewers of the city, as well as Beargrass Creek, will then be flooded, due to the height of water in the river alone, and a cloudburst occurring at such a time must be construed as an "act of Providence" for which the city cannot provide.

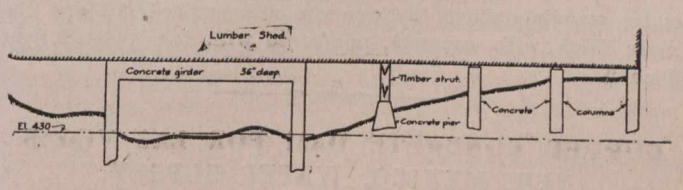
The invert of the main sewer where it reaches the top of the river bank is at elevation 404.09, Sea Level Datum. From this point down the river bank there is a drop chamber 93 feet long, with its invert at the lower end at elevation 370.48, making a slope rather steeper than one in three. From the lower end of the drop chamber the outlet structure extends 56 feet into the river, with an invert grade of 1 per cent. The crown of the sewer at its outlet is at elevation 378, and will be below the surface of the water in the river at all times after the proposed nine-foot stage is established. Before that time there may be occasions when the mouth of the sewer



Upstream side—Lumber Shed of the Alfred Struck Co.
Looking downstream.

will be partially exposed during the periods of extreme low water, although the river is not likely to fall as low as the bottom of the sewer. The maximum recorded flood level of the river at this point is about elevation 448, or 70 feet above the crown at the mouth of the sewer.

There have been indications of a strong tendency of the river bank to move towards the river after the falling of the water in the late spring or summer. The bank is composed largely of a deposit of silt, which becomes saturated when the river is high and when wet it is very heavy and has little stability. Underlying the silt is a bed of coarse sand and gravel, through which large quantities of water are continually flowing toward the river. The action of this water at the surface of the gravel probably tends to assist the sliding action of the silt above. In anticipation of any such action and consequent effect upon the sewer at its outlet, the foundation was carried down to bed rock. For a short distance, fifteen feet, the rock was excavated for a depth of four or five feet



Downstream Side—Lumber Shed of the Alfred Struck Co.
Looking downstream.

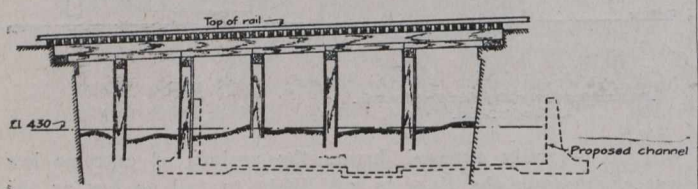
and the foundation carried to this depth, thus forming a key to further guard against any movement.

The drop chamber was built upon piles to assist in resisting any possible movement, as well as to support the structure in case by any chance it should be undermined by the action of the river. These piles extend to the rock, where it was within twenty feet below the masonry, and twenty feet into the ground further up the bank, in all cases penetrating a long distance into the gravel underlying the silt.

The outlet structure is eight feet in width and eight feet high, having a semi-circular arch, vertical side walls, nearly

three feet in height, and a comparatively flat but curved invert. At the end of this structure, two wing-walls were built, projecting out into the river, each making an angle of forty-five degrees with the axis of the sewer. The drop chamber is provided with arch, short side walls and invert of the same dimensions as those of the outlet structure. In the centre of the invert, however, there is a channel three feet wide and two feet ten inches deep, the bottom of which is lined with half-round vitrified sewer pipe. This channel is provided for the dry weather flow, which will have a very high velocity. The vitrified pipe lining was used rather than vitrified brick because of the absence of longitudinal joints at which sewer inverts on steep grades usually show the greatest amount of erosion, and for its great wearing qualities. The berm on each side of this channel will make inspections of the structure practicable. On account of the velocity which will be obtained during the lower stages of the river, both of these portions have been lined with vitrified brick as high as the top of the side walls.

The outlet structure was built within a cofferdam constructed of "U. S." steel sheet piling, 30 feet long, driven to rock. When the excavation for the outlet structure was complete, including a key cut into the rock, concreting was begun



Trestle of Ballard & Ballard Co. North of Broadway
Looking downstream.

and continued night and day until it was completed to the elevation of the invert, thus forming a solid monolithic mass of concrete to serve as an anchor for the drop and outlet structures.

Some difficulty was experienced in placing the concrete in the drop chamber, on account of the steel slope, about thirty degrees, but this was overcome by careful handling of a comparatively dry mixture. To construct the pile foundation, ten-inch W. I. pipes were sunk and rested upon bed rock where this was within twenty feet of sub-grade. The inside core of earth was removed by means of a sand bucket, after which a small amount of concrete was placed in the bottom as a seal to prevent the upward flow of water. As soon as sealed, the water standing above the concrete was pumped out and the pipes filled with concrete, reinforced with four twisted rods. Plan 2.

CURVED CONCRETE DAM FOR LAS VEGAS, NEW MEXICO, WATER SUPPLY.

Messrs. Metcalf & Eddy, Boston, Mass., the consulting engineers for the Agua-Pura Co., of Las Vegas, N.M., have just completed plans and specifications for an arched concrete dam for the proposed storage reservoir of the above company.

The dam is designed with an ultimate height of 95 feet, but it will only be erected to a height of 50 feet at present. The dam is designed to be of either reinforced concrete or of rubble masonry.

The above design will be 15½ feet wide at the base, and with the concrete dam 4 feet wide at the top, and in the masonry dam 6 feet wide at the top. It will be built with a radius of 250 feet, the vertical faces of the dam being upstream.

The total cost is estimated in the neighborhood of $40,000. It will furnish storage space for approximately sixty million gallons.

This dam is but one of several improvements advised by Mr. Harrison F. Eddy after a careful inspection of their present equipment.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

11387, dated August 11th, 1910, amending Order No. 11276, approving the location of the C.N.O.R. through the city of Belleville, and partially through the Township of Thurlow.

11388, dated 11th August, 1910, authorizing the construction of the drain known as the "Pierce Award Drain," in the 7th Concession of the Township of Malahide, Ont.

11389, dated 11th August, 1910, approving of the revised location of the Eye Hill Creek Extension of the Pheasant Hills Branch of the C.P.R. Company, from a point in Section 3, Township 39, Range 28, west 3rd Meridian, at mile 0, on said extension, and at mile 492.2 on the Pheasant Hills Branch at Macklin, to a point in Section 12, Township 33, Range 22, west 3rd Meridian, on the Moose Jaw North-Westerly Branch of said railway, being at mile 55.7 on said extension.

11390—August 11, 1910—Authorizing the C.P.R. Company to construct Bridge No. 24.2 on the Ontario Division, Port Burwell Branch.

11391—August 11, 1910—Extending the time within which the Essex Terminal Railway Company were authorized to do the work authorized to be constructed under Order No. 8993, until the 15th day of September, 1910.

11392—August 9th, 1910—Authorizing the C.N.O.R. Company to construct its railway across the public road between Lots 10 and 11, Concession 4, Township of Clarke, at station 990.69, and rescinding Order No. 9562, dated 15th February, 1910, authorizing the construction of a subway across the said public road.

(Continued on Page 307.)

A RUSSIAN ADVANCE.

(Via St. Petersburg.)

In the practical and intelligent application of scientific principles to the sanitary and hygienic condition of its citizens the Russian capital certainly cannot be credited with a display of indiscreet precipitation in launching out on any untried and immature system for the adequate solution of its sewerage and sanitary difficulties.

The authorities have now made the necessary appropriation for carrying out a vast canalization or sewage scheme as well as a water purification system on lines which will be thoroughly representative of the latest and best that sanitary science has yet attempted.

The question of the refuse disposal of the city has been the subject of long and exhaustive investigations into the merits of different systems in vogue in the large cities on the Continent and in Great Britain.

In these days when German methods and German science are held up to a more or less indiscriminating and ill-informed public as affording the most satisfactory and the only rational solution of the problems in our industrial and social organizations, not to speak of engineering in all its branches, sanitary and other, it is refreshing and encouraging to record that notwithstanding our effete and antiquated system the old country is to be congratulated on the achievement of a distinct triumph.

The leading experts and engineers of the city of St. Petersburg have decided in favor of British practice and British methods as applied to a large installation for the cremation of the waste of a certain portion of the city area.

This installation will be followed by half a dozen others located to serve different sections of the city.

The contract for this work is in the hands of Messrs. Heenan & Froude, Limited, of Manchester, and was obtained in the face of a combination of competition amongst contractors in this country and the strongest German and other continental firms.

ELEMENTARY ELECTRICAL ENGINEERING.

L. W. Gill, M.Sc.

CHAPTER VI.

ALTERNATING CURRENT APPARATUS AND SYSTEMS.

This series of articles will be continued for some months. They will be of particular interest to the student of electrical work and the civil engineer anxious to secure some knowledge of the simpler electrical problems.

SYSTEMS OF TRANSMISSION AND DISTRIBUTION.

Classification of Generating Plants.—Electric power stations may be divided into two principal classes—central stations and isolated plants. A few plants may fall in either class, but in general the distinction between the two is radical. The central station is more extensive and complicated, and is usually placed in a building constructed exclusively for this purpose, while the isolated plant is placed in a basement or some corner of a building. The former is operated by a company or municipality, and serves many different and independent customers, while the latter serves only one building or group of buildings under one management, and is operated merely as an incidental part of a business. In either case the current may be direct or alternating, but isolated plants as a rule use direct current, while the tendency in central station work is toward alternating currents exclusively, because of the ease with which the alternating voltage can be changed in magnitude, and also because alternating current generators are cheaper to build, give less trouble, and can be constructed to generate higher e.m.fs. than is possible with the direct current generator.

Electric plants are sometimes classified with reference to voltage. In general this classification will correspond to the one given above, since high voltage is necessary in the modern central station to avoid an excessive loss in transmitting power over long distances. On the other hand, the distances over which the isolated plant delivers power are not usually very great, and high voltage is not necessary except in cases where large amounts of power are involved. The usual classification with respect to voltage is as follows: A low voltage system is one on which there is a maximum difference of potential of any value between 10 and 550 volts. A high voltage system is one on which the maximum difference of potential is 550 to 3,500 volts; and an extra high potential system is one on which the voltage exceeds 3,500.

The selection of a system to meet any particular requirement will depend largely on local conditions. If the engineer in charge has not had experience he should, if possible, investigate some other plant where the conditions are similar. By this method even the most experienced will save time and trouble, get the benefit of the experience of others and secure the most satisfactory results. In general, however, the simple two-wire 110-115 volt direct current system will be found the most satisfactory for the small isolated plant. When the mean distance between the generator and the points of distribution (the points from which branch circuits lead to the various rooms in a building) reaches 100 to 400 yards, depending on the amount of power, a higher voltage is necessary to avoid the excessive cost of heavy transmission lines, without which there would be too much "line drop" (loss of voltage). In this case the choice lies between a two-wire 220 volt direct current system, a three-wire 220 volt direct current system, or an alternating current system with either two or three wires. If any considerable amount of power has to be transmitted 1,000 yards or more, then an alternating current system might be the most suitable. On the other hand, if variable speed motors are to be connected to the system, a direct current 440 volt three-wire system would be preferable, the lighting being done by arc lamps or 220 volt incandescent lamps. Such a system will meet all the requirements of the larger isolated plants. In most cases, however, the distances are not so great as to require 440 volts, and a three-wire 220 volt system is suitable. In all cases it is necessary to consider the kind of system in the nearest central station or hydraulic plant,

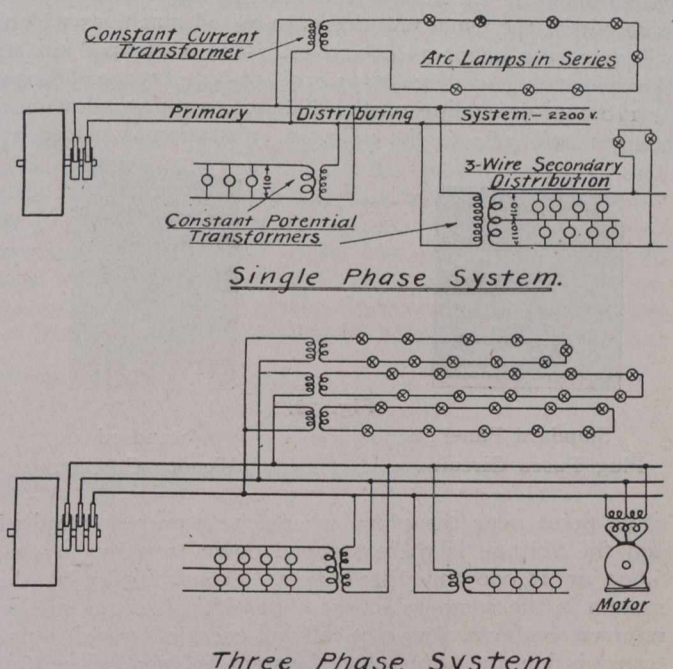


Fig. 69.

for it may be necessary in case of breakdown to obtain power from such source. In many cases provision is made to secure power in this way during periods of light load.

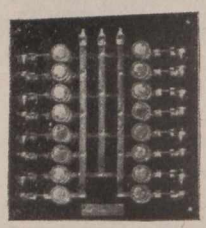
In the newer central stations the polyphase alternating current system is used almost exclusively, the power being generated at 1,100 or 2,200 volts in the smaller stations and at 6,600 or 11,000 in the large stations. As a large proportion of the central stations now in operation were doing business before the alternating current came into general use it is usual to find a combination of alternating current and direct current, the latter supplying the consumers in the immediate neighborhood of the plant and the former supplying the more distant points.

Transmission and Distribution of Power.—The term "transmission line" is usually applied to one or more circuits which transmit power over a considerable distance without branching. In the case of central stations in large cities power is generated at 6,600 or 11,000 volts (alternating) and carried over underground transmission lines to substations, or transformers placed underground,

where the voltage is reduced to 1,100 or 2,200. At this voltage it is carried over a "primary distributing system," placed on poles or underground, to various local distributing points, where the voltage is again transformed to 110, 220 or 440 by means of transformers placed on poles or underground. The circuits leading from these transformers constitute the "secondary distributing system." The branch wires leading into a building are known as "service mains." In the smaller stations the power is generated at 1,100, 2,200, or 3,300 volts and delivered directly to the primary distributing system.

When direct current is required at a distance from a central station equipped with high voltage alternating current generators, a direct current generator, driven by an alternating current motor, is placed in a substation from which the direct current low voltage system is supplied. In most cases the motor and generator are combined in one machine, known as a "rotary converter."

When a large amount of power is to be transmitted over several miles, as in the case of a hydraulic plant which may be far away from the points where power is required, the usual practice is to install machines which will generate about 11,000 volts. This is stepped up at the generating station to 33,000, 44,000, 66,000, 88,000 or 110,000, depending on the distance, a rough allowance being 1,000 volts to the mile. A substation is placed at



Standard Panel
Plug Fused Circuits.

Standard
Wooden Cabinet.

Fig. 70.

some point near the place where the power is required and the voltage is there stepped down to 2,200, 4,400, 6,600 or 11,000 for distribution. From this point the system is the same as in the case of the central station referred to above. In practically all cases of long distance transmission the three-phase system is used, since this system requires only 75 per cent. of the weight of copper which is required in a single or two-phase system operating with the same maximum voltage.

Distributing systems may be divided into "series" and "parallel" systems. In some cases a "series-parallel" system is used, but these are never used on a large scale. The series system is used principally for street lighting or the lighting of large areas, either with arc lamps or incandescent lamps, and may be supplied with direct current or single-phase alternating current. The parallel system, operated at constant potential, is always used when current is to be supplied for motors. With direct current this system may be two-wire 110 volt or 220 volt, three-wire 220 or 440 volt, or five-wire 440 volt. The last system is seldom used in America. For street railway service a two-wire service with 550-650 volts is the standard. When alternating current is used the distributing system may be single phase two-wire 110 or 220 volts, single phase three-wire 220 or 440 volts, or polyphase with any of these voltages. In some cases large motors are connected directly to the primary distributing system (1,100 or 2,200 volts) of a polyphase system. For lighting purposes each phase of a polyphase system is treated as a single-phase system, care being taken to load the phases equally to balance the whole system. The various alternating current systems are illustrated in Fig. 69. The direct current systems are illustrated in Figs. 44 to 47.

In connection with distributing systems it may be noted that the rules of the insurance companies do not permit more than 3,500 volts on any circuit entering a building other than electric stations. General practice limits the voltage to 220 on circuits entering residences and to 550 on circuits which extend around the interior of shops and factories.

Interior Distribution.—Interior distributing systems are similar in principle to external distributing systems, except that the former are on a smaller scale. In the case of small dwellings the service wires are connected by

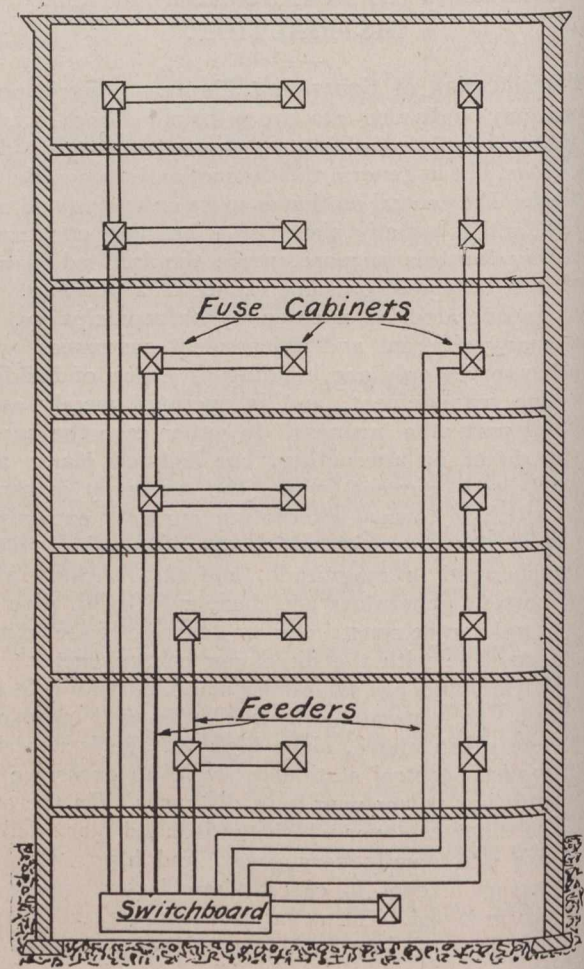


FIG. 71

"feeder wires" to some central "point of distribution," from which "branch circuits" are taken off and all fuses for the protection of lamps, etc., are placed. In large buildings the service wires (or generator, if the power is supplied by an isolated plant) connect to a switchboard, from which feeders lead to several distributing points. In large office buildings there may be several distributing points on each storey. At these points "fuse panels" or "cutouts" are placed, and all branch circuits connect to these panels. The latter are usually enclosed in a wooden or steel cabinet. One of these panels with eight branch circuits is shown in Fig. 70, together with the cabinet in which it is placed. This panel is for use on a three-wire system. Each of the branch circuits, which are

always two-wire, is provided with two plug fuses and a switch. As all the fuses are placed on these panels or on the switchboard, it is easy to locate the trouble in case of a short circuit. The arrangement of feeder circuits and panels in a certain six-storey building is shown in Fig. 71.

The methods of installing interior wiring are fixed in large measure by a collection of rules known as the "National Electrical Code." These rules are the results of the united effort of the various insurance, architectural, electrical and allied interests. At the present time all insurance companies, before accepting risks on a building, insist on the electric wiring being done in accordance with these rules. The Code covers exterior wiring as well as interior, but not to the same extent. A copy of the Code may be had from the local inspector representing the fire underwriters, whose duty it is to inspect new installations when called on to do so. Such inspection should be done as the work proceeds. In addition to this there is a municipal inspector in the larger cities whose duty it is to see that all local municipal regulations are carried out.

While the National Code permits the installation of wires in wooden moulding, on porcelain knobs or cleats, or in flexible tubing or conduit, the most satisfactory method of installing interior wires is to place them in rigid iron conduit, manufactured specially for this purpose. This method is more expensive than the other methods, but it practically eliminates the danger of fire. If the conduit is installed at the time of building it may be all concealed and the wires drawn into it after the building operations are complete. There is then no danger of the wires being damaged by careless workmen engaged in the building operations.

A UNIQUE AMERICAN 12-TON ROLLER.

The accompanying illustrations show the construction of a novel American steam road roller of 12 tons capacity having a front steering roller of unusual construction. This roller has an engine with double cylinders each 6 inches bore and 7½ inch stroke, the revolutions of engine shaft being 280 per minute. The maximum power is 72 horse-power for 160 pounds boiler pressure at 280 revolutions and 68.8% cut off. The cut off is variable with the position of the reverse lever, the latest possible cut off being 68.8% of the length of the stroke of the piston. Piston valves of 1¾ inch diameter are used and open hearth steel gear employed with double drive.

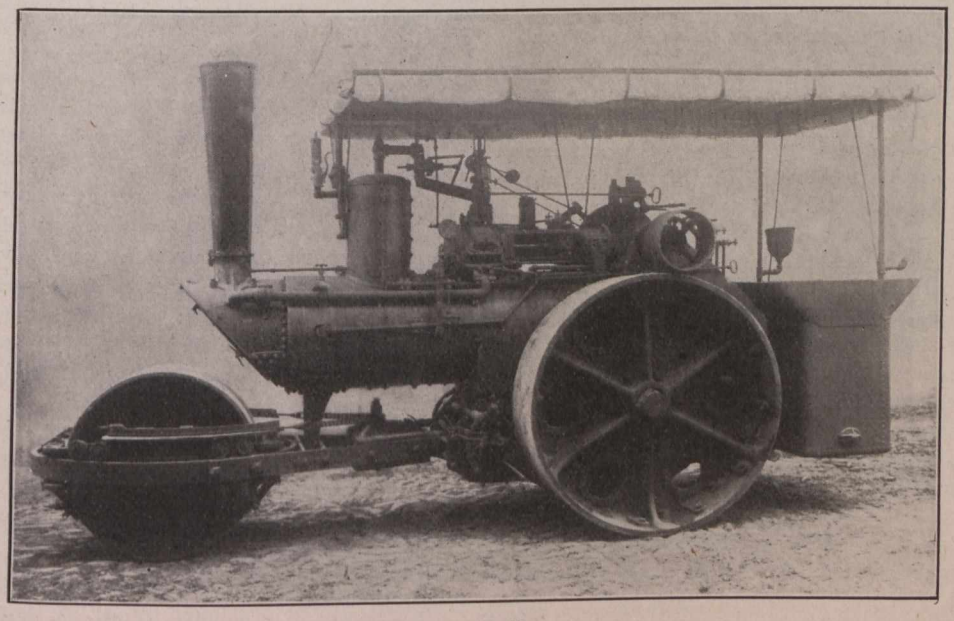
It may be stated that the springs are incorporated in the compensating gear arrangement and insure equal load distribution for the different pinions of this arrangement, and ability to absorb shocks without injury to the construction.

The countershaft is 4½ inches in diameter, the driving axle being 5 inches diameter in boxes, while the front roller axle is 4½ inches diameter, the hubs of rollers, with a steering hand wheel shaft 1⅛ inches diameter.

Each driving roller is 20 inches face and 64 inches diameter, and these rollers are atoered, the inside edge having a diameter of 63 inches, while the outer edge is 64 inches diameter. Each driving roller is equipped with 24 removable steel spurs.

It will be seen that the front rollers are two in number, each with a straight face of 20 inches and a diameter of 44 inches. For all the scrapers the holding on power is transmitted through springs, thus producing the elasticity necessary to compensate for clearances caused by worn bearings. The scrapers for the driving rollers are operated by hand levers, each lever actuating two scrapers at a time. The main tank holds 107 gallons and each side tank holds 70 gallons, so that the total tank capacity is 247 gallons. The coal box capacity neat is 475 pounds and heaped 600 pounds. The length of roller over all is 18 feet 3¼ inches, and the distance from centre of driving axle to centre of front roller is 9 feet 8 inches.

The total weight of roller empty is said to be 24,560 pounds and the driving wheel pressure on ground for empty roller is 87,730 pounds, while the front roller pressure on ground for empty roller is 7,100 pounds, and the total weight of roller in working condition 28,000 pounds.



12-Ton Road Roller.

In working condition the driving wheel pressure on ground roller is 10,650 pounds, and the front wheel pressure on ground is 6,700 pounds. This roller will make 2.178 miles per hour for governor speed, that is, for 280 revolutions of engine shaft.

It may be stated that stationary work is accomplished by means of a leathered pulley 15 inches diameter and 9 inches face. This pulley is mounted on the overhanding end of engine

shaft, and has a key integral with its hub, made to fit that way in the engine shaft which serves the engine shaft pinion. The pulley is pushed up against this pinion in its out of gear position, and is kept from slipping endwise on the shaft by a set-screw. In this position the inside edge of the pulley rim comes only 3½ inches from the outer face of the engine shaft box and also in line with the inner edge of the left-hand driving roller. The belt is run backward over the left-hand coal box, which in order to allow proper room for the belt is made collapsible.

This roller has a boiler with 59 flues 51 inches long, having a diameter of 1½ inch, height of fire-box above grates 31⅝ inches, and the width of fire-box is 20⅞ inches. The boiler has a total heating surface of 121½ square feet, the outside diameter of boiler being 26 inches. It has a grate area of 4.068 square feet. The boiler when filled to proper water line contains about 110 gallons.

It is claimed that the advantage afforded by the rear end arrangement of the roller is minimum width of tread of the driving rollers in connection with the maximum width of face of same, resulting in the applicability of the roller on narrow roads.

The advantages of the scraper rigging is handiness and flexibility. The scrapers are held up against the faces of the rollers by springs and consequently lay up against these faces, even though the rollers themselves on account of wear in the axle boxes have a slight irregularity of motion.

The universal coupling connects the steering hand wheel operatively with the steering worm and worm wheel which are mounted in the oscillating front truck frame and thereby it makes possible the application of the positive steering arrangement.

THE HYGIENIC VALUE OF SOFT WATER.*

Though our engineers spare no effort to render our water-supply absolutely pure bacteriologically, yet in the great majority of cases the water as it is drawn from the tap is far from safe for either drinking or general domestic purposes. The chances are that the water is hard, due to the presence of chalk and other inorganic substances in suspension, which exercises a distinctly injurious effect upon the body both internally and externally, and constitute a serious menace to the health and safety of the home. From the former standpoint, hard water should certainly be boiled before it is used for drinking or washing and toilet purposes, so as to get rid of the greater proportion of the deleterious substances contained in it. Hard water exercises a distinctly unfavorable effect upon the skin, and in many cases will provoke serious illness by interfering with the proper action of the pores, inducing gout, rheumatism, and many other disorders to which human flesh is heir; while, when taken internally, it often precipitates a severe derangement of the digestive organs. From the general domestic point of view it is highly dangerous, as, for instance, in the hot-water supply system, where the pipes and boilers become choked with a heavy deposit of scale, which, unless periodically removed, is apt to promote disaster swift and sudden, or else cause a complete break-down of circulation. It is for this reason that many private houses have recently made use of the facilities provided by an ingenious invention for ensuring a constant supply of water so softened as to be practically like distilled water. It is very simple and inexpensive. There is a small vessel into which the water from the main passes. This is connected to a receptacle containing a special powder which has the property of removing the harmful lime and magnesia salts, iron oxide, or other impurities. The water as it flows from the main comes into contact with this purifying medium, and then falls into another tank of the household variety. Here the impurities are precipitated to the bottom in a sludge, which is periodically drawn off; while the tank, being connected to the house-distributing system, ensures delivery of softened water to every part—the bathroom boiler, taps, and sink. The difference in the taste of soft and hard water is very marked. From the toilet point of view washing with soft water is very like a wash with rain-water, which is so freely advocated for those who wish to preserve their complexion and softness of the skin generally, while the pores are left open to admit of the natural functions of the human engine in throwing off excretion through these diminutive channels. Those who are prone to gout and rheumatic disorders should on no account drink water that is at all hard, as the absorption of an excessive amount of lime and other materials in solution feeds the malady. The hot-water system of the house, when fed with softened water, also performs its work much more satisfactorily, as there is no deposit of scale to obstruct pipes and interfere with the necessary radiation of heat from the fire, thus effecting an appreciable saving in the coal-bill as well. The apparatus is very simple, free from intricate mechanism, automatic in its action, and the container only requires recharging with the softening powder at intervals. It is now quite simple to secure an illimitable supply of softened water, and the apparatus is designed to meet the requirements of dwellings of any size.

*From Chamber's Magazine.

THE MINES BRANCH FOR 1910.

The Mines Branch of the Department of Mines, Ottawa, have outlined their work for the season of 1910. Most of their work has to do with mining, but the civil engineer will be particularly interested in the work of the Fuel Testing Plant.

The Fuel Testing Plant in Ottawa is to be operated, under the direction of Mr. B. F. Haanel, for the purpose of experimentation and demonstration. A second producer, suitable for lignite and bituminous coal is to be installed at the plant.

The Government Peat Bog at Alfred is to be operated for a period of about three months to demonstrate the latest process of manufacturing air-dried peat. Several thousand tons will be produced during the present season. Part of the peat fuel produced will be shipped to Ottawa for use in the peat-gas producer plant now installed, and part will be sold in the neighborhood for domestic use. The operation of the plant at the bog, which is open to public inspection, is under the direction of Mr. A. Anrep. The bog can easily be reached from Caledonia Springs, or from Alfred, on the Canadian Pacific Railway.

A cordial invitation is issued by the Mines Branch of the Department of Mines to all who are interested in the development of a peat fuel industry to visit the Fuel Testing Plant in Ottawa, or the peat-plant at Alfred.

The investigation of peat bogs in Canada, to ascertain their extent and to determine the quality and quantity of peat available, will be continued by Mr. A. Anrep after the operating plant at Alfred is closed down for the season.

NEW INCORPORATIONS.

Thetford Mines, Que.—Thetford Manufacturing Co., $20,000, D. H. Pennington, Lyster; J. C. Gagne, Sherbrooke; J. E. Lessard, Sherbrooke.

Blairmore, Alta.—Blairmore Brick Co., $60,000.

Calgary, Alta.—MacDonald Construction Co., $10,000.

Edmonton, Alta.—Evans Construction Co.; Western Investors, $10,000; Fresno Oil Co., $10,000; San Francisco Oil Co., $10,000; Los Angeles Oil Co., $10,000; Mexican Oil Co., $10,000; Santa Barbara Oil Co., $10,000; Edmonton and Fort McMurray Oil and Asphalt Co., $500,000.

CANADIAN MUNICIPAL UNION

Holds Annual Meeting at Toronto—Elects New Officers—Discusses Problem of Town Planning—Export of Water Power and Railway Service.

Mayor J. A. Chisholm, K.C., of Halifax, was elected president of the Union of Canadian Municipalities at the closing session of the tenth annual convention, held at Toronto, Ont., last week. Mayor Chisholm was vice-president, and his promotion was heartily endorsed by all the delegates. Mayor G. R. Geary, of Toronto, was elected first vice-president; Mayor J. A. F. Blean, of St. Boniface, Manitoba, second vice-president, and Mayor L. D. Taylor, of Vancouver, third vice-president. Mr. W. D. Lighthall, K.C., Montreal, was re-elected honorary secretary-treasurer.

The following vice-presidents for the various Provinces were elected:—

Ontario—T. E. McClellan, Mayor, Galt; A. C. Champagne, Controller, Ottawa; J. W. Hanna, K.C., Mayor, Windsor; A. M. Patterson, Mayor, Brockville; T. E. Simpson, Mayor, Sault Ste. Marie.

Quebec—Narcisse Papointe, Alderman, Montreal; L. E. Carron, Alderman, Quebec city; C. W. Cote, K.C., Mayor, Sherbrooke, Que.; J. B. Deschamps, Mayor, Lachine; W. H. Trenholme, Mayor, Westmount.

Manitoba—J. F. C. Menlove, Mayor, Virden; H. F. Adolphe, Mayor, Brandon; W. H. Evanston, Comptroller, Winnipeg; John Cardale, Councillor, Blanchurst; R. G. Willis, Reeve, Milton.

Alberta—Ex-Mayor, Gaetz, Red Deer, Mayor Jamieson, Calgary; Commissioner Butchart, Edmonton, Mayor of Lethbridge.

Saskatchewan—Andrew Holmes, Mayor, Prince Albert; John Ashworth, Alderman, Saskatoon; P. McAra, ex-Mayor, Regina; A. Matthews, Alderman, Moose Jaw.

New Brunswick—J. W. McCready, Secretary, New Brunswick Union; Jas. H. Frink, Mayor, St. John; E. A. Reilly, Mayor, Moncton; D. Murray, M.D., Mayor, Campbellton.

Nova Scotia—F. W. W. Doane, City Engineer, Halifax; W. M. Kelley, Mayor, Yarmouth; Geo. W. Stuart, Mayor, Truro; A. D. Gunn, Mayor, Sydney; Alfred Whitman, Alderman, Halifax.

British Columbia—L. D. Taylor, Mayor, Vancouver; J. A. Morley, Mayor, Victoria; John A. Lee, Mayor, New Westminster.

Quebec Next Meeting-place.

Quebec city was chosen as the next meeting-place of the Union.

A resolution demanding proper protection at all level railway crossings was moved by Mayor D. Milne, Medicine Hat, and seconded by Mayor T. E. McClellan, Galt, and referred to a special committee of the Union.

On motion of Mayor Williams, of Fort Frances, a resolution was passed favoring municipal or national operation of all water-power.

Mayor Chisholm, of Halifax, submitted a resolution, which carried, favoring the appointment of a special committee to deal with city and town planning, as outlined in the address delivered by Mr. Henry Vivian, M.P. for Birkenhead, Eng.

Ald. Sheppard, of Windsor, tabled a resolution favoring reduced taxes on houses and other buildings, and thus inferentially increasing taxes on land. The proposal was sent to the Union of Ontario Municipalities to deal with.

Mayor W. Sanford Evans, of Winnipeg, presided at the opening sessions, and Mayor Geary, of Toronto, after welcoming the delegates to the city, said this country was not getting from the railways the service it had a right to expect. He said they seemed not to have anticipated or provided for the recent emergency. "In some way or other," he said, "the whole question of the control of freight and passenger business should be taken hold of by the Union. It should make an effort to present facts to the proper authorities, so that the railways will be compelled to take care of any legitimate business which might arise."

Ald. D. E. Dubeau, Montreal, responded to Mayor Geary's words of welcome in the absence of Mayor J. J. Guerin, Montreal, who was not able to attend the convention.

Finances of Union Satisfactory.

Mr. G. S. Wilson, Montreal, Assistant Secretary-treasurer of the Union, reported the receipts for 1909 as $4,313.28, and the expenditures $4,260.37, there being a cash balance of $52.91. The receipts from January 1st, 1910, up to July 31st, 1910, were $4,633.93, the expenditures $4,034.56, and the cash balance on hand $599.37.

The financial report was carried with expressions of satisfaction. This was also the case with the report of Mr. Harry Bragg, Vice-President.

Reports of an encouraging character were received from the following affiliated Provincial Municipal Unions: Manitoba, British Columbia, Saskatchewan, New Brunswick, Nova Scotia and Quebec.

Planning Town Growth.

Probably the most interesting address of the session was that given by Mr. Henry Vivian, M.P. for Birkenhead, on "Town Planning and Town Housing." Mr. Vivian showed the unwisdom of allowing towns, cities and suburbs of cities to grow without regulation, in a manner very detrimental to the health and well-being of the inhabitants, either present or prospective. He himself had been interested in various plans for the betterment of housing conditions in Great Britain for over a score of years, and he had come to Canada at the request of Earl Grey, who believed the experience of Great Britain in these matters would be very useful to Canadian municipalities before they had grown so large as to make any readjustment of housing and building to suit the demands of health and beauty a very expensive and inconvenient enterprise.

Results of Poor Housing.

Mr. Vivian in 1901 had been on a select committee of the House appointed to inquire into this question with the view of passing an Act of Parliament to remedy the conditions. The result was that in 1909 a housing and planning Act was passed.

In Liverpool they divided the city into three grades, (a), (b) and (c), dealing consecutively with the schools of the fairly well-to-do, of those earning a medium subsistence, and of those who live in one and two-roomed houses. Comparison with the school children living in the model homes of the artisans in Lever Bros.' soap works at Port Sunlight showed the latter at fourteen years of age to be no less than five inches taller and thirty pounds heavier than grade (c) in Liverpool.

Death Rate High in Slums.

In the town of Finsbury, near London, the Medical Officer of Health went into this question thoroughly. He found the death rate in one-roomed homes to be forty per thousand of population, twenty per thousand in two rooms, fourteen or fifteen in three rooms, and eight or ten in four rooms, showing indubitably the vast importance of greater breathing space in the homes of the poor.

A Word of Warning.

Speaking in reply to a vote of thanks, moved and seconded by Mayor Geary, of Toronto, and Mayor Hopewell, of Ottawa, Mr. Vivian referred to the inefficient immigrants who had come to Canada as a product of bad housing. "They are unfit to do a day's work when they get here, and they were unfit before they left home. The truth is we are producing the unfit in England wholesale by these very conditions. You have not been confronted with it because you have large territories, and, though a man sleeps in an insanitary box at night, he breathes fresh air in the daytime. But, believe me, as you advance to the industrial stage as distinguished from the agricultural stage, and get cities such as we have, you will turn out inefficients in the same ratio as we are doing unless you make provision now to prevent the conditions that produce these deplorable results."

Canada to Do Likewise.

A resolution by Mayor J. A. Chisholm, of Halifax, to the effect that the Committee on Resolutions should be charged with the preparation of a resolution looking to the promotion of the views so ably expressed by Mr. Vivian, was seconded by Municipal Commissioner Baines, of Saskatchewan, and carried.

(Continued from Page 314.)

ENGINEERING SOCIETIES.

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

Chairman, L. A. Vallee; Secretary, Hugh O'Donnell, P.O. Box 115, Quebec. 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, W. J. Stewart, Ottawa; S. J. Chapleau, Resident Engineer's Office, Department of Public Works

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. Lighthall, 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. McMurchy; 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, J. 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 39th 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.

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.

NEW ENGLAND WATER WORKS ASSOCIATION.—September 21-23. Annual meeting, Rochester, N.Y. Willard Kent, Secretary, Narragansett Pier, R.I.

AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.—October 11-16. Seventeenth annual convention, Erie, Pa. Prescott Folwell, Secretary, 239 W. 39th Street, New York, N.Y.

NATIONAL MUNICIPAL LEAGUE.—November 14-18. Annual meeting, Buffalo, N.Y. Clinton Rogers Woodruff, Secretary, North American Building, Philadelphia, Pa.

INTERNATIONAL MUNICIPAL CONGRESS AND EXPOSITION.—September 18-30, 1911, at Chicago, Ill. Curt. M. Treat, Secretary, 1107-8 Great Northern Building, Chicago.

NATIONAL IRRIGATION CONGRESS.—Eighteenth Annual, September 26-30, 1910, Pueblo, Colorado. Secretary, Arthur Hooker, Spokane, Wash.

TORONTO, CANADA, SEPT. 8, 1910.

CONTENTS OF THIS ISSUE.

RAILWAY EARNINGS; STOCK QUOTATIONS.

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

Road	Wk ended	1910	Previous week	1909
C. P. R.	Aug. 31	$2,965,000	$1,897,000	$2,384,000
G. T. R.	Aug. 31	1,408,594	872,795	1,321,529
C. N. R.	Aug. 31	354,700	256,500	253,600
T. & N. O.	Aug. 31	47,297	24,756	52,342
Hal. Elec.	Aug. 31	7,130	5,160	6,541

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	Aug. 31	$17,586,000	$14,156,000
G. T. R.	3,536	Aug. 31	7,058,156	7,361,978
C. N. R.	3,180	Aug. 31	2,318,100	1,650,600
T. & N. O.	264	Aug. 31	224,051	284,310
Hal. Elec.	13.3	Aug. 31	44,954	41,482

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. 000's Omitted.	Price Sept. 2 1909.	Price Aug. 25 1910.		Price Sept. 1 1910.		Sales last week.
C. P. R.	$150,000	.....	182⅛	.....	188¼	....	660
Mont. St.	18,000	213	212½	247½	247¼	246¾ 245	7,355
Hal. Elec.	1,400	.....	116	126	123	126 123½	5
Tor. St..	8,000	126½	126	.....	.....	118	172
G. T. R.	226,000	1st pfd., 110; 3rd pfd., 57½; com.,27.					

CANADIAN PACIFIC.

July Net $3,484,620 Compared With $2,479,870 in 1909 and $2,274,573 in 1908.

The report of the Canadian Pacific Railroad Company for the month of July compares as follows:

	1910	1909	1908	1907
July gross ...	$8,869,214	$7,140,029	$6,292,880	$7,008,274
Expenses	5,384,594	4,060,159	4,018,307	4,501,421
July net	3,484,620	2,479,870	2,274,573	2,506,853

Toronto Railway for July.

The statement of the Toronto Railway Company's earnings for July is as follows:

		Inc.
Gross	$367,211	$37,407
Net	181,027	19,424
Oper. expenses	$186,184	$17,983

Ratio of operating expenses to gross earnings for the month, 50.71 per cent.

Year to date—

		Inc.
Gross	$2,386,424	$242,337
Net	1,148,926	103,680
Oper. expenses.	$1,237,498	$138,657

Ratio of operating expenses to gross for year to date, 51.86 per cent.

CALGARY STREET RAILWAY.

Annual Report of Company Shows Increase in Surplus.

The official annual report of the Calgary Street Railway, as required by the minister of railways and canals, for the year ending June 30, has been compiled by city officials.

Receipts of the system for the twelve months beginning July 1 and ending June 30, are shown to be $29,335.53 net after $27,545.28 had been paid for interest and sinking fund, and $2,204.40 paid for stock on hand, showing the system to have $31,639.93 to its credit on June 30, or a profit for the six months ending June 30 of $21,338.56, as compared with $10,001.37 for the six months ending December 31, 1909.

From the surplus will be deducted $4,335.90, being 5 per cent. off the revenue of $87,118.00 for six months from December 31 to June 30, as a contingent or reserve fund, and $11,250, half the amount of $22,500 apportioned to the city's general account as profits in the reduction of tax rates, still leaving a balance on June 30 of $16,154.03 of the profits available for other city purposes.

ST. THOMAS STREET RAILWAY.

The earnings of the St. Thomas Street Railway for August, this year and last, are as follows:

	Passeng.	Tickets.	Cash.
1909..	55,489	1,169.95	775.49
1910..	45,473	962.80	652.07
Decrease	207.80	207.80	123.42

The showing for August is comparatively better than that of July, although the number of passengers carried was only 45,473, as against 52,002 carried in July.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

11393—August 15th, 1910—Ordering the C.P.R. Company to place and maintain at its expense, a day and night watchman at the crossing of the C.P.R. by the tracks of the Winnipeg Electric Railway Company, on Logan Avenue, in the city of Winnipeg, Manitoba.

11394—August 1st, 1910—Granting the application of W. H. Burr, Chairman of the Express Traffic Association of Canada, Toronto, Ont., to the Board, asking that the Board accept filing of Joint Tariffs of International Express Tolls from points in the United States to points in Canada, by F. G. Airy, of New York City, as joint agent for the Express Companies interested.

11395—August 15—Authorizing the Chief Traffic Officer of the Board to deal with urgent cases on application of the railway companies in connection with excursion tariffs, for permission to move excursion or other special passenger traffic immediately, or with less than the three days' notice required by the Act for filing the necessary special tariffs.

11396—August 15—Authorizing the village of Coldwater, Ont., to lay a 6-in. cast-iron water pipe under the tracks of the C.P.R. at the point where the said railway crosses Grey Street, in the said village of Coldwater, in Lot 23, Concession 12, Township of Medonte, County of Simcoe, Ont.

11397—August 15—Authorizing the town of Taber, Alta., to lay water pipes under the tracks of the C.P.R. Company where said tracks cross DeVeber Avenue, in the said town of Taber.

11398—August 15—Authorizing the town of Galt, Ont., to take up the four-inch water pipe now crossing under the Galt and Berlin Branch of the G.T.R. Company at the intersection of Blair Road and George Street, in the said town, and to replace such four-inch pipe by a six-inch pipe.

11399—August 15—Authorizing A. Leofred, C.E., of the city of Quebec, Que., to construct water and sewer mains under the tracks of the G.T.R. Company at the town of Charny, Chaudiere, County of Levis, Que.

11400—August 15—Authorizing the St. Lawrence and Adirondack Railway Company, (New York Central and Hudson River R.R. Company, lessee), to extend the present side track now existing on the easterly side of its main line at Athelstane, northerly and across the public highway known as the Third Concession Highway, in the said Township of Elgin, to a union with its main line at a point northerly of said highway.

11401—July 25—Approving of the revised location of the Niagara, St. Catharines and Toronto Railway Company across ponds 1, 2, and 3, opposite locks 12, 13, and 14, old Welland Canal, Merritton, Ont.

11402—August 16—Authorizing the C.P.R. Company to construct, maintain, and operate a branch line or spur from a point near Agassiz on the main line of said company in the S.E. 27—3—29, West 6th Meridian, thence northerly to a ballast pit in Section 34—3—29, west 6th Meridian, Province of British Columbia, subject to the terms of the consent of the municipality, to wit: that the C.P.R. Company "take proper precaution to protect the public; put in proper cattle guards, and grade the road the full width so that the public can conveniently drive over the track."

11403—June 27—Authorizing the city of Brantford, Ont., to construct at its own expense, a foot crossing, not over seven feet in width, over the Brantford and Hamilton Electric Railway, connecting Mary Street and Greenwich Street, in said city of Brantford, and crossing the Brantford Canal Level.

11404—August 16—Rescinding Order of the Board No. 2029, dated 26th November, 1906, made upon the application of the Commissioners of the Transcontinental Railway; and authorizing the applicants to join their lines or tracks with the lines or tracks of the C.P.R. Company at a point west of Rennie Station, Province of Manitoba, such recision to take effect September 1st, 1910.

11405—August 19—Authorizing the Transcontinental Railway to cross, at grade, the C.N.R., Dundee Branch, at mileage 246.5, in the town of St. Boniface, Manitoba, the question of the interlocking appliances, if any, to be installed at the said crossing to be reserved for future consideration by the Board, and in the meantime the applicants to install at the crossing a double arm semaphore to be operated by the trainmen.

11406—August 18—Authorizing the British Yulon Railway Company to open for the carriage of traffic that portion of its line of railway from the "Best Chance Mine" to the "Pueblo Mine;" provided that the rate of speed in the operation of said line be limited to fifteen miles an hour, and eight miles an hour on temporary grades at stations 382, 487, and 520.

11407—August 18—Authorizing the C.P.R. Company to operate the following bridges on the Pacific Davision of the Esquimalt and Nanaimo Railway, namely, Nos. 29.8, 35.6, 39.3, 47.9, 65.1, 87.12, and 87.37.

(Continued from Page 300.)

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.
Charlottetown, P.E.I., electric light	Sept. 10.	Aug. 18.	211
Galt, Ont., vault	Sept. 10.	Sept. 1.	275
Hamilton, Ont., wharf	Sept. 28.	Sept. 1.	275
Medicine Hat., Alta., gas engine.	Sept. 12.	Sept. 1.	53
Montreal, Que., dredging, concrete pier	Sept. 14.	Aug. 18.	54
Montreal, Que., electric lighting.	Sept. 12.	Sept. 1.	275
Ottawa, Ont., dipper dredge	Sept. 12.	Aug. 18.	53
Ottawa, Ont., Quebec bridge	Oct. 1.	Aug. 25.	56
Ottawa, Ont., lighthouse	Oct. 31.	Sept. 1.	275
Point Rielle, Que., ice pier	Sept. 19.	Aug. 25.	243
Roberval, Que., public buildings.	Sept. 12.	Aug. 25.	243
Rossland, B.C., court-house repair	Sept. 30.	Sept. 1.	275
Trenton, Ont., sewers	Sept. 19.	Sept. 1.	53
Waterloo, Ont., pavements and Sewers	Sept. 14.	Sept. 1.	275
Wiarton, Ont., breakwater	Sept. 12.	Aug. 18.	211
Winnipeg, Man., rails	Oct. 1.	Sept. 1.	83
Winnipeg, Man., piping and wiring	Sept. 14.	Aug. 25.	243

TENDERS.

Edmundston, N.B.—Tenders for distribution system, also for the supply and erection of stand pipe and accessories, and for the construction of the concrete foundation and accessories, will be received until Thursday, the 8th September, for installing a system of water works, according to plans and specifications to be seen at the town clerk's office, and office of V. H. Dupont, engineer, 62 St. James Street, Montreal. Max D. Cormier, Town Clerk.

St. John, N.B.—Tenders will be received until September 9th, for masonry, carpentry, painting, heating, plumbing and electric wiring for a dwelling house. Garnet and Wilson, architects, 50 Princess Street.

St. John, N.B.—Time for receiving tenders for sewer and water main construction on Douglas Ave. was extended to Sept. 20th.

Bonaventure, Que.—Tenders will be received up to the 12th September, at 10 a.m., for the construction of two concrete pillars on the Bonaventure River, these pillars being designed for the construction of an iron bridge. Also tenders for placing the iron bridge in position. The tenders should specify the price of each piece of work separately, that is, for the pillars and for the bridge. Plans, etc., can be seen at the Department of Public Works at Quebec. S. Poirier, secretary-treasurer.

Montreal, Que.—Tenders will be received until September 12th, for the construction of two concrete pillars over the Bonaventure River. S. Poirier, Secretary-Treasurer, Department Public Works, P.Q.

Quebec, Que.—Tenders will be received until September 17th, for the construction of a new library annexed to the Parliament Buildings. Marchand & Tanguay, architects, 20½ D'Aiguillon Street.

Brockville, Ont.—Tenders will be received until 4 p.m., Wednesday, September 21st, for the construction of a pier. Plans, etc., can be seen at this department, at the office of J. G. Sing, district engineer, Confederation Life Building, Toronto, and on application to the Postmaster at Brockville. R. C. Desrochers, Secretary, Department of Public Works, Ottawa.

Dundas, Ont.—Tenders will be received until Sept. 15, for dredging the Desjardins Canal, involving the removal of about 27,500 cubic yards of material, the work to be completed by December 1, 1910. Plans may be seen at the office of John F. Armour, C.E., Dundas.

Galt, Ont.—Tenders for the labor and material required for the erection of a vault in the town hall, will be received up to Saturday, September 10th. Plans and specifications may be seen at the office of the Town Clerk or Town Engineer. Joseph McCartney, Town Clerk.

Hamilton, Ont.—Tenders will be received until 4 p.m., Wednesday, September 28th, for the construction of a wharf and two retaining walls at the city of Hamilton, County of Wentworth, Ont. Plans, etc., can be seen at this department, and at the offices of H. J. Lamb, district engineer, London, Ont.; J. G. Sing, district engineer, Confederation Life Building, Toronto, Ont., and the postmaster at Hamilton, Ont. R. C. Desrochers, Secretary, Department of Public Works.

Kingston, Ont.—Tenders will be received up to 6 p.m., Tuesday, September 20th, for the erection and completion of the Nicol Building, for the Governors of the School of Mining and Agriculture. Plans and specifications may be seen at the University, and at the office of Power & Son, architects, Kingston.

London, Ont.—Tenders will be received up to 4 o'clock Thursday, September 15th, for tile sewers on Redan Street and Marmora Street. Geo. W. Wright, Deputy City Engineer.

Ottawa, Ont.—Tenders will be received by the City Clerk up to 4 p.m., Thursday, September 8th, for asphalt pavements on following streets:—Wellington Street.—Lane near Irving to E. S. Phiney Street; Flora—Bank to Bronson; Melgund—Monk to Ralph; Anne—Mutchmor to 100 feet S. Regent. Specifications, etc., may be obtained at the City Engineer's drafting office, Waterworks Pumping Station, Pooley's Bridge, Ottawa. Newton J. Ker, City Engineer.

Ottawa, Ont.—Tenders will be received up to noon of the 31st October, for the construction of a twin screw steel lighthouse and buoy steamer for the Pacific coast, to be delivered at Victoria, B.C., of the following leading dimensions:—Length, between perpendiculars 200 feet, breadth 38 feet, depth 17 feet 6 inches, draught 11 feet 6 inches, and speed 12 knots per hour. Plans and specifications of this steamer can be seen at the Department of Marine and Fisheries, Ottawa, at the offices of the Collector of Customs, Toronto, Collingwood and Midland, and the Agencies of the Department of Marine and Fisheries at Montreal, Quebec, Victoria, B.C., Halifax and St. John, N.B.. Copies can be obtained from the Purchasing Contract Agent, Department of Marine and Fisheries, Ottawa, and from the Agent of this Department at Victoria, B.C. Alexander Johnston, Deputy-Minister of Marine and Fisheries.

Toronto, Ont.—Tenders will be received until September 8th, for the plaster work in connection with the reconstruction of the west wing of the Parliament Buildings. J. O. Reaume, Minister of Public Works, Ontario.

Trenton, Ont.—Tenders will be received until Monday, September 19th, for the provision and construction of Main Street sewers and sewage sedimentation tank. The work includes the construction of a concrete tank and the laying of 890 feet of 15-inch, 665 feet of 12-inch, and 987 feet of 8-inch sewers. Plans may be seen at the offices of the consulting engineer, T. Aird Murray, 303 Lumsden Building, Toronto, or at the office of the town clerk, G. W. Ostrom. Dr. E. Kidd, Mayor.

Virden, Man.—Tenders will be received for the grading and ditching of road and diversion of creek, along the north side of Kirkella branch C.P.R., up to the 15th September. Profile and specifications may be seen at municipal office. J. F. C. Menlove, secretary-treasurer.

Moose Jaw, Sask.—Tenders will be received until 8.30 p.m. Monday, Sept. 12, for the supplying of the following:—One two-horse street sweeper, with steel or hickory brush; two hand power patrol carts and buckets.

J. M. WILSON, City Engineer.

Moose Jaw, Sask.—Tenders will be received up to September 10th, by the secretary of the Pasqua South Eastern Telephone Company, Limited, for the construction and installing of a telephone line from Pasqua, approximately 11 miles, tenders to be at a rate per mile for building and at a rate per phone for installing subject to Government inspection. C. A. Mills, Pasqua, secretary-treasurer.

Yorkton, Sask.—This municipality has engaged W. E. Skinner, of Winnipeg, as consulting engineer to supervise the installation of its thirty-five thousand dollar electric light system. Tenders will be called for immediately for steam, oil and gas producer plants and work on the pole line will commence as soon as possible so as to have the same erected before the frost sets in. It is hoped to have the plant in operation by February 1st.

New Westminster.—Tenders will be received up to Monday, the 26th September, for the erection and completion of alterations and additions to court-house. F. C. Gamble, Public Works Engineer, Victoria, B.C.

CONTRACTS AWARDED.

St. John, N.B.—Tenders for a water main in Cross and Nelson streets, Carleton, were from: John Wheaton—Rock, $3.50; earth, 75c. George McHarg—Rock, $3.60; earth, 75c. McGouch & Pierce—Rock, $3.50; earth, 70c. The tender of McGouch & Pierce was recommended.

Montreal, Que.—A contract for 25,000 tons of steam coal for the city waterworks was divided between L. Cohen, and J. O. Labrecque, at $3.63 a ton.

North Toronto, Ont.—H. Jennings was awarded the masonry contract, $8,172, in connection with the new $16,156 school at Bedford Park.

Peterboro, Ont.—In connection with the new sewerage scheme for the south part of the city, contracts were awarded to E. Conroy, for the sewers, storm drains and pumping station, to the Ontario Sewer Pipe Company, for vitrified pipe, and to Taylor & Hall for reinforced concrete pipe.

Toronto, Ont.—E. C. Lewis accepted a contract for the construction of the Weston road viaduct at $17,066, although he had under-estimated the quantity of concrete work. The engineer's tender was $19,000.

Winnipeg, Man.—For galvanized meter fittings, a contract was given to the Crane & Ordway Company, of Winnipeg, at $830.75.

Winnippeg, Man.—The City Council decided to accept the proposal of the Sewer Deodorizing Co., Ltd., to supply ten or more machines and to supply the alcohol used in making a test for deodorizing and disinfecting the sewers, on the understanding that the city is to pay $75 each for the machines if they prove satisfactory.

Swift Current, Sask.—E. G. Marriott, resident engineer on construction, sends the following list of tenders for laying sewers and water mains and constructing sewage disposal works at Swift Current. Laidlaw & Macdonald, of Fort William, got contract A, for laying the sewers and water mains, at $39,179.85, and contract B, for the construction of the disposal works, at $8,299. The other bids were:

M. A. Pigott & Son, Kenora, Ont.	(A) $49,739.00	(B) $11,801.00
S. E. McManus & Son, North Battleford, Sask.	(A) $87,457.50	
Broley & Martin, Fernie, B.C.	(A) $71,535.13	(B) $11,137.95
H. G. McVean, Moose Jaw, Sask.	(A) $62,673.00	
W. I. Gray & Co., Winnipeg	(A) $59,000.00	

Contracts C and E were not let. J. Darlington Whitmore, of Regina, is the consulting engineer.

Fernie, B.C.—The contract for extending the sanitary sewer system was awarded to J. J. Wood, his bid, $12,560, being the lowest of seven.

New Westminster, B.C.—The contract for valves for the new Coquitlam pipe line has been let to T. J. Trapp & Co. for $2,300.

North Vancouver, B.C.—The Ferries Company has awarded the contract for its new offices here to Messrs. Tuck & Brewer at $5,000

RAILWAYS—STEAM AND ELECTRIC.

Montreal, Que.—Connection between the lines of the Grand Trunk Pacific and Transcontinental at Winnipeg was secured on Friday when the Railway Commission granted the application of the Transcontinental for temporary running rights through Winnipeg over the Canadian Northern. The latter did not object and the order stands till otherwise ordered by the board; but one year is mentioned as the probable time. Compensation is to be arranged by the companies and trains are to be handled by the C.N.R. The privilege is very important inasmuch as it establishes a direct G.T.P. line from Edmonton to Fort William for this season's grain carrying trade.

Sherbrooke, Que.—The Sherbrooke Railway and Power Company will shortly place an order for new cars of the latest type.

London, Ont.—Reports say that preliminary plans for the construction of an electric railway, 40 or 50 miles in length, to connect London and Stratford, will be outlined as soon as the Hydro-Electric power reaches the city.

Owen Sound, Ont.—It is altogether likely that a syndicate of Cleveland railway promoters will construct the Owen Sound and Meaford Railway. John B. Tanner, a representative of the syndicate was in conference with Mayor Harrison and a few members of the council and board of trade on Wednesday, when it was arranged that Mayor Harrison and Mr. Tanner should visit Montreal and interview the heads of the C.P.R. and G.T.R. with a view to either of these two corporations operating the road after completion. The proposed road is thirty miles long.

Toronto, Ont.—The report of Messrs. Jacobs & Davies, the New York exports, on the question of underground railways for the City of Toronto, was considered last week by the Board of Control. The scheme proposed is estimated to cost over $23,000,000, and as that figure is regarded as too high for present consideration, the work of construction will not likely be undertaken for some years.

Battleford, Sask.—Surveyors have been at work here for the past month locating a proposed line of the G.T.P. from Battleford to Wainwright.

Prince Albert, Sask.—Reaching here on Monday, after an inspection trip over the Grand Trunk Pacific from Winnipeg to Saskatoon, Hon. Geo. P. Graham, the Minister of Railways and Canals, said it was the most perfect newly-constructed piece of railway on the continent. The section is the first finished link in the system. The new railway blazes a trail in construction. Heretofore the plan adopted was to construct as cheaply as possible, without putting the road in a position of quick-earning capacity, and improving as the business warranted. Under the Government arrangement, the Minister aims at making the road adopt a permanent standard at the beginning, which necessitates unusual cost in construction. The grades and curves in the new railway are perfect now. With the exception of one "pusher grade" of twenty miles in the Rockies, the road is practically level. The grade throughout is four-tenths of one per cent. against eastbound traffic, and six-tenths of one per cent. against westbound traffic, a ruling grade lower than that of any other railway on the continent. The ruling grade on the G.T.R. from Montreal to Toronto is one per cent. The route of the railway is exceptionally straight. The first curve occurs 47 miles west of Winnipeg. The Minister anticipated that he would find an excellent road, and all his expectations were more than realized. The railway, so far as he had examined it, was permanently prepared for the carriage of heavy traffic, and was a credit to Canadian construction enterprise. The Minister left for Pas Mission. He was met at Saskatoon by Mr. M. H. McLeod, General Manager of the Canadian Northern, and a special train was made up for the trip from that point to Prince Albert and The Pas.

Pas Mission, Keewatin.—On Tuesday, Sept. 6th, Hon. George P. Graham, Minister of Railways and Canals, turned the first sod of the Hudson Bay Railway. The ceremony was performed at a spot on the south shore of the Saskatchewan River, near the approach of the bridge under construction by Messrs. Mackenzie & Mann. It is probable that Fort Nelson will be the terminal point of the new line, although no official decision has yet been reached. The construction of the bridge is in charge of R. W. Graham, who during the summer, has supervised four miles of bridge building on 600 miles of track for the C. N. R.

LIGHT, HEAT AND POWER.

Montreal, Que.—Tenders addressed to the Board of Commissioners, City Hall, will be received up to noon, Monday, 12th September, for:

1st. The supply, care, and maintenance of the public lighting by electricity of the streets, avenues, parks, and other public places.

2nd. The supply of electric current for lighting in municipal buildings.

3rd. The supply of electric current to motors used for municipal purposes.

L. N. Senecal, secretary.

Port Burwell, Ont.—A gas well was struck near here by the Dominion Gas Company of Hamilton, which has been drilling in the neighborhood all the summer. The well is 13,000 feet deep, and the estimated flow from the six-inch hole is 3,000,000 feet of gas per hour.

Winnipeg, Man.—Permission which may seriously affect the flow of water in the Winnipeg river and lessen the efficiency of Winnipeg's new power plant at Point du Bois, has recently been given to the Minnesota Power and Canal Company, to divert water from the Birch lake basin at the Rainy River watershed, into the St. Louis River. The water that would be diverted might seriously jeopardize the Winnipeg plant. With a view to protecting the city in this manner the Board of Control instructed its secretary to forward to the International Waterways Commission a request that the permit be held up until the effect of the diversion on the Winnipeg River can be estimated. The city's power engineers are trying to grasp the full significance of the permit and will report as soon as possible to the city, when more definite action will be taken. The amount of water which the Minnesota Power and Canal Company is given the privilege to divert is 600 cubic feet per second. The work to divert the water has not been started.

BY-LAWS AND FINANCE.

Bracebridge, Ont.—On Sept. 14th, Township of Muskoka ratepayers will vote on a $10,000 by-law for local improvements. Jas. Bryoon, Clerk.

Durham, Ont.—By-laws granting a loan of $20,000 and exemption from taxation to the Durham Furniture Company for extension of their business and one for the purchase of a new market site, were carried.

Elgin, Ont.—The Township council is considering a $10,000 bridge by-law.

Guelph, Ont.—On Sept. 26th the ratepayers will vote on an $85,000 street railway by-law.

Vonda, Sask.—A by-law has been passed to issue $8,000 debentures to build and equip a flour mill.

Stewart, B.C.—An order-in-Council has been passed to borrow $30,000 for public improvements.

Victoria, B.C.—The ratepayers defeated the $100,000 telephone by-law and passed the following: sewer, $50,000; school loan, $ 50,000; Dallas Road foreshore protection, $75,000; Isolation hospital, $25,000; public convenience, $20,000.

SEWAGE AND WATER

Montreal, Que.—Geo. Janin, superintendent of the water works, will submit to the Board of Control a report on the question of filtering the water supply.

Hering and Fuller in their report estimated the cost of a mechanical filtration plant having a capacity of 50,000,000 gallons daily, at $1,054,550, exclusive of the land, and the cost of a sand filtration system with a capacity of 50,000,000 a day at $1,692,800, also exclusive of the land required.

For a double filtration system the estimated cost is set down at $1,445,500.

The engineers remark that said filters will only remove some 20 to 30 per cent. of the vegetable stain in water, and while such filters would be acceptable for the clear water of the St. Lawrence, they would not give satisfactory results in producing a clear water from the shore supply.

Respecting mechanical filters, they would give good results with any of the local waters, but they would require the use of different quantities of coagulants. Larger quantities would, of course, be needed for the highly colored shore water than for the comparatively clear colorless water from the proposed outer intake.

Regarding double filtration the engineers remark that for the outer water it would not be necessary to use a coagulant, though allowance had been made in the estimates for the use of a coagulant when such an emergency as an excess of frazil ice would necessitate the consumption of shore water. If shore water were used considerably a further sum of $241,500 would have to be added to the estimates for the double filtration system for a coagulating basin.

The report of the engineers has been looked into carefully by the controllers, and Superintendent Janin will now advise them as to which is the best system to adopt.

St. Thomas, Ont.—Engineer Bell has recommended the construction of storm sewers.

Penticton, B.C.—Penticton will shortly have a complete domestic water and electric light and power system installed. Municipal Engineer Latimer has been asked by the council to make a preliminary report upon the cost of installing water, light and power. An estimate of the potentialities of the three great reservoirs, now the property of the municipality in this connection, has just been made. It is stated that at Ellis Creek reservoir 240 horsepower is available, sufficient to feed 1,200 sixteen candlepower lights, while it will be possible to generate at least 300 horsepower from Penticton Creek reservoir. All told there will be sufficient water available to furnish a domestic water, light and power system for a population of about eight or nine thousand As soon as Mr. Latimer's report is prepared bylaws will be framed and voted on by the people.

MISCELLANEOUS.

St. Lambert, Que.—The town engineer will shortly outline plans for the construction of macadam roads and cement sidewalks throughout the town.

London, Ont.—Council will probably decide to purchase a fire engine with a capacity of 1,000 gallons a minute. A recommendation has been made for the invitation of tenders.

London, Ont.—The Board of Works decided to instruct City Engineer Wright to prepare estimates of the cost of a bridge at the Wharncliffe road, connecting South and West London, and the council was recommended to submit a by-law to the people next January to raise funds for this purpose.

Ottawa, Ont.—Specifications for the St. John Drill Hall are being prepared, and there will be a call for tenders in the course of the next few weeks. The plans have been approved by the military authorities and the site for the building has been obtained.

Vancouver, B.C.—Messrs. Waddell & Harrington have filed plans of bridges to span the intervening places between Georgia and Harris streets, and Dunsmuir and Keefer streets. Each bridge will have an elevation sufficient to clear the railway yards of both the C. P. R. and G. N. R.

Each bridge has been designed with a view to economy as well as attractiveness and are calculated to withstand the combined weights of a 15-ton road roller and an electric railway load of 74,000 pounds. The heaviest grade will be on the Dunsmuir street span, which is approximately 3 per cent. The grade on the other will be 2.4 per cent. The approximate cost of the Georgia street bridge with two seven-foot sidewalks, with a 42-foot roadway, double-tracked is $415,000. The cost for same with a fifty-foot roadway would be $459,000.

The Dunsmuir to Keefer bridge, 42-foot roadway, 7-foot sidewalks and 42-foot overhead clearance, double-tracked would cost approximately $350,000. With a fifty-foot roadway the cost would be $387,000. Without the car tracks the cost would amount to $281,000. These figures include substructures, superstructures, abutments, lighting, engineering and all bridge work, but not the right-of-way.

The total length of the Georgia street bridge is 2,700 feet, while the other structure measures 2,200 according to plans. These figures have been prepared by Mr. Waddell, who explained in detail the points and advantage in each design. With regard to the danger from fire where the bridges came in close contact with wooden buildings the engineer suggested that cement be used as a protection to the steel work, as heat from a conflagration would be apt to twist the girders and close traffic.

A money by-law will probably be submitted to the ratepayers on January 1st to raise money for the construction of the bridges.

CURRENT NEWS.

Halifax, N.S.—Certificates as Provincial Land Surveyors, under the Crown Lands Act, passed at the last session of the Legislature, have been issued by the Crown Lands Department, to the following:

Annapolis County—C. F. Armstrong, Edward Berteaux J. B. Whitman.

Antigonish County—Hugh McDonald.

Colchester County—J. K. Eaton, Howard Mills, Samuel T. Ellis, Gilbert Sutherland.

Cumberland County—Fred A. Harris.

Digby County—S. M. Comeau, A. M. Comeau, Edwin B. Parker, C. M. Comeau.

Guysboro County—Charles W. Taylor, Charles W. Pyle.

Halifax County—Charles A. Macaloney, Harris S. Tremaine, H. W. Andrews, Lambert Lynn, Thomas J. Lynch Frank A. Creighton, H. B. Pickings, Albert A. Bryne, L. C. Archibald, W. A. Hendry, F. Christie, Harry J. Knight Hiram Donkin, F. W. W. Doane, Alex. Pickering.

Hants County—Letson M. Smith, John R. McKenzie, Reginald W. McKenzie.

Kings County—Archibald Foster, Hennigar Neily.

Lunenburg County—Thomas W. Johnstone, Charles H. Starratt Robert C. Stewart.

Pictou County—Albert McKeen, D. W. McDonald.

Queens County—D. Primrose Smith, Josiah Smith, Hartwell Putman, Francis E. Tupper, Howard S. Tremaine.

Shelburne County—James A. McKay.

Yarmouth County—Nelson Churchill.

Cape Breton County—Laurence Shanahan, A. R. McDonald, Richard S. Dahl, C. M. Odell, D. J. Ferguson, George J. Ross.

Inverness County—A. H. Aiens, W. F. Davis, James W. McKenzie, James H. Austen, Archibald D. McLellan.

Richmond County—Kenneth McIntosh.

Victoria County—J. A. McLean.

New Glasgow, N.S.—The output of the Nova Scotia Steel and Coal Company for August shows a total of 45,190 tons of ore, 76,010 tons of coal, 7,720 tons of pig iron, and 7,851 tons of ingots.

The increase over August, 1909, was as follows: Ore, 5,400 tons; coal, 3,070 tons; pig iron, 3,580 tons; steel ingots, 7,720 tons. The open hearth furnace was idle during August, 1909. Increase in finished products over August, 1909, 1,344 tons, while for the eight calendar months of 1910

the shipments show increases all along the line as follows: Ore, 42,710 tons; coal, 55,700 tons; finished steel products 1,900 tons.

Calgary, Alta.—Crude petroleum as a means to lay the dust on the unpaved streets of Calgary is hardly proving a success, from the trial being made under the supervision of Commissioner Clarke.

Fourth avenue from Sixth to Seventh streets west, was where the test was made; 231.6 gallons of oil were sprinkled over 9,591 square feet of roadway two weeks ago. The cost was $72.65, which is too expensive to make the oiling scheme a general one. The cost of oiling a square yard is 4¾ cents.

The commissioner considers the scheme impracticable in Calgary, not only because of the expense, but also on account of the dust which blows into the city from adjacent hills. The oil was bought in Calgary, and the 231.6 gallons cost $50.95. The labor of putting the oil down cost $20.50, and it requires a team of horses for two hours to sprinkle the oil, which consumed another $1.20, making the total $72.65. The total cost for oiling a square yard was 6¾ cents.

Westerly, R.I.—The concrete standpipe has been completed by the Aberthaw Construction Company, the general contractors for the entire work. It is being tested with a full head of water and some interesting results concerning the impermeability of concrete placed and mixed with the special object of making it waterproof without other means.

PERSONAL.

Mr. J. R. Blackett, for some time chief auditor of the Dominion Coal Co., has accepted the position of comptroller of the Halifax Electric Tramway Co.

Mr. Charles F. Kenworthy, until recently with the Engineering Department of the American Brass Co., and formerly of the Kenworthy Engineering Co., has been engaged by the Rockwell Furnace Co., to represent them in the New England States and Canada. Mr. Kenworthy has devoted his entire time for the past eighteen years to the design and construction of furnaces and fuel apparatus, and brings with him a large acquaintance among the builders and users of this line.

OBITUARY.

Mr. Hugh McCulloch, Sr., president of the Goldie & McCulloch Company, of Galt, Ontario, died on Saturday, September 3. Mr. McCulloch was born in Scotland in 1826, and would have been 84 years of age had he lived till the 19th of this month. He came to this country when a boy, and had been a resident of Galt or in the neighborhood of Galt for 60 years.

In 1859, with the late John Goldie, they purchased from James Crombie the Dumfries foundry, a small institution employing 22 men. Several large contracts were taken in the early days, and soon the name of Goldie & McCulloch was known all over Canada. At first general foundry work was done, but as the business grew the firm went into the manufacture of boilers, engines, flour and sawmill machinery and wood-working machinery. Thirty-one years ago the firm went into the manufacture of safes and vaults, in which department great success was achieved. The advancement of the trade led to a joint stock company being formed in 1891. In 1896 Mr. Goldie died, and his son, A. B. Goldie, took his place, and is to-day manager of the works. The firm employs in the neighborhood of 500 hands, and is Galt's largest foundry. Mr. McCulloch was president of the firm.

He is survived by two sons and one daughter, Hugh McCulloch, jr., vice-president, and Mr. R. O. McCulloch, secretary-treasurer of the firm, and Mrs. Shearson, of New York, and one brother, George, of Souris, Man.

Mr. Charles Talbot Porter, an engineer and inventor of international reputation, died at Montclair, N.J., on Wednesday, after a brief illness. In recognition of his work in advancing steam engineering and for improvements in engine construction, Mr. Porter received the John Fritz medal in 1900. The only other recipients thus far have been Lord Kelvin, Alexander Graham Bell, Thomas A. Edison and George Westinghouse. The medal is conferred by joint action of the four national engineer societies.

Mr. Henry Walter Selby, D.L.S., of Toronto, recenly died by drowning in the Athabasca River, at the rapids, 150 miles north of Athabasca Landing, according to word received in Toronto last week. Mr. Selby, who was a Dominion Government surveyor and who had for about ten or twelve years been engaged in survey work in the northwest, was, it is understood, in company with Mr. Walter E. W. Jackson of the Toronto Observatory staff, carrying on surveys for the Dominion Government when their canoe was upse and Mr. Selby was drowned. Mr. Selby was a son of the late Capt. Thomas Selby, formerly of Toronto. He was President of the Ontario Land Surveyors' Association.

Mr. Hector Murray, of the contracting firm of Holmes, Murray and Sharkey, died on Wednesday, Sept. 1st. near the G.T.P. bridge over the Red Deer river, six miles south of Alix, Alta., where he was fatally beaten about the head by a laborer.

CANADIAN MUNICIPAL UNION.

(Continued from Page 305).

A Handbook of Instruction.

Mr. H. J. Ross, Montreal, reported for the special Committee on Uniform Municipal Statistical Returns and a Uniform Principle of Municipal Accounting. The committee favored uniformity, and recommended that a handbook of instruction be prepared.

Mayor H. Williams, of Fort Frances, read an interesting paper on "The Export of Water-power." Mayor Williams referred to the fact that United States capitalists were seeking to obtain water-power privileges in Canadian municipalities. He mentioned as one of the chief dangers to small municipalities the over-anxiety of municipalities to get industries, and he urged careful consideration of all schemes of promoters.

Mayor Williams urged that legislation be secured providing that all power exported from Canada must contribute to the revenue of the Province that produces it. This view seemed to be shared largely by the convention.

MARKET CONDITIONS.

Montreal, September 7th, 1910.

A well-defined buying movement in pig-iron has started in the Pittsburg district, and actual transactions in the past week have been the largest for many months, while pending inquiry is also the largest seen for a long time. The movement is an evidence of revising confidence in values, but does not indicate prospective buying at such a rate as to engage capacity fully or produce any great market advance. The deliveries are well extended, and there has been some disappointment on the part of sellers to see that when inquiries do come out from particular customers, the delivery periods start late, indicating that such customers are well provided for the present.

There has been no advancing tendency in pig-iron, but on the contrary it is understood that most of the tonnage taken has been at special prices. In a very few instances open market quotations have declined slightly. The Bessemer pig-iron average for August was $15.15, valley, a decline of 35c. from July, and of $3.85 from January. The basic average was $14.02, a decline of 48 cents from July and of $3.46 from November. Bookings in finished steel products continue to increase slowly. August has seen a decrease in total unfilled tonnage on books, but there are hopes in some quarters that September will show a gain.

A return is being made to last winter's prediction of 50,000,000 tons of Lake Superior ore to be moved in the season, some predictions early in July being as low as 35,000,000 tons. The movement to September 1st appears to support the 50,000,000-ton prediction easily, and this would be a gain of 7,500,000 tons over 1907 and 1909, the two best years so far.

Up to the end of last week, there had been no improvement in the the buying of steel, and the general belief is that until the middle of the month no very accurate indication can be given of how matters will go. Enquiries are reported to be very good.

The report of the lock-out of some 50,000 boiler-makers in the shipbuilding establishments on the other side of the Atlantic certainly does not tend to improve matters greatly in the iron and steel trades of Great Britain. Reports being cabled this week are not any too cheerful, although it is expected that the labor trouble referred to above will be settled shortly, and that a good demand should set in shortly for export account, in order that deliveries may be made before the streams freeze up for the winter. Prices show no improvement worthy of mention.

In the local market there is practically nothing of consequence going on, other than the customary manufacturing, buying and selling. Canada has nothing to complain of. All the iron and steel mills are being kept well employed, apparently, and prices are said to be fairly satisfactory, all round. Indeed, the present year is expected to be the best in the history of the trade. The situation, however, is a little doubtful, because of the hesitation in the United States. Otherwise, every one appears quite satisfied with the present, and hopeful of the future.

Prices are still holding steady through the market for iron and steel and finished products, the following being the range of quotations:—

Antimony.—The market is steady at 8c. to 8¼c.

(Continued on Page 51).