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The Canadian Engineer

ESTABLISHED 1893.

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TORONTO, CANADA, APRIL 15, 1910.

CONTENTS OF THIS ISSUE.

CONSERVATION: WHAT IT INVOLVES.

The Canadian Institute of Toronto, during the winter season, holds some very interesting and successful lectures. The range of subjects discussed is wide, and it is doubtful if any other organization in Toronto presents so varied and valuable a series.

Last Saturday evening Dr. Fernow, of the Faculty of Forestry, Toronto University, addressed the Institute on "Conservation: What it Involves." Dr. Fernow, having for his life work forestry and its allied studies, is naturally greatly interested in the present movement, which has for its object the conserving and reserving for future generations the wealth of forest and stream.

In classifying natural resources the lecturer divided them into two classes, exhaustable and inexhaustable. The exhaustable ones were grouped into restorable and non-restorable, and the restorable ones into those liable to deterioration under private activity and those which yield increased returns under increased activity.

As might be expected, Dr. Fernow gave special attention to forest resources. In forest preservation a differentiation must be made between agricultural soil, which should be left entirely to the activity of the individual, for their removal is necessary to secure farm lands; those situated at head waters of streams, on shifting sands or other localities where the productive value of the forest cover is paramount, and public ownership can alone guarantee maintenance in necessary good condition; and third, those of absolute forest soils.

Conservation involves the development of sense of public responsibility. Without a care for the generations to come, enthusiasm in the preserving of natural resources cannot be attained.

In considering conservation, it must not be forgotten that there are times when it is wasteful to attempt to conserve. Many of the most valuable forest tracts of Canada have been wasted in the name of conservation, and some of the most suitable water-powers of the continent are undeveloped, and large areas without their benefit, in the name of the same movement. It requires just as much judgment not to be wasteful in conserving as not to be wasteful when using.

ADVERTISING.

Many firms are carrying on an advertising campaign in Canada to-day. The results from advertising are no more uncertain than the results in other lines of activity. Advertising is as exact an undertaking as many of the other occupations which we term sciences. The uncertainty in advertising is due to the unsuitable field selected and the lack of vitality and life put into the advertising. Alertness and resourcefulness are as necessary in conducting an advertising campaign as in selling if you wish to bring the desired results.

The advertising writer for the magazine and the daily papers has succeeded in making the advertising pages of many journals of as much interest to the women-folk as are the editorial pages. The advertisement writer for the technical magazine is making some attempt to brighten the advertising pages of the journals which they patronize, and to-day the pages of our better technical magazines are read and studied as carefully as our editorial pages. To appeal to people of intelligence it is necessary that judgment be shown, the claims made and the statements set forth in reference to the various articles and supplies that the advertiser may have to dispose must be reasonable. These claims may be made in a striking manner, but continued misrepresentation will lose its value. With the spread of education the numbers to be reached by magazines and technical journals is largely increased. The press is a great educational influence, and if its advertising pages are judiciously taken advantage of, it will become a powerful sales agent.

THE CITY ENGINEERS' TENDER.

Of late years it is becoming the practice of city engineers to tender along with the contractors upon every important piece of work undertaken by the municipality.

This practice grew out of the conditions which arose in many places when the contractors were few, and where they arranged among themselves as to prices. The immediate results were that contract prices were lowered in many places, and, as the competition became keener, it frequently happened that the city engineers' tender was higher than the average tender price.

Naturally, contractors have been objecting to this practice on the part of the city engineer, but it is not to be expected that such criticism will alter the procedure.

It might be well, however, to call the attention of engineers to the fact that in some municipalities the contractors who have provided large equipment are not being fairly treated, and that the general taxpayer, unknowingly, is contributing to the construction of works which should be charged entirely to local improvement. The fact that the city engineer is not required to deposit bonds, nor to make allowance for depreciation of plant, nor required to give a guarantee, makes it possible for him to tender at lower figures than the contractor who has to take these matters into consideration. The careless method of bookkeeping frequently employed makes it impossible to tell exactly what our work costs.

Contractors may be counted upon to take advantage of every legitimate means of securing good prices for their work, but in his endeavor to keep down the prices the city engineer must be careful that he is not favoring certain of the ratepayers at the expense of the municipality.

PAINTING OF STEEL BRIDGES.

Every spring the question of the maintenance of steel bridges should be carefully considered by those having such in their charge. A little money spent on repair, such as the renewal of floors, repair of piers and abutments and painting will add many years to the life of the bridge, and result in the saving of considerable money.

The principal operation in preparing steel for a coat of paint is to thoroughly remove all blisters, scales, rust and old paint until the steel has a polished surface, and dust and dirt cleaned from the steel. It is well known that any rust or moisture under the new paint will corrode the steel as much as if left exposed without a cover. Paint, therefore, should not be applied in the early morning or the late afternoon, or on damp, foggy days. It is just as necessary that the material be dry as clean.

The primary coat should be applied thin, and, if possible, without dryers. The second coat, applied after the first is thoroughly dried, may be thicker in consistency, but not so thick but that it will dry within two or three days. For painting steel bridges the Road Commissioner of Nova Scotia uses the best red lead, mixed in the proportion of 150 pounds of lead to one gallon of raw linseed oil, making a thick paste, which is to be used as soon as possible after being mixed. This is again thinned to 20 pounds of paste to one gallon of oil. In addition to the red lead paint, used in many places, there are a number of tar and graphite paints which are equally as good. These paints give a coat good in appearance and cheaper than the red lead.

Neglect of steel structures in the matter of painting is one of the most fruitful causes of their early weakening, and it is a matter that should not be overlooked.

EDITORIAL NOTES.

Mr. James H. MacDonald, Highway Commissioner for Connecticut, in a recent interview stated that he believed the coming street pavement will be of cement. Properly laid with hard rock, it will last under ordinary traffic many years.

* * * *

In this issue will be found a very interesting article by Mr. F. D. McArthur, B.Sc., engineer for Yorktown, Sask. Mr. McArthur describes the first compressed air waterworks tank used in Canada. This article would seem to indicate that the standpipe is a thing of the past in connection with waterworks systems, although this method of delivering water has been used for some time in connection with water supply for railway locomotives.

* * * *

The Clarkson School of Technology commemorated on March 18th last the fourteenth anniversary of their charter day. The programme was an exceedingly interesting one. The address of the occasion was given by Dr. C. P. Steinmetz, of the General Electric Comany, Schenectady, N.Y. As might be expected, Dr. Steinmetz was very complimentary in his reference to the engineering profession, and to the young men preparing to go out into the world his opening sentence was: "It will depend upon you young engineers to secure the success of the engineering in the future."

PRECIPITATION FOR MARCH.

The total precipitation recorded in Canada during March was very generally much less than the average, the only districts which recorded an amount in excess of the average were Western Alberta, Eastern Saskatchewan, Manitoba and the Rainy River district of Ontario.

The deficiency was very marked in Ontario and Saskatchewan.

At the close of the month the ground was bare of snow except in Quebec and Northern New Brunswick, where there was a depth of from 2 to 20 inches.

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

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

Station.	Depth in inches.	Departure from the average of twenty years.
Calgary, Alta.	1.10	+ 0.36
Edmonton, Alta.	0.80	+ 0.03
Swift Current, Sask.	0.10	— 0.76
Winnipeg, Man.	1.60	+ 0.35
Port Stanley, Ont.	0.60	— 2.26
Toronto, Ont.	0.66	— 2.49
Parry Sound, Ont.	1.60	— 1.41
Ottawa, Ont.	2.00	— 0.53
Kingston, Ont.	1.90	— 0.40
Montreal, Que.	1.50	— 2.40
Quebec, Que.	2.70	— 0.56
Chatham, N.B.	2.40	— 0.73
Halifax, N.S.	4.20	— 1.14
Victoria, B.C.	2.40	— 0.31
Kamloops, B.C.	0.20	— 0.22

WATER POWERS ON OUR NORTHERN SLOPE TO JAMES BAY, PROVINCE OF ONTARIO*

L. V. Rorke, O. L. S.
Inspector of Surveys, Ontario.

In attempting to get together some information and results with reference to the water powers on the rivers of Northern Ontario, which empty into James and Hudson Bay, a certain amount of latitude must be granted, because of the lack of accurate information with respect to the different data, which necessarily enter into a fine computation of any water power development. Having travelled over some of these rivers from their head waters to the outlet, and taken some cursory notes, the writer feels that the impression gained and the results herewith obtained from a summary of these water powers may be of interest to most of you in this progressive age of hydro-electric development.

Looking over the map of Northern Ontario you will notice that the rivers north of the watershed to James Bay assume a tentacular aspect with delicate feelers reaching out from the main body of water (Hudsons Bay) to taste of the large bodies of fresh water, which form the head water lakes, visit the ground and you find them great feeders, raging torrents in high water, with no sense of delicacy towards their surroundings. You may also notice the absence of lake expansions, so prevalent on the southern slope. It it were possible to show every little creek, stream and brooklet, it would be seen how wonderfully systematic and complete nature has provided these small laterals to the larger water courses. If you travel up those rivers when your canoemen hug the shores to keep from the heavy current and to take advantage of the back eddies, you will notice the numerous small natural drains in quick succession, especially through the great clay belt, which you would pass unnoticed if travelling in mid stream. The rivers are in many respects similar, in the lower reaches they become wide, shallow and swift, after tumbling down over what has been termed the Archean Boundary by geologists where an altitude of approximately 250 feet in a distance from 5 to 15 miles, is overcome by a series of falls and rapids. The principal on each river at this Archean Boundary are as follows: On the Missinabi, at the end of Long Portage at what is known as "Hells Gate" a fall and rapid of 140 feet, on the Opazatika, at Break-neck Falls, a drop of 60 feet. On the Mattagami, at the Long Portage falls and rapids, of 150 feet. On the Abitibi, the long rapids between the mouth of little Abitibi River and New Post and on the French River tributary Nettogami at Kawash Falls, 110 feet.. Above this Archean Boundary there is less current in the rivers, and the basin is coursed by a succession of falls, chutes and rapids with intervening stretches of river, whose velocity varies from ⅓ to 2 miles per hour. The large lakes at or near the head waters are fairly uniform in altitude, being approximately 1,000 feet above sea level and may be enumerated as follows:—The Abitibi Lakes on the Abitibi River, the Frederick House and Night Hawk Lakes on the Frederick House River, the Mattagami and Kenogamisee Lakes on the Mattagama River, Pish-kan-og-am-a, Matagaming and Rice Lakes on the Ground Hog River, the Missinabi, Kapuskasing, Opozatika, Kabanikagami, Kenogami and Ogoke Lakes at or near the heads of the respective rivers of the same name, Rainy Lake, Lake of the Woods and Lac Seul at the head waters of the Winnipeg River and its tributary, the English River.

The drainage basin of these several rivers within the limits of the Province of Ontario is approximately 100,000 square miles. The altitude of the head waters and length of rivers being approximately the same, and the river beds having a fair degree of uniformity. I propose to make certain deductions and arrive at some conclusions as to the amount of water power in the larger falls on these respective streams.

Every water power estimate must be calculated to be accurate on its own merits taking into consideration the annual water flow and its superficial surroundings, the natural head varies with the flow, and the flow varies with the temperature and rain fall, from month to month; in fact the only constant is the drainage basin, which remains always the same; unless the water is diverted by artificial means from its natural course, or by earthquakes; of which we know little by experience in this country.

The greatest error in making an estimate is always in gauging the volume of flow; a single measurement of a stream is of no value except as to that particular time. A close estimate can only be made by a series of measurements extended over the whole year, not only of the volume discharged over the fall but also of any lakes required for storage basins.

In drainage area calculations, the amount of run off as composed with the total rain and snow fall must be known. This percentage will vary with the conditions of the atmosphere, the quality and chemical composition of the soil and the grades of the valleys, hills and plains, which comprise the entire drainage basin. From information to hand in this respect a fair and conservative deduction of the volume of flow in these rivers can be arrived at by assuming a constant number of cubic feet per second discharge, to each square mile of area drained. The drainage area and head waters of the Ottawa River adjoin some of those herein enumerated and the volume of water in this river has been carefully gauged and investigated in connection with the Georgian Bay Canal scheme, with the following results:

The average annual precipitation for 10 years preceeding 1906, was 31.72 inches and the average discharge 53 per cent. of the precipitation or 16.8 inches.

* Abridged from an address before the Engineer's Club, Toronto.

The drainage area is 56,000 sq. miles and for the same 10 years the average yearly mean discharge was 56,641 c.f.s. The maximum high water discharge 3 times the mean discharge, and the minimum low water discharge 65/100 of the mean discharge.The results obtained from this discharge area are that the mean discharge is 1 c.f.s. per sq. mile area and the minimum low discharge is .65 c.f.s. per sq. mile area.

The Spanish River has been estimated to have a minimum discharge of 1,800 c.f.s. and 3,500 sq. miles area = .51 per sq. mile.

Mississagua River	1,050	c.f.s.	and	3,500	sq.	miles area	=.30
Sturgeon River	900	"	"	2,000	"	"	=.45
English River	8,000	"	"	20,000	"	"	=.40
Winnipeg River	20,000	"	"	50,000	"	"	=.40
Montreal River	750	"	"	1,500	"	"	=.50
Trent River	1,600	"	"	4,000	"	"	=.40

The average minimum low discharge of these rivers is .45 c.f.s. per square mile and for the purpose of this paper it will be well within the limits to assume 4/10 c.f.s. per square mile.

On the western part of the slope, the total precipitation is less than in the Ottawa River basin, but the percentage of run-off is greater. The average yearly precipitation during 10 years preceding 1907 in the Winnipeg River basin has been 23 inches and the run-off 70% of the precipitation or 16.1 inches, practically the same as the Ottawa River Basin.

In these rivers of our northern slope, the high water run-off is more gradual than on the southern slope. In such rivers as the Nepigon, Magpie, Pigeon, Spanish, French and others emptying at the north shores of Lakes Superior and Huron, the spring freshets are heavier and of shorter duration, because of the large amount of rock-exposed territory and the more broken and steep hills therein. The maximum discharge is not reached on the northern slope until late in the month of May or early in June, and owing to the gentler slopes of the land and the forest-covered area, the run-off is more gradual. Taking this into consideration the annual discharge can be more easily and uniformly controlled and requires less storage than such rivers as mentioned above.

On the Abitibi River, for example, we have a storage basin of 460 sq. miles in the Abitibi, Night Hawk and Frederick House Lakes; with a rise of 10 feet above low water mark (one square mile 1 foot deep = .88 c.f.s.) a storage of 4,000 c.f.s. could be obtained to maintain a mean discharge during the low water months, this is quite sufficient after allowing a reasonable percentage for evaporation.

A cross section of the Abitibi River, near the National Transcontinental Railway crossing, gives an area of 5,000 square feet below normal water level and 10,000 square feet in mean high water. The water from an area of 6,500 sq. miles discharges through this sectional area, in low water at the rate of ⅓ of a mile per hour, in high water at the rate of 1¼ miles per hour, a calculation based on the principal that the low flow is .4 c.f.s. per square mile and the mean high water 3 c.f.s. per square mile.

From this cross sectional point which is 800 feet above sea level, after deducting 280 feet in the falls and rapids, which are noted and 200 feet for the lower reach of the river where a uniform fall of probably 2 feet per mile exists, there remains a fall of 320 feet in a distance of 200 miles, or about 1 6/10 feet to the mile. This of course includes many minor rapids, which when estimated, would reduce the uniform river velocity to probably what is deduced from the above sectional discharge.

It has been ascertained that on the Winnipeg River in the Province of Manitoba, an aggregate head of 247 feet is available for horse power development, with a minimum efficiency of 486,000 h.p. which is equal to ¼ that of the great Canadian falls at Niagara. It may be of provincial interest to state that 75 per cent. of the drainage basin of this grand river, lies within the province, and 95 per cent. of the total discharge passes through the province before reaching the outlet into Lake Winnipeg. With control dams at Lake of the Woods, Rainy Lake, Lac Seul and other large lakes on this river and its tributary the English, the minimum efficiency of all powers on this river both within and without the province could be doubled.

The large water powers in Ontario on this river are enumerated herein, giving the same minimum low water flow per mile, as those on the more eastern end of the slope. The White Dog Falls and Rapids about 15 miles below the N.T.C. railway crossing is the 3rd largest waterpower in the province. Niagara being the largest and Sault Ste. Marie Rapids the second largest.

Aggregate of the water power on the larger falls and rapids of the more important rivers on the northern slope:

River.	Total Height in falls.	Possible Horse Power D'v'l'pment.
Abitibi, Black and Frederick House	451 ft.	359,300
Mattagami, Kapuskasing & Ground Hog.	830 ft.	393,800
Missinabi and Opazatika	534 ft.	292,100
Kabinakagami and Kenogami	486 ft.	98,800
Ogoke	170 ft.	216,600
Winnipeg and English	91 ft.	370,000
Total aggregate		2,030,600

In compiling this aggregate estimate the error is a minus quantity. Many rapids on these large rivers are not noted and many falls on the smaller tributaries such as the French, Little Abitibi, Muskego and Wabigoon rivers, which will develop from 500 to 5,000 h.p. do not figure in this total, neither is the water power on the River Albany—which at the present time forms a portion of the northern boundary of the province and has a drainage basin of about 50,000 square miles—included. The margin will be quite sufficient to balance the loss in converting from theoretical to practical horse power; the loss in transmission of energy to points within reasonable distance, and all other losses which accrue between the water power in its natural state and the manufactured article by means of that power.

As to the ultimate development and disposal of this great amount of water power, it is not within the limits of this brief paper to conjecture, suffice to say that upon the completion of the railways at present under construction it will all be within a distance of 100 miles from railway facilities, and thus can be transmitted without too great a loss even at this date—to meet the raw material at shipping points; and in years to come when these water powers have been harnessed and put under man's control, subjective to the will of Providence, I believe the results will fully substantiate these figures.

THE

Sanitary Review

SEWERAGE, SEWAGE DISPOSAL, WATER SUPPLY AND WATER PURIFICATION

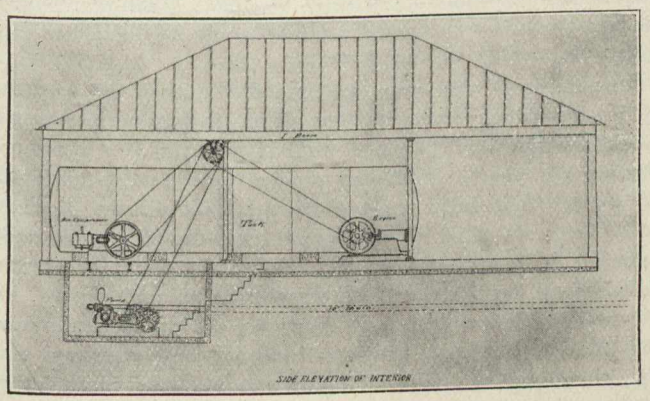
YORKTON COMPRESSED AIR WATER-WORKS SYSTEM.

F. T. McArthur B.Sc., Engineer for Yorkton, Sask.

During the summer of 1908 a compressed air water-works system was installed in the town of Yorkton, by J. L. White Company, of Sault Falls, South Dakota.

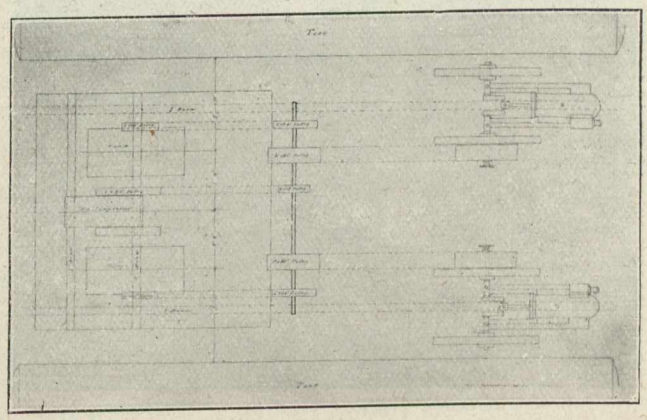
Until lately this is the only system of this kind in operation in the Dominion of Canada, although two other systems are now being installed and are possibly in operation by this time.

The entire pumping plant is confined to a brick building 60′ x 40′. It consists of two double acting duplex piston pumps of 500,000 gallons' capacity daily, of the Fairbanks Company's make; one 10 x 10 double acting driven air compressor capable of displacing 150 cubic feet of free air per minute at the regular rate of speed, and sufficiently strong to



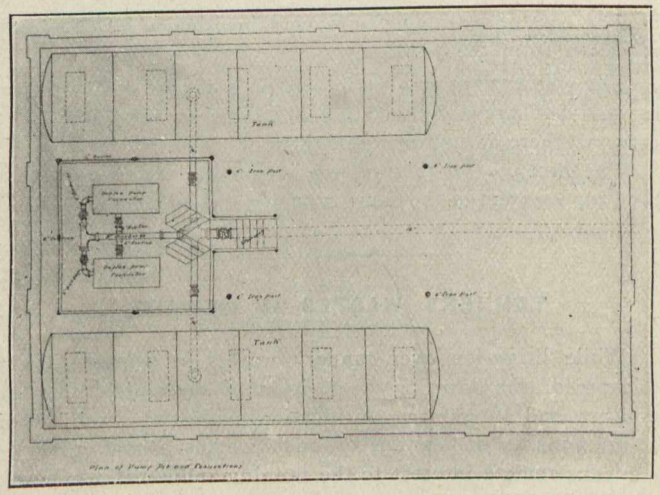
operate at that speed against a 100 lbs. per square inch pressure; two Fairbanks, Morse & Company's gasoline engines of 30 horse-power each, and two steel pneumatic compression storage tanks, cylindrical in shape, having a diameter of nine feet, and being 38 feet in length. These tanks are built of rolled steel of 60,000 lbs. tensile strength. All horizontal seams are double riveted, all girt seams single riveted, and heads staggard riveted with ¾″ rivets; the body sheets are ⅜″, and the heads ½″ thickness. The tanks are tested under an air pressure of 126 lbs. per square inch, and guaranteed to stand a working pressure of 65 lbs. per square inch, which is equivalent to a head of 150 feet.

The accompanying sketches will show the general lay-out of the plant. The system works exactly the same as the ordinary stand pipe system, the storage tanks taking the place of the stand pipe. The tanks are directly connected to the pumping main. They are first filled with compressed air to a pressure of about two atmospheres, and then the water is pumped into them against this pressure. As the water rises in the tanks, the air is compressed in the upper portion until when the tanks are about half full of water, the pressure has reached 60 or 65 lbs. After the pressure has risen to about this point, pumping may be stopped and the expansion of air forces the water out of the tanks through the distributing mains. Each connection to the tanks is supplied with a valve so that one or both may be shut off from the main and water pumped direct.



In the opinion of the writer, this system has many advantages over a stand pipe system in this Northern climate where we are subject to such extremes of temperature.

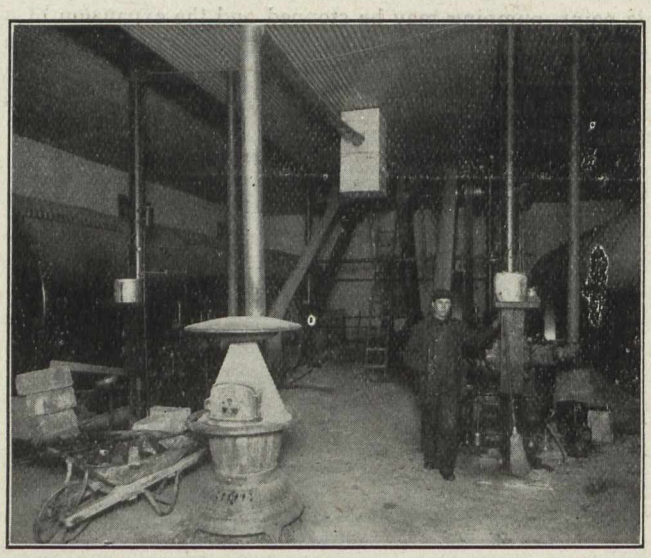
The building is kept warm in winter by an ordinary coal stove, so that there is no trouble whatever with ice, and the water entering the main is warmer than would be the case with a stand pipe system. This to a large degree lessens the



danger of water mains freezing, even when the frost has penetrated the ground below the depth of the main. It has practically all the advantages of the direct pressure system without the necessity of continuous operation, thus allowing the use of cheaply operated gas and gasoline engines, at the same time retaining the large pumping capacity and the ability to give direct pressure should the occasion demand.

It is true that the storage capacity of these tanks is much less than that of the average stand pipe, unless several tanks are used together. However, in the case of the stand pipe, we might say that the water in the upper portion determines the amount which can really be made use of, since the pressure decreases directly as the water lowers in the tank, while in the case of the compressed air system, every drop of water can be made use of as the tanks can be entirely emptied and there still be a pressure of about 30 lbs.

The compressed air system has the advantage of being possible to install in quite small units, suitable for and within the financial reach of all small towns and still be just as



efficient as a larger system, and can be expanded as the town grows, without it being necessary to discard any part of the original plant.

The storage capacity of the plant can be increased by merely adding more storage tanks.

The average time for pumping for the whole year in Yorkton is only from 2½ to 3 hours out of the 24; the pressure for the remaining time being maintained by the compressed air.

The cost of maintenance is very low due to its thorough protection from the weather.

The whole plant may be located in any part of a town or city and not cause depreciation of value to adjoining property, as there is nothing unsightly about it.

The first cost of this system is much less than that of a stand pipe system of the same capacity and efficiency.

TANNERY WASTES IN SEWAGE.

While litigation over tannery wastes in sewage is not widespread, the growing disposition of the public to seek damages and to enforce purification makes the subject of the inoffensive disposition of such wastes a matter of by no means remote interest to the tanning industry in general. Gloversville, N.Y., the centre of the glove industry in this country, has had a particularly lively experience with damage suits against the tanneries there, and under pressure of adverse verdicts, backed by an extensible injunction, the city has had to devise a new system of sewage disposal. A report on the matter by Harrison P. Eddy, civil engineer, of Boston, and Morrell Vrooman, city engineer, of Gloversville, who were assisted by H. B. Hommon, chemist, sets forth certain features of the new system that are likely to be imitated in other tanning centres whenever the question of sewage disposal becomes acute.

In addition to the glove manufactories, Gloversville has twenty-six tanneries, at which glove leather and the finer grades of shoe leather are prepared. There is also one hair mill, where the hair from the wastes of the various tanneries is recovered, besides knitting and silk mills and one brewery. All of the domestic sewage, tannery refuse and mill wastes were formerly emptied into the adjoining creek, and it was by riparian owners on this creek that the successful litigation was begun.

The gross weight of wet and dry hides tanned in Gloversville annually amounts to 9,000,000 pounds, and about 8,000,000 pounds of chemical reagents and other substances are used in the process. The waste liquors from this process contain spent chemicals, more or less of the active reagents, as it is not possible to completely exhaust the solutions, together with large quantities of hair, bits of flesh and dirt.

The shrinkage in weight in hides during the process of tanning probably amounts to not less than 50 per cent., or 4,500,000 pounds per year. It is also probably true that 50 per cent. of the chemicals and other agents employed in the process of tanning are carried away from the tanneries in the form of refuse. The only process which is employed to recover any portion of these wastes is that carried on at the hair mill for the recovery of the hair. While over 6,000,000 pounds of wastes are annually conveyed to the hair mill, only a comparatively small portion of these wastes is recovered in the form of hair. Much of the balance, together with chemicals from the exhausted baths, constitute a part of the sewage.

Analyses of the creek water indicate that the quantity of wastes which finds its way from the tanneries to the creek averages over 30,000 pounds per day, or 9,000,000 pounds per year. From the studies that have been made it appears that fully one-half of the total weight of hides and chemicals used in the process of tanning eventually finds its way into the creek. This is undoubtedly a low estimate of the total amount of solid and liquid wastes, for the reason that considerable portions are of such a nature that they do not readily flow along with the water, and may not, therefore, be included in the samples. At nearly every tannery are to be seen large quantities of lime and other refuse which have been dumped out upon the land, much of which could not be included in the samples analyzed, although some is washed into the creek in times of storm. The liquid wastes from the various tanneries and the hair mill contain not only large quantities of impurities in solution, but also much matter in suspension.

As the admission of the tannery wastes without the removal of any portion of the matters in suspension would not only place upon the purification plant a heavy burden for the disposal of sludge, but also might cause considerable deposit in the intercepting sewer, the city council passed an ordinance requiring all wastes from the tanneries to be passed through settling tanks before they were discharged into the intercepting sewer. Some of the interesting sections of this ordinance are as follows:—

> No mill, factory or other manufacturing establishment having mill waste shall use the sewer system of the city of Gloversville for sewering purposes without first connecting said mill, factory or other manufacturing establishment with settling tanks.

The purpose of the tanks at the mills is to remove the suspended solids, hair, leather and other heavy material from the mill wastes by sedimentation, and any chemical or biological action that may take place in the tanks, so that the combined mill and domestic sewage may be purified; also to avoid the clogging of city sewers or unnecessarily burdening the sewage disposal plant.

The size of the tanks to be constructed or used at any mill that is connected with the sewer system of the city of Gloversville shall be sufficient for the purpose for which they are intended, and they shall be constructed with such features and of such dimensions as may be required by the common council.

Tanks must be regularly cleaned at such intervals as their operation proves necessary, or at any time when the city engineer deems they should be cleaned. In cleaning the tanks no solids shall be emptied into the sewer or outlet from the tanks, nor in any other way shall solids from the tanks be permitted to enter the sewer in cleaning. If the tanks are not properly cared for or if they are not cleaned when necessary or when directed by the city engineer, they will be cleaned by the city and the expense thereof charged to the owner of the mill.

Free access to the tanks must be given to the common council or their representatives at any time for either the purpose of measurement, analysis, experiments or inspection, or for any other purpose connected with the operation or regulation of said sewer system.

It has been found when the tanks are kept properly cleaned that their efficiency is very satisfactory. Occasionally the quantity of suspended matter is slight, while at other times it is very high, occasionally exceeding 2,500 parts per million. Over 90 per cent. of the suspended matter has been removed in some cases, and it appears that there will be little difficulty in maintaining an average efficiency of 70 per cent. in all cases. If an efficiency of 90 per cent. could be maintained, all of the effluents would pass a standard of 300 parts per million of suspended matter. Difficulty has been experienced in securing the full co-operation of some of the mill-owners in cleaning the tanks, so that the results of this preliminary treatment have not been as satisfactory as had been hoped. It has been found necessary to establish a systematic inspection of the tanks, and to require the owners to clean them whenever the accumulation of sludge is so great as to interfere with their efficiency.

It has been found that a single tank has retained over 8,000 pounds of sludge (10 per cent. solids) in a single day, and in several cases from 3,000 to 3,500 pounds has accumulated in the same length of time. As a result of tests made at one time it was found that the tannery waste contained as much as 61,600 pounds of sludge in a single day, and that of this amount over 26,000 pounds were retained in the mill tanks. Had a uniform efficiency of 70 per cent. removal been secured, over 43,000 pounds of sludge would have been produced.

After removal of a large part of the suspended matter in the settling-tanks built by the tanneries, the sewage at Gloversville was subjected to experimental purification by means of sedimentation and septic tanks, sprinkling filters, and then further sedimentation followed by sand filtration. The important point established by these processes was the fact that the chemicals in the tannery sewage did not prevent bacterial purification, though such action was, perhaps, somewhat retarded.

Undoubtedly the most striking result of the whole investigation by Messrs. Eddy and Vrooman is the establishing of the fact that by the use of settling tanks at the tanneries the sewage from these places could be made to contain a low proportion of suspended matter, so that they conformed nearly to the standard of ordinary domestic sewage This fact is of practical importance to every tannery which has to consider actual or prospective litigation over the disposal of its wastes.

DISPOSAL OF WASTES FROM FACTORIES LOCATED UPON LOW GROUND.

Albert Priestman.

The general prohibition against river pollution has caused an increased interest to be taken by mill owners in the recent applications of compressed air for sewage disposal purposes. It frequently happens that long horizontal lengths of delivery mains are necessary to connect existing sewer systems (which have formerly emptied into the nearest stream) with the main sewers of the district. Consequently a back water check valve must be generally made use of and whenever some solid matter prevents a complete closure of this valve it may happen that considerably more sewage leaks back from the rising main into the sewage receiver than the flow into it from the sewers, and consequently not only is power wasted but the lifting capacity of the sewage raising appliance is proportionately reduced.

The new method of using compressed air expansively and independently of the conditions within the sewage receiver has enabled a valuable application to be made of the sewage holding capacity of the delivery main, and if desirable to eject the entire contents of same at each discharge and to do so economically.

By using measured charges of compressed air of predetermined volume, as is accomplished by a new type ejector, the horizontal run of delivery main laid at an elevation lower than that of the crown of the sewage receiver, may be emptied at each discharge and employed for sewage receiving purposes with the advantage that only the volume of sewage in the vertical, or rising portion, of the delivery main will require to be held in place by means of a back pressure check valve, and if the lift is not a high one a small volume of additional air is all that is necessary for expelling this sewage, because the expanding force of the increased measure of air will eject it as the head of liquid in the vertical or rising portion diminishes.

This feature appears to us to be one which may have a more or less general application in connection with low level sewage problems, but in any case will be of interest to those called upon to deal with the question of handling wastes from low-lying factories.

PATENTS.

The following is a list of Canadian patents recently issued through the agency of Messrs. Ridout & Maybee, Manning Chambers, Toronto, from whom further particulars may be obtained:—

Stratford Mill Building Company, driving mechanism for sifters and screens; Andre Conte, footwear; Andre Conte, ventilating device for footwear; Charles Trigger, combined hay and stock rack; Frank Van Slyke, breaking plow; C. Cahn and E. Seeberger, method of laying conduits (Case 1); C. Cahn and E. Seeberger, method of laying conduits, (Case 2); D. K. Morris and G. A. Lister, Electrical switches and the like; E. A. W. Beemer, door knob fastenings.

THE LOCH LEVEN POWER PLANT.

Although little favored as a whole in the matter of hydraulic energy, Britain can now boast of one of the largest and finest hydraulic power plants in Europe. We refer to the installation of the British Aluminium Company at Kinlochleven, Argyllshire, where about 30,000 B.H.P. of hydraulic energy is turned into electric current and utilized on the spot for the production of aluminium.

The general lay-out of the plant is shown in Fig. 1, for which we are indebted to Messrs. Meik & Sons, Consulting Engineers, under whose supervision the section of work comprising dam, conduit, and pipe-lines was carried out.

The River Leven, which collects the waters of an area of 55 square miles, shows on a distance of about 4 miles a total fall of roughly 960 feet.

A concrete dam of 1,000 yards length, with a maximum height of 86 feet, creates a storage reservoir of 3,300 million cubic feet capacity from which the water flows through regulating ground sluice valves, into an open conduit of reinforced concrete, 3½ miles long, 8 feet wide by 8 feet deep, designed for a flow of 415 cubic feet per second, and terminating in a penstock chamber (Fig. 2), with double strainer, ice apron, and overflow with spill-way discharging into the river-bed.

This penstock chamber forms the intake for the pressure pipe-lines which we propose to describe more especially in this article.

A general idea of the importance of the pipe-line plant will be obtained from Fig. 1, also 3, 4, and 5; the latter showing the upper two-thirds approximately of the pipe-track, from "B. Station," (see Fig. 1), upwards.

Beginning at the above-described lower penstock chamber, the pipe-track at first goes straight down the steep hillside, with maximum incline of 27 degrees; then, for the second third, nearly level across the open "thalweg" (valley) of a side stream, and round the hillspur to "B. Station;" hence again straight down the slope, with an average incline of 7° 20′, to the power house.

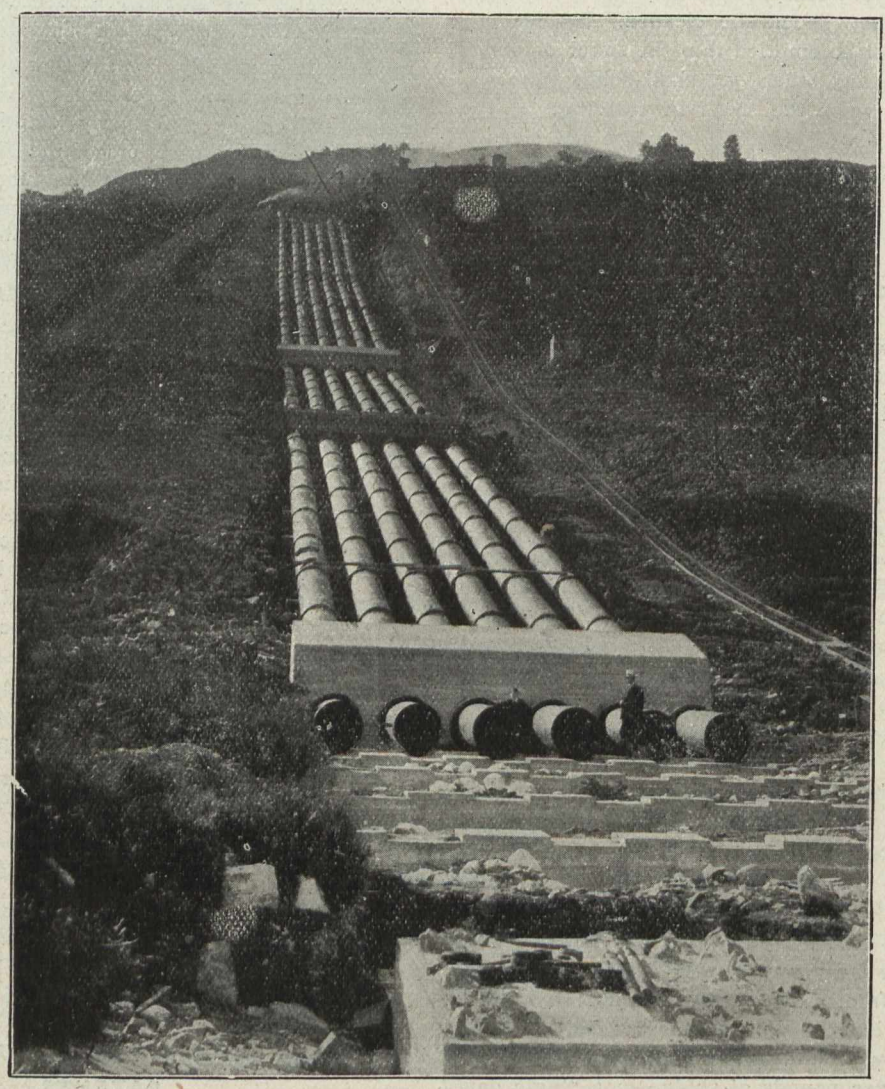
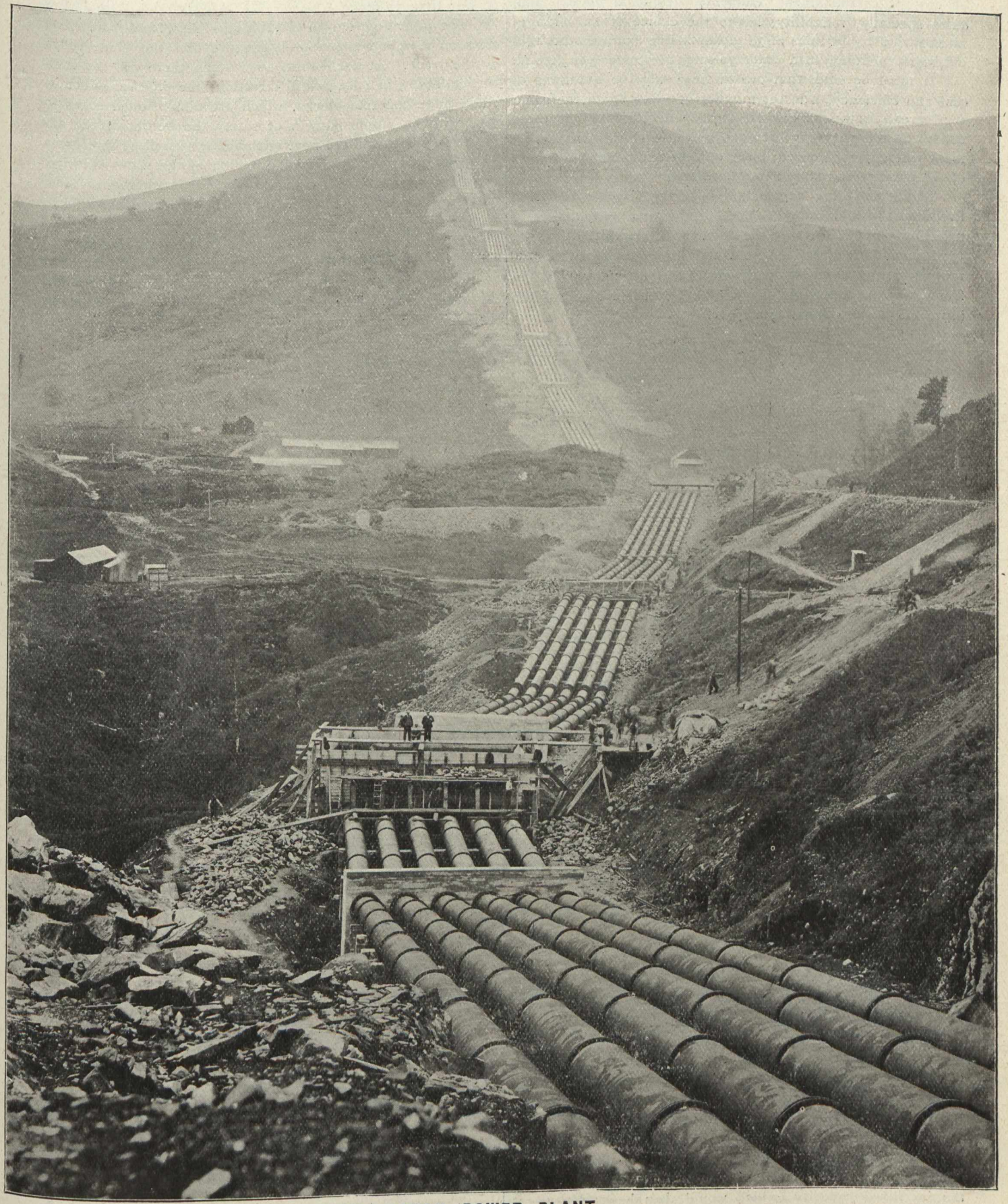


Fig. 1.

The static head at disposal, reckoned from the nozzles of the turbines to the normal water level in the intake chamber, is 940 feet; and the length of the pipe-lines, measured from the intake to the main valves at the east corner of the power-house, is exactly 6,200 feet.

The power plant is at present built up for a total normal output of 28,800 B.H.P., including 9 generator sets of 3,000 B.H.P., with 10 per cent. overload capacity plus 2 exciter sets of 900 B.H.P.

The pipe-line plant had accordingly to be designed for a normal carrying capacity of round 350 cubic feet per second.



LOCH LEVEN POWER PLANT

UPPER TWO-THIRDS OF PIPE LINE FROM "B" STATION.

A careful consideration from the opposite points of view of cost of establishment, efficiency (frictional losses) and, quite specially, reliability, led to the choice of an arrangement with six pipe-lines of 39 inches inside diameter throughout, corresponding to a water velocity of 70 feet per second.

It must be said, that considering only the questions of cost and efficiency, a lesser number of pipes (with the same total area) would have been more satisfactory; but these considerations were over-weighed by the wish for an arrangement whereby the consequences of a breakdown in any parts of the plant were reduced to a minimum.

Should anything happen to one of the six pipe-lines, the five others would easily suffice for the total duty, the distributing pipes connecting the main pipe-lines to the turbines (and which are described in detail lower down) being arranged in such a way that any one of the turbines can be fed from any one of the pipe-lines. That is to say, one of the pipes can be considered as a spare.

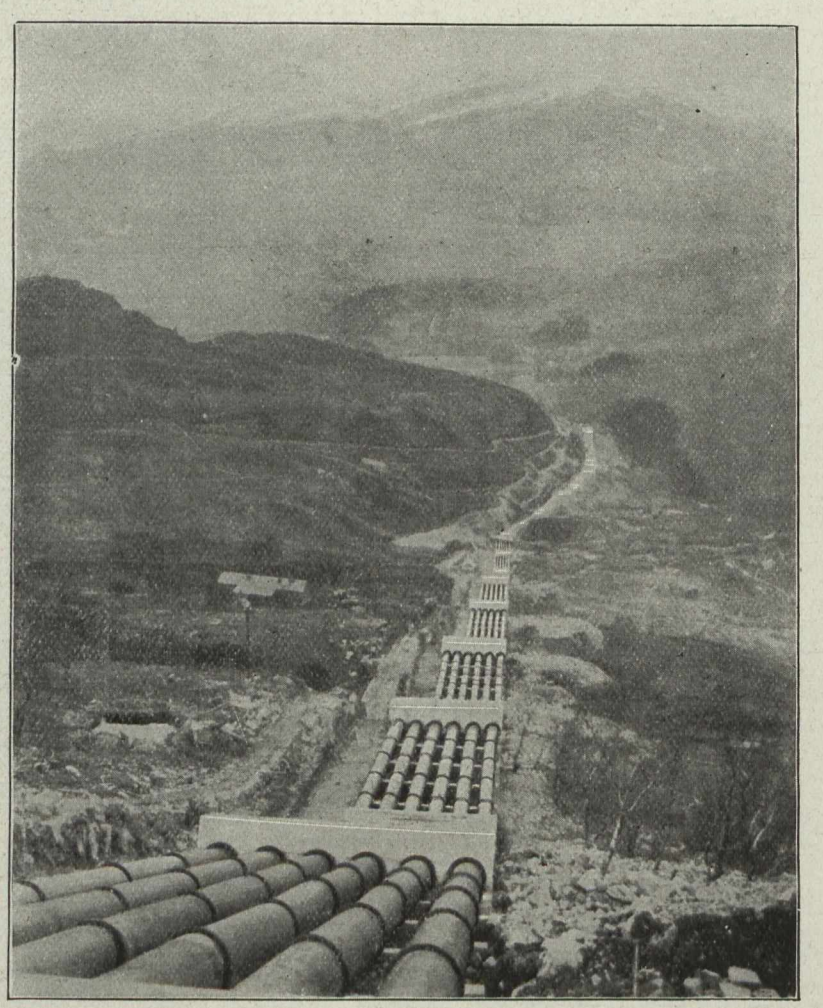


Fig. 2.

This same principle has been carried out in every detail of the plant, which in this regard at least, may well be said to be a model installation.

Provision has been made for future extension, when three more generator units of 3,000 B.H.P. could be put in; this will necessitate the installation of two more pipe-lines, the open conduit at the same time being already dimensioned for the increased capacity, which would then be nearly 40,000 B.H.P.

The complete digging work for the pipe-track has accordingly been made for 8 pipe-lines, and the total width of the track, including 6 feet for the erection cable railway, is no less than 50 feet.

The individual length of the pipes is 20 feet. Each pipe rests on a wall of concrete extended across the whole width of the track. At each bend (of which there are 29 in a vertical and 4 in a horizontal direction) the pipes are anchored in huge concrete blocks, which are dimensioned so as to take with an ample margin of safety the weight of the adjacent section up to the next anchorage, as well as the forces resulting from the change of direction of the water velocity. Fig. 7 shows a typical example of these anchorages. The axial pressure is transmitted on to the concrete block by a number of cast-iron rings made in two halves.

The material used for the pipes is Siemens-Martin steel plate (boiler plate of the best quality) with a tensile strength of 24 to 28 tons per square inch, and minimum elongation of 25 per cent.. The thickness of plate were calculated on the basis of a maximum stress of 4 tons per square inch (at working pressure) and vary between 10 m.m. at the top and 22 m.m. at the bottom. The total weight of the six pipe-lines is approximately 6,100 tons (distributing pipes included).

All the pipes are welded, and have two longitudinal and no circumferential welds, with the exception of the bends, which consist of two or three cylindrical pieces welded end to end.

The welding was effected by water gas and by quick working hammers mechanically operated. After welding, the whole pipe was thoroughly annealed in a large generator gas furnace; upon that it went through a rolling machine,

where it was rolled into a true cylinder and one end to a socket, all in one process. Immediately on leaving the rolling mill, the pipe was entirely coated with a rust-preventing preparation, by vigorously rubbing the surfaces with wire brushes. Three coatings were applied.

Before leaving the works, every pipe was tested at an hydraulic pressure 50 per cent. over and above the corresponding working pressure.

The type of joint used is shown in Fig. 3. It may be described as a spigot and faucet joint with packing flanges, the one sitting on the rolled-up faucet, the other wedging into the faucet a specially prepared hemp packing. The two flanges are of steel and accurately machined.

This joint, which is highly suitable for considerable pressures (it has been tested, in fact, up to 90 atm.), renders the erection extremely easy; a matter of capital importance in the case of the Loch Leven plant, where the six pipe-lines aggregate upwards of 2,000 pipes.

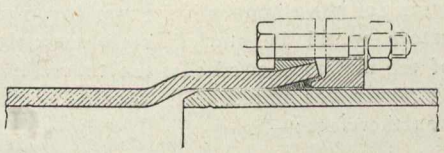


Fig. 3.—Patent High Pressure Muff.

Further, the packings can be got at from the outside without removing any pipe, and may be, if necessary, screwed tight when working. This type of joint also makes unnecessary any special expansion allowing the pipes to play freely under the influence of changes in temperature; every pipe, in this case, being an expansion.

All the bends, however, are for the sake of greater rigidity fitted with a special flange joint; flange welded on the bend itself, and loose flange sitting on the up-rolled end of the adjacent straight pipe.

The "Sleeve Pipe" shown in Section in Fig. 3, makes it possible to disengage and remove any pipe in case of necessity.

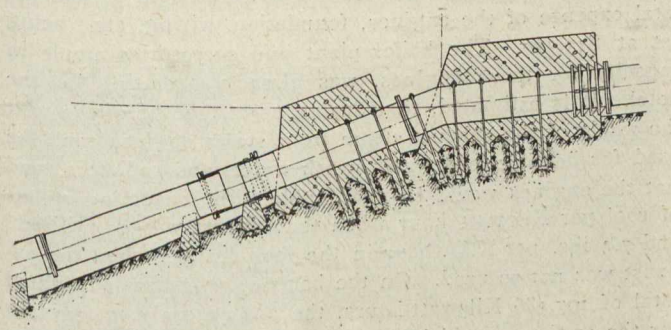


Fig. 4.—System of Anchorage.

For the transport on to site of this huge mass of material, a light temporary cable railway has been installed, following along the pipe track on the left-hand side from the power house up to "B. Station," at which point it crosses over the pipe-trench to the right-hand side.

The pipes were brought to Loch Leven by sea and landed at the wharf constructed by the company in connection with the laying down of the plant. They were then carried on an ordinary narrow gauge line by steam locomotives up to the site of the power house, where the carts were coupled to the cable of the first hauling station, situated at "B. Station." A second hauling station was installed at the intake, both equipped with a small steam plant.

The average rate of advancing during the whole erection was about 10 pipes per working day; this, taking into account the considerable length of the pipe-lines, must be considered as a very satisfactory figure.

After completion, extensive tests were carried out, every section being tested to a pressure 25 per cent. in excess of the corresponding head, and all welds, joints and packings were certified to be perfectly tight.

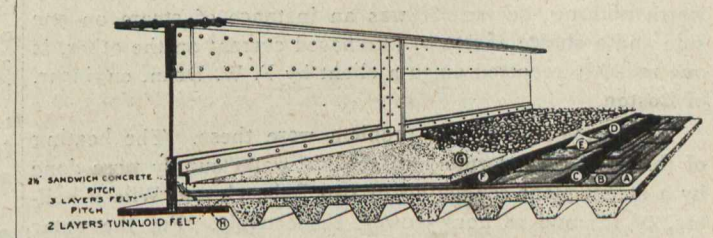
Distributing Pipes.

This forms one of the most interesting parts of the pipe-line plant. As already explained it was designed with the purpose to make it possible to feed any one of the 9 (or rather 12) turbines from any one of the six (later on eight) pipe-lines. There are two omnibus pipes running the whole length (about 400 ft. of the power-house) and which form the lower end of the future pipe-lines 4. One of the omnibus pipes is placed 4 feet lower than the other one, the whole distributing piping being accordingly arranged on the biplane system. The pipe-lines 6, 4 and 2 bend successively into the upper, and 5, 3 and 1 into the lower omnibus pipe; each turbine is connected to both omnibus pipes. The bends and T pieces are made of cast-steel, and the whole system is very safely anchored as shown by the photograph.

The complete pipe-line plant as above described was supplied to the British Aluminium Company, by Messrs. Jens Orten-Boving & Company, London, Hydraulic Engineers. The plant was started on normal working on the 26th February, 1909, and has given ever since entire satisfaction.

PROTECTION OF MASONRY AND CONCRETE BRIDGES BY WATERPROOFING.

Engineers and architects are realizing more and more the necessity of waterproofing the floors of masonry or concrete bridges before laying the top filling, street car or railroad tracks. The frequent disfiguring of otherwise handsome bridge work by the appearance of damp spots on the masonry is in itself a sufficient argument for the slightly increased cost of waterproof construction. But in climates where cold weather of any considerable severity occurs, water freezing in the masonry work may constitute a very real danger to the stability of the structure itself.



J. A. and W. Bird & Company, of Boston, Mass., have recently introduced a method of waterproofing under roadways and railroad tracks, on bridges and viaducts which contains some interesting features in waterproofing practice.

This method is designed to keep all dampness entirely away from the masonry of the structure itself, and particular attention is given to the question of preserving the waterproofing intact should there be any settling or cracking.

Their theory is to form a tough, pliable membrane over the entire surface of masonry exposed to water, and to pro-

tect this membrane on both sides from damage either by cracking or movement of the structure, or by any operations of building or repairing.

The waterproofing membrane itself is formed of three-ply Tunaloid Waterproof Felt, tightly cemented together with hot pitch or asphalt. Both above and below this membrane is a layer of pitch or asphalt, approximately 50 pounds to 100 square feet in each layer.

Between this membrane and the masonry or concrete surface are two-ply of Tunaloid Felt, cemented together only in spots—and these are kept detached from the masonry by a layer of thick sheathing paper laid dry. Thus any cracking or moving of the bridge structure due to settlement, or any expansion or contraction due to temperature changes, would in no way tear or damage the homogeneous waterproofing layer. The top surface is protected by a 2½-inch layer of concrete mixed one part Portland cement and three parts sand. The concrete should not be laid until the top coating of pitch or asphalt is thoroughly hard.

The accompanying cut shows a general application of this method.

(A) is one layer of sheathing paper laid dry.

(B) is two (2) ply Tunaloid Felt lapped 19 inches and cemented only in spots just sufficient to make them lay well.

(C) is a layer of pitch or asphalt mopped on hot—about 50 pounds to 100 square feet.

(D) is three (3) ply Tunaloid Felt lapped 14 inches and tightly cemented together.

(E) is a layer of pitch or asphalt mopped on hot—about 50 pounds to 100 square feet.

(F) is a 2½-inch protective layer of concrete—one part Portland cement and three parts sand.

ANOTHER SUGGESTIVE INSTANCE OF THE ECONOMY OF STEAM POWER.

The economic wisdom of making the fullest possible use of an existing steam plant before branching out into gas-engines, or purchasing electric current, will be readily admitted as a sound general principle, yet in many cases when the use of steam for power purposes is the obviously sound solution of a pending problem, the obvious too often requires the engineer specialist to discover it. The working out of every such problem on demonstrable superior economy in the use of steam is suggestive, however, and worth the close attention of the steam power man. A case that is particularly worth nothing, because it was an instance of steam on one side and a choice of gas or purchased current on the other, is one recently reported on to a client by F. W. Dean, engineer, of Boston.

The elements of the problem were these. The heating of the hotel and warming of the hot water supply were done by a steam plant consisting of two Babcock and Wilcox boilers, of 127 and 78 horse-power, respectively. For the water heating, there was a steel tank provided with a thermo-static valve which maintained a uniform temperature. There were also the necessary feed pumps. The condensation in the steam heating system was returned and used again in the boilers.

Power was required to run three elevators, two passenger and one freight; and three small motors for operating laundry and other machinery. The necessary electric current was purchased, and came in over three wires, two of these carrying 220 volts each, for power, and the third having 110 volts, for lighting.

The problem was to provide a new supply of electricity at an annual outlay considerably less than $8,200, which was the yearly cost of the purchased current. The only scheme open was to install generators in the hotel, operating them either by steam or gas; and the specific questions were what generators were needed, whether steam or gas was the cheaper motive power under the conditions, and whether either system would be cheaper than the purchased current.

As to the generators, the requirement was that they should be able to carry the lighting load, start two of the elevators simultaneously, and operate the small motors. there were about 1,800-16 candle power lamps in the house, and the maximum lighting load, as settled by general hotel practice, was that required to operate the lamps, or 900, at one time = 50 K.W. Tests of the power required for the elevators and motors showed that starting the two passenger cars took 50 horse-power, and the three small motors 6 horse-power. It was decided to depend on the overload capacity of the generators for the comparatively rare instances when all three elevators would be started simultaneously. Hourly readings of the meters showed that the theoretical allowance for lighting power was ample. The maximum electric power required was therefore:—

For lighting	50 K.W.
For statring two elevators 50 h.p.	38 K.W.
For operating three motors	6 K.W.
	94 K.W.

A 100 K.W. generator, in duplicate, with a 35 K.W. generator for use from midnight to some early hour in the forenoon, were recommended. The cost of a gas engine plant was estimated at a total of $27,400, this including $20,-950 for three engines, and covering excavating, foundation work, piping, wiring, switchboard and incidentals. The annual cost of operation of gas engines was estimated at $9,286, of which $4,504 was required for gas used for power, and $3,562 for fixed charges on the cost of the engine installation.

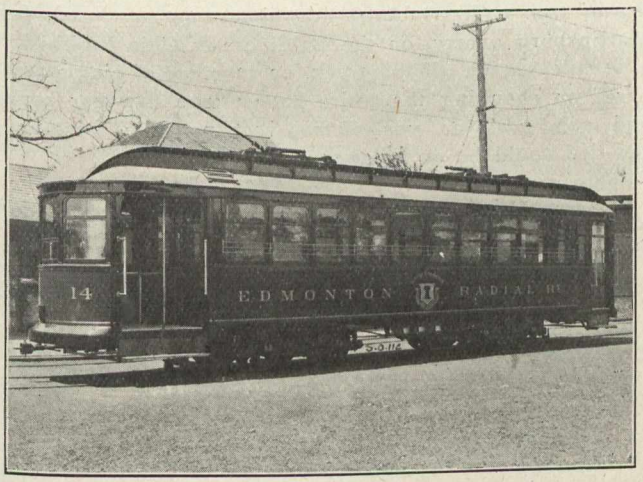
Three steam engines were estimated to cost $8,408, the total expense of the engines, foundation, wiring, etc., being set at $13,500. The boiler plant and accessories ample in capacity for these engines, was already operating in the hotel. It is estimated, that during eight months of the year the whole of the exhaust steam from steam engines could be used for heating feed water, wash water, and radiators, and that the engines would be chargeable with consuming 2 lbs. of coal per Kilowatt hour when the exhaust was so utilized; and 7.3 lbs. per K.W.-hour in the four months when the exhaust was not so used. On the basis of an estimated annual total of 197,586 Kilowatt-hours, the annual coal consumption for the engines would be 372 tons, costing, at $4.34 per ton, $1,614. The annual cost of steam power operation was set at a total of $4,539, which included $1,614 for coal, and $1,755 for fixed charges. Comparative costs were summarized as follows:—

Cost of installing gas engines	$27,400
Cost of installing steam engines	13,500
Annual cost of operasting gas engines	9,286
Annual cost of operating steam engines	4,539
Probable cost of purchased current	8,126

A saving of about $3,587 annually by the use of steam engines was demonstrated to be possible in this plant. Gas engines were shown to be more costly for operation than the purchase of current.

PAY-AS-YOU-ENTER CARS AND SPRINKLERS FOR WESTERN CANADA

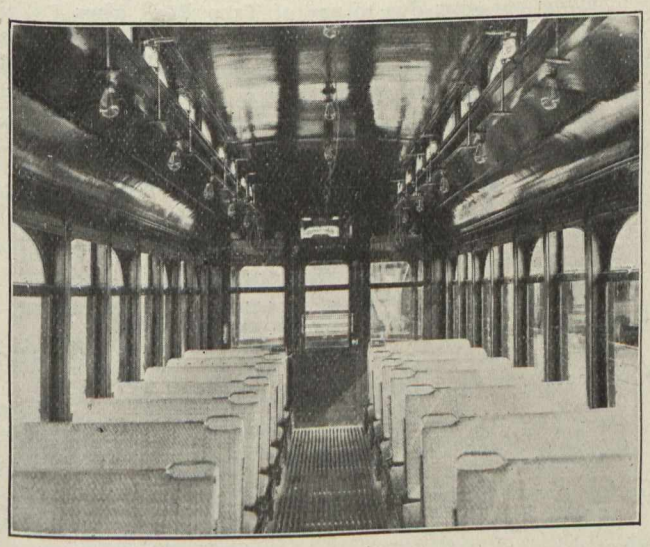
The handsome pay-as-you-enter cars shown in the accompanying illustrations have been built by the Preston Car & Coach Company, Preston, Ont., for the rapidly growing cities of Edmonton and Calgary. The car shown with the two trolley stands is for the Edmonton Radial Railway. It is of the double-end type, having a sliding door on the right-hand side of each vestibule and double folding doors on the



Pay-as-You-Enter Car for Edmonton, Alta.

left-hand side, equipped with gates for summer use. The disappearing platform steps are controlled through a lever and staff extending up into the vestibule and manipulated by the conductor.

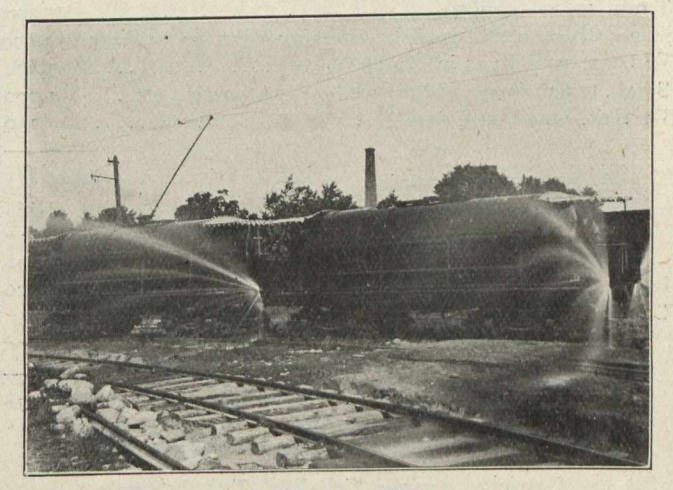
The car body is 28 ft. long and the vestibules 7 ft. each. The body is mounted on Bemis No. 45 trucks, with 4 ft. 6 in. wheelbase, which carry four GE motors. The exterior is painted Newport green below the belt rail and Carmilion light above, thereby giving a very pleasing effect. The car interior is finished in birch, stained mahogany with head-



Interior of Edmonton Car.

linings painted a light green with gold trimmings. The seats are of the car-builder's "Walkover" type and are upholstered in rattan. Crouse-Hinds interchangeable headlights are standard.

The Calgary cars, which have wide arched windows, are of the single-end pay-as-you-enter design, with the usual exit and entrance doors at one end. The vestibule railings are similar to those used on the cars of the Montreal Street Railway Company. The car body is 28 ft. long, the rear vestibule 7 ft. and the front vestibule 5 ft. The trucks are of the same type as those used for the Edmonton cars. The roof is of the full monitor type, with the bullnose extending to the points of the vestibule. The top side and deck sash are semi- elliptic, glazed with chipped glass and having a ¾-in. clear margin with imitation bevel. The lower side sash drop into the wall of the car. The covers for the sash openings cannot be lifted by passengers when the sash is up, although no lock is required. The seats are also of the "Walkover" rattan type. All the trimmings are of solid, polished bronze. The car exterior is painted Newport green below the belt rail and Carmilion light above. The electrical equipment consists of four Westinghouse 101-B-2 motors and K-6 control. Other fixtures of the Calgary design are Jenkins fenders, Brill scrapers and an illuminated sign box in the front dash.



Sprinkler in Action.

The Calgary and Edmonton systems have also purchased one 5,000 gal. sprinkler each from the Preston company. These sprinklers are mounted on the same trucks as the cars. The electrical equipment for the Calgary sprinkler consists of four Westinghouse 101-B-2 motors and K-6 control, and that for the Edmonton sprinkler consists of four GE-80 motors. The pumps are of the Allis-Chalmers centrifugal type, and in tests have enabled the sprinklers to throw spray as far as 55 ft. on each side of the track. The sprinkler heads were supplied by the McGuire-Cummings Company, Paris, Ill. The sprinkler frame is made of structural steel throughout. An awning of striped duck extends over each platform.

COST ESTIMATES SHOWING THE ADVANTAGES OF TRAP ROCK OVER LIMESTONE FOR BALLAST.*

From tests of trap and other rocks, it is seen that a material saving can be effected by the use of trap for ballast purposes. Less stone will be required to maintain the track, and it can be used in smaller sizes, as its higher percentage of hardness and toughness will insure less breaking under traffic and tamping. Figures taken from comparison of line and surface in trap with that in stone whose quality is abou

the same as limestone show that line and surface cost approximately $20 less per mile in trap than in limestone.

Cost of Plant.—From published figures, the cost of building a plant of 1,000 tons daily capacity, and its cost of operation to quarry is as follows:

Capacity, 1,000 tons daily, 300,000 tons annually.
900 cu. yds. trap per 10-hour day, 270,000 cu. yds. annually.

Crushers, 4, 250-ton Farrell, at $1,250	$ 5,000
Engines, 4, 60-hp.., 14x12, at $500	2,000
Foundations	100
Belting, 13-in., 200 ft., at $2.75	550
Boilers, 2, 200-h.p. and setting	7,500
Steam fittings	4,000
Boiler house	2,500
Engine house	1,500
Stack	2,000
Scales, 60-ft., includng foundations and timber	1,225
Bins	600
Elevators with platforms, 4, at $1,500 (for tailings)	6,000
Pump for water supply, 5,500 gallons per hour	200
Tank, 50,000 gallons	1,200
Steam drills, with tripods connecting hose, 20, at $245	4,900
Screens, rotary, 54-in., 4, at $950	3,800
Small tools, forges, bars, wedges, hammers, etc.	1,200
Derrick, small stiff leg	150
Total	$44,425
Contingencies, 8 per cent.	3,553
	$47,978
Land, 50 acres, at $150 per acre	7,500
Cable railway and dump cars for haul to crusher, this being a varying item as quarry is worked	5,000
Total cost of quarry	$60,478

Cost of Operation of Quarry Plant.

Capacity, 270,000 Cu. Yds. Per Annum.

18 drillers at $3 per day, 300 days	$16,200
18 helpers at $1.75 per day, 300 days	9,450
3 blacksmiths at $3 per day, 300 days	2,700
50 bar sledgers at $1.75 per day, 300 days	26,250
60 coal loaders at $1.75 per day, 300 days	31,500
8 crusher men at $1.75 per day, 300 days	4,200
1 quarry boss at $5 per day, 300 days	1,500
1 fireman at $2.50 per day, 300 days	750
1 engineer at $3 per day, 300 days	900
4 bin men at $1.75 per day, 300 days	2,100
1 scale man at $2 per day, 300 days	600
1 carpenter at $3 per day, 300 days	900
10 laborers at $1.75 per day, 300 days	5,250
1 clerk at $750 per year	750
Fuel, 2,700 tons of coal at $2.70	7,290
Oil, waste, etc.	500
Dynamite, 7 lb. per cu. yd., 270,000 cu. yds.—189,000 lbs. at 15 cts.	28,350
Drill repairs—	
1 machinist at $4	1,200
1 helper at $2.50	750
Supplies at $1.25 per month per drill	270
Blacksmiths included above	.....
Total	$141,410
4 per cent. on first cost of plant	$2,418
10 per cent. depreciation on machinery, except crushers	2,160
16 2-3 per cent. depreciation on crushers	833
	5,411
	$146,821
Contingencies, 8 per cent.	11,750
	$158,571

This shows a cost per yard of 59 cents.

With this figure, the estimated saving shown from the use of trap rock (Gabbro) over limestone now used, from Martinsburg quarry, on the Baltimore & Ohio Railroad, in a 16-mile section, double-track, or 32 miles of single track, based on changing the entire ballast in a five-year period, and using 2,200 cu. yds. of trap rock per mile, 8-in. under the tie, would be as follows:

Gabbro.	
Quarrying	$0.60
Placing in track	.15
Average haul, 18 miles at .001	.02
Total estimated cost per cu. yd.	$0.77
Limestone.	
Quarrying	$0.55
Screenings, 33 per cent.	.18
Placing in track	.15
Average haul, 98 miles at .001	.10
Total actual cost per cu. yd.	$0.98

Summary

Limestone, 14,080 cu. yds. at 98 cents	$13,798.40
Gabbro, 14,080 cu. yds. at 77 cents	10,841.60
Saving per year during ballasting due to use of Trap Rock	$ 2,956.80

As to saving in maintenance 300 cu. yds. of trap rock per mile per year will maintain track as efficiently as 400 cu. yds. of limestone.

32 miles × 400 cu. yds. Limestone × 98 cents	$12,544
32 miles × 300 cu. yds. Trap Rock × 77 cents	7,392
Saving per year due to use of Trap Rock after track is fully ballasted	$ 5,152
Saving in line and surface, 32 miles at $20	640
Total saving per year after track is fully ballasted	$ 5,792

The saving in maintenance labor during ballasting would be:

1st year	
2nd year, 6.4 miles × $20	$128
3rd year, 12.8 miles × 20	256
4th year, 19.2 miles × 20	384
5th year, 25.6 miles × 20	512
Total five years' labor saving during ballasting (Maintenance)	$ 1,280.00
Five years' saving in first cost, due to use of Trap Rock	14,784.00
Total five years' saving during ballasting	$16,064.00
Average saving per year during ballasting	3,212.80
Saving per year after fifth year	5,792.00

These figures give an idea of the savings which may be effected by going into such questions thoroughly and getting accurate data. Such comparisons may be worked up for stone, gravel and cinder, and estimate made which will show a railroad management how far they are justified in going into such economies.

Benefits From Use of Trap.—The physical benefits which may be expected from the use of trap rock can be summed

*Abstract of report of the Committee on Ballast to the American Railway Engineering and Maintenance of Way Association.

up as follows, and it would appear that wherever stone is available within the limits of reasonable haul, that its use is unquestionably economical:

(1) By holding up ties under the rail-seats more firmly and longer, danger of centrebound track is decreased and many broken ties saved.

(2) By virtue of the hardness and low cementing power of tap rock, the water will be drained away from the ties quickly, and thus lessen the tendency to decay. This may have an important bearing on the prolonging of the life of the tie.

(3) The expense of maintaining line and surface is necessarily less in a ballast that stands up and does not pulverize, allowing the track to sink and shift laterally.

(4) By standing up under track, the tendency to broken rails, broken joints and spike-pulling is lessened.

(5) With better drainage, disturbances from frost-heaving are minimized.

(6) Smaller-sized ballast may be used with a hard ballast than with soft stone.

(7) The sharp fracture of the trap rock is instrumental in securing a wide distribution of the loads transmitted by it to the subgrade.

ELEMENTARY ELECTRICAL ENGINEERING.

L. W. Gill, M.Sc.

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.

Resistance.—When water or air flows through a pipe there is always more or less resistance to the flow on account of the friction between the moving fluid and the surface of the pipe. The existence of this friction is evidenced by a change in the pressure of the fluid from point to point along the pipe, and this change or drop in pressure between any two points is a measure of the frictional resistance between these two points. If, for example a given current of air is forced through a pipe of a certain size, the difference in pressure between the two ends will be less than if the same current were forced through a smaller pipe, or through another pipe of the same size with a rougher surface. This indicates that the **resistance** to the flow depends on the size and physical conditions of the pipe. It also depends to some extent on the temperature of the air. The loss of pressure due to the resistance represents a loss of energy, which obviously is dissipated in the form of heat. This is indicated by a slight rise in the temperature of the conducting pipe. In some cases this rise in temperature is considerable, but in most cases it is too small to be easily observed.

When electricity flows in a conductor or wire there is always a **resistance** to the flow, which is analogous to the resistance which controls the flow of air in a pipe, as explained above. This resistance varies with the size of the conductor, its physical character and its temperature. Its existence is indicated by a change in the potential from point to point along the conductor through which a current is flowing, and this change of potential is a measure of the resistance.

The unit of resistance is the "ohm," which may be defined as the resistance of a conductor or wire which will allow a current of one ampere to flow through it when there is a difference of potential of one volt between the ends.

Experimental investigation has shown that at a given temperature the resistance of a conductor varies directly as its length and inversely as its sectional area. If R represents the resistance, **l** the length, A the area, and **k** is a constant, then

$$R = k\frac{l}{A} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

The value of the constant in this equation depends on the chemical composition of the conductor and the mechanical treatment to which it has been subjected. Chemical impurities may diminish or increase the resistance, while the hardening effect of wiredrawing always increases the resistance. The value of **k** for any given substance is known as its "specific resistance" or "resistivity." Table I. gives the relative resistance of the more common metals in the **pure** state, silver being taken as unity.

If the length of a conductor is expressed in feet and the sectional area in circular mils,* equation (2), when applied to copper at 20° Centigrade, reduces to

$$R = 10.37\frac{l}{A} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1a)$$

If the section of the conductor is circular, $A = d^2$ (**d** represents the diameter of the conductor), and

$$R = 10.37\frac{l}{d^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1b)$$

The reciprocal of the resistance is known as the "conductance," or "conductivity." A conductor with low resistivity will, therefore, have high conductivity.

Equation (1a) or (1b) may be applied to any other metal by changing the constant in proportion to the relative resistances given in Table I.

Table I.

Name of Metal.	Relative Resistance.	Temperature Coefficient.
Silver, annealed	1.00	.0041
Silver, hard-drawn	1.09	....
Copper, annealed	1.06	.0042
Copper, hard-drawn	1.11	....
Aluminum, annealed	1.96	.0043
Platinum, annealed	6.10	.0025
Iron, annealed	6.55	.0054
Nickel, annealed	8.40	.0050
Lead, pressed	13.10	.0042
Mercury	64.00	.00078
German silver	14.20	.0047

It has been noted that the resistance of a conductor varies with the temperature. If R represents the resistance at any temperature **t**, and R_0 the resistance at zero temperature, then from experiment,

$$R = R_0 (1 + at) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

a being a constant, known as the temperature coefficient. Values of **a** for the common metals are given in Table I. These values are based on the Centigrade scale of temperature.

* A circular mil is the area of a circle, the diameter of which is one mil. (One mil is equal to 1/1,000 inch.)

Equation (2) indicates that when **a** is positive the resistance increases with the temperature, and experiment has shown that this coefficient is positive for practically all pure substances. Carbon is a notable exception, its coefficient being negative. A number of alloys have coefficients which are approximately zero, and in some cases negative.

If R_1 represents the resistance at a temperature t_1, then

$$R_1 = R_0 (1 + a t),$$

and, combining this with equation (2),

$$\frac{R}{R_1} = \frac{1 + a t}{1 + a t_1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

This equation expresses the relation between the resistance R_1 at any temperature t_1 and the resistance R at any other temperature **t**. Taking the case of annealed copper, and substituting the proper value of **a** from Table I., it is found that when temperatures are expressed in degrees Centigrade

$$R = R_1 \frac{238 + t}{238 + t_1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3a)$$

Problem 1.—The resistance of a coil of copper wire at 20° C. is found by measurement to be 2 ohms, to determine its resistance at 60°.

$$R_1 = 2, \; t = 60, \; t_1 = 20.$$

$$R = 2 \frac{238 + 60}{238 + 20} = 2.31 \text{ ohms.}$$

Equation (3) may be applied to other metals or alloys by substituting the proper value for the temperature coefficient.

(To be Continued.)

REINFORCED CONCRETE WORKSHOPS AND STABLES FOR CITY OF HALIFAX, N.S.

The accompanying illustration shows the north front of the workshops, stores and stables built in 1908 for the city of Halifax, N.S. The building is 540 feet long by 63 feet wide, and is built of reinforced concrete.

The site was a bog, and a treacherous one. The contractor in excavating soon struck the wet bog, and called the attention of City Engineer F. W. W. Doane to the matter. He gave orders to test the site all over with long bars. The bog was found to be 10 to 14 feet deep. The engineer thought it would be too expensive to excavate to solid bottom, or even drive piles, so decided to use what is known as a spread foundation. The contractor was instructed to excavate five feet wide and to the depth of the sewer only, and, as there was a great quantity of old granite blocks lying around, to use these in the bottom laid crosswise of the trench close beside each other, well rammed down.

On top of the granite blocks four twisted wire cables were stretched taut, and at about every thirty feet the cables were anchored with heavy blocks of granite, and about the centre of these (fifteen feet) the cables were raised up and a slab of stone on edge was pressed under the densest concrete, and require the least amount of sand and cement. "Maximum Density is Maximum Strength."—Albert Moyer, Assoc. Am. Soc. C.E.

NEW YORK STREET CLEANING WITH GASOLINE MOTOR TRUCKS.

In New York City the street cleaning department took advantage of the speed, power and reliability of modern American gasoline motor trucks, following a great blizzard in that city, utilizing them for removing the blockade and clearing

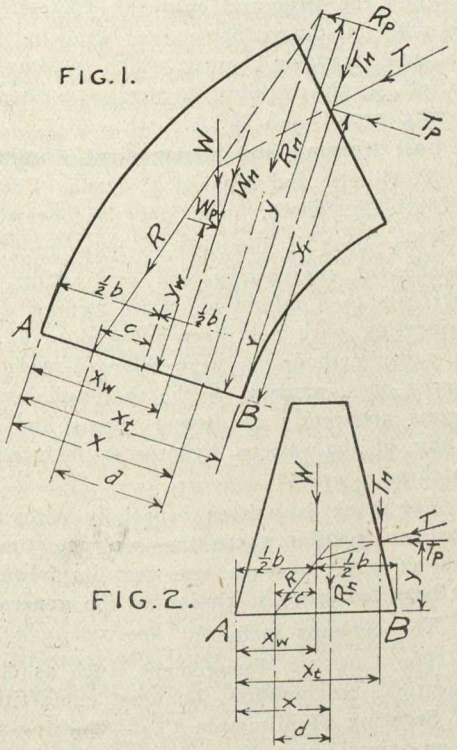
the ice and snow from the city and dumping it into the river. One of the three ton gasoline motor trucks employed for this service is shown in the accompanying photograph and illustrated the sturdiness and strength of the up-to-date motor truck and a new field of usefulness to which they may be applied with great economy and saving of time and labor.

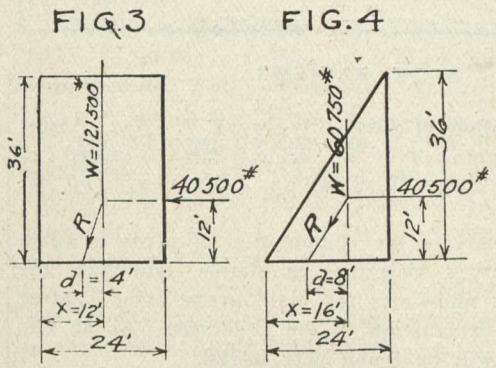
Concrete Workshops, Stores and Stables erected for the City of Halifax.

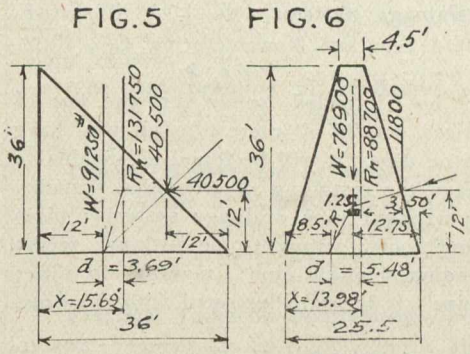
STABILITY AGAINST OVERTURNING

W. C. Johnson.*

Factors of stability against overturning, in both algebraic and graphic teams, are viz. :—







For Fig. 3. $\frac{121\,500 \times 12}{40\,500 \times 12} = 3.00$

$\frac{x}{d} = \frac{12}{4} = 3.00$

For Fig. 4. $\frac{60\,750 \times 16}{40\,500 \times 12} = 2.00$

$\frac{x}{d} = \frac{16}{8} = 2.00$

For Fig. 5. $\frac{91\,250 \times 12 + 40\,500 \times 24}{40\,500 \times 12} = 4.25$

$\frac{x}{d} = \frac{15.69}{3.69} = 4.25$

For Fig. 6. $\frac{76\,900 \times 12.75 + 11800 \times 22}{40\,500 \times 12} = 2.55$

$\frac{x}{d} = \frac{13.98}{5.48} = 2.55$

These citations render clear that, except for symmetric bodies with section like Figs. 3 and 4, subject to no forces normal to the base other than their own weight, the mere position of the total resultant on the base tells nothing about the overturning stability, and that, for other shaped bodies the graphic solution of the problem is likely to be no shorter than the algebraic solution. They show, too, that the total resultant pressure may cut the edge of the middle third of the base, and yield a factor of from 2 to 5 for ordinary forms of dams and retaining walls. With other shapes of bodies and other inclinations of acting forces, the factor might be almost anything. Therefore, the writer contends that the only use made of the graphic fixing of resultant upon base line should be that of stress distribution especially for the condition with respect to the third points. If the resultant pressure falls within the middle third of a rectangular base, or the middle quarter of a circular base, we know that no tension or lifting exists on the side of the base farther from the point struck; if the resultant strikes the limit of such division we know that unit pressure at the near edge is twice what it would be were the normal pressure uniformly distributed, and that zero pressure exists at the far edge; and if the resultant is outside the middle division, we know that the maximum unit pressure at the near edge is greater than the amount last specified for that edge and that the other edge is in tension, if tension can exist, or is lifted off the support for the base; in any case the stresses may be determined, from scalar data, by methods the discussion of which is aside from the purpose of this article. These matters are discussed at this length only to show that, as the position of resultant pressure on the base of a body always tells directly something about maximum unit pressure, but seldom tells directly anything about stability against overturning, a graphical determination of this stability is often advisable, or of value. Further, since any failure of a body so subjected is most liable to be by crushing rather than by overturning for we may have a high factor of stability against overturning and yet have dangerous stress in the case of body with section such as Fig. 5, and since overturning cannot occur if resultant comes at all within the limits of the base, it is here contended that when graphic analysis finds the resultant within such limits all reference to stability against overturning might well be omitted from the treatment of ordinary structures, and safety against crushing and sliding alone may be made the criteria of investigation.

*From Proceedings of Engineers' Club, University of Illinois.

ENGINEER'S LIBRARY

BOOK REVIEWS.

The Computation of Area.—By Frank J. Gray, Assoc. M. Inst. C.E. Published by St. Bride's Press, Limited, 24 Bride Lane, Fleet Street, London, Eng. Size, 5 x 7; pp. 60. Price, 35 cents.

This book treats of the computation of areas of plain surfaces. The author describes in simple language the principal methods and rules for plain areas. One chapter is devoted to an explanation of the slide rule. As an elementary book it will be found very useful.

Wrought-Pipe Drainage Systems.—By J. J. Cosgrove. Published by Standard Sanitary Manufacturing Co., Pittsburg, U.S.A. Size, 6 x 9; pp. 140. Price, $1.

This volume is not intended solely for the use of helpers and apprentices, but is of interest to all who have to do with wrought-iron pipe. It will be found an invaluable aid to those who have the installing of iron pipe systems. The work describes wrought pipe drainage systems; pipe-cutting and threading tools; wrought-pipe fittings; recess drain fittings; bending wrought-pipe; making up pipe; installing wrought-pipe. It is well illustrated with drawings and diagrams.

Concrete Bridges and Culverts.—By H. Grattan Tyrrell, Grad. of Toronto University. The Myron C. Clark Publishing Co., Chicago and New York. Pp. 250. Price, $3.

The book, 4½ x 7 inches, well bound in soft leather, is an example of refreshing simplicity in the realm of technical work. The writer covers the ground in a clear and concise manner, does not overburden the engineer student or reader with elaborate and exhaustive higher mathematics, but to cull from the preface: "Only such material is given as is directly required in the design and construction of ordinary concrete or masonry arches, so it will be unnecessary for the busy engineer to spend valuable time and thought in the perusal and study of abstruse mathematical treatises."

A good example is taken of a concrete arch bridge, and carried forward to conclusion in a way that is easily understood and of practical utility, besides tables and data, profusely illustrated. Reasons for methods of figuring and of design are given with lucidity, with a foreword leading up to reasons for using concrete arches of interest and value.

The portion of the book devoted to Culverts is, from the nature of the subject, necessarily more limited, but is dealt with in the same able manner. The whole work, while small, is efficient and valuable, and well indexed.—A. McA.

Bridge and Structural Design.—By M. Chase Thomson, Mem. Can. Soc. C.E., assistant engineer, Dominion Bridge Co., Montreal. The Engineering News Publishing Co., New York. Pp. 190. Price, $2.

The book, 6 x 9 inches, bound in cloth, with double index, is an admirable addition to the library of the young engineer, who finds himself confronted by problems that his technical training should have made him thoroughly familiar with, but who will realize the value of a concrete example placed before him in a clear and careful manner, easily followed, and complete from a very practical point of view.

Beams and columns, roof trusses and highway bridges are all treated in this work from the elements of statics to a finished and detailed example, with numerous tables, plates and illustrations to govern a wide range of work, the whole put together in a commendable manner, which ought to attract the structural engineer, Chapter VI., example in steel office building construction, being put before the reader in a terse, readable chapter, which is complete and valuable in itself, as the building of steel structures in our cities is growing rapidly.—A. McA.

Cost Keeping and Management Engineering.—By Halbert P. Gillette and Richard T. Dana. Published by Myron C. Clark Co. Cloth, 6 x 9; pp. 340. Price, $3 net.

This book is intended to help men engaged in all branches of engineering and contracting, to reduce their unit costs to a minimum. Cost-keeping and management engineering have now been reduced to a science by much the same methods as were followed with the earlier discovered ones, namely, by the thorough investigation of numerous apparently conflicting items and the subsequent testing of the various hypotheses deduced from these researches.

The book is written especially with reference to outdoor construction where the contractor manufactures, but with an outfit of such size that its frequent moving may not bear too large a relation to the general cost.

The contents include:—

The Laws of Management, such as division of duties, education, cost reports, bonuses, competition, etc.

Securing of Minimum Cost—Working to capacity, man as an animal, cost of moving, overhead charges, accidents.

Payroll—Profit-sharing, piece rate and bonus system, wage rate.

Output—Concrete work, transportation, record cards, measurements, working, etc.

Cost-keeping—Distinct from bookkeeping, cost cards, diaries, charts, sketches, etc.

Office Appliances—System.

Some hundred and fifty pages are devoted to illustrations of the methods advocated, cost report blanks for almost every class of work being given. The general contractor will find this full of useful hints. The last chapter is taken up with a discussion of the subject before the American Society of Civil Engineers.

A book of this type, coming as it does from so well-known a pen, should prove very acceptable to many Canadian contractors, whose staff is being so rapidly enlarged that they have difficulty in retaining the same close touch with their work as has made them what they are. It is well known that one of the main secrets of the success over his rivals of Andrew Carnegie was his possession of such a perfectly organized accountant's staff that all "leaks" were quickly discovered, and his personnel kept keyed up to its greatest efficiency.—A. O.

Nelson's Perpetual Loose-Leaf Encyclopædia. Editor-in-Chief, John H. Finley, LL.D., President of the College of the City of New York. Associate Editors, William Peterson, LL.D., C.M.G., Principal of McGill University, Montreal, Canada, and George Sandeman, M.A., Edinburgh, Scotland. New York: Thomas Nelson & Sons, 1909. Twelve royal octavo loose-leaf volumes, illustrated with colored plates, plans, and engravings. Price $96.00.

An encyclopædia is a necessity in the library of every engineer. It is not proposed that an encyclopædia is a text-

book, nor is it suggested that an encyclopædia will give better review of current affairs than the technical journals of the day, but the engineer can more readily deal with the various problems which he is to face when he has before him briefly stated the history of this particular question, to date. In the past, one of the great difficulties with encyclopædias has been that they so quickly get out of date. The Nelson people have recognized this and are now placing upon the market a publication which will be revised from time to time and it will thus be able to include the most recent information on the subjects under discussion.

The efforts to keep all this material in alphabetical order and keep it abreast of the times has always been a serious problem, which the publication of annual volumes has not solved for the reason that the additional matter published contains only the new facts, while leaving the old and worn out ideas in the original encyclopædia, where they are liable to mislead the reader. A new departure in the line has just been made in the Nelson's Loose-Leaf Encyclopædia, which is so arranged that any facts which may become out of date can be taken out of the very heart of the volume and replaced with new material, without in the least effecting the alphabetical order or destroying the arrangement as a book of ready reference. The loose-leaf binding is ingeniously contrived to give the volume the appearance of being permanently bound. Nelson's Encyclopædia was first prepared for permanent binding in 1907. When a year later the loose-leaf edition was published, it was found necessary to make 600 changes in order to bring the encyclopædia up-to-date. A large staff of editors is employed to keep the present encyclopædia up to the hour, and from time to time new leaves are issued and sent to the subscribers, furnishing them with authorative information on current topics, and informing them where to insert the matter in the encyclopædia. As an illustration of the up-to-dateness of this system, a set of leaves was issued last month on the death of Governor Johnston and the Cook-Peary controversy. These leaves are temporary, and in March of each year a complete set of leaves of about 500 will be sent to each subscriber to add to his encyclopædia and to replace matter that is out of date. Formerly a man could obtain better information on the occurrence of the previous decade than those of the current year. With the advent of Nelson's Encyclopædia such is no longer the case. The subjects covered in this work are many, probably a greater variety than is to be found in any other encyclopædia of the same number of volumes. The articles are, therefore, short and concise. The aim of the encyclopædia appears to be to provide general information and to avoid technical language as far as possible, to furnish not merely a record of events, but to give instructions wherever possible that will be of practical value to the reader. Take, for example, the entry "Cycle." Not only is a brief history of the bicycle given, but also instructions to the prospective buyer of the wheel which will enable him to choose the best machine, and hints on the care of a wheel. This strikes us as a rather unique feature, but one that will doubtless be appreciated by many subscribers to this work. The articles are a trifle more brief than one would like to have them, but they are accompanied by carefully selected bibliographies for those who desire to study the subject further. The encyclopædia appears to be an exceptionally good gazetteer, containing many geographical names that do not appear in other works of this kind. A pronouncing dictionary is placed at the end of each volume, so that if a person is in doubt as to the pronounciation of a certain word he can look it up very quickly and without having to wade through the body of the book, where his attention is liable to be diverted by the many interesting subjects which the volume contains.

PUBLICATIONS RECEIVED.

The Smithsonian Institution.— Annual report of the Board of Regents for the year 1908. Issued by Charles D. Walcott, secretary the Smithsonian Institute, Washington. Pp. 800; size, 6 x 9.

Primer of Sanitation.—Issued by John W. Ritchie, Professor of Biology, College of William and Mary, Virginia. Published by World Book Co., Yonkers-on-Hudson, N.Y. Pp. 200; size, 6 x 9. Price, 60 cents.

The Thermal Conductivity of Fire Clay at High Temperatures.—By J. K. Clement and W. L. Egy, issued as Bulletin No. 36 of the Engineering Experiment Station, University of Illinois, is a report of the results of experiments on the thermal conductivity of several commercial fire clays at high temperatures. A detailed description of the instruments and methods of high temperature measurements is included. Copies of Bulletin No. 36 may be obtained gratis on application to W. F. M. Goss, director of the Engineering Experiment Station, University of Illinois, Urbana, Illinois.

The Waterproofing of Structures.—Published by J. A. & W. Bird Co., 34-35 India Street, Boston, Mass. Pp. 40; size, 6 x 3. Price,

Canada Department of Mines.—Report on the bituminous or oil shales of New Brunswick and Nova Scotia. Issued by R. W. Ells, LL.D., F.R.S.C. Pp. 70; size, 6 x 9 (pub. doc.) Published at Government Printing Bureau, Ottawa, Ont.

Practical Talks on Contracting.—Published by the Contractor Publishing Co., Monadnock Block, Chicago. Pp. 130; size, 6 x 9. Price, $1.50. By Frank B. Gilbreth, C. A. Worden, A. O. Davison and E. S. Hanson.

American Mining Congress.—Published by the American Mining Congress, Denver, Col. Pp. 460; size, 6 x 9.

Gas, Gasoline and Oil Engines.—By Gardner D. Hiscox, M.E. Pp. 480; size, 6 x 9. Price, $2.50. Published by the Norman W. Henley Publishing Co., 132 Nassau Street, New York, N.Y.

Bureau of Health.—Annual report of the Department of Public Health and Charities, Philadelphia, for the year 1908. Issued by the city of Philadelphia. Pp. 480; size, 6 x 9. Published by Philadelphia Dunlap Printing Co., 1332-38 Cherry. Street.

Report of the Department of Mines, Province of Nova Scotia, 1909. Issued by Christopher P. Chisholm, Commissioner of Public Works and Mines, Halifax, N.S. Pp. 230; size, 6 x 9.

American Railway Bridge and Building Association.— Proceedings of the nineteenth annual convention, held at Jacksonville, Fla., October 19th to 21st, 1909. Published by Brethren Publishing House, Elgin, Ill. Pp. 340; size, 6 x 9.

A Ballistic Electro Dynamometer Method of Measuring Hysteresis Loss in Iron, being Bulletin of the University of Kansas, Vol. XI., No. 1. By Martin E. Rice and Burton McCollum. Published by the University of Kansas. Pp. 30; size, 6 x 9.

Electric Power Plant Engineering.—By J. Weingreen. Pp. 430; size, 6 x 9. Price, $5. Published by the McGraw-Hill Book Co., 239 West 39th Street, New York, N.Y.

Practical Management of Sewage Disposal Works.—By W. C. Easdale, M.S.E. Pp. 60; size, 4 x 6. Published by the Sanitary Publishing Co., Limited, 5 Fetter Lane, Fleet Street, London, E.C., Eng.

Inspectors' Handbook of Reinforced Concrete.—By Walter F. Ballinger and Emile G. Perrot. Pp. 70; size, 4 x 6.

Price, $1. Published by the Engineering News Publishing Co., 220 Broadway, New York.

The Assistant Engineer (Book I., The Axeman).—By Prof. Jean P. Genthon, assistant engineer Aqueduct Commissioners, member of the Municipal Engineers of the city of New York. Published by the Chief Publishing Co., 45 Centre Street, New York. Pp. 50; size, 6 x 9.

The Assistant Engineer (Book VIII.)—By Prof. Jean P. Genthon. Published by the Chief Publishing Co., 45 Centre Street, New York. Pp. 60; size, 6 x 9.

Modern Bridges for Illinois Highways.—Issued by a commission, of which A. N. Johnson is State engineer. Published by the Illinois State Journal Co., State printers, Springfield, Ill. Pp. 40; size, 6 x 9.

Report of the Department of Mines, Province of Nova Scotia, for the year 1909. Compiled by Christopher P. Chisholm, Commissioner of Public Works and Mines. Pp. 250; size, 6 x 9. Published by the Chronicle Printing Co., Limited, Halifax, N.S.

Designers' Charts for Reinforced Concrete.—By H. B. Andrews, Mem. Am. Soc. C.E. Published by author (166 Devonshire Street, Boston, Mass.) Pp. 40; size, 9 x 12. Price, $1.

Unit Coal and the Composition of Coal Ash.—Bulletin No. 37. By S. W. Parr and W. F. Wheeler, University of Illinois Engineering Experiment Station. Published by the University, Urbana, Illinois. Pp. 70; size, 6 x 9. Price,

The Mechanics' Hand Book.—A reference book for all persons interested in mechanical engineering, steam engineering, electrical engineering, railroad engineering, hydraulic engineering, bridge engineering, etc. Issued by the International Correspondence Schools, Scranton, Pa. Published by the International Textbook Co., Scranton, Pa. Pp. 330; size, 4 x 5. Price,

The Field Practice of Railway Location.—By Willard Beahan, B.C.E. Published by the Engineering News Publishing Co., New York. Pp. 260; size, 6 x 9. Price, $3.

Modern Location of Standard Turnouts.—By C. M. Kurtz, B.S. Published by the author, 234 Iowa Street, San Francisco, Cal. Pp. 70; size, 4 x 6. Price, $1.25.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

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

10003—March 26—Authorizing C.P.R. to construct, maintain, and operate its Regina, Saskatoon and North Saskatchewan Branch across the highways between mile 0 and mile 14.7 on the said Branch.

10004—March 29—Approving plan of C.N.R. of subway for a crossing on Massey Farm, Lot 35, Con. B, Tp. of Scarboro, Ontario.

10005—March 22—Dismissing application of Elder-Dempster & Company, without prejudice to the rights of any person interested to any relief the Board may deem proper upon a different set of facts being presented to it, for an Order directing the C.P.R. Company and the G.T.R. Company to apply the established export basis covering general merchandise and commodities shipped from points in Eastern Canada to Montreal, Quebec, St. John, New Brunswick, and Halifax, N.S., for export to Vancouver, Victoria, and other British Columbia points.

10006—March 11—Directing that the C.P.R. construct a suitable highway crossing over the road known as the Graham-Grinton Road, situate 1½ miles south of the said town of Armstrong, B.C.

10007—March 26—Authorizing the C.P.R. to cross highways of a portion of its Snowflake Extension and spur to international boundary from mile 9.2 to mile 15.9.

10008—March 26—Authorizing the C.P.R. to construct and operate the Virden to McAuley Branch of its railway across highways between mile 0 and mile 14 on said Branch.

10009—March 26—Authorizing the C.P.R. to lay its tracks across all the highways on the Teulon Extension of its Stonewall Branch, from mile 56.55 to mile 73.88, from Rugby Junction.

10010—March 21—Directing that the C.P.R. Company's Telegraph, the Great North-Western Telegraph Company, and the Canadian Northern Telegraph Company file with the Board, not later than April 12th, 1910, new tariffs of tolls covering telegraphic services to newspapers.

10011—March 29—Amending Order No. 9854, dated March 11th, 1910, relieving the G.T.R. from providing further protection where its railway crosses the highway at rail level one mile south of Caldwell in the County of Grey, and the application of the G.T.R. to amend said Order by striking out the words "Caldwell" and "Grey" in the fourth line of the recita to the Order, and substituting therefor the words "Colwell Junction" and "Simcoe."

10012—March 29—Authorizing the Bell Telephone Company to erect its aerial wires and cables across the track of the London & Port Stanley (L. E. & D. R. Railway) Railway Company at public crossing, Ottawa Avenue, London, Ont.

10013—March 29—Directing that the G.T.R. install within sixty days from the date of this Order, an electric bell, at the crossing of Canfield Street, in the city of Belleville, Ontario, by the tracks of the Grand Trunk Railway Company.

10014—March 29—Authorizing the Hamilton Powder Company to ship by railway in their present packages, which do not in all respects comply with the requirements of the Order of the Board No. 7881, dated August 27th, 1909, explosives now on hand in the Hamilton Powder Company's magazines at Nanaimo, Vancouver, Cranbrook, and Nelson, B.C.

10015—March 30—Authorizing the C.P.R. to construct a branch line at or near Marysville Station, on Lot 2377, Group 1, Kootenay District.

10016—March 30—Approving Standard Freight Tariff C.R.C. No. 37, of the Essex Terminal Railway Company.

10017—March 26—Authorizing the C.P.R. to lay its tracks and to divert the highways on its Lethbridge to Aldersyde Branch from mile 0 to mile 28.

10018—March 30—Authorizing the G.T.R. to construct a branch line to the premises of Isaac J. Rank, Hagersville.

10019—March 30—Approving agreement between the Woodbridge and Vaughan Telephone Company, and the Bell Telephone Company, also the Union Telephone Company, Limited.

10020—March 30—Authorizing the C.N.O.R. to divert and cross by an overhead structure the public road between Lots 20 and 21, Con. 2, Township of Scarboro, Station 499.50, Ontario.

10021—March 31—Authorizing the C.N.O.R. to construct its line across the public road between Lots 18 and 19, Con. 4, Tp. of Pickering, Ontario.

10022—March 25—Directing that the cost of operating and maintaining the gates at the highway crossing of M. C. Railway just west of the Comber Station, be borne and paid, ten per cent. by the Township and the balance by the Railroad Company.

10023—Mrch 30—Ordering the Railway Company concerned in the crossing at the following point be relieved for the present from providing further protection at the crossing named, it appearing from an inspection made by the Board's Engineer and Operating Department, and from plans furnished, that the view at the crossing is excellent from both directions; that the crossing signboard is properly placed, and that there are whistling posts on the railway:—G.T.R. crossing 1½ miles south of Lacolle Junction, in the Parish of Lacolle, County of St. Johns, and Province of Quebec.

10024—March 22—Adding the County of Peel and the Tp. of Toronto as parties in the matter of protection at crossings by the G.T.R. at Port Credit, Ontario.

10025—March 22—Adding the County of Oxford as a party in the matter of protection to be provided at the crossing of the highway by the Grand Trunk Railway, just east of the Station at the Police Village of Beachville, Ont.

10026—April 1—Approving location of the C.N.R. through Townships 5-6, Ranges 11-18, west 2nd Meridian, Province of Saskatchewan, mileage 95.58 to 147.14, from Junction at Maryfield.

10027—March 31—Authorizing the C.P.R. to construct an industrial spur and siding to the premises of Henry Noah Sereth, at mileage 15.04, east of Cranbrook.

10028—March 26—Authorizing the C.P.R. to lay its tracks across all the highways on its Weyburn to Lethbridge Branch from mile 0 to mile 26.2.

10029—March 31—Authorizing the Montreal & Atlantic Railway Company, (C.P.R.), to divert the highway crossing in the town of Sweetsburg, Quebec.

10030—March 24—Rescinding Order No.9782, dated the 21st of February, 1910, in connection with refusal of Bell Telephone Company to connect with the West Williams Telephone Company's telephone system at Parkhill, Ontario.

10031—March 31—Authorizing the G.T.R. to construct a bridge carrying the farm crossing at Lot 2, Con. 1, of the Township of Fullerton, Ontario, (near Sebringville) across the 20th District of the G.T.R. at mile post 122.84.

10032—March 31—Amending Order of the Railway Committee of the Privy Council respecting the interlocking, derailing and signal system at the intersection of the G.T.R. with the Ontario & Quebec Railway (C.P.R.) at a point four miles west of Chatham, by approving of the addition of a four lever section to the original interlocking machine.

10033—March 31—Approving Stress Sheet for bridges Nos. 17, 18, and 20, being three highway crossings adjoining the Soulanges Canal, Quebec.

10034—March 31—Directing that the G.T.R within sixty days of the date of this Order install an electric bell at the crossing just west of Rockwood Station, Ontario.

10035—March 31—Authorizing J. A. Coleman of Winger, Ontario, to lay and thereafter maintain a gas pipe under the tracks of the G.T.R. at public highway 4½ miles west of Marshville, Ontario.

10036—March 31—Authorizing J. A. Coleman of Winger, Ontario, to lay and thereafter maintain a gas pipe under the tracks of the Michigan Central Ry. Co., at public highway, Montague Station, in the Province of Ontario.

10037—March 31—Authorizing the Canadian Niagara Power Co., to erect its wires for the transmission of electrical power over the International Bridge and the lines of the G.T.R. upon the said International Bridge in the Village of Bridgburg, County of Welland, Ontario.

10038—March 31—Authorizing the C.P.R. to construct and operate an industrial spur for Messrs. P. Burns & Company, located north of Silver Avenue, and between Golden and Morrow Avenues, Toronto.

10039—April 1—Authorizing the Chatsworth Rural Telephone Company to erect its telephone wires across the track of the C.P.R. ¾ mile north of Chatsworth Station, Ontario.

10040—April 1—Authorizing the Department of Public Works of Saskatchewan to construct a highway over the tracks of the Pasqua Branch of the C.P.R. by extending Rouleau Street southerly in the Townsite of Wilcox, Province of Saskatchewan.

10041—April 1—Amending Order of the Railway Committee of the Privy Council, dated September 10th, 1895, in connection with the interlocking, de-

railing and signal system at the point of intersection of the G.T.R. Company's line of railway, known as the Air Line, with the line of the Tillsonburg, Lake Erie and Pacific Railway Company. (Now the Canadian Pacific Railway Company east of the Tillsonburg Air Line Station), by providing for the addition of two levers to the original interlocking machine installed at said crossing so as to permit of each derail being operated by a separate lever, the Canadian Pacific Railway Company to pay to the G.T.R. the cost of making the said changes and of maintaining the same.

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.

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 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, F. 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, 92 Victoria Street, London, S.W.; 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, Ont.

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

ROYAL ARCHITECTURAL INSTITUTE OF CANADA.—President, A. F. Dunlop, R.C.A., Montreal, Que.; Hon. Secretary, Alcide Chausse, 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 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.

MISCELLANEOUS.

Regina, Sas.—Robt. Armour has let a contract for a $30,000 apartment block on Twelfth Avenue.

Winnipeg, Man.—J. D. Atchison, architect, is preparing plans for a new branch office which will be erected on Main Street for the Eastern Townships Bank.

London, Ont.—The Township of Hav have instructed F. W. Farncomb, C.E., of London to prepare plans for two steel bridges with concrete floors and abutments.

Peterboro', Ont.—The proposed extension to the plant of the Canadian General Electric will be built in Peterboro'. The company will expend $250,000, and will erect a power house at the new waterworks dam to generate the power for their own purposes.

Hamilton, Ont.—Will spend over $28,000 this summer in making repairs to macadam roads.

Brandon, Man.—Public Utilities Committee have submitted a favorable report on the question of establishing a street railway and installing a power plant.

Winnipeg, Man. — Plans are being considered by the Y.M.C.A. for a $300,000 building.

SOCIETY NOTES.

Canadian Gas Association:

The above Society will hold their 3rd annual convention and first exhibition at Hamilton. Ont.. from June 6th to June 11th. A. W. Smith, 52 Adelaide St. East, Toronto is the secretary for the exhibitors.

Ottawa Branch, Canadian Society of Civil Engineers:—

At a recent meeting of the above branch of the C. S. of C. E. a Committee was appointed to act with the Executive in regard to meeting representatives of the American Soc. of C.E., and furnish them with information as to holding their annual summer convention at Ottawa.

It was also decided to hold two branch banquets each year; one in the early part of November and one in the latter part of February.

At the weekly Wednesday meeting on the 13th of April, Mr. C. R. Coutlee, M. Can. Soc. C.E. delivered a lecture on the water power possibilities of the Ottawa River.

At the weekly annual meeting on the 6th April a paper was read by Mr. Geo. A. Mountain, Chief Engineer Railway Commissoiners, on "Grade Separation" by W. H. Breithaupt, M. Can. Soc. C.E.

A motion of recommendation to Council was made, recommending that the by-laws be changed to make a new class between Student and Associate Member: that members of branches be known as Resident Members and pay the fees as such and that branches receive a considerable larger refund from the main society on dues paid by Corporate Members and others who belong to the Society and are resident at branches.

RAILWAY EARNINGS AND STOCK QUOTATIONS

NAME OF COMPANY	Mileage Operated	Capital in Thousands	Par Value	RAILWAY EARNINGS. Date from	Date to	1910	1909	STOCK QUOTATIONS TORONTO Price April 7 '09	Price Mar. 31 '10	Price April 7 '10	Sales Week Ended Apr. 7
Canadian Pacific Railway...	10,048	$150,000	$100	Jan. 1	April 7	$21,492.000	$18.527 000	176½ 176	181½ 181⅜	182½ 182⅜	2375
Canadian Northern Rail'y.	3,180	.....	.....	"	April 7	2,596,700	2,049 00	.....	.....	.....	.....
*Grand Trunk Railway	3,536	226,000	100	"	April 7	11,107.740	9.059 931	*1st. pref. 110, 3rd pref 64¾, ord'y 28.			
T. & N. O.....	264.74	(Gov. Road)	.....	"	March 31	256.865	170.031	.....	.....	.....	.....
†Montreal Street Railway...	141.79	18,000	100	"	April 9	1,115,471	9.6 734	212 211½	246½ 246⅜	247½ 247	288 3
Toronto Street Railway,...	114	8 000	.00	"	March 31	975 806	804 631	.....	123¾ 122	123⅜	66
Halifax Electric	13.3	1.400	100	"	April 7	48 996	43.009	110 109	124 123	124 123	55

*G.T.R Stock is not listed on Canadian Exchanges. These prices are quoted on the London Stock Exchange.
† Quoted on Montreal Exchange.

WEEKLY EARNINGS

NAME OF COMPANY	TRAFFIC RETURNS Week Ending	1910	Previous Week	1909
Canadian Pacific Railway.	April 7	$1,959.000	$2.732,000	$1,555 000
Canadian Northern Rail'y.	April 7	247,600	320,900	100,500
Grand Trunk Railway	April 7	815,893	1,349,741	718,063
T. & N. O.....	March 31	34,556	35.934	27,377
Montreal Street Railway ...	April 9	76.940	70,130	65,491
Toronto Street Railway....	.....	.....	.....	.....
.....	April 7	3.501	,230	3,134
	March 31	18,063	.....	17,454

†For month of January—31 days

CANADIAN PACIFIC.

February Net $1,487,000 Compared with $762,000 Same Time Year Ago—Eight Months $7,680,000 Gain.

The report of the Canadian Pacific Railroad Company for the month of February and eight months ended February 28 companies as follows:—

	1910	1909	1908	1907
Feb. gross .:	$ 5,992,052	$ 4,966,208	$ 4,129,044	$ 4,268,206
Expenses	4,505,032	4,204,063	3,771,947	3,646,218
Feb. net ...	$ 1,487,020	$ 762,145	$ 357,097	$ 621,988
8 mos. gross.	62,021,988	50,439,722	49,513,098	45,938,208
Expenses	39,148,498	35,246,651	34,100,987	30,182,026
8 mos. net ..	$22,873,490	$15,193,071	$15,412,111	$15,756,182

GRAND TRUNK SYSTEM.

The Grand Trunk Railway system reports for February:

	1910	1909	Changes Increase
Gross receipts	£471,000	£412,800	£ 58,200
Operating expenses .	386,900	341,200	45,700
Net profit	£ 84,100	£ 71,600	£ 12,500
From Jan. 1 to Feb. 28:			
Gross receipts	£961,000	£821,800	£139,200
Operating expenses .	810,000	699,900	110,100
Net profit	£151,000	£121,900	£ 29,100

Net profits of the Canada Atlantic Railway Company for February increased £3,900 net; net profits of the Grand Trunk Western Railway Company increased £12,100 and the Grand Haven & Milwaukee Railway Company showed net profits larger by £3,600. The net profits of the entire system for February increased £32,100.

TORONTO STREET RAILWAY

Earnings of the Toronto Street Railway for March, 1910, were $343,541.86 and for March, 1909, $301,005.95.

WINNIPEG STREET RAILWAY

Earnings Show 14.39 Per Cent. Earned on Stock in 1909 Against 13.14 Per Cent. in 1908—Marked Increase in Per Capita Receipts Since Company was Organized.

Earnings of the Winnipeg Electric Railway Company for the fiscal year ended December 31 last were the largest, for both gross and net, ever previously reported in the history of the company. Net income, after deduction of all operating expenses, taxes, and fixed charges, was equal to 14.39 per cent. on the $6,000,000 capital stock outstanding, as compared with 13.14 per cent. earned on the $5,669,541 stock outstanding in the year previous.

Gross returns for 1909 rose almost to $500,000, of which improvement nearly $200,000 was saved for the gain in net, and surplus after deduction of 10 per cent. dividends was higher than at the close of 1908, when a smaller amount of dividends was paid. The expansion in gross is equal to 18.93 per cent., and that of net 16.63 per cent., operating expenses having risen about $231,700, or 21.29 per cent.

That the property has enjoyed a healthy growth since its inception in 1904 is clearly shown in the following statement of gross and net earnings, operating ratio to gross, percentage earned on capital and average amount of capital stock outstanding in each year given:—

	Gr. earn.	Net earn.	Oprat. to gr.	P.C. earn. on cap.	Cap. outstdg.
1909	$2,623,731	$1,303,066	50.34	14.39	$6,000,000
1908	2,206,695	1,117,222	49.35	13.14	5,669,541
1907	1,722,407	946,676	45.05	12.01	4,664,200
1906	1,416,305	714,341	49.56	11.17	4,144,480
1905	1,119,769	544,022	51.42	9.86	4,000,000

Thus it will be noted that the company has enjoyed a marked degree of improvement in each succeeding year of operation. The number of passengers carried last year expanded more than 4,300,000, the total carried having been over 26,300,000, while the number of transfers issued was about 1,200,000 in excess of 1908. That the company has kept well apace with the development and population of the centre served is reflected in the per capita earnings since the property was organized. In 1905 railway earnings were at the rate of 6.80c. per capita, which compares with 10.03c. per capita for 1909.

Earnings Per Capita.

Below are given the number of passengers carried, transfers issued and railway earnings per capita of the past five years:—

	Passengers	Transfers	Per capita railway earnings, cts.
1909	26,382,773	8,925,849	10.03
1908	22,019,507	7,777,315	9.80
1907	20,846,317	5,954,067	9.84
1906	17,229,554	3,109,094	8.30
1905	13,081,249	1,682,685	6.80

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.

Place of Work.	Tenders Close.	Issue of.	Page.
Vancouver, B.C., hose wagons	Apr. 21.	Mar. 11.	233
Toronto, Ont., Don syphon	Apr. 19.	Mar. 18.	50
North Battleford, Sask., sewerage and waterworks	Apr. 19.	Mar. 18.	256D
Weston, Ont., sewerage and waterworks	Apr. 18.	Mar. 25.	281
Weyburn, Sask., sewerage and waterworks	Apr. 27.	Mar. 25.	281
Calgary, Alta., sewer pipe	Apr. 22.	Mar. 25.	48
Calgary, Alta., sewerage and waterworks	Apr. 22.	Mar. 25.	48
Calgary, Alta., canal system	May 1.	Apr. 1.	46
South Middleton, Ont.. school-			
Prince Rupert, B.C., electrical and water works equipment	May 3.	Apr. 1.	307
house	Apr. 20.	Apr. 1.	306
Sault Ste. Marie, Ont., Railway	Apr. 30.	Apr. 8,	56
Yorkton, Sask., concrete sidewalk	Apr. 25.	Apr. 8.	50
Brantford, Ont., reinforced concrete bridge	Apr. 22.	Apr. 8.	50
Toronto, Ont., cast-iron water-pipe	Apr. 19.	Apr. 8.	50
Toronto, Ont., pavements	Apr. 19.	Apr. 8.	336
Dunnville, Ont., sewage pumping station	Apr. 19.	Apr. 8.	336
Ottawa, Ont., Dredging		Apr. 8.	336

TENDERS.

Annapolis Royal, N.S.—Tenders will be received until April 20th for the construction of a wood stave pipe flume, 49-inch diameter, 600 feet long. J. W. Harris, Clerk.

Sydney, N.S.—Tenders will be received until April 20th for the erection of the proposed Academy building. James J. Curry, Secretary, School Board Commission.

Quebec, Que.—Tenders will be received until April 25th for supplies for 1910 for the Board of Health. L. Catellier, Medical Health Officer.

Quebec, Que.—Tenders will be received until April 20th for the construction of a Normal School. A. Gagnon, Secretary Department of Public Works.

Barrie, Ont.—Tenders will be received up to noon, April 18th, for all work and material required in the erection of a new wing at the Royal Victoria Hospital. F. S. Baker architect, Toronto.

Chatham, Ont.—Tenders will be received until April 27, for the construction of a large outlet drainage work. The work is in parts of Dover and Chatham Townships. Wm. Abraham, Reeve Township of Chatham.

Hamilton, Ont.—Tenders will be received until April 19th for the construction of sewers on five streets in Hamilton. A. F. McCallum, City Engineer.

Kingston, Ont.—Tenders will be received until 15th April, for the construction of an earth stop mill at the Rifle Range. Eugene Fiset, colonel, Deputy Minister of Militia and Defence, Ottawa.

London, Ont.—The council of Lobo invite tenders for two steel bridges on concrete abutments over Bear Creek, near Poplar Hill. F. W. Farncomb, C.E., 64 Bank of Toronto Chambers.

Ottawa, Ont.—Tenders will be received until April 28th for removing range beacon and widening the channel at the upper entrance of Sault Ste. Marie Canal. L. K. Jones, Secretary Department of Railways and Canals.

Ottawa, Ont.—Tenders will be received until May 5th for work connected with the construction of Section 4 of the Ontario-Rice Lake division of the Trent Canal. L. K. Jones, Secretary Department Railways and Canals.

Ottawa, Ont.—Tenders will be received until April 26th for the construction of Section 6 of the Ontario-Rice Lake division of the Trent Canal. L. K. Jones, Secretary Department Railways and Canals.

Ottawa, Ont.—Tenders will be received until April 23rd for the erection of a brick schoolhouse on the Oneida Indian Reserve, Ont. J. D. McLean, Secretary Indian Affairs.

Ottawa, Ont.—Tenders will be received until May 31st, for the construction of a steel steamer for the (fresh water) Quarantine Service at Grosse Isle, Quebec. A. L. Jarvis, Assistant Deputy-Minister, and Secretary of Agriculture.

Craik, Sask.—Tenders for building a farmers' elevator will be received until April 2nd. E. A. Phipps, Secretary-Treasurer, Farmers' Elevator & Trading Company.

Port Arthur, Ont.—Tenders will be received until April 30th for 50,000 square yards asphalt pavement construction. J. J. Antonisen, City Engineer.

Toronto, Ont.—Tenders will be received until April 19, for conduit. G. R. Geary, (Mayor), Chairman Board of Control, City Hall.

Toronto, Ont.—Tenders will be received until April 19th, for the construction of a new fire hall on Parliament Ave. G. R. Geary, (Mayor) Chairman of Board of Control.

Toronto, Ont.—Tenders will be received up to April 27th, for the masonry, reinforced concrete construction, terra cotta and artificial stone work required in the erection of St. Augustine's Seminary, on the south side of the Kingston Road, near Toronto. Plans and specifications may be seen at offices of Bowman & Connor, consulting engineers, 36 Toronto St.; Arthur W. Holmes, Architect, 10 Bloor St. E.

Toronto, Ont.—Tenders will be received until April 19th for supply of cast-iron pipe for 1910. C. H. Rust, City Engineer.

Toronto, Ont.—Tenders will be received until April 20th for the construction of a station at North Parkdale, C.P.R. A. L. Hertzberg, Division Engineer, Union Station.

Toronto, Ont.—Tenders will be received until April 20th for the construction of a new station building, North Parkdale. A. L. Hertzberg, Division Engineer.

Toronto, Ont.—Tenders will be received until April 19th for cement sidewalks. G. R. Geary (Mayor), Chairman Board of Control, City Hall, Toronto.

Toronto, Ont.—Tenders will be received until April 19th for the concrete piers, abutments, etc., for the Wilton Avenue Bridge. C. H. Rust, City Engineer.

Toronto, Ont.—Tenders will be received up to noon, Wednesday, April 20th, 1910, for the supply of coal to the buildings of the University of Toronto, including Victoria, St. Michael's, Knox, Wycliffe, and Trinity Colleges. Graham Campbell, Superintendent.

Windsor, Ont.—Tenders will be received until 5 p.m., April 25th, for interior fittings, post-office. Plans at office of Wm. Curtis, Windsor; T. A. Hastings, Clerk of Works, Postal Station "F," Toronto, and at Department of Public Works, Ottawa. Napoleon Tessier, Secretary Department of Public Works, Ottawa, Ont.

Winnipeg, Man.—Tenders will be received until April 30th for supply of arc lamps and regulating apparatus, switchboards and accessories, insulated line wire and mast-arm parts. M. Peterson, Secretary Board of Control. (Advertisement in The Canadian Engineer.)

Winnipeg, Man.—Tenders will be received until April 9th, 1910, for branch buildings for the Bank of Hamilton, to be erected at Swan Lake, Man., and Roland, Man. Wm. Fingland, architect, 334 Portage Ave., Winnipeg.

Winnipeg, Man.—Tenders will be received until April 18th for excavating and backfilling of trenches for six-inch pipe lines at the following points on the Western Division, C.P.R.: Chaplin, Forrest, Macoun, Grassy Lake, Walsh.

Plans may be seen at Assistant Chief Engineer's office, Winnipeg; Division Engineer's office, Calgary, and Resident Engineer's offices at Moose Jaw and Medicine Hat. N. E. Brooks, Division Engineer.

Winnipeg, Man.—Tenders will be received until April 14th for the construction of abutments for bridge 24.4, Souris section. Frank Lee, Division Engineer Canadian Pacific Railway.

Craik, Sask.—Tenders will be received until April 23rd for building a 60,000 bushel farmers' elevator with 30-inch, 1,200 bushel bins, 6-inch 2,300 bushel bins, balance in three dumps, two scales, first-class large cleaner, gasoline engine of sufficient power and car-puller. E. A. Phipps, Secretary-treasurer Farmers' Elevator and Trading Co.

Calgary, Alta.—Tenders will be received up to noon, April 15th, for labor required to complete the concrete construction required in the western section of the Canadian Pacific Railway Company's irrigation system, amounting to upwards of two thousand five hundred cubic yards of reinforced concrete, together with the necessary excavation and backfilling. J. S. Dennis, assistant to second vice-president.

Davidson, Sask.—Tenders will be received until April 18th for the erection of a town hall. A. J. Robertson, Clerk.

Estevan, Sask.—Tenders will be received until April 20th for the installation of a heating and plumbing system in an eight-roomed school. Plans can be seen at the Builders' Exchange, Winnipeg, and at Estevan. B. Glover, Secretary Public School.

Prince Albert, Sask.—Tenders will be received until noon, April 23rd, for the construction of about 10,500 lineal feet of concrete sidewalk and crossings. C. O. Davidson, City Clerk.

Prince Albert, Sask.—Tenders will be received until April 16th for the supply of approximately 2,500 barrels of cement. Parties tendering should state brand of cement, weight per barrel, earliest delivery date, and price f.o.b Prince Albert. C. O. Davidson, City Clerk.

Regina, Sask.—Tenders will be received until April 20th for the construction of five telephone lines. S. P. Porter, Deputy Minister.

Nanaimo, B.C.—Tenders are invited by the municipality for a supply of Portland cement, f.o.b. at Nanaimo, and will be received until the 23rd April. Allan Waters, City Engineer.

Victoria, B.C.—Tenders will be received until April 25, for the installation of a complete system of Cluster Street Lights. W. W. Northcott, Purchasing Agent, City Hall.

Victoria, B.C.—Tenders for the construction of cement walks will be received shortly. Angus Smith, City Engineer.

CONTRACTS AWARDED

Campbellton, N.B.—A contract for the removal of trees and bushes from the shores of Smith's Lake Reservoir, covering an area of 18.35 acres, was awarded to Sephen Harriman, Campbellton, at $811.25. D. T. Black, town engineer.

Moncton, N.B.—Following contracts were recently made: Brass goods, $234.50, Sumner Co.; 2 doz. meters, $261.60, Canadian General Electric Company, who will also supply four transformers.

Montreal, Que.—The Dominion Car and Foundry Company have just received from the C.P.R. another order for a thousand steel frame 80,000 lb. box cars.

Montreal, Que. — Orders totalling $250,000 have been placed by the Harbor Commission. Darling Bros. of Montreal will construct an electric freight and team hoist, while the Browning Manufacturing Company, of Cleveland will build an excavation for land work. Other orders include a tug, dredge and elevator system.

Brantford, Ont.—Lock Joint Pipe Company, of New York, were given the contract for reinforced concrete tile for storm sewers on Brant Avenue, Waterloo and Albion Streets.

Brantford, Ont.—Mr. Reid will construct the Holmedale sewer.

Guelph, Ont.—The Water Commissioners let contracts for the various supplies for the ensuing year as follows:—All brass goods, to Morrison & Company, of Toronto; all galvanized pipes and fittings, the Bond Hardware Company; cast iron pipes, Gartshore-Thompson Company, of Hamilton; and valves to the Kerr Engine Company, of Walkerville.

Hamilton, Ont.—Geo. E. Mills was given the contract for masonry work, in the construction of a Nurses' Home, at $6,900.

Hamilton, Ont.—Many new mains will be laid by the city engineer's department as bids submitted by contractors were too high. The city will purchase a trenching machine for $8,000.

Kingston, Ont.—The Public Works Department of the Ontario Government has awarded the contract for laying 650 feet of intake pipe from Rockwood Asylum into the harbor, to the Donnelly Wrecking Company, of Kingston. Of this amount of pipe, 300 feet is to be laid inshore and the remainder at the outer end of the present pipe. Professor A. K. Kirkpatrick, of the School of Mining, is the engineer in charge.

London, Ont.—F. W. Farncomb, C.E., has let contracts for a mile of grading and 1,500 feet of storm water sewer work in South London. Thomas Henry will do the latter for $1,950, while C. F. Gillam will do the grading at 95 cents a rod.

Mimico, Ont.—On page 337, April 8th, we published the tenders submitted for the construction of the New Toronto sewage scheme. At a meeting recently held in the office of Murray & McAllister, the consulting engineers, the tender of J. M. Scott, at $4,727, was accepted. A. L. McAllister, B.A.Sc., will supervise the work of construction.

Mimico, Ont.—The Forcott Construction Company were given the contract at $2,495 for the construction of a pipe sewer connecting the Victoria Industrial School with the new sewerage system of New Toronto. J. A. L. Macpherson, engineer-in-charge.

Ottawa, Ont.—John Lowry, of Ottawa, has the contract for the construction of a protection pier at Winnipeg beach, Man.

St. Thomas, Ont.—Walter Mitchell of Port Stanley will supply 690 poles for the Hydro-electric transmission line at $2,900.

Toronto, Ont.—The Connell Anthracite Mining Company, Ltd., has been awarded the contract for supplying coal for the various Military Buildings at Toronto, Hamilton and London for the coming season.

Toronto, Ont.—Board of Education accepted the following tenders in connection with the enlargement of Balmy Beach School:—Masonry, R. Chalkley & Sons, $9,559; concrete floor, A. Gardner & Company, $1,840; carpentry, M. Hutchinson, $7,230; roof and tinsmithing, A. B. Ormsby, $1,304; plastering, George White, $1,165; painting, James Finnemore, $620; plumbing, Fiddes & Hogarth, $1,059; structural steel, Reed & Brown, $1,048; heating and ventilating, Pease Heating Company, $795; electric wiring, Hall & Dollery, $67. The enlargements consist of six additional class-rooms, and will cost in all $24,687.

Toronto, Ont.—The J. H. McKnight Construction Company were awarded the contract for laying and jointing cast iron water mains up to a diameter of 12 inches, the contract to expire on December 31st. The contract price is $51,845. Other bids were:—$53,059, $56,032, $61,327, $62,393, $67,558.

Somerville, Limited, were given the order for brass curb cocks required by the Waterworks Department, at the following prices each:—½-inch, 53 cents; ⅝-inch, 73 cents; ¾-inch, 93 cents; 1-inch, $1.41.

For pole line supplies, the tender of the Canadian, H. W. Johns-Manville Co., was accepted at $1,157. Other bids were $1,225, $1,425, $1,450.

Wire required for the hydro-electric system will be supplied by the Northern Electric and Manufacturing Co., at 16.5 cents a lb. by rail and 16.45 cents by boat.

The Toronto Furnace and Crematory Company will install the steam heating plant in St. Lawrence Hall for $907, the lowest tender submitted. Bids ranged from $907 to $998.

Excelsior Construction & Paving Co. will construct a sewer on Salem Ave. for $243. Highest bid was $315.

House of Industry addition wil be built by James A. Wickett, Limited, at $5,937. Other tenders were:—$6,745, $6,150, $6,619, $6,597.

Vault and office fittings for the electrical department will be furnished by the Deisenroth Contracting Company, at $5,339.62. Other tenders, $5,800, $7,773, $7,900.

Woburn, Ont. — Rutherford & Patten were awarded a contract for the construction of a reinforced concrete arch bridge over the River Rouge, at $3,600, by the Scarboro Township Council. Other tenders were:—Horace Thompson, $4,600. McManus & Co., $5,520; Rutherford & Patten, $3,600; B. W. Hyde, $10,495; E. J. C. Elliott, $4,690, and J. A. Watson, $5,510. The price quoted does not include the cement and engineering costs, which will, it is expected ap-

proximate nearly $1,800. The plans were prepared by Frank Barber of Barber & Young, Toronto.

Winnipeg, Man.—The James Robertson Company will supply lead pipe required by the city at $4.90 per 100 lbs.

Winnipeg, Man.—The Board of Control decided to recommend that the contract for water pipe be awarded to W. Beverley Robinson, of Montreal, on behalf of the Stanton Iron Works, at $18,131, the lowest tender.

Winnipeg, Man.—The following contracts have been made:—Sewer on McMillan, $734.20, engineer of construction. Sewer on Helen Street, $1,909, engineer of construction. Sewer on Helen, $1,407.20, Thomas Jackson & Sons. Sewer on Ida, engineer of construction, $309.15. Water main on McMillan, $169.60, engineer of construction. Water main on Grosvenor, $154.00, engineer of construction. The total cost of these improvements is $4,683.15.

Vancouver, B.C.—Tenders for an additional five miles of cement walks were as follows: H. Ledingham, 13 cents per square foot; Palmer Bros. & Henning, 13 1/3 cents; McCachran & Richardson, 13½ cents. Referred to the engineer for report.

Vancouver, B.C.—Contracts to the amount of approximately $325,000 have been awarded for the construction of the Metropolitan ten-storey office building on the north side of Hastings Street. Work will be started immediately after April 10. Some of the contracts were given the following firms:—John Coughlan & Sons, steel fabrication; Ross & Howard, cast-iron bases; E. E. Davis & Company, steel erection; Wells Construction Company, preparation of site, concrete work and stone; Canada Foundry Company, ornamental iron; Barr & Anderson, steam heating; Dorel & Killing, plumbing; Sears & Company, bricklaying; Raftery & Company, expanded metal and plastering; Western Sheet Metal Works, sheet metal and roofing; Cope & Son, electrical work; Robert Stewart, Ontario, hardwood finishing; British Columbia Plate Glass & Importing Company, painting and glazing; A. & P. Steven, Glasgow, elevators. The contract for the model stone carving and general enrichment work will be awarded during the next few days.

Victoria, B.C.—J. L. Skene will build the new Y.M.C.A. building for $70,000.

Victoria, B.C.—Evans, Coleman & Evans were awarded the contract for supplying coal for the Vancouver courthouse and normal school for the current year. The contract for coal for the New Westminster court house and jail goes to Belyea & Co., and for the hospital for the insane to Gilley Bros., Ltd.

RAILWAYS—STEAM AND ELECTRIC.

St. John, N.B.—The survey for the St. John Valley Railroad will be started by the Hazen Government as soon as weather permits, with P. S. Archibald, formerly Chief Engineer of the Intercolonial Railway, in charge.

Toronto, Ont.—W. H. Grant left Toronto on Tuesday for Vancouver to superintend the construction of D. D. Mann's Portland Canal Short Line Railway in Northern British Columbia. He was accompanied by D. O. Lewis, C.E.

Toronto, Ont.—A big programme of expansion on the Temiskaming & Northern Ontario Railway is foreshadowed by Mr. J. E. Englehart, Chairman of the commission, who recently returned from his tour of inspection over the line. Plans are perfected for many extensions and improvements and contracts will be awarded in the course of a few days for the construction of new steel bridges. Several new stations are also completed, and the double-tracking of an additional portion of the road. New stations are under way for Cobalt, Matheson and Cochrane.

Niagara Falls, Ont.—G. F. Hanning and staff have completed the survey of the Canadian Northern route to the Falls. It runs along the right-of-way of the Toronto & Niagara Power Company to the city line, through the heart of the city, crossing the river on a bridge to be built three hundred feet north of the upper steel arch bridge. The Niagara, St. Catharines & Toronto Railway, owned by Mackenzie & Mann interests, may build a line to Fort Erie during the coming summer, forming a belt line through the Niagara district as a feeder for the Canadian Northern.

Niagara Falls, Ont.—The N. St. C. & T. Railway intend to lay new girder on several streets here.

Winnipeg, Man.—G.T.P. officials announce that the new G.T.P. shops at Winnipeg will be completed by the end of the present year. The shops and grounds will cover 300 acres, and there will be seventeen acres of floor space in the thirteen buildings.

Winnipeg, Man.—The Cowan Construction Company, received from the Canadian Northern Railway a contract for grading the Maryfield to Moose Jaw extension, while the Northern Construction Company will grade the Vegreville and Goose Lake extension. These contracts cover about 230 miles of road.

Brandon, Man.—City council have accepted the proposition of the Canadian Northern Railway to build a transfer railway connecting the three lines running through Brandon.

Edmonton, Alta.—Grading has commenced on the Tofield-Calgary railway line from Camrose into Calgary. This line will be finished this year. Work has also started on the Vegreville-Calgary C.N.R. branch.

Phoenix B.C.—C.P.R. will spend $20,000 on track improvements between Phoenix and Eholt.

Yorkton, Sask.—Engineer Wallace and a party of five G.T.R. surveyors have arrived here and will locate the proposed line between Yorkton and Canora.

LIGHT, HEAT, AND POWER

Fort William, Ont.—Three tenders were received for the gas franchise, while the firm of John Coates & Co., London, England, offered to install a plant. The city had prepared specifications in which they would grant a franchise, but none of the tenderers stuck to these, claiming that it would be impossible to install a plant under the conditions imposed. The only tenders received on these specifications were on a basis of two dollars per thousand cubic feet. The International Heating and Lighting Co., Cleveland, offer to take the franchise on a 25-year basis, not exclusive, and supply gas at $1.30 on a start, to grade down to $1 upon sixty million cubic feet issued per year. W.D.B. Turville, Port Arthur, tendered at $1.30 for a 30-year franchise, also to grade down to $1. The tenders were turned over to a special committee.

SEWERS, SEWAGE AND WATERWORKS.

Forest, Ont.—Municipal officials are discussing waterworks. The town will have to purchase a new engine in any event, and a system of waterworks may be constructed.

Fort William, Ont.—Board of Works have passed plans which involve the expenditure of $110,000 on sewer construction.

Saskatoon, Sask.—Geo. T. Clark, city engineer, is preparing plans for new sewage disposal works.

Regina Sask.—A. J. [illegible]erson, C.E., recently submitted plans and estimates of the cost of the trunk sewer to be built in connection with the general sewerage scheme. The total sum involved is $476,275 of which $280,000 is to be this year's portion of expenditure. These estimates have been approved by the works committee.

Victoria, B.C.—Provincial Government recently decided to conserve the water supply on both sides of the Okanagan lake in order to assure an abundant supply for future demands.

BY-LAWS AND FINANCE.

The following municipalities have sold debentures as follows:—

Bloomfield, Ont., $3,000, streets and sidewalks.

Woodstock, Ont., $37,500.

Hibbert Township, Ont., $6,525, drainage.

Hespeler, Ont., $10,509, Niagara power and local improvement.

Stirling, Ont., $10,000, electric light.

St. Thomas, Ont., $59,405, Hydro-electric and local improvements.

Nanaimo, B.C., $100,000, sewer.

Welland, Ont., $105,242, $18,612, $23,600 and $63,000 for sewers, schools and concrete walks.

Three Rivers, Que.—A bill will be presented to the Legislature asking permission to borrow $200,000 for improvement purposes.

Sydney, N.S. — The local legislature will be asked to authorize the borrowing of $60,000 for local improvements.

Brantford, Ont.—The ratepayers passed the $55,000 new bridge by-law, and the $30,000 school extensions by-law.

Huntsville, Ont.—A by-law to raise $12,000 for the extension and improvement of the sidewalks and roads was carried.

Niagara Falls, Ont.—A by-law for a $2,500 fire hall will be submitted.

Toronto, Ont.—Ratepayers have passed by-laws to raise $279,000 for new watermains and a grant of $250,000 for the new general hospital although it is claimed that the latter was not legally passed since it should have been voted on in January.

Kildonan, Man.—The ratepayers will on April 30th, vote on a $11,000 school by-law. A similar by-law was defated last month.

Winnipeg, Man.—A $600,000 hospital by-law will be submitted to the ratepayers for approval.

Calgary, Alta.—The ratepayers will be asked to vote on a $125,000 power plant by-law.

Medicine Hat, Alta.—Ratepayers will shortly vote on by-laws amounting to $141,850 for sewer extensions, sidewalks and new road machinery.

Estevan, Sask.—By-laws for $1,000 to complete the town hall and $25,000 for an extension of sewers. Carried.

Cainsboro, Sask.—H. J. Guthridge secretary, offers for sale $3,000 telephone debentures of this village.

Regina, Sask.—By-laws to raise $280,000 to construct the northern portion of the trunk sewer, $115,000 for pavements and $10,000 for cement sidewalks have passed the second reading.

Regina, Sask.—On April 29th, the ratepayers will vote on by-laws to grant a street railway franchise and provide $26,500 for the Colegiate Board. Particulars of the former were given some time ago in these columns.

Regina, Sask.—Pavement and sidewalk by-laws will probably be voted on at the next council meeting.

Moose Jaw, Sask.—A by-law will be introduced to raise money for new sidewalks and macadamizing roads.

Waldron, Sask.—W. J. Johnston, secretary-treasurer of this municipality, offers for sale $5 000 debentures.

Edmonds, B.C. — C. T. Saunders offers for sale until April 21st, $16,500 school and $13,000 waterworks debentures of the Corporation of Burnaby.

CURRENT NEWS.

Ottawa, Ont.—The Canada Gazette announces the incorporation of the Dominion Drydock Company with headquarters at Quebec, and a capital stock nominally placed at $1,000,000. The incorporators are Sir Thomas Shaughnessy and Hugh Andrew Allan of Montreal; George D. Davie and William M. Dobel of Quebec; Walter E. Foster of St. John, N.B.; Baron Perrie of Belfast and Sir Robert W. Perks and Arthur M. Grenfell of London, England. The company is empowered to carry on a general business of shipbuilding and ship-repairing, building and operating drydocks and subsidiary undertakings.

Victoria, B.C.—City Council have decided to engage a medical health officer who will devote his whole time to the work of the muinicipality.

London, Ont. — Murray A. Verner, of Brantford, has been elected president of the London & Lake Erie Transportation Company.

Montreal, Que.—Rumor says E. H. Fitzhugh, third vice president of the Grand Trunk Railway will shortly retire.

PERSONAL.

Mr. George C. Powell, B. A. Sc., A. M. Can. Soc. C.E., will probably succeed Mr. T. S. Scott as assistant city engineer at Toronto, while Mr. Murray Stewart will likely take Mr. Powell's place as roadways engineer.

Mr. A. S. Innes, who has been District Manager in Winnipeg for the Canadian Inspection Company, has resigned from that position and has accepted the appointment of Engineer and General Superintendent of St. Andrews Dam and Locks.

Canadian Laboratories, Ltd., have removed from 37 Melinda Street, to 24 Adelaide Street West, Toronto.

Mr. R. J. Sandover-Sby, S. M. Can. Soc. C.E., has been appointed resident engineer on the construction of the sewerage and sewage disposal works which will be built by the Township Council of Etobicoke, Ontario.

Mr. Thomas Watson, for four years sanitary inspector at Fort William, Ontario, has been appointed sanitary inspector for the Province of Saskatchewan.

Mr. P. C. Flaherty has been appointed acting master of transportation in the Eastern Division of the G.T.R., with office in Montreal.

Mr. Frederick H. Stott, S. M. Inst. E. E., has been appointed by the City of Guelph to superintend the erection of the new Hydro-electric power plant equipment which is being supplied by the Lancashire Dynamo & Motor Company.

OBITUARY.

Mr. Robert Wright, for many years treasurer of the Grand Trunk Railway, died on Tuesday, April 5th, at Montreal, in his 78th year.

Mr. Robert Rutherd Cochrane, mathematical professor of Manitoba University, died on April 3rd, aged sixty years. Professor Cochrane was born in Sullivan Township, Grey County and was formerly principal of the Perth, Ont., Collegiate Institute. He became Professor of Mathematics at Wesley College, Winnipeg, in 1888, and of Manitoba University in 1904.

MARKET CONDITIONS.

Following the quotations of the various articles listed in the markets will be found in brackets numbers, thus (10). These numbers refer to the list number of advertisers on page 3 of this issue, and will assist the reader to quickly find the name and address of a firm handling any particular article. Buyers not able to secure articles from these firms at the prices mentioned will confer a favor by letting us know.

Montreal, April 14th, 1910.

Deliveries of pig iron in the United States are still heavy and large quantities are still being manufactured. It is claimed, however, that the quantity being manufactured is largely in excess of that going into consumption, taking the country as a whole. In certain sections, requests are being received to delay shipping goods thirty to sixty days. During the past week have been heard rumors of intentions on the part of certain producers to curtail their output and it now seems certain that a number of smaller furnaces will shortly be blown out. Many furnaces are not taking the coke they contracted for at the anticipated rate, thus causing further depression in the spot market.

The principal factor in the trade at present is the uncertainty of the labor situation. Thousands of miners are reported to have left their work and many others are threatening to join them. All this labor unrest is

naturally exerting a disadvantageous influence upon the trade. It is generally admitted that most of the recent business has been done at a decline in price and the tendency towards lower levels is still observable. About the only business worthy of special mention, at the moment, is that coming from the car and railway works, and even here nothing particularly encouraging is to be noted. An order for no less than 800,000 tons of furnace coke has just been booked for delivery, extending over three years.

In Great Britain, producers of pig-iron, almost without exception, continue to take a hopeful view of the market, particularly as labor troubles, actual and anticipated, seem to be diminishing. Makers are not exhibiting any hurry to sell, except upon their own terms, their belief being that prices are more likely to advance than to decline. Demand for finished iron and steel is still increasing, and makers of plates and angles are in receipt of a substantial volume of business. The ship-building industry continues to show activity and the volume of work is steadily increasing. Although prices are firm, there does not seem to be any great increase in the amount of business being put through by the trade as a whole.

Trade in the local market shows but little change, as compared with the past few weeks. Demand keeps up and stocks on spot are practically cleaned out, so that the entire trade is waiting on supplies to arrive on the opening of navigation. Demand for deliveries extending over the summer months is fairly good, and some good orders have been placed. Prices continue steady and the tendency for special Scotch brands is in an upward direction.

Merchants report that the market for plates and sheets continues steady, although more has to be paid for the new stock. At the same time prices on the old stock refuse to advance, and dealers hardly know what to expect from the situation. Trade, however, is excellent, being largely in excess of that of a year ago.

Prices are as follows:—

Antimony.—The market is steady at 8¼ to 8½c. (111).

Bar Iron and Steel.—The market promises to advance shortly. Bar iron, $1.85 per 100 pounds; best refined horseshoe, $2.10; forged iron, $2; mild steel, $1.85; sleigh shoe steel, $1.85 for 1 x ⅜-base; tire steel, $1.00 for 1 x ⅜-base; toe calk steel, $2.35; machine steel, iron finish, $1.90; imported, $2.20. (111, 119).

Building Paper.—Tar paper, 7, 10, or 16 ounces, $1.80 per 100 pounds; felt paper, $2.75 per 100 pounds; tar sheathing, 40c. per roll of 400 square feet; dry sheathing, No. 1, 30 to 40c. per roll of 400 square feet; tarred year will be the largest in the history of the country. Prices on foreign fibre, 55c. per roll; dry fibre, 45c. (See Roofing; also Tar and Pitch). (164).

Cement.—Canadian cement is quotable, as follows, in car lots, f.o.b., Montreal:—$1.30 to $1.40 per 350-lb. bbl., in 4 cotton bags, adding 10c. for each bag. Good bags re-purchased at 10c. each. Paper bags cost 2¼ cents extra, or 10c. per bbl. weight. (26, 164).

Chain.—Prices have advanced considerably of late, being now as follows per 100 lbs.:—¼-inch, $5.10; 5-16-inch, $4.50; ⅜-inch, $3.70; 7-10-inch $3.45; ½-inch, $3.35; 9-16-inch, $3.25; ⅝-inch, $3.20; ¾, ⅞ ,and 1-inch, $3.15.

Coal and Coke.—Anthracite, egg, stove or chestnut coal, $6.75 per ton, net; furnace coal, $6.50, net. Bituminous or soft coal: Run of mine, Nova Scotia coal, carload lots, basis, Montreal, $3.85 to $4 per ton; cannel coal, $9 per ton; coke, single ton, $5; large lots, special rates, approximately $4 f.o.b., cars, Montreal.

Copper.—Prices are strong at 14¼ to 14½c.

Explosives and Accessories.—Dynamite, 50-lb. cases, 40 per cent. proof, 15c. in single case lots, Montreal. Blasting powder, 25-lb. kegs, $2.25 per keg. Special quotations on large lots of dynamite and powder. Detonator caps, case lots, containing 10,000, 75c. per 100; broken lots, $1; electric blasting apparatus:—Batteries, 1 to 10 holes, $15; 1 to 20 holes, $25; 1 to 30 holes, $35; 1 to 40 holes, $50. Wire, leading, 1c. per foot; connecting, 50c. per lb. Fuses, platinum, single strength, per 100 fuses:—4-ft. wires, $3; 6-ft. wires, $3.54; 8-ft. wires, $4.08; 10-ft. wires, $5.

Galvanized Iron.—The market is steady. Prices, basis, 28-gauge, are:—Queen's Head, $4.10; Colborne Crown, $3.85; Apollo, 10¾ oz., $4.05. Add 25c. to above figures for less than case lots; 26-gauge is 25c. less than 28-gauge, American 28-gauge and English 26 are equivalents, as are American 10¾ oz., and English 28-gauge. (111).

Galvanized Pipe.—(See Pipe, Wrought and Galvanized).

Iron.—The outlook is strong. The following prices are for carload quantities and over, ex-store, Montreal, prompt delivery; No. 1 Summerlee, $21.50 to $22 per ton; selected Summerlee, $21 to $21.50; soft Summerlee, $20.50 to $21; Clarence, $19.50 to $20; Carron, No. 1, $21.50 to $22, and Carron special, $21 to $21.50. (111).

Laths.—See Lumber, etc.

Lead.—Prices are about steady at $3.55 to $3.65.

Lead Wool.—$10.50 per hundred, $200 per ton, f.o.b., factory.

Lumber, Etc.—Prices on lumber are for car lots, to contractors, at mill points, carrying a freight of $1.50. Red pine, mill culls out, $18 to $22 per 1,000 feet; white pine, mill culls, $16 to $17. Spruce, 1-in by 4-in. and up, $15 to $17 per 1,000 ft.; mill culls, $12 to $14. Hemlock, log run, culls out, $13 to $15. Railway Ties; Standard Railway Ties, hemlock or cedar, 35 to 45c. each, on a 5c. rate to Montreal. Telegraph Poles: Seven-inch top, cedar poles, 25-ft. poles, $1.35 to $1.50 each; 30-ft., $1.75 to $2; 35-ft., $2.75 to $3.25 each, at manufacturers' points, with freight rate to Montreal. Laths: Quotations per 1,000 laths, at points carring $1.50 freight rate to Montreal, $2 to $3. Shingles: Cedar shingles, same conditions as laths, X. $1.50; XX, 2.50; XXX, $3. (112).

Nails.—Demand for nails is better and prices are firmer, $2.40 per keg for cut, and $2.35 for wire base prices. Wire roofing nails, 5c. lb.

Paints.—Roof, barn and fence paint, 90c. per gallon; girder, bridge and structural paint for steel or iron—shop or field—$1.20 per gallon, in barrels; liquid red lead in gallon cans, $1.75 per gallon.

Pipe.Cast Iron.—The market shows a steady tone although demand is on the dull side. Prices are firm, and approximately as follows:—$32 for 6 and 8-inch pipe and larger; $33 for 3-inch and 4-inch at the foundry. Pipe, specials, $3 per 100 pounds. Gas pipe is quoted at about $1 more than the above. (74, 188).

Pipe.—Wrought and Galvanized.—Demand is about the same, and the tone is firm, though prices are steady, moderate-sized lots being: ¼-inch, $5.50 with 63 per cent. off for black, and 48 per cent off for galvanized; ⅜-inch, $5.50, with 59 per cent. off for black and 44 per cent. off for galvanized; ½-inch, $8.50, with 69 per cent. off for black, and 59 per cent. off for galvanized. The discount on the following is 71¼ per cent. off for black, and 61¼ per cent. off for galvanized; ¾-inch, $11.50; 1-inch, $16.50; 1¼-inch, $22.50; 1½-inch, $27; 2-inch, $36; 2½-inch, $57.50; 3-inch, $75.50; 3½-inch. $95; 4-inch, $108.

Plates and Sheets.—Steel.—The market is steady. Quotations are: $2.20 for 3-16; $2.30 for ⅛, and $2.10 for ¼ and thicker; 12-gauge being $2.30; 14-gauge, $2.15; and 16-gauge, $2.10. (111).

Rails.—Quotations on steel rails are necessarily only approximate and depend upon specification, quantity and delivery required. A range of $30.50 to $31 is given for 60-lb. and 70-lb.; 80-lb. and heavier, being $30; rails, per gross ton of 2,240 lbs., f.o.b. mill. Re-laying rails are quoted at $27 to $29 per ton, according to condition of rail and location. (73).

Railway Ties.—See lumber, etc.

Roofing.—Ready roofing, two-ply, 70c. per roll; three-ply, 95c. per roll of 100 square feet. Roofing tin caps, 6c. lb.; wire roofing nails, 5c. lb. (See Building Paper; Tar and Pitch; Nails, Roofing). (164).

Rope.—Prices are steady, at 9c. per lb. for sisal, and 10½c. for Manila. Wire rope, crucible steel, six-strands, nineteen wires; ¼-in., $2.75; 5-16, $3.75; ⅜, $4.75; ½, $5.25; ⅝, $6.25; ¾, $8; ⅞, $10; 1-in., $12 per 100 feet. (132).

Spikes.—Railway spikes are firmer at $2.45 per 100 pounds, base of 5¼ x 9-16. Ship spikes are steady at $2.85 per 100 pounds, base of ⅝ x 10-inch, and ⅝ x 12-inch. (132).

Steel Shafting.—Prices are steady at the list, less 25 per cent. Demand is on the dull side.

Telegraph Poles.—See lumber, etc.

Tar and Pitch.—Coal tar, $3.50 per barrel of 40 gallons, weighing about 500 pounds; roofing pitch, No. 1, 70c. per 100 pounds; and No. 2, 55c. per 100 pounds; pine tar, $8.50 per barrel of 40 gallons, and $4.75 per half barrel; refined coal tar, $4.50 per barrel; pine pitch, $4 per barrel of 180 to 200 pounds. (See building paper; also roofing).

Tin.—Prices are firm, at $34.50 to $35.

Zinc.—The tone is easy, at 5¾ to 6c.

CAMP SUPPLIES.

Beans.—Prime pea beans, $2 per bushel. (74).

Butter.—September and October creamery, 28 to 32c.; dairy, 23 to 24c.

Canned Goods.—Per Dozen.—Corn, 80 to 85; peas, $1.05 to $1.15; beans, 75 to 80c.; tomatoes, 82½ to 90c.; peaches, 2s, $1.65, and 3s, $2.65; pears, 2s, $1.60, and 3s, $2.30; salmon, best brands, 1-lb. talls, $1.87½, and flats, $2.02½; cheaper grades, 95c. to $1.65. (74).

Cheese.—Finest, colored, 12¾c.; white, 13 to 13¼c. (74).

Coffee.—Mocha, 20 to 25c.; Santos, 15 to 18c.; Rio, 10 to 12c. (74).

Dried Fruits.—Currants, Filiatras, 5¾ to 6½c.; choice, 8 to 9c.; dates, 4 to 5c.; raisins, Valentias, 5 to 6c.; California, seeded, 7½ to 9c.; Sultana, 8 to 10c. Evaporated apples, prime, 9¼ to 9¾c. (74).

Eggs.—New laid, 21 to 23c. (74).

Flour.—Manitoba, 1st patents, $5.80 per barrel; 2nd patents, $5.30; strong bakers, $5.10. (74).

Molasses and Syrup.—Molasses, New Orleans, 27 to 28c.; Barbadoes, 40 to 50c.; Porto Rico, 40 to 45c.; syrup, barrels, 3½c.; 2-lb. tins, 2 dozen to case, $2.50 per case. (74).

Potatoes.—Per 90 lbs., good quality, 45 to 60c. (74).

Rice and Tapioca.—Rice, grade B., in 100-lb. bags, $2.95 to $3; C.C., $2.90. Tapioca, medium pearl, 4½ to 4¾c. (74).

Rolled Oats.—Oatmeal, $2.45 per bag; rolled oats, $2.20, bags. (74).

Tea.—Japans, 20 to 38c.; Ceylons, 20 to 40c.; Ceylon, greens, 19 to 25c.; China, greens, 25 to 50c.; low-grades, down to 15c. (74).

Fish.—Salted.—Medium cod, $7 per bbl.; herring, $5.25 per bbl.; salmon, $15.50 per bbl., for red, and $14 for pink. Smoked fish.—Bloaters, $1.10 per large box; haddies, 7½c. per lb.; kippered herring, per box, $1.20 to $1.25. (74).

Provisions.—Salt Pork.—$30 to $34 per bbl.; beef, $18 per bbl.; smoked hams, 16 to 20c. per lb.; lard, 17 to 18c. for pure, and 11¾ to 13½c. per lb. for compound. (74).

MONTREAL HORSE MARKET.

Dealers reported a slight improvement in trade. It would seem that Manitoba and the Northwest is taking quite a few cheap horses just now, prices ranging from $75 to about $125 each. Heavy draft, 1,500 to 1,700 lbs., $250 to $325 each; light draft, 1,400 to 1,500 lbs., $200 to $250 each; light animals, 1,000 to 1,100 lbs., $100 to $175 each; inferior, broken-down horses, $50 to $100 each, and choice saddle or carriage animals, $350 to $500 each.

* * * *

Toronto, April 14th, 1910.

It is now two weeks since the strike began (1st April) among bituminous coal mine workers in Virginia and Pennsylvania. Owing to these labor troubles the supply everywhere is lessened, and manufacturers here as well as in the United States are threatened with having to shut down. The Hamilton smelter has a very light supply, and Toronto is not much better off. It is difficult to quote prices now. Contracts are being made, it is true, but not to any great extent, on account of unsettled condition of the market. However, it is expected that a speedy settlement will be effected. The mines are getting in shape to handle the larger tonnage expected to be needed after all the differences are adjusted and the trade settles down.

As to anthracite the present prices may be said to govern, i.e., $7.25 net, with $6 for pea coal. But the summer quotations will begun on 1st May, which may be expected to be reduced.

The following are wholesale prices for Toronto, where not otherwise explained, although for broken quantities higher prices are quoted:

Antimony.—Demand quiet at 9c. per 100 lbs. (332).

Axes.—Standard makes, double bitted, $8 to $10; single bitted, per dozen, $7 to $9. (217, 377).

Bar Iron.—$2.00 to $2.10, base, per 100 lbs., from stock to wholesale dealer. Market supply limited. (332).

Bar Mild Steel.—Per 100 lbs., $2.10 to $2.20. (372).

Boiler Plates.—¼-inch and heavier, $2.20. Boiler heads 25c. per 100 pounds advance on plate. Tank plate, 3-16-inch, $2.40 per 100 pounds. (241, 362, 456).

Boiler Tubes.—Orders continue active. Lap-welded, steel, 1¼-inch, 10c.; 1½-inch, 9c. per 10 foot; 2-inch, $8.50; 2¼-inch, $10; 2½-inch, $10.60; 3-inch, $11 to $11.50; 3½-inch, $18 to $18.50 per 100 feet. (514).

Building Paper.—Plain, 27c. per roll; tarred, 35c. per roll. Demand is moderate. (518).

Bricks.—In active movement, with very firm tone. Price at some yards $9 to $9.50, at others, $9.50 to $10 for common. Don Valley pressed brick are in request. Red and buff pressed are worth $18 delivered and $17 at works per f,000. (518).

Broken Stone.—Lime stone, good hard, for roadways or concrete, f.o.b., Schaw station, C.P.R., 75c. until further notice, per ton of 2,000 lbs., 1-inch, 2-inch, or larger, price all the same. Rubble stone, 55c. per ton, Schaw station, and a good deal moving. Broken granite is selling at $3 per ton for good Oshawa. (518).

Cement.—Car lots, $1.75 per barrel, without bags. In 1,000 barrel lots $1.60. In smaller parcels $1.90 is asked by city dealers. Bags, 40c. extra. (61, 518).

Coal.—Anthracite, $7.25 net at retail for grate, egg, stove, chestnut; pea coal, $6. We suspend quotations for bituminous, owing to the strike in the Virginia and Pittsburg coal mines. It is impossible to get quotations meanwhile. Stocks in Canada are small, and manufacturers are apprehensive.

Copper Ingot.—The market may be described as "very sick," and the price is 13¾ to 14c.

Detonator Caps.—75c. to $1 per 100; case lots, 75c. per 100; broken quantities, $1. (212).

Dynamite, per pound, 21 to 25c., as to quantity. (212).

Felt Roofing.—The spring trade has opened very well at an unchanged price, which is $1.80 per 100 lbs. (518).

Fire Bricks.—English and Scotch, $30 to $35; American, $25 to $35 per 1,000. Fire clay, $8 to $12 per ton. (518).

Fuses.—Electric Blasting.—Double strength 4 feet, $4.50; 6 feet, $5; 8 feet, $5.50; 10 feet, $6. Single strength, 4 feet, $3.50; 6 feet, $4; 8 feet, $4.50; 10 feet, $5, per 100 count. Bennett's double tape fuse, $6 per 1,000 feet. (212, 217, 377).

Iron Chain.—¼-inch, $5.75; 5-16-inch, $5.15; ¾-inch, $4.15; 7-16-inch, $3.95; ½-inch, $3.75; 9-16-inch, $3.70; ⅝-inch, $3.55; ¾-inch, $3.45; ⅞-inch, $3.40; 1-inch, $3.40, per 100 lbs. (217, 377).

Iron Pipe.—A steady request at former prices:—Black, ¼-inch, $2.03; ⅜-inch, $2.25; ½-inch, $2.63; ¾-inch, $3.28; 1-inch, $4.70; 1¼ inch, $6.41; 1½-inch, $7.70; 2-inch, $10.26; 2½-inch, $16.39; 3-inch, $21.52; 3½-inch, 27.08; 4-inch, $30.78; 4½-inch, $35.75; 5-inch, $39.85; 6-inch, $51.70. Galvanized, ¼-inch, $2.86; ⅜-inch, $3.08; ½-inch, $3.48; ¾-inch, $4.43; 1-inch, $6.35; 1¼-inch, $8.66; 1½-inch, $10.40; 2-inch, $13.86, per 100 feet. (185).

Pig Iron.—There is great activity and prices are maintained. Clarence quotes at $21 for No. 3; Cleveland, $20.50 to $21, Summerlee, for winter delivery, $22.50 in Canadian pig, Hamilton quotes $19.50 to $20 per ton Producing plants are everywhere busy, and there is considerable business in prospect for 1910. (332, 372).

Lead.—The market is slightly easier, we quote $3.75 to $3.85.

Lime.—Retail price in city 35c. per 100 lbs. f.o.b., car; in large lots at kilns outside city 22c. per 100 lbs. f.o.b. car without freight. Demand is moderate. (518).

Lumber.—Dimension stuff is in brisk demand, for present or later delivery. Prices are generally firm, especially in pine. We quote dressing pine $32.00 to $35.00 per M; common stock boards, $26 to $30; cull stocks, $20; cull sidings, $17.50; Southern pine dimension timber from $30 to $45, according to size and grade; finished Southern pine according to thickness and width, $30 to $40. Hemlock in car lots, $17 to $17.50; spruce flooring, car lots, $22 to $24; shingles, British Columbia, are steady, we quote $3.10, lath growing scarce and stiffening, No. 1, $4.40, white pine, 48-inch; No. 2, $3.75; for 32-inch, $1.70. (333).

Nails.—Wire, $2.35 base; cut, $2.60; spikes, $2.85 per keg of 100 lbs. (217, 377).

Pitch and Tar.—Pitch, unchanged at 70c. per 100 lbs. Coal tar dull at $3.50 per barrel. (518).

Plaster of Paris.—Calcined. New Brunswick, hammer brand, car lots $1.95; retail, $2.15 per barrel of 300 lbs. (518).

Putty.—In bladders, strictly pure, per 100 lbs., $2.25; in barrel lots, $2.10. Plasterer's, $2.15 per barrel of three bushels. (518).

Ready Roofing.—An active demand; prices are as per catalogue. (453).

Roofing Slate.—Most of the slate used in Canada comes now from Pennsylvania or Maine, the Canadian supply being slender and mostly from the Rockland quarries of the Eastern Townships in Quebec. There is a great variety of sizes and qualities, so that it is difficult to indicate prices. But No. 1 Bangor slate 10 x 16 may be quoted at $7 per square of 100 square feet, f.o.b., cars, Toronto; seconds, 50c. less. Mottled, $7.25; green, $7, with a prospect of advance. Dealers are beginning to be busy. (518).

Rope.—Sisal, 9½c. per lb.; pure Manila, 10½c. per lb., Base. (217, 377).

Sand.—Sharp, for cement or brick work, 90c. per ton f.o.b., cars, Toronto siding. (518).

Sewer Pipe.—

	4-in.	6-in.	9-in.	10-in.	12-in.	24-in.
Straight pipe per foot	$0.20	$0.30	$0.65	$0.75	$1.00	$3.25
Single junction, 1 or 2 ft. long	.90	1.35	2.70	3.40	4.50	14.65
Double junctions	1.50	2.50	5.00	....	8.50	.....
Increasers and reducers		1.50	2.50	....	4.00	.....
P. traps	2.00	3.50	7.50	....	15.00	.....
H. H. traps	2.50	4.00	8.00	....	15.00	.....

Business moderate; price, 73 per cent. off list at factory for car-load lots; 65 per cent. off list retail. (96, 211, 421).

Steel Beams and Channels.—Quiet.—We quote:—$2.50 to $2.75 per 100 lbs., according to size and quantity; if cut, $2.75 to $3 per 100 lbs.; angles, 1¼ by 3-16 and larger, $2.50; tees, $2.80 to $3 per 100 pounds. Extra for smaller sizes of angles and tees. (65, 77, 94, 241, 362, 363, 372, 454, 551).

Steel Rails.—80-lb., $35 to $36 per ton. The following are prices per gross ton, for 500 tons or over; Montreal, 12-lb. $45, 16-lb. $44, 25 and 30-lb. $43. (217, 377,422).

Sheet Steel.—The market continues steady; American Bessemer, 10-gauge, $2.50; 12-gauge, $2.55; 14-gauge, $2.35; 17, 18, and 20-gauge, $2.45; 22 and 24-gauge, $2.50; 26-gauge, $2.65; 28-gauge $2.85. As the dumping clause has been put in operation, an advance in price may be looked for. (65, 77, 94, 241, 362, 363, 372, 454, 551).

Sheets Galvanized.—Apollo Brand.—Sheets 6 or 8 feet long, 30 or 36 inches wide; 10-gauge, $2.90; 12-14-gauge, $3.00; 16, 18, 20, $3.10; 22-24, $3.25; 26, $3.40; 28, $3.85; 29, $4.15; 10¾, $4.15 per 100 lbs. Fleur de Lis—28-gauge, $4; 26, $3.80 per 100 lbs. A very large tonnage of all sorts has been booked. The feeling is toward an advance. (332).

Tank Plate.—3-16-inch, $2.40 per 100 lbs. (241, 362).

Tool Steel.—Jowett's special pink label, 10½c. Cammel-Laird, 16c. "H.R.D." high speed tool steel, 65c. (3, 372).

Tin.—Irregular outside, but firmly held locally. At present we quote slightly higher, at 34½ to 35c.

Wheelbarrows.—Navvy, steel wheel, Jewel pattern, knocked down, $21.60 per dozen; set up, $22.60. Pan Canadian, navvy, steel tray, steel wheel, $3.30 each; Pan American, steel tray, steel wheel, $4.25 each. (217, 377).

Zinc Spelter.—A very active movement continues, and a large business is being done. Price as before, $5.75 to $6 per 100 lbs.

CAMP SUPPLIES.

Butter.—Dairy prints, 25 to 26c.; creamery prints, 30 to 32c., the supply is very limited and the demand brisk. (74).

Canned Goods.—Peas, $1.10 to $1.50; tomatoes, 3s, 85c. to 95c.; pumpkins, 3s, 80 to 85c.; corn, 80 to 85c.; peaches, 2s, white, $1.50 to $1.60; yellow, $1.90 to $1.95; strawberries, 2s, heavy syrup, $1.50 to $1.85; raspberries, 2s, $1.50 to $1.95. (74).

Cheese.—Moderately firm; large, 13c.; twins, 13¼c. (74).

Coffee.—Rio, green, 11 to 12½c.; Mocha, 21 to 23c.; Java, 20 to 31c.; Santos, 11 to 15c. (74).

Dried Fruits.—Raisins, Valencia, 5¾ to 6¼c.; seeded, 1-lb. packets, fancy, 7½ to 8c.; 16-oz. packets, choice, 7 to 7½c.; 12-oz. packets, choice, 7c.; Sultanas, good, 5 to 6c.; fine, 6 to 7c.; choice, 7 to 8c.; fancy, 8 to 9c.; Filiatras currants, 6½ to 7c.; Vostizzas, 8½ to 9c.; uncleaned currants, ¼c. lower than cleaned. California Dried Fruits,—Evaporated apricots, 15 to 16c. per lb.; prunes, 60s to 70s, 7½ to 8c.; 90s to 100s, 6c.; evaporated apples, 8c. (74).

Eggs.—New laid, free receipts, good demand, 20 to 21c. per dozen, in case lots. (74).

Flour.—Manitoba Flour.—Quotations at Toronto are:—First patents, $5.60; second patents, $5.10; strong bakers', $4.90; 90 per cents., Glasgow freights, 28s. 6d. Ontario Flour.—Winter wheat patents, for export, $4.20 to $4.25, in bupers' sacks outside. (74).

Lard.—In small supply, and again advanced. Tierces, 16¾c.; tubs 17c.; pails, 17¼ to 17¾c. (74).

Molasses.—Barbadoes, barrels, 37 to 45c.; West Indian, 27 to 30c.; New Orleans, 30 to 33c. for medium. (74).

Pork.—Market very firm. Short cut, $29 to $30 per barrel; mess, $27 to $28. Light stocks and not much doing. (74).

Rice.—B. grade, 3½c. per lb.; Patna, 5 to 5¾c.; Japan, 5 to 6c. (74).

Salmon.—Fraser River, talls, $2; flats, $2; River Inlet, $1.55 to $1.75. (74).

Smoked and Dry Salt Meats.—Long clear bacon, 15 to 15½c. per lb., tons and cases; hams, large, 17 to 17½c.; small, 17½ to 18c.; rolls, 15 to 15¼c.; breakfast bacon, 19 to 20c.; backs (plain), 20 to 21c.; backs (peameal), 21 to 22c.; shoulder hams, 13½c.; green meats out of pickle, 1c. less than smoked. Market very firm. (74).

Spices.—Allspice, 15 to 19c.; nutmegs, 30 to 75c.; cream tartar, 22 to 25c.; compound, 15 to 20c.; pepper, black, pure Singapore, 14 to 17c.; pepper, white, 20 to 30c. (74).

Sugar.—Granulated, $5.20 per 100 lbs., in barrels; Acadia, $5.10; yellow, $4.80; bags, 5c. lower. (74).

Syrup.—Corn syrup, special bright, 3½c. per lb. (74).

Teas.—Japans, 20 to 35c. per lb.; Young Hysons, 16 to 35c.; Ceylons, medium, 16 to 45c. (74).

Vegetables.—Beans, hand-picked, $2.35; prime, $2.25; stocks light, market firm; beets, 85c. a bag; carrots, 60 and 65c. a bag; onions, $1.25 a bag; potatoes, best, 65 and 70c. a bag; turnips, 45c. a bag. (38).

TORONTO HORSE MARKET.

The general outlook for the horse trade is good, prices are still steady with an upward tendency, $290 has been given in several cases, $200 to $225, with the supply very limited.

* * * *

Winnipeg, April 12th, 1910.

The splendid weather that has prevailed in Western Canada this spring has brought the building season on with such a rush that supply houses are extraordinarily busy, and in several cases prices have gone up. It is practically impossible to secure common brick at any price, while face brick, cement, stone, and terra cotta, as well as fireproofing brick, are very scarce.

It is estimated that so far this spring more than five millions of bricks have been ordered, and to-day local stocks are exhausted. Dealers are bringing this material to Winnipeg from Portage la Prairie, Beausejour, and Sidney, but the supply is not equal to the demand. It is stated that this shortage in brick alone will delay the building operations on large structures almost a month. Brick which previously sold at ten dollars a thousand is now quoted at eleven dollars.

Lumber has also been increased in price. Both pine and fir products are listed at from two to three dollars per thousand feet in advance of the prices asked at the opening of the year.

The increase in the cost of brick is due to the shortage, and the shortage in turn is caused by the heavy spring demand. The shortage is more noticeable than during any previous year, and may be responsible for many extensions to brick-yards this summer. Winter building is also blamed for the present shortage. Last winter was practically the first winter in the history of the Western Metropolis when building operations were carried on, and reserve stocks of material were greatly depleted by this unexpected condition. Supply firms will not be able to overcome the difficulty until new

(Continued on page 50).

TENDERS CALLED FOR

Department of Railways and Canals, Canada.

NOTICE TO CONTRACTORS.

SEALED TENDERS addressed to the undersigned, and endorsed "Tender for Removing Range Beacon, and widening the Channel at the Upper Entrance," will be received at this office until 16 o'clock on **Thursday, the 28th April, 1910.**

Plans, specifications and the form of the contract to be entered into can be seen on and after the 8th April, 1910, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Engineer in charge, Sault Ste. Marie, Ont., at which places forms of tender may be obtained.

Parties tendering will be required to accept the fair wages Schedule prepared, or to be prepared, by the Department of Labor, which schedule will form part of the Contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signatures, the nature of the occupation and the place of residence of each member of the firm.

An accepted bank cheque for the sum of $500.00, made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security or part security for the due fulfillment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order.

L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, 8th April, 1910.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

TRENT CANAL

Ontario-Rice Lake Division

SECTION No. 4.

NOTICE TO CONTRACTORS.

SEALED TENDERS addressed to the undersigned, and endorsed "Tender for Trent Canal," will be received until 16 o'clock on **Thursday, the 5th May, 1910,** for the works connected with the construction of Section No. 4, Ontario-Rice Lake Division of the Canal.

Plans, specifications and the form of the contract to be entered into can be seen on and after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, Trent Canal, Peterboro', Ont., at which places forms of tender may be obtained.

Parties tendering will be required to accept the fair wages Schedule prepared, or to be prepared, by the Department of Labor, which schedule will form part of the Contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signatures, the nature of the occupation and the place of residence of each member of the firm.

An accepted bank cheque for the sum of $20,000.00, made payable to the order of the Honorable the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work at the rates stated in the offer submitted.

The cheque thus sent will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security or part security for the due fulfillment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order.

L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, 7th April, 1910.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

TRENT CANAL

Ontario-Rice Lake Division

SECTION No. 6.

NOTICE TO CONTRACTORS.

SEALED TENDERS addressed to the undersigned, and endorsed "Tender for Trent Canal," will be received until 16 o'clock on **Tuesday, the 26th April, 1910,** for the works connected with the construction on Section No. 6, Ontario-Rice Lake Division of the Canal.

Plans, specifications and the form of contract to be entered into can be seen on and after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, Trent Canal, Peterboro', Ont., at which places forms of tender may be obtained.

Parties tendering will be required to accept the fair wages Schedule prepared, or to be prepared, by the Department of Labor, which schedule will form part of the Contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signatures, the nature of the occupation and the place of residence of each member of the firm.

An accepted bank cheque for the sum of $10,000.00, made payable to the order of the Honorable the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work at the rates stated in the offer submitted.

The cheque of the successful tenderer will be held as parties whose tenders are not accepted.

The cheque of th esuccessful tenderer will be held as security or part security for the due fulfillment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order.

L. K. JONES,
Secretary

Department of Railways and Canals,
Ottawa, 5th April, 1910.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

TENDERS—Continued on page 50.

POSITIONS WANTED

Advertisements under this heading, three cents a word. Displayed, $1.00 an inch.

CHAINMAN, with previous experience in Northern Ontario, desires position on survey party. Box 76, Canadian Engineer.

POSITION WANTED.– Civil Engineer desires appointment. Experienced in Britain and West Africa in railroad construction and maintenance, municipal engineering including surveying, sewage disposal, street railway, street, buildings, and sewers construction. Good draughstman, surveyor, and leveller, accustomed to preparing estimates. Associate Member of the Institute of Civil Engineers. Certificate from Royal Sanitary Institute in "Sanitary knowledge." Apply Box 72, Canadian Engineer.

POSITIONS VACANT

Advertisements under this heading, two cents a word. Displayed, $1.50 an inch.

WANTED.—A neat and rapid tracer for a railway engineer's office, Box 74, The Canadian Engineer.

AGENT WANTED in Canada for the sale of a special wood preservative manufactured by a British firm. The preparation is used extensively for the cure and prevention of dry rot in timber and for the cure of fungus. It is especially adapted for use on wood erections and for timber piling in rivers. Apply Box 76, Canadian Engineer.

AGENT WANTED for British firm of manufacturing electrical engineers. Apply Box 78, Canadian Engineer.

FOR SALE

Good Second-hand Hydraulic Hoist, complete, capacity 2½ tons. For sale, very cheap. Apply to R. J. Dodds, 16 King Street East, Toronto, Ont.

To the Civil Engineer and Engineering Contractors The Canadian Engineer is an investment—not an expense.

TENDERS FOR ELECTRICAL SUPPLIES.

SEALED TENDERS addressed to the Chairman of the Board of Control for supply of Arc Lamps and Regulating Apparatus, Switchboards and Accessories, Insulated Line Wire and Mast Arm Parts will be received at the office of the undersigned up to 11 a.m. on **Saturday, April 30th, 1910.** Specifications and conditions governing tenders as prescribed by by-law may be obtained at the office of the City Electrician; also at office of Canadian Engineer, 62 Church Street, Toronto. The lowest or any tender not necessarily accepted.

M. PETERSON,
Secretary.

Board of Control Office,
Winnipeg, April 6th, 1910.

CITY OF PRINCE ALBERT.

TENDERS FOR SIDEWALK.

SEALED TENDERS addressed to the undersigned, and marked "Tender for Sidewalk," will be received until noon on **Saturday, the 23rd day of April, 1910,** for the construction of about 10,500 lineal feet of Concrete Sidewalks and Crossings.

Plans and specifications may be seen and forms of tender obtained at the office of the City Engineer in the city of Prince Albert.

C. O. DAVIDSON,
City Clerk.

Dated at Prince Albert, Sask., April 5th, 1910.

NOTICE TO CONTRACTORS.

THE CANADIAN PACIFIC RAILWAY COMPANY.

IRRIGATION DEPARTMENT.

SEALED TENDERS addressed to the undersigned, and endorsed "Tenders for Concrete Construction," will be received up to noon of **April 15th, 1910,** for all the labor required to complete the concrete construction required in the Western Section of the Canadian Pacific Railway Company's Irrigation System, amounting to upwards of two thousand five hundred cubic yards of reinforced concrete, together with the necessary excavation and backfilling. Plans, specifications and all other information may be had at the office of the Assistant Chief Engineer, Calgary, on deposit of $5.00 (five dollars), which will be refunded on their return in good condition.

J. S. DENNIS,
Assistant to Second Vice-President.

Calgary, Alta., April 7th, 1910.

CANADIAN PACIFIC RAILWAY

ONTARIO DIVISION

NOTICE TO CONTRACTORS

Sealed tenders will be received in my office up to noon, Wednesday, 20th April, 1910, for the construction of a new station building, North Parkdale. Plans and specifications can be seen in my office, Room 601, Union Station. The lowest or any tender not necessarily accepted.

A. L. HERTZBERG,
Division Engineer.

Toronto, April 8th, 1910.

YORKTON, SASKATCHEWAN

Tenders will be received by the Secretary-treasurer of the town of Yorkton, Sask., until Monday, April 25, 1910, for the furnishing of a material and the construction of approximately 80,000 sq. ft. of concrete sidewalk. Particulars may be had on application to the Town Engineer. A marked cheque for $300.00 to accompany each tender. Lowest or any tender not necessarily accepted.

F. T. McARTHUR,
Town Engineer.

TENDERS, Continued on p. 52

(Continued from page 272).

brick is placed on the market which will not be for six weeks.

Other quotations are steady and are as follows:—

Anvils.—Per pound, 11 to 12½c.; Buckworth anvils, 80 lbs., and up, 10¼c.; anvil and vice combined, each, $5.50 (111, 132).

Axes.—Chopping axes, per dozen, $6 to $9; double bits $12.10 per dozen.

Barbed Wire.—4 point and 2 point, common, $3.15 per cwt.; Baker, $3.20; Waukegan, $3.30.

Bar Iron.—$2.50 to $2.60.

Bars.—Crow, $4 per 100 pounds. (119.)

Beams and Channels.—$3 to $3.10 per 100 up to 15-inch. (4, 30, 41, 50, 118, 119, 127, 132, 145, 176.)

Boards.—No. 1 Common Pine, 8 in. to 12 in., $38 to $45; siding, No. 2 White Pine, 6 in., $55; cull red or white pine or spruce, $24.50; No. 1 Clear Cedar, 6 in., 8 to 16 ft., $60; Nos. 1 and 2 British Columbia spruce, 4 to 6 in., $55; No. 3, $45.

Bricks.—$10, $11, $12 per M, three grades.

Building Paper.—4½ to 7c. per pound. No. 1 tarred, 84c. per roll; plain, 60c.; No 2 tarred, 62½c.; plain, 56c.

Coal and Coke.—Anthracite, egg, stove or chestnut coal, $9.75 large lots to $10.50 ton lots, net; Alleghany soft coal; carload lots, basis, Winnipeg, f.o.b., cars, $6 per ton; cannel coal, $10.50 per ton; Galt coal, $2 f.o.b., carload lots, $9 single ton; coke, single ton, $7 at yard; large lots, special rates. American coke, $11 to $11.50 a ton; Crow's Nest, $10 a ton.

Copper Wire.—Coopered market wire, No. 7, $4 per 100 lbs.; No. 6, $4; No. 10, $4.06; No. 12, $4.20; No. 14, $4.40; No. 16, $4.70.

Cement.—$2.25 to $2.50 per barrel, in cotton bags.

Chain.—Coil, proof, ¼-inch, $7; 5-16-inch, $5.50; ⅜-inch, $4.90; 7-16-inch, $4.75; ½-inch, $4.40; ⅝-inch, $4.20; ¾-inch, $4.05; logging chain, 5-16-inch, $6.50; ⅜-inch, $6; ¼-inch, $8.50; jack iron, single, per dozen yards, 15c. to 75c.; double, 25c. to $1; trace-chains, per dozen, $5.25 to $6.

Copper.—Tinned, boiler, 26½c.; planished, 29½c.; boiler and T. K. pits, plain, tinned, 45 per cent. discount.

Dynamite.—$11 to $13 per case.

Hair.—Plasterers', 80 to 90c. per bale.

Hinges.—Heavy T and strap, per 100 lbs., $6 to $7.50; light, do., 65 per cent.; screw hook and hinge, 6 to 10 inches, 5¼c. per lb.; 12 inches up, per lb., 4¼c

Galvanized Iron.—Apollo, 10¾, $4.90; 28, $4.70; 26, $4.30; 22, $4.10; 24, $4.10; 20, $4; 18, $3.95; 16, $3.90; Queen's Head, 28, $4.90; 26, $4.70; 24, $4.30; 22, $4.30; 20, $4.10 per cwt.

Iron.—Swedish iron, 100 lbs., $4.75 base; sheet, black, 14 to 22 gauge, $3.75; 24-gauge, $3.90; 26-gauge, $4; 28-gauge, $4.10. Galvanized—American, 18 to 20-gauge, $4.40; 22 to 24-gauge, $4.65; 26-gauge, $4.65; 28-gauge, $4.90; 30-gauge, $5.15 per 100 lbs. Queen's Head, 22 to 24-gauge, $4.65; 26-gauge English, or 30-gauge American, $4.90; 30-gauge American, $5.15; Fleur de Lis, 22 to 24-gauge, $4.50; 28-gauge American, $4.75; 30-gauge American, $5. (119).

Lead Wool.—$10.50 per hundred, $200 per ton, f.o.b., Toronto.

Lumber.—No. 1 pine, spruce, tamarac, British Columbia fir and cedar—2 x 4, 2 x 6, 2 x 8, 8 to 16 feet, except 10 feet, $27; 2 x 20 to 2 x 40, up to 32 feet, $40.

Nails.—$4 to $4.25 per 100. Wire base, $2.85; cut base, $2.90.

Picks.—Clay, $5 per dozen; pick mattocks, $6 per dozen; clevishes, 7c. per lb. (132.)

Pipe.—Iron, black, per 100 feet, ¼-inch, $2.50; ⅜-inch, $2.80; ½-inch, $3.40; ¾-inch, $4.60; 1-inch, $6.60; 1¼-inch, $9; 1½-inch, $10.75; 2-inch, $14.40; galvanized, ½-inch, $4.25; ¾-inch, $5.75; 1-inch, $8.35; 1¼-inch, $11.25; 1½-inch, $13.60; 2-inch, $18.10. Lead, 6½c. per lb.

Pitch.—Pine, $6.50 per barrel; in less than barrel lots, 4c. per lb.; roofing pitch, $1 per cwt.

Plaster.—Per barrel, $3.

Roofing Paper.—60 to 67½c. per roll.

Rope.—Cotton, ¼ to ½-in. and larger, 23c. lb.; deep sea, 16½c.; lath yarn, 9¼ to 9¾c.; pure Manila, per lb., 13¼c.; British Manila, 11¼c; sisal, 10½c. (132.)

18 to 20-gauge, $4.40; 22 to 24-gauge, $4.65; 26-gauge, $4.65; 28-gauge, $4.90; 30-gauge, $5.15 per 100 lbs. Queen's Head, 22 to 24-gauge, $4.65; 26-gauge English, or 30-gauge American, $4.90; 30-gauge American, $5.15; Fleur de Lis, 22 to 24-gauge, $4.50; 28-gauge American, $4.75; 30-gauge American, $5. (119.)

Spikes.—Basis as follows:—1¼ 5 and 6, $4.75; 5-16 x 5 and 6, $4.40; ⅜ x 6, 7 and 8, $4.25; ½ x 8, 9, 10, and 12, $4.05; 25c. extra on other sizes.

Steel Plates, Rolled.—3-16-in., $3.35 base; machinery, $3 base; share, $4.50 base; share crucible, $5.50; cast share steel, $7.50; toe calk, $4.50 base; tire steel, $3 base; cast tool steel, lb., 9 to 12½c.

Staples.—Fence, $3.40 per 100 lbs. (119).

Timber.—Rough, 8 x 8 to 14 x 16 up to 32 feet, $36; 6 x 20, 8 x 20, up to 32 feet, $40.

Tool Steel.—8½ to 15c. per pound.