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The Canadian Engineer

ESTABLISHED 1893

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Editor—E. A. JAMES, B.A. Sc.

Business Manager—JAMES J. SALMOND.

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HEAD OFFICE: 62 Church Street, and Court Street, Toronto TELEPHONE MAIN 7404.

Montreal Office: B 32 Board of Trade Building. T. C. Allum, Editorial Representative. Phone M 2797.

Winnipeg Office: Room 315, Nanton Building. Phone 8142. G. W. Goodall, Business and Editorial Representative.

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TORONTO, CANADA, OCTOBER 30th, 1908.

CONTENTS OF THIS ISSUE.

STEEL ORDERS.

Considerable activity exists among the steel plants of the United States. New orders are being placed, held orders are being revived, and in some instances new contracts are being made.

The Illinois Central Railway have ordered from the Chicago mills 25,000 tons of heavy section rails for prompt delivery. This order is on an old contract. The Pennsylvania Steel Company has entered orders for 2,000 tons of rails for trolley lines, 1,000 tons for Long Island and 1,000 for Pennsylvania delivery.

There is a greater demand for light sections than for heavy sections, and considerable competition exists, the rolling mills taking orders at $23.

In structural steel a large number of orders have been placed. Four thousand tons have been ordered for the steel viaduct at Denver, Col., and the Pennsylvania Bridge Company has been awarded Government contracts for steel lock gates at Hales Bar, Tenn., requiring 240 tons of steel. The same company will furnish five small highway bridges, requiring 250 tons of steel, for the Department of Public Works of New York State, as well as 200 tons for highway bridges in North Carolina. As previously noted, the Empire office building at Birmingham, Ala., will require 1,100 tons steel, and a hotel at San Antonio, Texas, 1,000 tons. The New York Central Railroad is asking bids for 2,000 tons steel additional for New York terminal work.

Although this volume of business is not unusually large, yet it indicates a revival of business.

DISTRIBUTION OF FREIGHT BY CITY STREET CAR SYSTEMS.

The Montreal Street Railway Company in their report give as receipts from freight carried for the year ending September, 1908, $17,783. This revenue from an undeveloped business indicates the value of a freight handling franchise to street railway companies.

A street railway freight handling system would be a great gain to the shipper and the public at large. It would also be a tremendous gain to the manufacturer located away from the sidings and freight tracks of the railways. The reduction in time and cost of cartage would place the smaller manufacturers scattered throughout the cities on a more equal footing with the large concerns.

Such a system would reduce the pavement traffic and permit of lighter pavements, would give us less crowded streets and better service and would reduce the municipalities' share of cost of street paving.

Electric lines now run into most of our cities and towns of any size. The ease with which they can collect freight twenty or thirty miles distant and deliver it, within an hour, in the heart of commercial centres has given its patrons such an advantageous position that there is a growing demand for such service. A financial proposition for the railways, 'tis true, yet municipalities should be careful and not exact unreasonable conditions, and thus check the spread of a convenience that would be appreciated by residents of urban and suburban districts alike.

PUBLIC OPINION AND THE RAILWAYS.

The present depression in Great Britain reduced the railway earnings to such a degree that some radical curtailment of expenses had to be made. On certain roads this reduction in expenses was effected by the managers entering into an operating agreement whereby each road discontinued certain train service, each agreeing to run certain trains at certain hours instead of both running trains through parallel districts at the same hour.

British papers commented favorably upon the arrangement, and the public generally lauded the management for their wisdom in meeting the situation.

Had such an agreement been entered into between roads on this side of the Atlantic there would be a perfect storm of protest and the management branded as tyrants and law-breakers.

Fairer consideration should be given by the public to the problems which confront the railways. Too frequently we expect for one fare the accommodation provided for four. In equipment and roadbed American roads compare favorably with British roads, and we should consider more kindly the suggestions of the management in connection with expense reduction.

EDITORIAL NOTES.

In this issue we commence a series of articles on "The Design of Canal Diversion Weirs on a Sand Foundation," by Mr. W. G. Bligh, M. Inst. C.E. Mr. Bligh is author of a book on "The Practical Design of Irrigation Works," and has spent several years in Public Works Department of India.

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The Japanese Government has decided to refrain, as far as possible, from purchasing foreign material for Government works. At the present time influential Japanese merchants are making inquiries for the purchase of iron or engine works with the object of manufacturing materials required by the Government.

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In the current number of the "Monetary Times," Toronto, there appears an interesting article on "Irrigation in Southern Alberta." Certain sections of the article we have republished, for it gives one a clear idea of the necessity for and the commercial advantages to be secured by means of irrigation in Western Canada. There will be in Canada a large field for the engineer expert in irrigation matters.

STORAGE BATTERIES.

Apropos of the discussion at the Nottingham Conference of Municipal Engineers originating upon Mr. Taylor's paper on Storage Batteries, the "D.P." Battery Company, Limited, of Bakewell, send us the following figures as an adept example of the saving resulting from the installation of one of their batteries after the station has been erected and running some years.

The comparison of working has been kindly furnished by the electrical engineer-in-charge. A Diesel oil engine was the motive power, having a guaranteed consumption of .468 pounds per B.H.P. hour at three-quarter load.

The following figures show the actual working results:

Nov., 1906—10.2 units were generated per gallon without battery.

Nov., 1907—12.3 units were generated per gallon with battery.

Thus the installation of the battery enabled an increase of 20 per cent. in the output on the same consumption of fuel.

Nov., 1906—Total units generated = 24628, Pounds of oil consumed = 22718 } Without battery.

Nov., 1907—Total units generated = 24516, Pounds of oil consumed = 18198 } With battery.

Thus the consumption of fuel was reduced by 24 per cent. on practically the same load.

Fuel consumption on average of four months' working, viz., November to February inclusive:

.580 pounds per B.H.P. hour without battery.
.474 pounds per B.H.P. hour with battery.

The reduction in the average consumption thus shown is 22.15 per cent.

These figures are striking, but are by no means the actual measure of economy effected, for the installing of a battery is followed by a reduction in the wages sheet, stores supply, etc. It is further evident that in designing a generating plant to meet the circumstances of a fluctuating load such as has to be provided for in power stations, factories, mines, iron works, and similar undertakings, the initial outlay can be considerably minimized by the equalizing of the load by means of a battery.

SEPTEMBER LAKE LEVELS.

The United State Lake Survey reports the stages of the Great Lakes for the month of September, as follows:

Lakes—	Feet above tide water New York.
Superior	602.79
Michigan-Huron	581.26
Erie	572.72
Ontario	247.14

Since last month, Lake Superior has fallen 2¼ inches, Lakes Michigan and Huron have fallen 5¼ inches, Lake Erie has fallen 5 inches, and Lake Ontario 9¾ inches. The large fall in all the levels of the lakes has been due to a drought of unusual persistence, rainfall being almost entirely lacking.

ERROR OF WATER METERS.

In connection with the many tests made in various boiler plants with the object of determining the conditions of every-day operation and how increased economy could be obtained, the Coal Department of the Arthur D. Little Laboratory, Boston, have had occasion to calibrate several water meters. In one instance a hot water meter read 55 per cent. too low, another read 30 per cent. low when passing 136 cubic feet per hour, and 36 per cent. when passing 102 cubic feet per hour. On account of the slip and leakage most of the meters read too low, but one case was found where a meter read 13.6 per cent. too high. Even with a calibrated meter the results are questionable on account of the varying error at different rates of flow and the non-uniformity of feeding the boiler.

THE NEW STEAM TURBINE POWER PLANT OF THE KERR MILLS OF THE AMERICAN THREAD CO., FALL RIVER, MASS.

In the early part of 1907 the American Thread Company decided to make an addition to their plant at Fall River. The old plant consisted of a spinning and twisting mill, dye and gassing house. The power for the main mill was derived from a double tandem-compound engine of about 1,600 indicated horse-power; and the dye and and gassing houses were driven by small engines, the power from these and the main engine being distributed throughout the various mills by belts and shafting.

It was decided to drive the new mill electrically, principally on account of the probability that, as the business increased, various additions would have to be made, and the electrical drive lends itself particularly well to this end. The building of the new plant necessitated the complete rearrangement of the machinery in the old main mill.

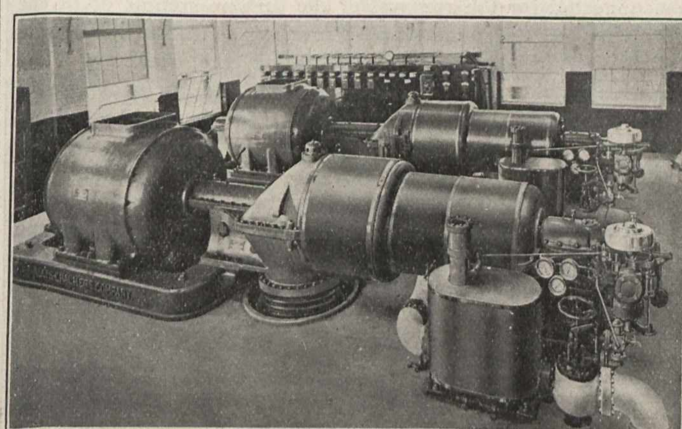
It was first proposed to merely make a new arrangement of the shafts and belts, and at some future time, when it became necessary to install a new engine, to change to electrical drive. An accident, which might have had serious results, occurred to the main engine before this plan had been carried out, which decided the management to abandon the engine and immediately install electric drive, not only in the new mill, but in the old mill as well. The new power house, described in this article, was, therefore, designed to furnish power for the complete plant, and is arranged so that it can be conveniently enlarged to care for future power requirements.

The power house is located on South Watuppa Pond. The tracks of the New York, New Haven and Hartford railroad run between the power house and the pond, cutting off a small body of water from the main pond. Connection was made with the main pond at two points, the water being brought into the power house through one of these connections and a trench, and the water from the condensers flowing into the small pond and thence under the railroad, through the other connection, into the main pond. These connections were placed some distance apart so that the used water would have no tendency to return to the power house.

The power house building consists of a turbine room, 43 ft. by 56 ft. and a boiler-room 58 ft. by 132 ft. The building is of brick, with concrete floors and roofs.

The boiler-room contains twelve horizontal tubular boilers, built by the Bigelow Co., of New Haven, Conn., each rated at 200 horse-power. Those boilers are hung from beam supports and are brick set, the setting being arranged so that superheaters can be installed in the rear end of the setting. Three Foster superheaters have been installed for the purpose of testing their durability and efficiency. The gases from each battery of six boilers pass through a flue to a green fuel economizer, and thence to the chimney. The flue back of each battery is arranged so that the gases can either pass to the chimney or through the economizers. All of the boilers are arranged for burning low grades of fuel, and are equipped with "Parson" blowers and arrangement of setting. A Warron Webster open feed-water heater and purifier is located at the end of the boiler-room, next to the turbine room. Two skylights are placed in the roof of the boiler-room, one over the firing space and one over the tops of the boilers. The wall opposite the front of the boilers and back of the firing space is made of galvanized iron, as any future addition to this boiler-room will be a duplication of the present layout, the new boilers facing the present ones. The boiler-room floor is level with the yard. Coal will be brought from the storage piles by a conveyor system and dropped in front of the boilers. The steam piping is arranged so that superheated or saturated steam can be supplied to the turbines or to the auxiliaries, either separately or in conjunction. This arrangement was made primarily for use in testing the efficiency of the different types of apparatus. The feed water is delivered to the open heater and purifier and is then pumped to the boilers. The feed-water main is of cast-iron, and so arranged that water can be supplied either from the pond or from the heater and purifier and delivered directly to the boilers or through the economizer. The drips from all of the high-pressure steam mains are collected at one point, and from there returned to the boilers by a Holly return system. The turbine room has two floors, but the upper floor, where the turbines are located, does not extend over the space occupied by the pumps. This space was left open so that the travelling crane, which is of ten tons capacity, and was built by the Northern Engineering Co., could be utilized in installing and repairing the auxiliaries as well as the turbines. The turbine room contains two 1,500 kw. Allis-Chalmers A.C. turbo-generators, two General Electric 75 kw. D.C. turbo-generator exciters, and a General Electric switchboard. This apparatus is located upon the upper floor level.

Incorporated in the main turbines are the various patented features controlled by the builders, Allis-Chalmers Company, among which may be mentioned channel-shaped shrouds protecting the ends of the blading from injury, machine-cut slots in the foundation rings insuring accurate spacing of the blades, a method of fastening the latter which effectually prevents them from working loose, and improved balance pistons. Other details of special interest will be mentioned briefly under the subjects to which they belong.



Two 1,500 k.w. Allis-Chalmers Steam Turbines and Generators.

The turbines operate at 1,800 revolutions per minute, with a steam pressure of 150 pounds at the throttle, dry saturated, and a vacuum of 28 in. of mercury referred to 30 in. barometer at the exhaust nozzle. Large temporary overload capacity has been provided for in the design of these machines; high efficiency is maintained and close regulation secured, even under the most unfavorable operating conditions. The bedplate is divided into two parts, one carrying the low-pressure end of the turbine. The turbine is secured to the former, while the latter is provided with guides, which permit the end of the turbine to slide back and forth with differences of expansion caused by varying temperature, at the same time maintaining the alignment. The "Bulkley" condensers are located outside the building. The speed of each turbine is regulated within close limits by a governor driven from the shaft through cut gears working in an oil bath. This governor, by means of a relay, operates a balanced throttle valve. The entire mechanism is so proportioned as to respond at once to variation of load, but its sensitiveness is kept within such bounds as to secure the best results in the parallel operation of the two turbo-generators in this station. The governors can be adjusted for speed while the turbines are running, thereby facilitating the synchronizing of the generators and dividing the load as may be desired. In order to provide for any possible accidental derangement of the main governing mechanism there is an entirely separate safety or over-speed governor. This governor is driven directly by the turbine shaft without the intervention of gearing, and is so arranged and adjusted that if the turbines should reach a predetermined speed above that for which the main governor is set the safety governor will come into action and trip a valve, shutting off the steam and stopping the turbine. The lubrication of the four bearings, two for the turbine and two for the generator, is effected by supplying an abundance of oil in the middle of each bearing by means of a small cycloidal pump, driven from the turbine shaft, and allowing it to flow out at the ends. The oil is passed through a tubular cooler with water circulation and pumped back to the bearings. It is not necessary to supply the bearings with oil under pressure, but only at a head sufficient to enable it to run to and through the bearings, this head never exceeding a few feet. No oil of any kind is used in the interior of the machines nor in the glands, through which their shafts pass. No oil alarms have been provided for the turbines. The hot parts of each turbine up to the exhaust chamber are covered with an ample thickness of non-conducting material and lagged with planished steel, so applied that it may be easily removed. The non-conducting covering is also removable at the cylinder joint to facilitate the opening of the turbine for examination. Between the turbine and its generator a special type of flexible coupling is used to provide for any slight inequality in the alignment of the bearings, to permit axial adjustment of the turbine spindle, and to allow for difference in expansion. This coupling is so made that it can be readily disconnected for the removal of the turbine spindle or of the revolving of the generator. Provision is made for ample lubrication of the adjoining faces of the coupling. The revolving field alternators driven by these turbines are of Allis-Chalmers Company's standard type, designed for high efficiency and safe operation at high peripheral speeds. Some of the principal advantages embodied in their construction are summarized as follows:—

The field core is built up of steel discs, each in one piece, giving high magnetic permeability and great strength. Coils are placed in radical slots, thereby avoiding side pressure on slot insulation and the complex stresses resulting from centrifugal force, which, in these rotors, acts normal to the flat surface of the strip windings. Bronze wedges hold the coils firmly in the slots, making the surface of the rotor a smooth cylinder, reducing windage losses and insuring quick operation. The end connections are securely held by chrome-nickel steel rings. The stator is completely enclosed, eliminating noise of operation. Coils were completely wound and insulated before being placed on the core, thus obviating the risk of defective insulation. Stator windings are placed in open slots, rendering the coils readily removable. End connections are firmly braced, preventing deformation of coils in case of short circuit.

For the purpose of obtaining adequate ventilation and for muffling the noise produced by the circulation of the air the turbo-generators are enclosed in such a manner that the air is taken in at the ends through fans mounted on the rotor shaft, which discharge it over the end connections of the armature coils into the bottom of the machine, whence it passes through the ventilating ducts of the core to an opening at the top. This patented system of ventilation is most efficient.

On the lower floor of the turbine room are two engine-driven Lawrence centrifugal pumps for condensing water, one Blake 1,000 gallon underwriter fire pump, one electrically-driven Deane triplex power pump for sanitary water for the mills, one Fairbanks-Morse duplex steam tank pump for water supply to the heater and purifier, one engine-driven Doane triplex power pump, and one Heisler duplex steam pump for boiler-feeding purposes. The engine-driven triplex boiler feed pump is arranged so that it is automatically controlled by the opening and closing of the boiler feed valves, a constant pressure being maintained on the feed line. Any lowering or raising of this pressure causes the pump to run faster or slower, according to the demand for water.

The level of high water in the pond is about one foot lower than the lower floor of the turbine room. At the end of this room, where the pumps are located, there is a trench, into which the water flows. All of the pumps have independent suction pipes from this trench. This arrangement is economical and works perfectly. The pump space may appear to be somewhat crowded, but it was thought best to use as little as possible, for when additional turbines are installed there will be ample space and to spare for all new pumps needed.

The switchboard is located on the same floor as the turbines, and consists of two panels controlling the exciters, two panels for the main turbo-generators, one panel for a Tirrill regulator, seven panels for the power circuits, and one panel connected to the lighting circuits. This switchboard has a complete equipment of instruments, and all switches are oil-immersed, except the main generator switches, which are solenoid-operated circuit-breakers. The feeder mains are carried underground to each mill through fibre conduits. Taken all in all, this plant is very complete, being so designed as to secure both maximum economy and low operating costs. The plans for it were made and its construction superintended by S. M. Green, consulting engineer, of Holyoke, Mass.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

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

5407—Oct. 14—Authorizing the C.P.R. Co. to place the line or track of its Goose Lake Branch across the line or track of the G.T.P.R. at a point in the south-east quarter of Sec. 23, Township 36, Range 6, west third meridian, west of Saskatoon, Sask.

5408—Oct. 14—Authorizing the C.P.R. Co. to use and operate the bridges at mileage 144.6 and mileage 124.3 on the Medicine Hat section of its line of railway.

5409—October 16—This order authorizes the C.N.R. to construct a bridge across the North Saskatchewan River at Prince Albert, Sask.

5410—Feb. 17—Authorizing the village of Beaverton, Ont., to erect, place, and maintain electric light wires across the main line and siding of the G.T.R. where the same cross Mara Street, Beaverton, Ont.

5411—Oct. 9—Directing the G.T.R. to refund to James G. Cane & Co., of Toronto, one cent per 100 pounds on shipments of lumber from Wiarton to Toronto during month of May last; and further directing the G.T.R. to refund to other shippers, if any, from Wiarton to Toronto, during said month of May last, all amounts collected on shipments in excess of the rate of eight cents per 100 pounds, which the G.T.R. put in force between the said points on June 1st, 1908.

5412—Oct. 9—Authorizing the New Brunswick Telephone Co. to place and maintain its wires across the tracks of the C.P.R. at Wapske, N.B.

5413—Oct. 9—Approving Supplement 2 to Standard Freight Tariff, C.R.C. No. 38, of the C.N.R. Co., applying between stations west of and including Maryfield, Sask.

5414—Oct. 8—Approving Standard Freight Tariff, C.R.C. No. 3, of the Montreal Terminal Railway Co.

5415—Sept. 17—Authorizing the G.T.P.R. Co. to cross certain highways in the municipality of Miniota, Man., and directing the protection to be provided at these crossings.

5416—Oct. 15—Authorizing the C.P.R. Co. to open for traffic that portion of its line of railway from Piapot, mileage 67.75, to Colley, Alta., mileage 75.10, a distance of 7.35 miles.

5417—Sept. 14—Authorizing the G.T.P.R. Co. to cross at grade the track of the Pembina branch of the C.P.R. at Oak Point Junction, near Winnipeg, Man.

5418—Sept. 16—Approving location of new station and rearrangement of the C.P.R. yards in St. Boniface, Man., provided the platform of said station be removed, if it is found to be in the way upon the extension of Provencher Street in said city.

5419—Oct. 9—Authorizing the Canadian Express Co. to carry, free of charge, for ninety days a publication called "The Flag," published in Great Britain.

5420—Oct. 9—Authorizing the C.P.R. Co. to construct, maintain, and operate a branch line or spur to and into the premises of the Great West Coal Co., in the town of Roche

Percee, Sask.; and further directing that Orders of the Board Nos. 4918 and 5178 be rescinded.

5421—Oct. 8—Directing the C.P.R. Co. to clean out and put in good order all the ditches leading to and from the culvert No. 89.9 as far as station 31 + 18, near Cookstown, Ont., and that the said work be completed by November 15th, 1908.

5422—Oct. 15—Authorizing the C.P.R. Co. to construct, maintain, and operate two branch lines of railway, forming a Y, at St. Gabriel de Brandon, Que.

5423—Oct. 15—Extending until December 15th, 1908, the time within which the C.N.Q.R. Co. may install the interlocking plant directed to be provided by Order of the Board, No. 4862, dated June 2nd, 1908, at a point on Lot 2375, Parish of St. Sauveur, Que., between mileage 0 and mileage 1 of the Quebec and Lake St. John Junction spur, where same crosses the C.P.R. east of Lorette, Que.

5424—October 16—Extending until December 31st, 1908, time within which interlocking plant on G.T.R. at Chatham may be installed.

5425—October 15—Granting leave to the C.P.R. to construct its branch line across St. Gabriel, St. Village of St. Gabriel de Brandon, P.Q.

5426—October 14—Granting leave to the Toronto and York Radial Railway Company to operate their trains over the G.T.R. at the village of Sutton, County York, Ont.

(Continued on Page 772.)

IRRIGATION IN ALBERTA.

(The Monetary Times.)

It is difficult sometimes to grasp the full significance of the irrigation development of Southern Alberta. It unquestionably constitutes one of the important steps in agricultural progress that Canada has witnessed. It is confidently expected that within the next decade there will be created upon the Canadian Pacific Railway Irrigation Block, east of Calgary, a densely populated and highly productive agricultural area with excellent land values.

Along the main line of the Canadian Pacific Railway in Alberta signs greet the eye announcing the fact that "irrigation doubles crops," implying that by the application of water the yield per acre is doubled. The promoters of the irrigation idea might even go a step further and state that "irrigation doubles crop area" as well. The general agricultural practice throughout Manitoba, Saskatchewan and Alberta is tending more and more towards confining crop production to summer fallowed lands. This has become the universal practice all through the Pacific wheat-producing States, in fact, wherever farming under light rainfall conditions prevails. Upon the winter wheat farms in Southern Alberta the summer fallow practice is also in vogue.

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Irrigation in Northerly Latitudes.

Artificial watering as an aid in crop production is not by any means a new principle in Canada. It has been practised for years in British Columbia and also in the Provinces of Alberta and Saskatchewan with great success. The idea that irrigation is a class of farming difficult for the average man to master is quite erroneous. The application of water to the soil is not nearly so complicated a matter as conducting the ordinary cultivation and harvesting operations of the ordinary farm. The district south of Lethbridge was principally settled by the Mormon Church and the citizens of that town prevailed upon the Land Company to set apart a certain area immediately surrounding Lethbridge for colonization with Ontario farmers. It is a peculiar fact that to-day Ontario men who had never seen an irrigation ditch in their lives use water more skillfully and intelligently than do the Mormons, who were practically brought up on the irrigated lands in the State of Utah.

In considering the possibilities of irrigation in northerly latitudes, it is well to bear in mind that the State of Montana, where the conditions are almost identical with Southern Alberta, raises more agricultural products under irrigation than the State of Idaho, more than the States of Oregon, Washington, and Wyoming combined, as much as the State of Utah, and half as much as the State of Colorado. Enormous irrigation projects are now in the course of construction in Northern Montana under the auspices of the United States Government which will place Montana in the front ranks among irrigating states. In fact, there is unmistakeable evidence that the largest areas of irrigable lands in America will presently not be in the arid parts of the continent, but located among the rich agricultural lands in northerly latitudes and under sub-humid climatic conditions.

Backbone of Irrigation Farming.

In studying the economic side of irrigation, the first fact to be thoroughly grasped is that the foundation of irrigation enterprises is not the production of either fruits, cereals, roots or garden truck, but the feeding and finishing of live stock. This has been the history of irrigation development in every State of the Union. The proof of this contention is that of the total irrigated area in crops in the United States at the time of the last decennial census, 64 per cent. was in hay and forage. The actual figures are:—Total acreage, 5,712,000 acres. In hay and forage, 3,666,000 acres.

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A Significant Deduction.

It has been established in the foregoing that the most valuable crops irrigated lands anywhere can produce is material for the feeding and finishing of live stock. It has been demonstrated that the climatic and soil conditions in Alberta are peculiarly favorable to the highest development of alfalfa and other forage crops. It will be also readily admitted that by reason of a healthy invigorating climate, absence of disease and other favorable factors, Alberta has no peer in the production of live stock of all classes. The market conditions for finished live stock are, on the whole, nearly as favorable as the United States. In some respects they are more favorable. Such being the case, it is a fair deduction that irrigated lands in Southern Alberta should command the same value as those south of the line.

It is expected that 1,500,000 acres will be brought under artificial watering when the Canadian Pacific Railway Company's project east of Calgary is finally completed. The most striking way of illustrating what this development means is to compare it with the total irrigable area of the United States. This is, at present, 7,263,000 acres. It will thus be seen that the area of land to be placed under irrigation under one project exceeds one-fifth of the present total irrigated area of the whole of the United States. It is five times as great as the irrigated area of the State of Utah, and is greater than that of the State of California and equal to the irrigated area of the whole State of Colorado. Within a few years, Southern Alberta will, therefore, become the greatest irrigating district on the continent of America.

Beet Sugar Production.

Sugar beet culture is rightly considered a leading feature of irrigation farming. The northerly latitude of Canadian irrigated lands, with the long cloudless days, increases the activity of the chlorophyl cells of the beet leaves, which elaborate the saccharine, so that a great quantity of sugar is formed in proportion to the area of leaf surface. We have, therefore, a climatic or geographical advantage over our southern competitors in sugar beet culture.

Few countries can compete with Western Canada in the production of sugar, and it is expected that agricultural and industrial history will be written when the proper cultivation and treatment of beets in that latitude is once thoroughly understood and practised. Coal is found everywhere, at least in districts where sugar beet growing is likely to be prosecuted on a large scale, and enormous lime-stone deposits are available on the eastern slope of the Rocky Mountains.

The value of a sugar factory to a community needs only incidental reference. The era of "sugar towns" has dawned in Western Canada, and with the enormous extension of irrigation, her manufacturing capacity of this commodity will be only limited by market requirements, which promise to become enormous in view of the unprecedented influx of population into the prairie section as well as the Pacific Province.

How Calgary Benefits.

It is reasonable to suppose that the Canadian Pacific Railway tract of 3,000,000 acres, irrigated and non-irrigated lands will be divided into at least 15,000 farms, sustaining six individuals each, including hired help. This would make a rural population of 90,000. According to the last census, the ratio of rural to urban population is as three to two. This would give an additional town and village settlement of 60,000, or a total population of 150,000 souls. In other words, a settlement almost as great as the present total population of the whole Province of Alberta will ultimately occupy the territory lying within a distance of 120 miles east of Calgary. Any wholesale merchant or manufacturer knows what such a development will mean to Calgary, which has even now taken a distinct lead as an important distributing centre.

Furthermore, there is no district in Canada or the United States where exists as vast an agricultural area, devoid of waste lands, as that contiguous to Calgary which can be developed by irrigation. Consequently, Calgary will have not alone a densely populated, but also an extensive irrigated farming area tributary to it.

Sales are frequently made by the Canadian Pacific Railway of 40 and 80 acre tracts to families from the irrigated districts of the United States where such land is worth from $100 up to $2,000 per acre. This indicates the possibilities in the way of population and production.

THE DESIGN OF CANAL DIVERSION WEIRS ON A SAND FOUNDATION.

W. G. Bligh, M. Inst. C.E.

Sand is proverbially an unsuitable material on which to found a solid structure of any kind, but, when this structure in addition, acts as a dam in holding up water, nine persons out of ten would consider that its stability under such circumstances was absolutely impossible.

Such, however, is by no means the case and the object of this paper is to show the means adopted to insure the safety of structures such as river weirs, which are not only exposed to undermining by their foundation being washed out by subsoil percolation, but are also subject to the erosive action of the powerful currrent of a river in flood, which completely submerges the whole work. Not having its base resting on solid impervious material as clay or rock, the masonry of which the weir is composed is further subjected to the disability of loss of weight by displacement, which often amounts to one half of its weight in air.

When a dam of earth, as a reservoir embankment, is thrown across the sandy bed of a stream leakage will necessarily take place beneath the base of the dam. With a low level of water in the reservoir this leakage may be quite harmless, that is to say, the percolating water will not carry with it any particles of sand, when, however, the depth of the water in the reservoir, that is, the head acting on the base, is increased, the percolating undercurrent will likewise increase in volume and velocity and will eventually convey particles of sand along with it and so gradually undermine the dam.

The weight of the dam is naturally the same whatever be the depth of water impounded, and further sand is practically imcompressible, consequently the imposed load must be ruled out as a determining factor in this case. The real factor influencing the safety of the work is the length of the enforced percolation, or as it is technically termed the **creep** of the undercurrent, which is clearly identical with the base width of the earthen dam. This length of percolation must naturally be some multiple of the head of water acting on the work, and if we can only find out a safe value for this multiplying co-efficient, suitable to the particular sand under consideration, we shall be enabled to design any structure on a sand foundation with perfect confidence as regards its safety with reference to statical considerations.

An example of the successful construction of a dam on a sand foundation is that of the Amani Shah storage reservoir at Jeypore in India. This dam upholds a depth of over 30 ft. of water. It is built of sand and is founded on pure sand, but its base width is exceptionally great, being over 350 ft., i.e., 12 times the head. The silting up of the river bed, which occurred before the full flood level was reached, increased the effective value of the length of creep by over 100 feet, and thus enabled the work to stand an increased head of 44 feet in perfect safety. This dam is not water-tight and does not pretend to be so, but the visible leakage is unimportant.

The natural question will arise, if this is the case, why are the foundations of bridges over rivers, reservoirs, dams, etc., always carried down to solid rock or clay? The answer is that in these cases it is cheaper to do so. As we shall see later, the correct value of the requisite base width will be from 10 to 20 times the head, consequently in case of a dam 60 ft. high founded on sand, a base width of say $15 \times 60 = 900$ feet would be necessary for safety. Thus it would, as a rule, be more economical to adopt a deep foundation. As regards a river bridge, isolated piers of great depth are generally the only practicable and economical method of construction.

In large rivers the bed of sand is often of great depth, the piers of the Benares Railway Bridge over the Ganges River had to be sunk over a hundred and fifty feet through the sand before clay was met with, consequently for a continuous work, like a river weir, a deep foundation is an economic impossibility.

The definition of the term weir, in contradistinction to that of dam, implies that the river water falls over its crest, whereas in the case of a dam the surplus flood water is conveyed either through the body of the work, as in the case of the Assuan Dam in Egypt, or else its escape is provided for by a specially built waste weir distinct from the dam itself. Weirs built across rivers, with sand beds of great depth, are invariably, what is termed "diversion" weirs, that is to say, their function does not include that of the storage of water, but is limited to the diversion of a portion of the discharge of the river down a canal through an intake; a good example of this is the Calgary canal head in Alberta.

The function of a weir is to raise the water of the river when the latter is at a low level, in order to pass a sufficient supply down the canal. During flood time, or whenever the supply exceeds the demand, the crest is topped and the surplus water follows its course down the river. Owing to the sandy nature of the bed. which in part is carried along in suspension during floods, deposit takes place in rear of the weir almost to crest level, and in some cases even higher, so that during low water there is but a narrow channel from which supply can be drawn. This channel is artificially conserved by the adoption of weir scouring sluices in close proximity to the canal intake. As canals, when on sand, mostly take of at not more than 2 to 5 feet above river bed level, and their full supply depth seldom, if ever, exceeds 10 feet, it is clear that the height of these submerged diversion weirs will not be greater than 15 feet, the general average being 10 or 12 feet. On boulder or clay formations much greater heights are practicable.

A **dam** is subjected solely to hydrostatic pressure, but a **weir** on the other hand has also to withstand the dynamic scouring action of water. The design, however, is mainly influenced by hydrostatic considerations, for which alone precise rules can be framed, with however this proviso that the design of the work must also suit what may be termed the hydrodynamical side of the question.

The following facts may here be noted:

The hydostatic pressure on a weir is greatest when the head water stands exactly at crest level, the river bed being empty below, when this occurs the hydrodynamical forces are nil. Again, when the latter forces are a maximum, i.e., during full flood, the hydrostatical pressure on the weir foundation is at a minimum.

The hydrostatic problem, with water at rest, will first be considered as follows:

FIG 1

Figure 1 represents a pipe line BC, proceeding from the bottom of a reservoir of water. The original head H is the difference of levels between A, the summit level, and C, the tail water, it being presumed that the outlet at C is free and unrestricted. The line A, C drawn from a point near the summit level to C, is termed the hydraulic gradient, or grade line, and the hydrostatic pressures on the pipe at any point are measured by vertical ordinates drawn up to this line. The distance AA′ is the head due to the uniform velocity of the current in the pipe plus a further small quantity representing loss of head at entry.

This supposes the pipe to be straight or nearly so. If the pipe had vertical projections, and so was sensibly lengthened, the hydraulic gradient would not be A′C but A′C′; BC′ being the sinuous line of pipe stretched out straight.

Fig. 2 represents a simple section for a low masonry weir, built on river sand, supposed, as is usually the case, to be completely submerged during floods. Such a work must necessarily consist of a vertical wall of masonry, or any other material, whose function is to uphold the water, connected

Mr. Bligh, while in Canada, addressed the Engineers' Club, Toronto, and the Engineering Society of Toronto University on this subject.

with which, is a horizontal apron of some description, for protection again erosion of the river bed by falling water. In this particular case an impervious masonry floor is provided. The base of this floor C D, rests on a stratum of pure sand. The vertical wall holds water up to the summit level H, the tail level, i.e., the original low water level of the river is supposed to be at B, i.e., coincident with the floor surface. The head H is the difference of level between the summit and tail levels, which is a **maximum** when the reservoir level is flush with the weir crest. The reason for this is as follows: When the water overtops the crest the velocity of the film passing over exceeds that of the tail water in the normal channel below, consequently the rise of the tail water will be more rapid than that of the head water—the ratio being from 2 or 3 to 1, varying mainly with the slope of the river bed. The action of the impounded water in its endeavour to reach its own level, a property inherent in liquids, is to force a passage through the sand stratum underneath the impervious floor, the particles of liquid taking a curved course, first downwards then horizontally, and once the obstructing plane is passed, upwards.

The proposition here presented is exactly similar to that in Fig. 1, the only difference being that instead of the water being confined in a pipe of a limited size, it is confined within the sand substratum, being prevented from rising above it. The initial velocity due to the head of water, is reduced in the pipe by friction against its sides to a constant velocity right through, in exactly the same way, reduction, or neutralization of head is effected by friction in the passage of water between the particles of the sand. The greater the length of the confined passage, the less will be the velocity of the slowly percolating stream.

It is evident that under similar conditions of head and base length, the velocity of the current in different weir beds must vary with the nature of the sand stratum in accordance with its qualities of fineness or coarseness. Fine sand will be closer in texture, passing less water at a given head than a coarser variety, at the same time fine sand will be disintegrated and washed out under a less pressure. The problem now to be solved is evidently what proportion the base CD, or l, should hold to the head H in order, to insure safety from washing out or from what is technically termed piping. This value can only be obtained experimentally, that is, by deduction from sections of existing successful river weirs. Fortunately there are also some most instructive examples of failures due to insufficient length of base, so that the safe value of the relation of l to H or of the sine of the hydraulic gradient can be deduced with absolute certainty.

In Fig. 2, supposing the length of the base CD or l, of the floor (which clearly must be some multiple of H). provides a length of creep or percolation sufficient to reduce the head, or, strictly speaking, the velocity of the current, to such proportions, as will just prevent piping. Then the hypothenuse HB will represent the hydraulic gradient. This slope starts from the summit level itself, for this reason, that the velocity head is insignificant and the loss at entry is nil. This gradient is found to be about 1 in 10 for fine sands and 1 in 8 for coarse sands, and might be termed the equilibrium gradient. Now the water having free egress at the point D, the conditions are identical with those in Fig. 1, and the upward head of water, acting on the base of the floor CD will be correctly represented by the vertical ordinates of the triangle HAB, and the total pressure by the area HAB.

In these expressions the unit weight of water generally represented by the letter W, which is 62.5 pounds, i.e., 1/36 ton per cubic foot, or 1 ton per cubic metre, is invariably omitted. Where weight comes under consideration it is represented by Area × S.G. or by A p, while unit weight (as per ft. run) is represented by t p, i.e., thickness × SG, the Greek letter p being the sign for specific gravity, which is much better than the G, sometimes employed, and which can be confounded with the recognized symbol denoting gravity. In the same way the pressure of water is represented by the head H, omitting W, it being virtually HW.

With regard to the value to be assigned to l, in actual construction a considerable factor of safety is necessary so that the safe proportional value of l must be half as much again as its bare value. If the floor be thus increased in length to the point E, so that CE=1½ CD, the safe hydraulic gradient will be HE, and the value of c in the expression l=cH will become 15. This lengthening of the floor will, however, have the effect of increasing the upward pressure on it in proportion as the area HAE is greater than HAB, consequently there is a positive disadvantage in lengthening the impervious floor beyond what is necessary to insure an absolutely safe base length, i.e., one sufficient to prevent disintegration of the sand substratum by piping.

Supposing the length of floor reduced below the minimum CD, to CG, the hydraulic gradient then will be HG. This triangle of hydrostatic pressure HAG is less than either of the preceding, but failure will take place by piping, the floor becoming gradually undermined, by the sand being slowly washed out, the reduction of the velocity effected by friction in this shorter length being insufficient to overcome the disintegrating horizontal influences of the current of water. Two such cases have actually occurred in the case of the Chenab and the Jhelum weirs.

It is self-evident that the effective weight of the floor must equal or exceed that of the upward hydrostatic pressure unless its construction is such as to render it capable of resistance to bending stress. In this latter case the downward pressure on the sand will be simply the reaction of the hydrostatic pressure, as is the case in a pipe. This reacting pressure is hardly enough, although in the case of Narora weir a floor of insufficient weight has been known to stand for several years, but eventually, owing to a comparatively small increase in the upward pressure, it blew up. Weight in the floor and superstructure generally, well in excess of the hydrostatic pressure, is always a desideratum. and is only limited by considerations of economy.

We have already seen that the proportion of l: H or the value of c, the expression l=cH varies in different rivers. River sands will be classified according to the following known qualities:

Class 1a.—The Nile. Coefficient adopted 18.

Class 1.—Rivers taking their source in the Himalayas, which include the Ganges, Jumna, Indus, and the four main Punjab Rivers of fine light micaceous sand, to this category belongs the Colorado River. Coefficient adopted 15.

Class 2.—The coarse grained sands of the rivers of Central India and Madras and Bengal, most rivers belong to this class. Coefficient adopted 12.

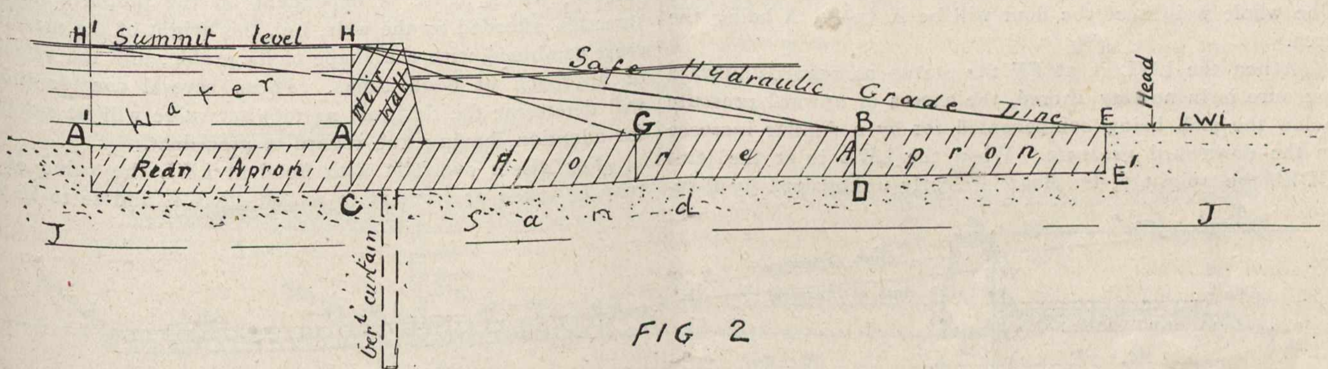

FIG 2

Class 3.—Boulder and sand formation. Coefficient 6 to 9.

The coefficients all are obtained from actual examples given in the table accompanying.

With regard to hydrostatic pressure on the base the following points still require notice.

In Fig. 2, if a hole were bored in the floor CE and a pipe inserted, the water would rise up as far as the existing hydraulic gradient HE, the head acting on the base CE would thus be greater than the triangle HAE, would, in fact, be the trapezium HCEE. This is accounted for by the addition to the external head, which is HA, that due to the displacement. To avoid confusion, the extraneous or active head of water symbolized by H, which always means the difference of levels above and below a weir or regulator, will be kept distinct from that due to displacement or immersion, this latter pressure will be allowed for by reduction in the effective weight of the immersed body. As is well known a solid material immersed in water loses weight to the extent of the area immersed, or if SG be substituted for actual weight and l symbolize the SG of the material in air, that of the same material immersed in water will be p—I. Thus if the SG of a block of masonry be 2¼ when immersed in water, the reduced weight can be expressed by 2¼—1=1¼.

In the figure when the low water level is at E′ the floor ACEE′ is clearly immersed, and the upward pressure due to displacement will be the weight of the water displaced, that per ft. run, being represented by the thickness t. The weight of the slab per ft. run, also omitting w, is t p, consequently the effective balance downward pressure will be W=t (p—1). The whole weight of the floor will be A (p—), A being the area.

When the LWL is at FF the status as regards upward pressure is in no way altered, the excess of upward pressure below the slab being compensated for by a similar increase in the downward pressure. When the LWL is at the level CDE′, the weight of the floor is clearly unimpaired by flotation, when intermediate, the effective weight of that portion of the floor lying below the level has alone to be considered as thus impaired.

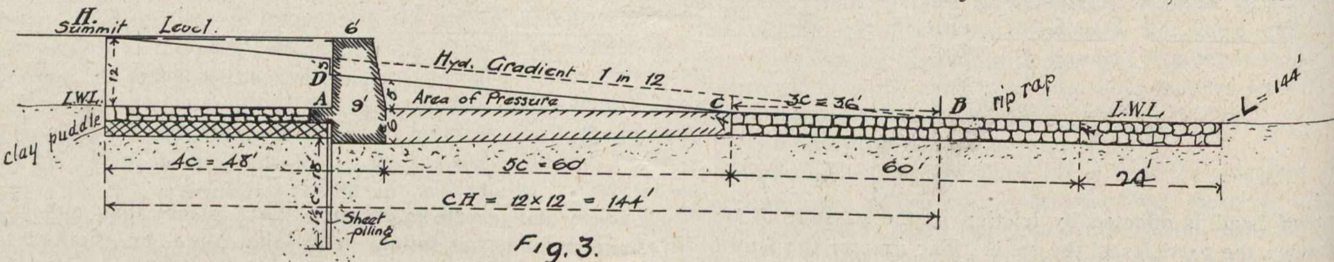

Fig. 3.

When the floor is built well above LWL, as when the LWL is at JJ, the sand substratum being porous, the water level will rise up to the base of the impervious floor thus practically reducing the head from HJ to HC. The acting head therefore cannot be taken as extending below the actual impervious base of the weir, except as regards calculation for base length, or length of creep.

In Fig. 2 it is evident that the value of l is in no way effected, whatever be the position of the vertical drop wall with regard to the horizontal floor. For instance suppose the floor extended backwards to A′ and AA′ made = BE, then the action of the head of water is thrown back from H to H′ the Hyd. gradient will be H′B parallel to H′E, and the statical condition is in no way altered.

This rear projection is termed the rear apron. Its value in design has only recently been recognized. The rear apron is not subjected to any upward pressure, the latter being more than counterbalanced by the downward weight of water lying over it, it is also free from the erosive action of falling water, consequently it can be constructed of less expensive material than the fore apron or floor. On the other hand it must be impervious and must have a water-tight connection with the weir wall otherwise the head may act between it and the weir wall thus practically isolating it from the rest of the work. This actually occurred in the case of Narora weir, to be illustrated later. Another weir, the Chenab, failed by sinkage of the floor, the sand base having been gradually washed out by the undercurrent.

Theoretically, the rear apron would be effective if only a thin impervious layer, but practically it is considered that unless constructed of a definite weight, water passing underneath it would partake of the nature of a surface current and so not be effective in the neutralization of head.

With weirs of ordinary height, with a sand coefficient of 12 to 15, and with a value of H up to 15 feet the economical length of the rear apron will not exceed 3 to 5 H. The reason being that the rear apron performs but one function, namely, statical, whereas the fore apron in addition to this, adds that of an anti-erosive nature, consequently material placed in front of the drop wall is of greater value than that in rear, and if the rear apron is designed too long there will necessarily be excess material in the whole section, which by a more economical distribution could be avoided. The reason for this is that dynamical considerations cannot be lost sight of and the requirements to meet this second governing condition demands a certain minimum length of fore apron symbolised by L which is measured from the toe of the drop wall. This length consists in part of the masonry floor designed to meet the requisite length of creep, i.e., for statical requirements, and when this length falls short of the minimum the balance has to be made up by loose stone rip rap as a further protective covering to the sand. This latter portion is termed the talus.

The value of L is influenced by the erosive power of the current, which again is dependent on the proportional obstruction afforded by the weir, i.e., the height of the masonry crest combined with the shape of its profile, and the velocity of approach at flood times. These several considerations will determine the designer as to what value will be suitable for adoption, having due regard to precedent.

For direct overfalls with flood at LWL the value of L may be taken as from 15 to 20 NF class 1, and 12 to 16 for weirs of class 2. N in this case not being necessarily the maximum statical head but the height of the permanent masonry weir crest above floor level.

The summit level in all modern weirs is raised by means of collapsible crest shutters which fall automatically in flood times to a height varying from 2 to 6 feet above the solid masonry weir crest. This device lessens the permanent obstruction to the normal river waterway.

We have hitherto been considering only a section which has no vertical depressions in the base line. The creep of water beneath an impervious apron is known to hug all vertical sinuosities. Thus if a row of sheet piling or some other impervious curtain were inserted below the base CE in Fig. 2, the line of creep would be forced down one side of the vertical obstruction and up the other. This added length of creep is thus twice the depth of the curtain. The insertion of sheet piling or other form of curtain walling is thus a most valuable means of increasing the length of creep and thus saving that in the expensive horizontal apron.

An example of the method of applying the principles already enunciated will now be given for the design of a weir under assumed conditions, viz. :—

H=12 feet.

River, Class 2 with C=12. Whence l = C × H = 12 × 12 = 144 feet.

The first point to be decided is the length to be given to the rear apron, and the depth of the sheet piling as it is proposed to adopt a curtain below the weir wall. The thickness of the fore apron at the toe of the drop wall which is the crucial point in the whole design, is determined by the values thus adopted for this reason that the hydrostatic pressure is here first felt and the neutralization of head up to this point should be sufficient to reduce the required depth of floor to reasonable and economical dimensions. The minimum average thickness of the fore apron is obtained by the empirical formula $= \sqrt{18} + 1\frac{1}{2}$, varies from 6 ft. as maximum to 3 ft. as minimum. $T = \frac{3h}{2} + 1\frac{1}{2}$. (h = height of solid masonry weir) = $5\frac{1}{2}$ feet nearly.

In designing these weirs it is a great convenience to make all dimensions multiples of the coefficient c, as then each unit represents a neutralization of one foot off the original head. The length of the rear apron should be measured back from the toe of the drop wall. In the design this length is made = 4c = 48 feet. Deducting the base thickness of the weir wall which is 9 feet, the actual length of the rear apron = 3H. This, if anything is somewhat short, a length of $3\frac{1}{2}$ C would give better results. The thickness of the rear apron composed of puddle covered with stone rip rap will be 5 feet, it cannot be less.

Now we come to the sheet piling steel or concrete steel. This is made $1\frac{1}{2}$C or 18 feet in depth consequently the total neutralization of head effected up to the toe of the weir wall is 4 + 3 ft. = 7 feet, leaving 5 feet hydrostatic upward pressure acting here. The SG of the material in the masonry fore apron will be taken as 2 (a common low value). The apron is submerged lying below LWL, its effective SG will therefore be unity. Now the effective weight should (it is deemed) exceed the upward pressure at least by one-fifth, as a precautionary measure, the depth required will be 5 + 1 1-5 = 6 feet of water, corresponding to 6 feet depth of masonry with an effective value p—1 of unity. The length of the fore apron will be the remaining balance of lH, i.e., (12—7 c = 5c), and the terminal thickness, theoretically nil, is made 4 feet for other than statical reasons. This ends the design as regards statical requirements. For anti-erosive purposes the floor will have to be continued as a talus of loose stone pitching for another 60 feet giving a length, measured from toe of drop wall, of 12H = 144 feet. This, as we have seen, is obtained from an empirical rule, and can be varied as experience may dictate. The minimum length of fore apron is 4 to 5H.

The graphical method of design is shown on the same figure and is very simple. From the extremity of the rear apron the total requisite base length, = cH = 12 × 12 = 144 feet is set out to the point B. The line HB then is the hydraulic gradient of 1 in 12. From B set back BC = vertical portion of the base length = 3c or 36 feet, and from the point C draw a line CD parallel HB up to D, its intersection with a continuation of the vertical curtain.

The triangle DAC is the triangle of pressure. The dimensions of the base drop wall are found by the following formula: $\frac{H'}{Vp}$ in which H′ is the height above floor of the head water at the time when the tail water is level with the crest being generally $1\frac{1}{2}$ times the height of the solid drop wall. But when the maximum statical head, i.e., to shutter crest exceeds this H′ will become H and the formula $\frac{H}{Vp}$

We will now give another example of design of a direct overfall weir with floor at LWL, viz., that of an alternative design for the Chenab weir. The actual given conditions are:—

H = 13 c = 15. Whence l must = 13 × 15 = 195 feet.

In this design the original arrangement is followed of having the permanent drop wall of low elevation, the requisite summit level being obtained by the use of steel collapsible crest shutters. As in the existing work, the level of the crest of the drop wall is placed at seven feet above extreme low water, while the remaining 6 feet required to bring the summit level RL 728 is provided by the shutters.

The commencement of the rear apron is placed 4c = 60 feet behind the toe of the weir wall, below which sheet piling 1c or 15 feet in depth is provided. These neutralize 6 feet of head leaving a balance of 13—6 = 7 feet, hence a farther base length of 7 × 15 = 105 has to be provided in the fore apron. This is too long for actual requirements, which is 5 H = 65 feet, consequently another row of sheet piling is introduced at the end of the floor with a depth of ½c, or 7½ feet. This admits of the curtailment of the floor by C or by 15 feet, reducing it to 6c or 90 feet. There are thus two vertical depressions in the base line.

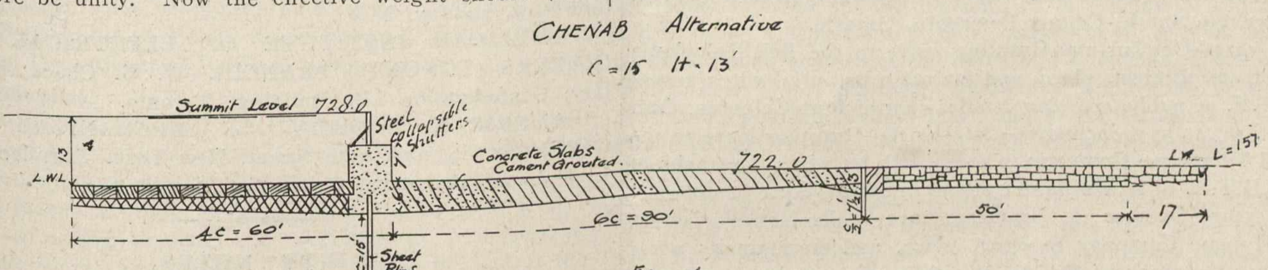

Fig. 4

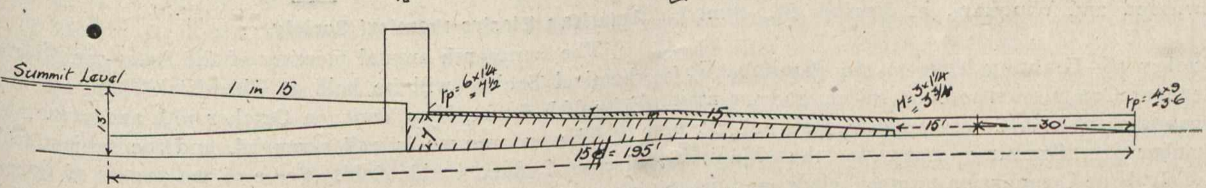

Fig. 4A

The graphical diagram is shown in figure 4A. First, the total required base length or 15H = 15 × 13 = 195 feet is measured off from the commencement of the rear apron, and the hypothenuse is drawn in from the point thus obtained. Secondly, the respective values of the two vertical depressions are set back, viz., 2c = 30 feet, and C = 15 feet. A line parallel to the hydraulic gradient is then drawn from the first-mentioned point up to its intersection with a vertical through the first row of piling. A second parallel cannot be drawn from the second point as the intersection with the vertical is at the same spot, consequently the second step occurs at this very point. The outline of the pressure area below the weir wall is not a triangle, as heretofore, but a trapezium. The value of tp adopted is marked on the diagram. This thickness is hardly sufficient and should be increased from 6 to 7 feet giving a value of tp of 7 × 1¼ = 8.8.

The rear apron is composed of puddle overlaid with concrete slabs, the weir wall is of concrete, the fore apron is of concrete slabs laid on a slope, breaking joint, subsequently cement grouted. This is a novel but economical method of subaqueous construction, and was first adopted at the Colombo breakwater.

This design would, (it is now considered), be improved by increasing the length of the rear apron from 4c to 5c, and cor-

N.B.—The letter p is used for the Greek letter roe in formulae.

respondingly reducing the fore apron to 5c or 75 feet, the thickness could then remain as it is in the drawing. This example is useful as showing the ease with which the design can be altered by manipulation of the length of the rear apron and depth of rear curtain, till the most economical arrangement is arrived at.

RAILWAY ORDERS.

(Continued.)

5427—October 16—Granting leave to the Manitoba Government Telephones Commission to erect, place, and maintain its wires across the C.P.R. at Public Crossing 3½ miles east of Burnside Station, Man.

5428—October 16—Granting leave to the Manitoba Government Telephone Commission to erect, place, and maintain its wires across the C.P.R. 100 yards east of Manitou, Man.

5429—October 16—Authorizing the town of Montreal West, to lay water pipe under tracks of the G.T.R. on the line of Inspector Avenue, Montreal West, P.Q.

5430—October 16—Granting leave to the Manitoba Government Telephone Commission to erect, place, and maintain its wires across the tracks of the C.P.R. four miles north-east of Portage la Prairie, Man.

5431—October 16—Granting leave to the Muncp. Corp. Tp. Smith, to construct highway on line and width of Dumble Avenue across lands and tracks of Chemong Branch G.T.R., Township Smith, County Peterboro, Ontario.

5432—October 16—Granting leave to the Bell Telephone Company to erect, place, and maintain its aerial wires across G.T.R. at public crossing 2 miles east of Port Colborne, Ont.

5433 to 5436 inclusive—October 16—Granting leave to the Bell Telephone Company to cross with its wires the tracks of the G.T.R. at four different points in the Province of Ontario.

5437—October 16—Granting leave to the Norfolk County Telephone Company to erect, place, and maintain its wires across the track of G.T.R. at public crossing between townships of Townsend and Wingham, at Norfolk St., Simcoe, Ont.

5438—October 16—Granting leave to the Manitoba Government Telephone Commission to erect, place, and maintain its wires across track of C.P.R. 300 feet east, Rathwell, Man.

5439—October 16—Granting leave to the Manitoba Government Telephone Commission to erect, place, and maintain its wires across the track of the C.P.R., ½ mile east of Wheatlands, Man.

5440—October 16—Granting leave to the Manitoba Government Telphone Commission to erect, place, and maintain its wires across the track of the C.P.R. 1½ miles east of Burnside Station, Man.

5441—October 13—Granting leave to the Arundel Telephone Company to erect, place, and maintain its wires across the track of the Canadian Northern Quebec Railway at Huberdeau, Arundel, Batesville, and Weir, P.Q.

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ARCHITECTURAL INSTITUTE OF CANADA.—President, A. F. Dunlop, R.C.A., Montreal, Que.; Secretary, Alcide Chaussé, P.O. Box 259, Montreal, Que.

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CANADIAN STREET RAILWAY ASSOCIATION.—President, J. E. Hutcheson, Ottawa; Secretary, Acton Burrows, 157 Bay Street, Toronto.

CANADIAN INDEPENDENT TELEPHONE ASSOCIATION.—President, J. F. Demers, M.D., Levis, Que.; Secretary, F. Page Wilson, Toronto.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—413 Dorchester Street West, Montreal. President, J. Galbraith; Secretary, Prof. C. H. McLeod. Meetings will be held at Society Rooms each Thursday until May 1st, 1908.

QUEBEC BRANCH OF THE CANADIAN SOCIETY OF CIVIL ENGINEERS.—Chairman, E. A. Hoare; Secretary, P. E. Parent, P.O. Box 115, Quebec. Meetings held twice a month at Room 40, City Hall.

TORONTO BRANCH OF THE CANADIAN SOCIETY OF CIVIL ENGINEERS.—96 King Street West, Toronto. Chairman, C. H. Mitchell; Secretary, T. C. Irving, Jr., Traders Bank Building. Regular monthly meeting, October 29th.

MANITOBA BRANCH OF THE CANADIAN SOCIETY OF CIVIL ENGINEERS.—Chairman, H. N. Ruttan; Secretary, E. Brydone Jack. Meets first and third Friday of each month, October to April, in University of Manitoba.

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CANADIAN CEMENT AND CONCRETE ASSOCIATION.—President, Peter Gillespie, Toronto, Ont.; Vice-President, C. T. Pulfer, London, Ont.; Secretary-Treasurer, Alfred E. Uren, 62 Church Street, Toronto.

NOVA SCOTIA SOCIETY OF ENGINEERS, HALIFAX.—President, J. H. Winfield; Secretary, S. Fenn, Bedford Row, Halifax, N.S.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS (TORONTO BRANCH).—W. G. Chace, Secretary, Confederation Life Building, Toronto.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—29 West 39th Street, New York. President, H. L. Holman; Secretary, Calvin W. Rice.

SOCIETY NOTES.

American Electro-chemical Society.

The fourteenth annual meeting of the American Electro-chemical Society will be held at Chemists' Club, 108 West Fifty-fifth Street, New York, on October 30th and 31st.

The programme is well arranged, and the subject to be discussed cover a wide field. Some of the papers of general interest are "The Corrosion of Underground Structures," by Albert F. Gang; "Electrolytic Corrosion of the Bottom of Oil Tanks," by A. A. Knudson; "The Sash Steel Process and the Electric Furnace," by F. A. Fitzgerald; and "The Correct Methods of Measuring Stray Currents," by Claytor H. Sharp.

The Institution of Municipal Engineers.

At a meeting of the Council of the Institution, held at the Bedford Hotel, Southampton Row, London, W.C., on Friday, October 9th, 1908, 40 applications for membership were considered. Of these 26 were accepted. The membership roll now stands at 345.

The Secretary reported that an agreement for the tenancy of offices at 39 Victoria Street, Westminster, S.W., had been entered into, and members are requested to note the consequent change of address.

At the general meeting held later, Mr. Charles A. Fortune, City Surveyor of Bath, in the chair, the draft of the proposed by-laws of the Institution, which had been circulated among the members, was considered and approved, and an amended copy will shortly be sent to each member. The only alteration of any moment is the inclusion of a clause setting forth that the designatory agnomen for members is "M.I. Mun. E."

A New Association.

On Wednesday, December the 9th, 1908, there will be a meeting of men interested in Gas and Gasoline Engines, held at the Auditorium Hotel, Chicago. It is expected this will be an organization meeting for a new association. The call is issued by M. A. Loeb, of the Rock Island Battery Company, Cincinnati, Ohio.

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.

Nova Scotia.

BLUE ROCKS.—Tender for Blue Rocks Breakwater, N.S., will be received at this office until 4.30 p.m. on Friday, November 6, 1908, for the construction of a breakwater at Blue Rocks, Lunenburg County, Province of Nova Scotia, according to a plan and specification to be seen at the offices of C. E. W. Dodwell, Esq., Resident Engineer, Halifax, N.S., E. G. Millidge, Esq., Resident Engineer, Antigonish, N.S., on application to the Postmaster at Blue Rocks, N.S., and at the Department of Public Works, Ottawa. Nap. Tessier, secretary, Department of Public Works.

WEST ADVOCATE.—Tender for West Advocate Breakwater, N.S., will be received at this office until 4.30 p.m. on Friday, November 13th, 1908, for the construction of a breakwater at West Advocate, Cumberland County, N.S., according to a plan and specification to be seen at the offices of C. E. W. Dodwell, Esq., resident engineer, Halifax, N.S.; E. G. Millidge, Esq., resident engineer, Antigonish, N.S.; on application to the postmaster at West Advocate, N.S., and at the Department of Public Works, Ottawa. Nap. Tessier, secretary, Department of Public Works.

New Brunswick.

HAVELOCK.—Tender for Havelock village culvert, will be received at the Department of Public Works, Fredericton, until Monday, 30th day of November, 1908, at noon, for rebuilding Havelock village culvert, Parish of Havelock, King's County, according to plans and specifications to be seen at the Public Works Department, Fredericton, N.B., and at the office of Mr. J. A. Murray, M.P.P., Sussex, N.B., and at the office of Mr. H. A. Keith, Havelock, N.B. John Morrissy, Chief Commissioner, Department of Public Works.

LORNEVILLE.—Tender for Lorneville Wharf, N.B., will be received at this office until 4.30 p.m., on Tuesday, November 10th, 1908, for the construction of a combined breakwater and wharf at Lorneville, Reed's Point, St. John County, N.B., according to a plan and specification to be seen at the offices of E. T. P. Shewen, Esq., resident engineer, St. John, N.B.; Geoffrey Stead, Esq., resident engineer, Chatham, N.B., on application to the postmaster at Lorneville, N.B., and at the Department of Public Works, Ottawa. Nap. Tessier, secretary. Department of Public Works.

QUACO.—Tender for Quaco Wharf Extension, will be received at this office until 4.30 p.m. on Friday, November 13th, 1908, for the construction of an extension to the east pier at Quaco, St. John County, N.B., according to a plan and specification to be seen at the offices of E. T. P. Shewen, Esq., resident engineer, St. John, N.B.; Geoffrey Stead, Esq., resident engineer, Chatham, N.B., on application to the postmaster at Quaco, N.B., and at the Department of Public Works, Ottawa. Nap Tessier, secretary, Department of Public Works.

ST. ANDREWS.—Tender for St. Andrews Wharf, N.B., will be received at this office until 4.30 p.m., on Friday, November 6th, 1908, for the construction of a wharf at St. Andrews, Charlotte County, N.B., according to a plan and specification to be seen at the offices of E. T. P. Shewen, Esq., resident engineer, St. John, N.B.; Geoffrey Stead, Esq., resident engineer, Chatham, N.B., on application to the postmaster at St. Andrews, N.B., and at the Department of Public Works, Ottawa. Nap. Tessier, secretary, Department of Public Works.

Quebec.

CAP ST. IGNACE.—Tender for Cap St. Ignace Wharf will be received at this office until 4.30 p.m., on Friday, November 13, 1908, for the construction of a Wharf at Cap St. Ignace, Montmagny County, Province of Quebec, according to a plan and specification to be seen at the offices of A. Decary, Esq., Resident Engineer, Post Office, Quebec; Chs. Desjardins, Esq., Clerk of Works, Post Office, Montreal; on application to the Postmaster at Cap St. Ignace, P.Q., and at the Department of Public Works, Ottawa. Nap. Tessier, secretary, Department of Public Works.

MONTREAL.—Tender for the construction of a concrete retaining wall at Bellerive Square, addressed to the City Clerk, and deposited in the office of the said City Clerk, City Hall, will be received until 12 o'clock noon, on Wednesday, the 4th November, 1908, for the construction of a concrete retaining wall at Bellerive Square. Plans and specifications for the proposed work may be seen at the office of Mr. L. R. Montbriant, architect, No. 230 St. Andre Street, or at the office of the Secretary of the Parks and Ferries Committee, City Hall. L. O. David, city clerk.

POINTE à BROUSSEAU.—Tender for Pointe à Brousseau Wharf will be received at this office until Monday, November 16, 1908, for the construction of a Wharf at Pointe à Brousseau, Gaspe County, Que., according to a plan and specification to be seen at the office of Ph. Beland, Clerk of Works, Post Office Building, Quebec, on application to the Postmaster at Little Valley, P.Q., and at the Department of Public Works, Ottawa. Nap. Tessier, secretary, Department of Public Works.

RIVIERE BLANCHE.—Tender for Riviere Blanche, Pier Head Extension, will be received at this office until 4.30 p.m., on Monday, November 16, 1908, for the construction of an extension to Head Block of Pier at Riviere Blanche, Rimouski County, Province of Quebec, according to a plan and specification to be seen at the offices of Mr Chs. Desjardins, Clerk of Works, Post Office, Montreal; Mr. A. R. Decary, Resident Engineer, Post Office, Quebec; on application to Mr. Hermel Parent, Postmaster, Tessierville, Que., and at the Department of Public Works, Ottawa. Nap. Tessier, secretary, Department of Public Works.

STE. EMILIE.—Tender for roadway and enlargement of block at Ste. Emilie, will be received at this office until 4.30 p.m., on Monday, November 23rd, 1908, for the construction of a roadway and enlargement of block at Ste. Emilie (Leclercville), Lotbiniere County, Province of Quebec, according to a plan and specification to be seen at the office of A. Decary, Esq., resident engineer, post office, Quebec, on application to the postmaster at Leclercville, Lotbiniere County, Que., and at the Department of Public Works, Ottawa. Nap. Tessier, Secretary, Department of Public Works.

Ontario.

LINDSAY.—Tender for Trent Canal will be received at this office until 16 o'clock on Tuesday, 17th November, 1908, for the works connected with the construction of the Lindsay Section of the Canal. Plans and specifications and the form of the contract to be entered into can be seen on and after the 19th October, 1908, 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, Peterborough, Ont., at which places forms of tender may be obtained. L. K. Jones, secretary, Department of Railways and Canals. (Advertised in the Canadian Engineer.)

MICHIPICOTEN.—Tender for Michipicoten River Wharf, Ont., will be received at this office until 4.30 p.m., on Friday, November 27th, 1908, for the construction of a wharf at the mouth of the Michipicoten River, district of West Algoma, Lake Superior, Ont., according to a plan and specification to be seen at the offices of J. G. Sing, Esq., resident engineer, Confederation Life Building, Toronto; E. B. Temple, Esq., resident engineer, Port Arthur, Ont.; on application to the postmaster at Michipicoten River, Ont., and at the Department of Public Works, Ottawa. Nap. Tessier, secretary, Department of Public Works.

OTTAWA.—Tender for Head of Long Sault Dam, Bulkheads and Slide, Ottawa River, will be received at this office until 4.30 p.m., on Thursday, November 19th, 1908, for the construction of a dam, bulkheads and slide at the head of Long Sault Rapids, Ottawa River, in the Township of Gendreau, Que., according to a plan and specification to be seen at the office of J. G. Sing, Esq., resident engineer, Confederation Life Building, Toronto, on application to the postmaster at North Bay, Ont., and at the Department of Public Works, Ottawa. Nap. Tessier, secretary, Department of Public Works.

PELEE ISLAND.—Tender for the Pelee Island Wharf Extension, will be received at this office until 4.30 p.m. on Monday, Nov. 23rd, 1908, for the construction of an extension to the west wharf at Pelee Island, Essex County, Ontario, according to a plan and specification to be seen at the offices of J. G. Sing, Esq., resident engineer, Confederation Life Building, Toronto; H. J. Lamb, Esq., resident engineer, London, Ont., on application to the postmaster at Pelee Island, Ont., and at the Department of Public Works, Ottawa. Nap. Tessier, secretary, Department of Public Works.

PORT STANLEY.—Tender for Groynes at Port Stanley, Ont., will be received at this office until 4.30 p.m., on Thursday, November 5th, 1908, for the construction of six groynes for shore protection at Port Stanley, Elgin County, Ontario, according to a plan and specification to be seen at the offices of J. G. Sing, Esq., resident engineer, Confederation Life Building, Toronto; H. J. Lamb, Esq., resident engineer, London, Ont., on application to the postmaster at Port Stanley, Ont., and at the Department of Public Works, Ottawa. Nap. Tessier, secretary, Department of Public Works.

CONTRACTS AWARDED.

Ontario.

COLLINGWOOD.—A contract has been signed between the Northern Navigation Company and the Collingwood Shipbuilding Company for the construction of a steel passenger steamer to replace the old City of Toronto. The keel of the new steamer will be laid within two months. She will have triple expansion engines, twin screws and a speed of 16 miles per hour. The vessel will be 135 feet in length, with 25-foot beam. She will cost $60,000 complete, and is to be ready to go into commission May 15th next.

HAMILTON.—The contract for equipment of the Beach pumping station was awarded to the Canadian Westinghouse and the John McDougall Company, Montreal. The combined price was $20,148, or $2,028 higher than the tenders of the General Electric Company, of Sweden, with McDougall pumps. The motors and pumps will have a speed of 800 revolutions a minute. The cost is made up as follows:

Westinghouse Co., two synchronous motors..	$ 9,574
Additional starting motors and panels.......	3,354
John McDougall Co., two pumps.............	7,220
	$20,148

By having only one starting motor the Westinghouse Company's tender would have been reduced $1,600. The engineer advised in favor of this, but Paul J. Myler, general manager of the company, clearly demonstrated to the aldermen that it would be false economy, and it was decided to have two starting motors.

TORONTO.—Tenders have been opened for the equipment and apparatus for the Ontario Hydro-Electric line. Although it has not been awarded, it is understood that work will be divided between the Canadian General Electric Company, of Peterborough, and the Canadian Westinghouse Company, of Hamilton.

WALKERVILLE.—The Kerr Engine Company, Limited, have just received an order for 100 of their gate hydrants for the city of Vancouver, B.C.

Manitoba.

WINNIPEG.—The Dominion Bridge Company have secured the contract for the steel work superstructure of the new first steel bridge, Brandon. Contract price being $27,000. They have also the contract for the Miners Hall at Fernie, B.C., supplying the steel and ornamental iron work. Both orders will be shopped in their Winnipeg works.

Saskatchewan.

SASKATOON.—The tender of McVean and Craig, of Prince Albert, has been accepted for the sewer and waterworks extension.

British Columbia.

VANCOUVER.—The tenders were opened for cast iron pipe of the following quantities and dimensions: Ten thousand feet 4-inch, 30,000 feet 6-inch, and 10,000 feet 8-inch, these supplies being needed for the ordinary city extensions during 1909. Steel pipe needed for the extension of the Seymour Creek mains across the city to Little Mountain was tendered for as follows: Ten thousand feet 12-inch, 17,000 feet 16-inch, 10,000 feet 18-inch and 1,500 feet heavy 18-inch. For the second submarine main across Second Narrows prices were submitted for 1,000 feet of bell-jointed pipe. Other prices submitted covered 100 fire hydrants and the supply of lead for caulking mains.

The prices submitted are as follows:

Vancouver Engineering works, cast iron pipe, per ton, 4-inch, $42.17; 6-inch, $40.90; 8-inch, $40.37. Steel mains, per lineal foot, double riveted pipe, 12-inch, $1.27½; 16-inch, $1.60; 18-inch, $1.75; 18-inch thick, $3.60. Lap welded steel pipe, 12-inch, $1.49½; 16-inch, 1.76½; 18-inch, $2.01; 18-inch, thick, $3.23. Flexible jointed pipe for submarine main, per lineal foot, $4.95 to $5.60, according to thickness.

Simpson, Balkwill & Company, Ludlow hydrants, $43.95 each.

Crane & Company, Pittsburg, Pa., steel mains, lump price, 12-inch, $15,000; 16-inch, $37,315; 18-inch, $25,000; 18-inch thick, $4,980. Ludlow hydrants, $46.46 each.

W. G. Winterburn, submarine main, per ton, $53.50.

Robert Ward & Company, steel main, per lineal foot, 12-inch, $1.40; 16-inch, $1.91; 18-inch, $2.09; 18-inch, thick, $3.40.

Evans, Coleman & Evans: Cast iron pipe, lump price, 4-inch, $3,652.18; 6-inch, $17,615.25; 8-inch, $8,446.45; submarine main, per ton, $44. Steel mains, lump price, riveted pipe, 12-inch, $13,300; 16-inch, $31,110; 18-inch, $21,300; 18-inch, thick, $5,145. Lap welded pipe, 12-inch, $12,400; 16-inch, $28,050; 18-inch, $18,800; 18-inch thick, $4,905. Pig lead, $3.64 per 100 pounds.

Munderloh & Co., cast iron pipe, per lineal foot, 4-inch, 34 cents; 6-inch, 50 cents; 8-inch, 83 cents. Steel mains, per lineal foot, 12-inch, $1.43; 16-inch, $1.79; 18-inch, $2.02; 18-inch, thick, $3.27.

Robertson, Godson & Co., steel mains, per hundred lineal feet, 12-inch, $150.15; 16-inch, $190.60; 18-inch, $209.50; 18-inch thick, $295.80. Submarine main, per ton, $47.25 to $60.12, according to weight. Cast iron pipe, per ton, 4-inch, $40.81; 6-inch, $40.81; 8-inch, $41.57. Ludlow hydrants, $40.50 each. Pig lead, $3.64 per 100 pounds.

A. J. Forsyth & Co., cast iron pipe, all sizes, $39.80 per ton. Steel mains, per lineal foot, 12-inch, $1.19; 16-inch, $1.49½; 18-inch, $1.61; 18-inch, thick, $3.11. Submarine main, per ton, $47.33 to $44.40, according to weight.

John Inglis Company, steel mains, per lineal foot, 12-inch, $1.95; 16-inch, $2.42; 18-inch, $2.80; 18-inch, thick, $5.45.

W. Beverly Robinson, cast iron pipe, per ton, 4-inch, $41.17; 6-inch, $38.34; 8-inch, $38.44. Submarine main, $42.30 per ton. Steel mains, per lineal foot, 12-inch, $1,235; 16-inch, $1,579; 18-inch, $1,701; 18-inch, thick, $2,491.

Canadian General Electric Company, cast iron pipe, per ton, 4-inch, $41.94; 6-inch, $41.23; 8-inch, $41.12.

C. W. Stancliffe & Co., cast iron pipe, per ton, 4-inch, $41.94; 6-inch, $41.23; 8-inch, $41.12.

C. Gardiner, Johnson & Co., cast iron pipe, per ton, 4 and 6-inch, $42.74; 8-inch, $42.05. Steel mains, per lineal foot, 12-inch, $1.59; 16-inch, $2.08; 18-inch, $2.21; 18-inch, thick, $3.87.

The contracts was awarded of steel mains to Thomas Piggott Company; cast iron pipe, A. J. Forsyth; sub-merged mains, Evans, Coleman and Evans; Ludlow hydrants, Robertson, Godson & Company; pig lead, Robertson, Godson & Company.

RAILWAYS—STEAM AND ELECTRIC.

Quebec.

MONTREAL.—Half a dozen dining cars equal to the best on the continent have just been completed at the Angus shops for use on the Transcontinental service. Each car is 76 feet long and affords accommodation for 36 diners.

MONTREAL.—Work on the Montreal and Southern Counties Railway, to connect Montreal with the south shore, is now starting. John Quinlan & Company have the contract for the concrete work, and the United States Steel Company will supply the rails and other special work.

Alberta.

EDMONTON.—Monday, October 26th, saw the first street cars running in Edmonton and incidentally the first street cars to run between Winnipeg and the Pacific Coast in Western Canada.

EDMONTON.—It is alleged that the C.P.R. purposes building a branch 600 miles north of Edmonton to the Great Slave Lake. At Sturgeon Lake, 200 miles south of Great Slave Lake, another branch—really a main line—will run through the Peace River district and traverse the Pine River Pass will cross the Rockies, and, striking the Fraser River, will follow it for hundreds of miles. The objective is either Kamloops or Ashcroft. It is stated that the company may also extend this line westerly from Northern Cariboo to a point on tidewater midway between Vancouver and Prince Rupert.

LETHBRIDGE.—A contract will be completed whereby the C.P.R. take over the A. R. & I. Railway, and property. It includes 113 miles of railway and 425,000 acres of land.

British Columbia.

VANCOUVER.—Railway construction in Central British Columbia is an assured finality, according to Louis Hill, of the Great Northern Railway, who states that work on the branch line—the V. V. & E.—from the Boundary district to the coast, will be commenced and perfected early next spring. There yet remains the gap to be completed between the Similkameen and Sumas, at the ends of which points the V. V. & E. connects with the Great Northern system, controlled by the Hills.

Foreign.

LONDON, ENG.—Regarding the steel rails ordered by the Southern Punjab Railway from the Dominion Iron & Steel Company, it is said that the exact price quoted has been communicated in confidence to some of the English firms who tendered. The secret is being carefully preserved, but the price is said to be considerably lower than that at which the same firm is now supplying the same type of rail in the Dominion of Canada.

LIGHT, HEAT, AND POWER.

Quebec.

MONTREAL.—It is claimed that yet another company will make an effort to break through the ring at the City Hall for the purposes of supplying light to the city. The company in question is the Electric Service Company, and although nothing definite has as yet transpired, the terms to be offered are said to be equal to those of the old contract of the Montreal Light, Heat and Power Company.

Ontario.

CHATHAM.—The new agreement with the Colonial Engineering Company, of Montreal, Que., calls for a proper dynamo instead of the present second-hand 50-light dynamo installed by the Colonial Engineering Company. All the other equipment put in by the company was accepted, and the company were asked to pay the costs of any repairs, for one year, if the said repairs be caused by defective installation.

FORT FRANCES.—Work has resumed on the development of the big water-power here for the Backus-Brooks Lumber Company. The development on the Canadian side of the river, including the erection of paper and pulp mills, will be rushed ahead and concluded before any extensive work is done on the American side. The contract for the completion of the dam and building the pulp mill has been let to J. J. White & Company, of New York. Their general superintendent and chief engineer, Mr. P. F. Richardson, of New York, is now on the ground, accompanied by Mr. H. P. Carter, assistant superintendent.

SEWERAGE AND WATERWORKS.

MONTREAL.—Superintendent Janin expects that with the present rate of progress the new conduit for the city's water supply will be completed in another fortnight. If the connection with the wheel house can be made before winter, Montreal will have an ample water supply and plenty of power to drive all the turbines for pumping the water to the reservoir.

MISCELLANEOUS.

Quebec.

MONTREAL.—Rapid shop work was recently done by the Structural Steel Company, Limited, in its Montreal works. On Friday, August 21, a contract was closed for two 125 feet through Pratt highway spans, with riveted trusses, steel floor and latticed handrails, meeting the requirements of Cooper's Class D., except that additions were made where necessary to carry a 20-ton threshing engine without exceeding 16,000 lb. fiber stress. The drawings were sent to the shops on Monday, August 24th, the trusses were fabricated, assembled, inspected by the Canadian Inspection Company, and matchmarked, and on Friday, August 28, the spans were shipped to Alberta, one week after closing the contract.

Ontario.

ROSEDALE.—In improvement of the Trent Canal system, an old wooden lock at Rosedale, Ont., seven miles from Fenelon Falls, is being replaced by a concrete-and-iron lock, and a long channel and dam is in the course of construction. Lake Cameron and Lake Balsam will, by this work, be joined by a modern, easily-navigated waterway. The cost of the work will be $300,000.

TORONTO.—Randolph MacDonald, President of the Dominion Engineering and Construction Company, announces that his organization will resume work in the spring. When the slump in the contracting business became evident last Fall, the company's head office at Montreal was closed, and the business placed in the hands of Henry Holgate, of the firm of Ross & Holgate. The value of the firm's plant was estimated at $300,000, very little of which has been sold.

Alberta.

CALGARY.—The Western Canada Cement and Coal Co. were very successful in their exhibit of Exshaw cement at the Spokane Exhibition. This brand of cement is being used on the Washington water-power dam and two reinforced bridges across the Spokane River.

PERSONAL NOTES.

MR. HENRY E. CARRY has removed from Merritt, B.C., to Vancouver City.

MR. E. L. G. STRATHY, S.P.S., 1907, sails on October 31st for Porto Rico, where he has secured a position on the staff of United States engineers engaged on roads and irrigation work.

MR. MATTHEW A. SAMMETT has severed his connection with the Montreal Light, Heat and Power Company, as engineer-in-charge of tests and design, and has opened an office at 702 Canadian Express Building, Montreal, as a consulting engineer. Mr. Sammett's work will embrace estimates, reports, acceptance tests, preparation of specifications for electric machinery, and supervision of plants for industrial enterprises.

RAILROAD EARNINGS.

	Week ending.	1907	1908	Change.
C.N.R.	Oct. 14	$208,100	$265,300	+ $57,200
G.T.R.	Oct. 14	935,632	849,270	86,362
Montreal St. Ry.	Oct. 14	71,187	70,483	— 6,704
Toronto St. Ry.	Oct. 17	65,445	68,560	+ 3,115

PATENTS.

The following is a list of Canadian patents recently obtained through the agency of Messrs. Ridout & Maybee, 103 Bay Street, Toronto, from whom further particulars may be obtained:—E. B. Badcock, steam engine and pump; G. W. Thexton, two-cycle gas engine governor; Rudolph Hennig, reversible valve gear; Victor Chaveriat, brake adjustment; John T. Macgregor, car fender; Sir Charles Wakefield, gas burner for flare lights; Connolly & Osborne, device for measuring hides; F. K. Pierpont, punch and matrix cutting machines; James Dulziel, voltage regulator; Hon. C. A. Parsons, ship propulsion system.

The Kellogg Switchboard & Supply Company have recently issued a folder, describing their new push bottom intercommunicating system. Five views showing wall and desk set styles, both open and closed, are given. The illustration shows it to be one of the most compact, private, automatic house systems on the market. Being compact, it is necessarily simple in operation. Both styles, wall and desk sets, are easily handled, and attractive in appearance. They are finished in either oak or mahogany, and add to the appearance of any office or room, because of the high grade of cabinet work, for which all Kellogg apparatus is noted. The desk set box takes up little room, and can be used either movably or placed in any convenient position on a desk or table. The company will be glad to send these folders to those interested, and will also, if requested, forward original photographs, which give accurate views of both styles and sizes. Any inquiries on the subject, will have the company's careful attention.

MARKET CONDITIONS.

Toronto, October 29th, 1908.

Accounts from the United States announce a waiting market in lumber as well as in steel. The election is so close at hand that buyers seem resolved to await its result. The very satisfactory report of the United States Steel Company, issued on Tuesday, showed a gain in earnings as also an increase in unfilled orders, which had a stiffening effect on steel prices in the meantime. Advices as to other kinds of material show the same hesitancy about buying and the same determination to wait until after November 4th.

In Canada, the result of the elections gives a steadying effect to prices, although thus far it has not made much difference in the volume of orders. Building materials have been moving fairly these two months, and no increase of moment is apparent this week. Features in the metals trade are not pronounced, the usual speculative vagaries have been going on but prices are not quotably affected by them.

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

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

Antimony.—Price unchanged at 8¾c., with more enquiry.

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

Bar Iron.—$1.95 base, from stock to the wholesale dealer.

Boiler Plates.—¼-inch and heavier, $2.40. No special activity. Boiler heads 25c. per 100 pounds advance on plate.

Boiler Tubes.—Demand limited. Lap-welded, steel, 1¼-inch, 10c.; 1½-inch, 9c. per foot; 2-inch, $8.50; 2¼-inch, $10; 2½-inch, $10.60; 3-inch, $12.10; 3½-inch, $15.30; 4-inch, $19.45 per 100 feet.

Building Paper.—Plain, 30c per roll; tarred, 40c. per roll. Business brisk.

Bricks.—Common structural, $9 per thousand, wholesale, and the demand moderately active. Red and buff pressed are worth, delivered, $18; at works, $17.

Cement.—The market is lower; cement can be had in 1,000 barrel lots at $1.80 per barrel, including the bags, which is equal to $1.40 without bags. Overproduction is evident, and demand is not brisk in a wholesale way. The smaller dealers, however, are busy selling small quantities.

Coal Tar.—In improved request; $3.50 per barrel the ruling price.

Copper Ingot.—A very active enquiry is reported with a firm feeling. The price is still 14¼c.

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

Dynamite, per pound, 21 to 25c., as to quantity.

Roofing Felt.—There is much more demand and a better feeling. Price $1.80 per 100 pounds.

Fire Bricks.—English and Scotch, $32.50 to $35; American, $28.50 to $35 per 1,000. Demand, moderate and steady.

Fuses—Electric Blasting.—Double strength, per 100, 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. Bennett's double tape fuse, $6 per 1,000 feet.

Galvanized Sheets—Apollo Brand.—Sheets 6 or 8 feet long, 30 or 36 inches wide; 10-gauge, $3.05; 12-14-gauge, $3.15; 16, 18, 20, $3.35; 22-24, $3.50; 26, $3.75; 28, $4.20; 29, $4.50; 10¾, $4.50 per 100 pounds. Fleur de Lis—28-gauge, $4.30; 26-gauge, $4.05; 22-24-gauge, $3.50. Queen's Head—28-gauge, $4.50; 26 gauge, $4.25; 22-24-gauge, $3.70.

Iron Chain.—¼-inch, $5.75; 5-16-inch, $5.15; ⅜-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.

Iron Pipe.—Black, ¼-inch, $2.03; ⅜-inch, $2.25; ½-inch, $2.63; ¾-inch $3.56; 1-inch, $5.11; 1¼-inch, $6.97; 1½-inch, $8.37; 2-inch, $11.16; 2½-inch, $17.82; 3-inch, $23.40; 3½-inch, $29.45; 4-inch, $33.48; 4½-inch, $38, 5-inch, $43.50; 6-inch, $56. Galvanized, ¼-inch, $2.86; ⅜-inch, $3.08; ½-inch, $3.48; ¾-inch, $4.71; 1-inch, $6.76; 1¼-inch, $9.22; 1½-inch, $11.07; 2-inch, $14.76. Rather more movement following the natural fall demand.

Lead.—Active, with a firmer feeling, price maintained at $3.90.

Lime.—In adequate supply and moderate movement. Price for large lots at kilns outside city 22c. per 100 lbs. f.o.b., cars; Toronto retail price 35c. per 100 lbs. f.o.b. car

Lumber.—Dressing pine we quote $32 to $35 per thousand for usual lengths (12, 14, and 16 ft.), and stock sizes of boards, and $38 to $40 for special lengths, common stock boards, as to grade, $24 to $28; Cull stocks, $20; sidings, $17.50; Southern pine, moderately firm; Norway pine rather easy. Hemlock moves steadily in small quantities. British Columbia shingles still $3.20; lath, No. 1, $4; No. 2, $3.50, with perceptible stiffening; spruce flooring, $25. No quotable change in price anywhere, but a more settled feeling.

Nails.—Wire, $2.55 base; cut, $2.70; spikes, $3. There is a fair supply and no especial activity.

Pitch.—An active trade at unaltered prices, at 70c. per 100 pounds.

Pig Iron.—More business doing, but no change in prices. Clarence quotes at $19.50 for No. 3; Cleveland, $19.50 to $20; in Canadian pig, Hamilton quotes $19.50 to $20.00.

Plaster of Paris.—Calcined, wholesale, $2; retail, $2.15.

Putty.—In bladders, strictly pure, per 100 lbs., $2.

Rope.—Sisal, 9½c. per lb.; pure Manila, 12½c., Base

Sewer Pipe.—

	4-in.	6-in.	9-in.	10-in.	12-in.	24-in.
Straight pipe per foot	$0.20	$0.30	$0.60	$0.75	$1.00	$3.25
Single junction, 1 or 2 feet long.	.90	1.35	2.70	3.40	4.50	14.63

In good demand; price 70 per cent. off list at factory for car-load lots; 60 per cent. off list retail.

Steel Beams and Channels.—Quiet. We quote:—$2.50 to $2.75, according to size and quantity; if cut, $2.75 to $3; 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.

Steel Rails.—80-lb., $35 to $38 per ton. The following are prices per gross ton; Montreal, 12-lb. $45, 16-lb. $44, 25 and 30-lb. $43.

Sheet Steel.—Market steady, with fairly good demand; 10-gauge, $2.50; 12-gauge, $2.55; American Bessemer, 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.

Tool Steel.—Jowett's special pink label, 10½c. Cyclops, 18c.

Tank Plate.—3-16-inch, $2.50.

Tin.—The United States market is strong and a little higher. Moderate activity here at prices unchanged from last week, say 30 to 32½c.

Wheelbarrows.—Navvy, steel wheel, Jewel pattern, knocked down, $21.35 per dozen; set up, $22.35. Pan Canadian, navvy, steel tray, steel wheel, per dozen, $3.30 each; Pan American, steel tray, steel wheel, $4.25 each.

Zinc Spelter.—Business very good at unchanged prices, say, $4.90 to $5.

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Montreal, October 28th, 1908.

Reports from Glasgow are to the effect that the warrant market is easy, the increase of stocks in store amounting to 7,000 tons.

The German situation appears to be in control, and it is claimed that price cutting is taking place amongst German makers. There is talk from time to time of a new argeement being arrived at but considerable doubts are expressed on this score. The political situation for some time also exercised a bearish influence, so that it is not surprising that those who were bullish on the situation have to a very considerable extent altered their views.

In the United States the situation shows a decided improvement, the lethargy of the past few weeks having been succeeded by a moderate de-