PAGES

MISSING

The Canadian Engineer

VOL. X.—No. 9. TORONTO AND MONTREAL, SEPTEMBER, 1903. PRICE 10 CENTS $1.00 PER YEAR.

The Canadian Engineer.

ISSUED MONTHLY IN THE INTERESTS OF THE

CIVIL, MECHANICAL, ELECTRICAL, LOCOMOTIVE, STATIONARY, MARINE, MINING AND SANITARY ENGINEER, THE SURVEYOR, THE MANUFACTURER, THE CONTRACTOR AND THE MERCHANT IN THE METAL TRADES.

SUBSCRIPTION—Canada, Great Britain and the United States, $1.00 per year; foreign, 6s. Advertising rates on application.

OFFICES—18 Court Sts. Toronto ; and Fraser Building, Montreal.
Toronto Telephone, Main 4310. **Montreal Telephone,** Main 2589.

BIGGAR-SAMUEL, LIMITED, Publishers,

All business correspondence should be addressed to our Montreal office. Editorial matter, cuts, electros and drawings should be addressed to the Toronto Office, and should be sent whenever possible, by mail, not by express. The publishers do not undertake to pay duty on cuts from abroad. Changes of advertisements should be in our hands not later than the 15th of the preceding month or if proof is desired, 4 days earlier.

CONTENTS OF THIS NUMBER :

ORILLIA POWER DEVELOPMENT.

The town of Orillia has satisfactorily solved the question of municipal ownership, and has in successful operation an electrical plant which furnishes light for its streets and private consumption, and supplies power at such a cheap rate as to have already superceded steam in most of its factories, and induced a number of manufacturers to look to it as a desirable location for their business.

More than twenty years ago, a private company built waterworks, which were taken over by the town in 1883. In 1887 electric lighting was introduced—the arc system that year, followed by the incandescent system in 1894. The waterworks and electric light plant were both operated by steam till the electric power now in successful operation was installed.

Within the last four or five years the town found itself face to face with the problem of how power could be most economically obtained. The applications for water and light were increasing, and to meet them an extension of the steam plant had become imperative. The price of fuel had increased. The proposition to employ water-power was made, and though the town had no water-power close at hand, there was a splendid fall at Ragged Rapids, on the Severn, nineteen and one-half miles distant, with the whole of Lakes Simcoe and Couchiching as a source of supply. Engineers were consulted, who estimated that for an expenditure of $75,000, some 800-horse-power generated at these falls could be delivered to the extent of 720 horse-power in the town, the difference representing the loss in transmission. This entailed an annual expenditure of some $4,337 to pay off principal and interest on the capital invested, in thirty years, or $500 less than would probably be spent on fuel to supply much less power. The people readily voted the money. The contract for the development of the power—dam, flumes. wheels, penstocks, electric generators—was given for $71,000. The contract was in a lump sum, and it is difficult to say just how much was apportioned to each service. The concrete and masonry dam was to take about 2,200 yards at $7 a yard, or in all about $15,000; the rock excavation for tail-race, flume, etc., about $15,000; the new waterworks electric pump cost $4,000; the hydraulic and electric machinery about $11,000, the pole line and wire to the town about $1,000 a mile, or some $20,000. Then there was a power-house at the falls, of concrete, and a residence for the engineer. The total cost has been about $150,000.

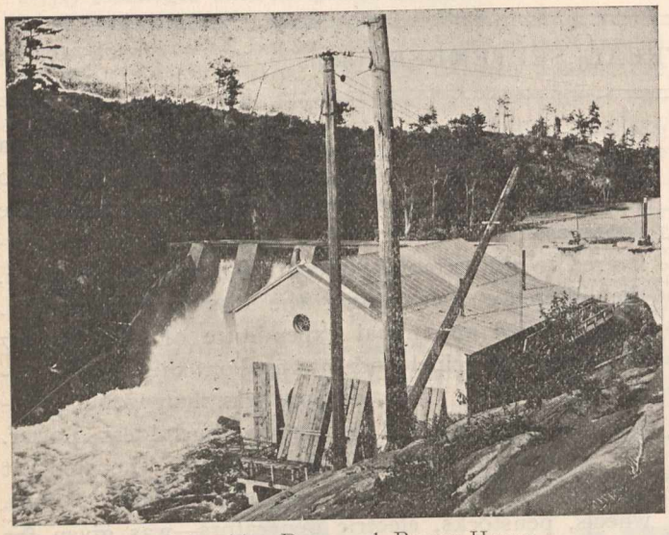
Ragged Rapids is in a gorge of the Severn river, nineteen and one-half miles from Orillia. Before the improvements were effected, there was a fall of about 35 ft. in the rapid, but most of the rapid has been effaced by the construction of the dam. The power house stands at the water's edge in the gorge, the rock having been blasted away to make way for the foundation. The dam, which is of concrete construction, gives a head of 33 ft.

The power-house is 62 by 40 ft. and is built of concrete on stone foundation. The concrete is in the proportion of one of cement, three of gravel, and six of broken stone.

The power-house contains two pairs of 35-inch turbines of the Croker variety, having a speed of 238 revolutions per minute, and regulated by two Lombard water-wheel governors. The dynamos consist of two units, S.K.C. system, made by the Royal Electric Co., Montreal. The current is generated at a voltage of 1,200, at which it passes from the machine to the high voltage panels and through step-up transformers, which step it up to 22,000 volts, at which it passes over the transmission lines to Orillia. The capacity of each generator is 300-kilowatts, equal to 400 horse-power. Lightning arresters are provided at both ends.

The transmission line consists of three No. 4 copper wires supported on poles 105 feet apart. There is also a double telephone line, the wires being transposed at every fifth pole.

The sub-station at Orillia is a brick building, 38 by 60 ft., with concrete floor, and two stories high the upper being used as a storeroom and workshop. It is furnished with a high voltage, 10-panel switchboard, of white marble. The distributing board is of



Ragged Rapids—Dam and Power-House.

blue Vermont marble, having eight panels. Step-down transformers reduce the current from 22,000 to 2,000 volts, at which rate is is distributed.

There are 5,000 incandescent lights in use in Orillia, and the streets are lighted by 50 alternating arc lamps. One hundred horse-power is used for the pump in the water-works, but not continuously, and 422¾ horse-power is contracted for to run various industries in the town. The first contract was for 720 horse-power, delivered at Orillia, but that amount has never been available, because the tail-race was defective, and did not allow the water to get away fast enough from the turbines. As soon as this defect is remedied, 100 horse-power more will be available. Contracts have recently been let for an extension, which will double the capacity of the plant. The con-

Interior of Power-House.

tract for the electrical installation goes to the Westinghouse Co., and for the hydraulic to the Wm. Hamilton Co., of Peterboro.

The installation was commenced in the fall of 1898, the first contractors being Pratt & Mullaney, of Buffalo. Slow progress was made, and the work was eventually taken out of their hands and in 1899 given to P. H. Patriarche, who had the contract for everything but the town sub-station building. He did a large amount of work, but also failed to complete it, the town having to do so under the direction of its own engineer. A lawsuit is still going on in connection with Patriarche's contract. The works were finally completed, and current turned on, January 24th, 1902. Since that time the only interruption has been from the breaking of the runner of one of the turbines caused by a sprung shaft.

The addition to the works, already referred to and now in progress, includes a new 600-K.W. generator, with water wheels direct-connected to run the same, and an extension of the power-house to provide the necessary accommodation. The new installation will not be completed before February, 1904, as it is impossible to obtain the machinery sooner. Meantime the current required for power and light is beyond the capacity of the works, but as it will not all be in use at any one time, no serious difficulty is apprehended.

Four men are required to run the plant at

Dam and Power-House Looking down Stream.

Ragged Rapids, and four or five are employed at the sub-station and on line work in Orillia. W. J. Mitchell was hydraulic engineer, and R. J. Parke electrical engineer for the installation. No engineer is employed for the new work beyond the permanent staff. The works are under the charge of Peter Ritchie, who was trained on the spot, as superintendent. Alex. Ritchie is engineer at the Ragged Rapids power-house.

The revenue the town derives from the various services is about as follows:

Water	$5,000
Light	9,700
Power	6,537
	$21,237

The cost of running the works, with repairs, is about $7,500, adding to which the interest on investment, leaves a profit of from $600 to $1,000 on present capacity. In addition the town has its street and municipal building lights free. There are both flat and meter rates. The flat rate for residences is 25c. per month for each 16 candle-power lamp. In stores,

hotels, halls, and churches the charge is 35c. per month. When ten or more lamps are installed, the current is supplied on a meter basis if desired at the rate of 13c. per thousand watts. On all these rates there is a discount of 20 per cent. for payment within ten days of presentation of the bill. Fifteen cents a month is the rental charge for the meter. The charge for power is $15 per horse-power per annum.

The population of Orillia is a little over 5,000.

THE GRAND TRUNK PACIFIC.

As briefly announced in last issue, the Government's arrangement with the Grand Trunk Pacific Railway Co. for the building of a new Canadian transcontinental line have been laid before the House, and has been discussed by both advocates and opponents. Nothing has been brought out in the discussion that has weakened the claim of the Canadian Engineer that the great work should be undertaken and maintained by the Government. As Mr. Blair maintains, it is only by such ownership that the country can secure the full benefit of the most reasonable rates, and the best terms in making connections with other roads in the future; and only by such ownership can it reap the full benefit of profits that will accrue as the West develops and the line becomes valuable. The Government ownership of railways has been found to be good policy in South Africa, in India, and in Australia. Readers of Sir Charles Dilke's "Problems of Greater Britain," will find a high testimony to the public spirit and enterprise of the Australian Government in developing a system of railways which have yielded dividends for the public benefit and yet have enabled people to travel throughout those great colonies at a penny a mile—about a third of what is now charged in some portions of Western Canada under company ownership. The Government railways of India are one of the most valuable of state assets, and afford cheap rates while producing a good revenue. In South Africa—notwithstanding the fact that the railways are all narrow gauge, the rolling stock poor in hauling capacity, and the construction in several instances extravagant in cost and bearing the burden of serious faults in administration—the state railways in every instance have been revenue producers. In the case of the Orange Free State, the railway, during the long administration of President Brand, was the mainstay of the Government revenues; while the railway operated by the Netherlands Co. in the Transvaal was considered a gold mine richer than any in the Rand. The railways of Natal and the Cape Colony are all Government lines and in good years have yielded an annual dividend ranging from three per cent. to eight per cent. for the past quarter of a century. For a transcontinental line, the best solution of the problem would be a state-owned road running across the country far enough north of the C.P.R. to create a new sphere of traffic and give access to the lands now being reached with difficulty by the swarms of new settlers, and incidentally near enough to James' Bay or Hudson Bay to afford an outlet for grain by those waters, as well as by the Great Lakes to the south of the main line. Instead of making a second political road through the Maritime Provinces, such a line should reach tide water by the straightest and nearest route, which would be across northern Quebec to a port created on the Gulf of St. Lawrence or the coast of Labrador. By this plan not only would the greatest amount of new territory be opened up for settlement, as a direct result of the road, but the shortest route would be created for the commerce between Europe and Asia, which is one of the other great purposes of such a trunk line.

If, however, the Dominion Parliament decides that the road is to be built by private enterprise, then some arangement with the Grand Trunk will give the best results to the public, for the reason that that system has the largest number of ramifications, and can give direct access to the West to the greatest number of cities and towns in the East. As a matter of broad policy, the Grand Trunk should reach out to the Pacific for the vast traffic that awaits a road of such a character, that will materially shorten the ocean route between Eastern Asia and Western Europe; and we have often wondered why the Grand Trunk authorities did not years ago see the drift of events that have made such a step a present necessity. It is apparent that Mr. Hays was not long installed in the management before he saw the one thing which the Grand Trunk lacked, and in supplying this one thing he and his associates will be public benefactors while serving the interests of their own system.

POWER FROM THE TIDES AND WAVES.

The possibilities of the ocean tides and of ocean and lake waves as a source of power have not heretofore engaged more than fitful attention from engineers and inventors. In past ages, in the babyhood of machinery and the industries carried on by mechanical force, the need of power in large units was not so keenly felt. The wayward winds and mountain glen streams furnished nearly all that the primitive industries, such as those for grinding wheat and sawing lumber, required of the elements. Now the transformation of power into so many forms and for so many uses by electricity, steam and water, makes new and ever-increasing demands on the latent forces of the earth and air, and tidal power and wave power will soon come in for more serious attention than they have yet received.

On the sea coast of California, and at one or two points on Lake Ontario, among other places, wave motors have been successfully applied within the past three years to pumping water and other mechanical uses; but with the appliances so far used the power derived has not been in large units; and wave motion is subject to the same drawback as wind motion, that of being variable according to the weather.

If the power of the tides can be harnessed economically, we can obtain it in some places in large units, and it will be found more reliable even than that derived from falling water. Big rivers will sometimes run low from a drought; and under the influence of a long and strong east wind even the mighty

Niagara has been known on two occasions within the records of European settlement to have run dry at the Falls for several hours at a time. But our tides are as certain as the motion of the moon, which causes their rise and fall, and though poetry charges our satellite with being "the inconstant moon," science teaches that the charge is a slander, and proves it by the fact that the moon's motions can be calculated on and predicted to a second of time for half a century ahead. Hence we can have no more reliable power than that of the tides, but the question is how can it be impounded and released in such a way as to furnish regular, if not continuous, power?

An esteemed contributor to the Canadian Engineer, Charles Baillairge, C.E., of Quebec, recently presented a paper to the Canadian Society of Civil Engineers, in which he expressed the opinion that the tides cannot be successfully used as a source of power, because, among other things, of the low head obtainable, and the intervals of idleness at half flood and half ebb. The latter can be got over to a great extent by electrical storage; and the former difficulty is to be got over by wheels constructed to operate on a low head. We gave in 1895-96 an account of a motor operated by the tides in England in such a way as to be utilized successfully for lighting and for a small amount of power. But low tides are not universal. We have in the upper reaches of the Bay of Fundy tides that rise and fall 66 feet, and the total available power of the Fundy tides would be almost incalculable. Here, at least, there are situations where enough head could be obtained and enough water impounded to supply power on an extensive scale. As a matter of fact, tidal-power saw-mills were operated for years in the last century near St. John, N.B., as briefly described some years ago in this journal; and the remains of a tidal-power grist mill is to be seen at Knightville, a suburb of Portland, Me. A representative of the Canadian Engineer, on a visit to Portland the other day, was informed by an old resident that this mill was in regular operation down to about fifteen years ago, and that it was the successor of several other mills operated by the tides since the time of the British occupation of Maine, the mill privilege having been granted by the British Colonial Government. This mill and its predecessors must therefore have been in successful working for over a hundred years. The last mill was operated by turbine wheels which yielded about 100 horse-power. It was built on an embankment which extended across the mouth of a stream emptying into Portland harbor. The lowlands enclosed by this embankment comprised several acres, and as the tide rose the water was let in through a sluice gate under the mill. At high tide the gates were closed and when the tide fell in the harbor the mill was operated by letting the water out. Thus the grinding had to be done during a few hours out of the day; but the machinery in other cases was so arranged that it could be operated in both directions, that is by the rising tide as well as the ebbing tide. If a mill could be successfully operated by the crude machinery of the early part of the last century, surely the hydraulic engineer of to-day can design a better tidal motor.

Dr. Louis Bell, writing in an engineering contemporary, gives his views on this subject, as follows:

Tidal power has been utilized in only a very small way; its large use has always been considered dubious. In the first place, tides of a height readily available are local in their occurrence; and, second, tides are essentially periodic, so that their direct power is available only in two short daily periods occurring in cyclic order during each part of the twenty-four hours, as the month is rounded out. Hence the first problem of tide utilization is storage of power. It is possible by the use of multiple reservoirs to extend the use of the tides throughout the twenty-four hours. A three-pond system accomplishes this end at considerable cost in complication of waterways and variations in head, and even a two-pond system helps to a steady use of tidal power for part of the day. There is, too, great variation in the rate of flow in the tides in different localities, the most favorable case being that in which the tide rises and falls most rapidly. But the main trouble with the tides is that the total rise and fall is relatively small, compelling one to deal with low, as well as variable heads, and to provide enormous reservoirs to store even enough water for use in two daily five-hour runs. In very few places would it be possible to rely on more than six feet mean working head. This means that if the storage pond were six feet deep, each square mile of reservoir would store water for about 5,000 horse-power for a five-hour run. Even this is an unusually favorable case, and it is evident at once that hydraulic works on this scale imply a very large investment for the power obtained. The only tidal powers to be taken seriously as able to count in large work are such as exist in exceptional spots, like the Bay of Fundy, where the tides run forty feet high under normal conditions. There it should be possible to obtain, for two five-hour runs, more than 50,000 horse-power per square mile of reservoir. A glance at a map will show that the inner extremity of the Bay of Fundy is almost a tidal lake, known as the basin of Minas. At its outlet rise two great headlands, less than three miles apart, while the narrower tide-race between them takes the full current for the basin within. This covers an area of more than 400 square miles, so that it is safe to say that through that narrow gap more than 200,000,000 horse-power hours run daily to waste. To utilize it would require an engineering feat more tremendous than anything yet attempted by man, but in years to come the game may be worth the candle.

CANADA'S SHARE IN IMPERIAL DEFENCE.

Not the least important of the resolutions offered at the Congress of Chambers of Commerce, in Montreal, last month, was that on Imperial defence, presented by George E. Drummond, representing the Canadian Manufacturers' Association. The resolution simply affirmed the duty of the self-governing colonies to participate in the cost of the Empire's defence. To this an amendment was offered by D. Masson, representing the Chambre du Commerce of Montreal, expressing the opinion that Canada's duty

to the Empire would be best done by the application of its revenues to the development of its own resources, and that the colonies should claim the privilege of taking their own initiative as to the nature and mode of aid to be given in the defence of the Empire. In order that unity of policy might be reached, a conference was held between the parties to the resolutions on this subject, and a compromise resolution agreed upon and passed, affirming it to be the duty of the self-governing colonies to participate in the cost of defending the Empire, but leaving each colony to determine the nature and mode of help towards this defence.

It is creditable to the hearts and minds of those representing the French-Canadian Chamber of Commerce that they consider their first duty to be the peaceful development of the resources of Canada. But the predatory instincts of mankind have not changed since primitive days, and how can we carry on these peaceful developments except under the shelter of the mighty armaments which Great Britain has raised, at such a great sacrifice, for our protection as well as her own? If to-day these armaments were destroyed, we know what would happen to our peaceful developments to-morrow. What, then? Are we to go on forever shouting our loyalty to the old flag while not lifting a finger, as a nation, towards the maintenance of those means of protection by which the Mother Nation has enabled Canada to grow to what she is to-day? The Cape of Good Hope colony has contributed a cruiser to the British navy, Natal has offered to furnish free coal to the navy, and the Australian Commonwealth has established the nucleus of a navy for her own coast defence. Canada—that is official Canada—cuts a mean and measly figure in the test, or rather no figure at all, for the amount spent on the militia and local defences cannot be called a contribution to that arm of the Imperial service to which this country is indebted for its safety from foreign invasion, namely the navy. We are, of course, not considering exigencies like the South African war, but a permanent policy of defence. For this the only thing we are now doing, apparently, is a contribution of $150,000 towards the fortifications of Esquimault, while the annual cost of maintaining these forts, and those of Halifax, is about $1,000,000. These in a large sense are really local works, and ought certainly to be paid for and maintained by the Canadian Government. Towards the navy, which really shields us from foreign interference, we contribute nothing.

This is all the more strange when we take into account the natural aptitude of Canadians to the sea, the extent of our mercantile marine (only five nations in the world exceeding us in this respect), and the extent of our sea coasts and the vast stretches of lake and river, which keep alive our taste for navigation. Nature has given us in a supereminent degree the opportunity of being expert seamen and marine engineers, and our relations to our kindred peoples thus point out naval defence as our special share of duty in the burden of Empire. Strange it is, therefore, that with this special capcaity for developing power on the sea, with a supply of sailors and sea-faring people equal to any in the world, and an equal supply of men able to furnish the engineering and mechanical talent required for a modern navy, no Canadian Government, Conservative or Liberal, has as yet appreciated its opportunity or followed up the natural bent of the people.

The opinions expressed by Mr. Drummond will be found to voice those of a considerable majority of the people of Canada, if this question were put to a test vote. In his speech, in proposing his resolution, he said: "While it was true that Canada had done and was doing something in connection with the land defences of the Empire, its position with regard to the maintenance of the Royal Navy was indefensible and inexcusable. Canada contributed absolutely nothing to the maintenance of the navy, and yet His Majesty's ships made it possible for Canadian shipping and Canadian commerce to flourish in all seas. The British navy was an insurance guard on all British, including Canadian, and the whole of the cost fell upon the British taxpayer. Canada carried in her registers no less than 660,000 tons of shipping afloat, and was dependent for the protection of it upon a fleet to the maintenance of which she did not contribute one single cent. Such a position was humiliating and intolerable to a free and high-spirited people. He presented a calculation showing that on the basis of British tonnage afloat Great Britain pays in the royal naval expenditures a national marine insurance at the rate of 50 cents a ton. If Canada paid her share she would have to pay some $9,000,000 a year as her share towards the navy. This might appear at first too large a sum, and perhaps it was, but this Canada could and should do—relieve the Mother Country of the cost of the warships maintained on our Atlantic and Pacific coasts. These vessels cost a little over $18,000,000, and they should be replaced within the next fifteen years by ships built in Canadian shipyards, with Canadian money, maintained by Canada and manned by Canadian seamen. The giving out of the contract for the construction of these ships would produce a new shipbuilding trade in Canada, for the speaker had no doubt that with such a Government contract in view some of the great British shipbuilding firms could be induced to establish branch shipyards in Canada. The industry was a most desirable one for the country. Then something should be done towards making Canada a centre of production for warlike supplies. The country's natural resources fit it to become a manufacturer of cordite, guns, projectiles and arms and ammunition of every description. The money spent by Canada on Imperial defence would thus tend to the development of Canadian industries. If Canada had been behind Australia and Natal in the matter of contributions to the Royal Navy, it was not that the hearts of Canadians were not warm to Britain. It was the public man to take the question up that was needed. As to the men who would be required to man the Canadian ships in the Royal Navy, he would only say that on our lakes and coasts are seamen as brave and experienced as any Blake or Nelson ever led, and, thank God, they are British to the core.

As Mr. Drummond observes, the creation of

shipyards and shops capable of turning out a ship of war would of itself add much to the industrial versatility of the country, and as a feature of strength to the Empire in a time of war, it would be of incalculable importance, increasing immensely the offensive and defensive strength of British naval power, while adding an element of moral strength against a possible foe. A Britain capable of building and repairing modern war ships in any one of the seven seas would be a vastly more formidable foe to any European nation than a Britain having shipyards and machine shops only around the central island. A British Empire so equipped and living in harmony with the United States, as it should live, would bring in a new principle of equipoise more likely to inaugurate universal peace than any other condition of national relationship, for this reason that so long as these two peoples retain their vital Christianity they are less likely to wish to use their power to despoil other nations. The predatory instinct still inherent in the natural man would be held in more secure check. It is only a nation with Christianity as a guiding principle of self-government, and not a name to conjure with for selfish purposes, that can be considered fit to hold the balance of power on earth. Yet we cannot assume that we are thus fitted to rule in the earth. We can only be sure that the power already bestowed upon the Empire shall not be used to wrong another nation, or make the earth less free or less a region of peace and good-will.

Meantime it is the duty of this Dominion to assume its rightful share in defending the liberties it has won, and preserving in honor the glories it has already achieved. We claim our inheritance in these glories, and most of we British-Canadians raise our voice in matters of Imperial policy and destiny. We cannot claim all the privileges of the Imperial position and then shirk its duties and responsibilities.

Marine News.

St. John, N.B., is to have a dry-dock.

Sydney, N.S., is to have a dry-dock.

The steamer Erin, loaded with iron, sank at Farrens' Point.

H. H. Ross has built a steamer at Medicine Hat, for the North Saskatchewan River.

Repairs have been completed in the power canal at Sault Ste. Marie, and the water turned on.

The Fredericton people want the steamer Aberdeen put on the route between that city and Georgetown.

The R. & O. steamer Montreal, recently burned, is to be rebuilt at the company's shops, at Sorel.

The C.P.R. SS. Empress of India was damaged to the extent of $20,000, by running into a Chinese cruiser.

A new floating elevator is to be built by the Wolvin syndicate to replace the one recently burned at Quebec.

The R. & O. steamer Carolina went ashore near Tadousac, in a dense fog, and was somewhat damaged.

The New York yacht Presto, which has arrived on the St. Lawrence, is expected to make over 30 miles an hour.

The dry-dock at Collingwood is completed. It is 525 feet long, and can take in any vessel on the Great Lakes.

The Government has leased the Connolly dredge and plant, which have been working at St. John, for use on the St. Lawrence.

The steamboat inspector at Kingston has called attention to the law which requires that all boats of three tons or over whether run by steam, gasoline, or electricity, must be inspected and get a certificate.

It is announced that the Government has entered into an arrangement with a Mr. Carbonneau, of Paris, for a direct steamship service between Canada and France for a period of ten years, the annual subsidy being $100,000.

The Montreal Star says that Messrs. Brown, McFarlane & Co., a Glasgow firm of turbine engine manufacturers, are making arrangements with the Canadian Pacific Railway Company for the installation in the latter's lake boats of turbines, which have the advantage of reducing vibration to a minimum.

Major W. H. Bixby, United States engineer, has closed contracts for the removal of two wrecks which have been a menace to navigation in St. Clair River—the steamer Stimson, which burned and was beached in the Flats, and the barge Champion, sunk by the steamer Bunson in the channel, at the head of Russell's Island.

The Allan Line is gradually weeding out its smaller vessels. The Norwegian, built at Glasgow in 1865, has just been sold. A new ship, the Victorian, larger than any now in their fleet, will be built. She will be 545 feet long, 60 feet wide, and 43 feet deep, with a tonnage of 11,000, and a speed of 16 knots.

The United States Government has, after some hesitation, agreed to the construction of a dam 300 feet long, across the Gut channel in the St. Lawrence, between Adams Island in Canadian waters, and Galoup Island on the American side, to stop a dangerous cross-current which interferes with the usefulness of the newly constructed North channel.

The steamer Nebing, built for Thomas Marks & Co., of Port Arthur, at the yard of Sir W. G. Armstrong, Whitworth & Co., Newcastle-on-Tyne, has been launched. She is a steel steamer 256 feet long, 42 feet beam, and 25 feet deep, with a carrying capacity of 3,000 tons on 18 feet, and a speed of 12 miles per hour.

Mining Matters.

The Nova Scotia Steel and Coal Company has decided to build four new blast furnaces within the next two years.

A report from Skagway says that another rich placer mining region has been found on Takeena river, which is 180 miles from White Horse.

The timbers in the War Eagle mine at Rossland recently took fire. The mine was sealed up and steam vapor turned in to extinguish the flames.

The Gooderham & Blackstock syndicate will put improved machinery into the Leroi No. 2, War Eagle and Centre Star mines at Rossland.

A huge coal area, estimated to contain 300,000,000 tons, has been discovered in the Peace River country, 400 miles north-west of Edmonton. The difficulty of transportation stands in the way of immediate development.

The International Coal and Coke Company, which has property three miles west of Blairmore, on the Crow's Nest Pass Road, is making extensive preparations for taking out coal. Yards have also been laid out for coke ovens.

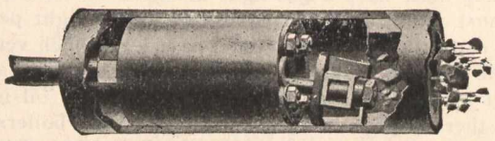
The production of zinc having fallen behind the demand in the United States the Kootenay region in British Columbia is being prospected as a source of supply. This, with the bounty on lead, has given an impetus to mining in that district.

A report from J. M. Bell, who is in charge of the party prospecting for coal in Northern Ontario, states that considerable beds of lignite have been found, particularly in the valley of the Lowiska. Beds of gypsum have also been discovered.

Several of the large slate quarry operators in Wales are said to be planning to move to Newfoundland, the quarries in the former having given out, except for deep mining. The Newfoundland slate is said to be better even than the Welsh, and more easily mined.

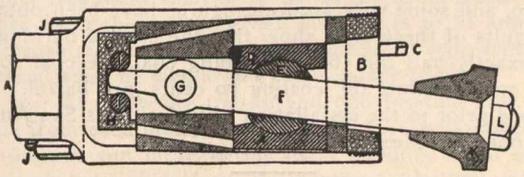
BOILER TUBE CLEANER.

One of the most difficult problems which confronts engineers in charge of steam boilers, and which gives them no little thought is how to get rid of scale formation on tubes. They know that all water in converted into steam, that all water contains certain foreign ingredients and that this foreign matter gradually, sometimes rapidly, accumulates and forms a hard scale deposit of a non-conducting property, injurious and wasteful in the generation of steam. Scale once formed generally becomes a serious detriment to effective and economical operation. It is natural for engineers to resort to all kinds of expedients for its prevention and removal. The shells of boilers and their tubes will, if prompt and efficient remedies are not taken, become coated to such an extent that firing is made more and more irksome and the consumption of fuel unduly increases. These are the simple facts known to every engineer and fireman, who are



Diamond Steam Tube Cleaner for Water Tube Boilers.

always ready to assert, and with truthfulness, that the most troublesome operation in the care of their boilers, is the cleaning of the tubes. In ordinary return tubular boilers, scale forms on the outside of the tubes, and in water tube boilers, scale forms on the inside of the tubes. In the former the tubes are so close to each other, that it is a difficult task to clean off the whole exterior surface. Many are the contrivances in use to-day for the removal of scale, but the most efficient, known as the Diamond Steam Cleaner, con-

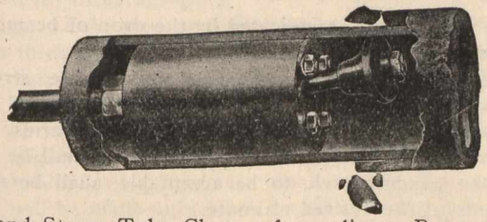


Sectional View of Diamond Steam Tube Cleaner.

A—Shell. B—Shell ring. C—Bolt holding shell ring. D—Cylinder. E—Piston. F—Hammer handle. G—Pin in cylinder. H—Valve. JJ—Bolt holding shell and piston. K—Hammer. L—Hammer nut.

structed and introduced by the Power Specialty Co., 361 Washington St., Buffalo, N. Y., and who have also a factory at Bridgeburg, Ont., is worthy of special attention. The accompanying illustration shows its form and arrangement.

The cleaner is practically a little engine, operated by steam or compressed air. At the end of what would be the piston rod, on a large engine, is a small iron vibrator or oscillator, made with the same curve as the tube. This vibrator has a movement like the pendulum of a clock, only of course the machine works in a horizontal position, and its movements are infinitely more rapid.



Diamond Steam Tube Cleaner for ordinary Return Tubular Boilers.

Having been connected by a steam hose with an adjacent boiler, the machine is introduced at the front end of the boiler tubes to be cleaned. The steam is turned on, the vibrator commences its oscillating movement, increasing its strokes rapidly, as the pressure is increased to 40 or 50 pounds, which is the normal steam pressure required. By this time the machine will be making from 1,000 to 1,200 strokes a minute, while the accumulation of soot and soot crust is removed and blown out by small jets of live steam. In itself this is a most valuable feature, yet of very minor consideration compared with the vastly more important results, the dislodgment of the scale. The vibration on the inside causes the scale on the outside of the tubes to fall off.

There are two ways to remove hard, thick scale in a water tube boiler, either to bore it out by some device that has a circular movement in the tube, or to give the scale a direct blow to cut and loosen it from the tube. In the former case great power is required, which is almost impossible to obtain in a tube of 3½ or 4 inches in diameter. A great complication of machinery in needed to do any sort of heavy work in this way. In the latter case, the really correct principle, it is claimed is very much simpler and does not involve the use of such immense power. The vibrator of the cleaner is changed to carry a head which is made sharp to cut and scatter the scale, yet so guarded that when the scale is removed, and the boiler is clean, the sharp edge cannot reach the iron itself or make the slightest indentation in the tube. The vibration, meanwhile, serves also to remove any soot formation on the outside of the tube.

OIL AS FUEL,

T. E. Edgar, before Nat. Electric Light Association.

The method of burning fuel oil, the changes necessary in the boilers, the style of burners, etc., are practically the same in all cases, but a brief description of the installation in the electric light plant at El Paso, Texas, may be of some interest.

The oil is stored in two steel tanks, each 30 feet long by 10 feet in diameter, made of 3-16-in steel, which are buried in the ground directly behind the plant. These tanks are buried end to end, four feet below the surface, and covered with a four-inch wood lagging treated with a wood preserver to prevent the alkali in the soil from destroying the tanks. Between the ends of the tanks is a manhole four feet wide by eight feet, into which all pipes, valves and connections possible are made, affording easy access to make repairs. The tanks are connected together with both the supply and suction pipes and are filled and emptied both at the same time, but the piping is so arranged that it is possible to use each tank separately, affording an opportunity to clean either of them. The oil is delivered in specially-built tank cars, holding from 155 to 300 barrels of oil. A rubber hose three inches in diameter is used to convey the oil from the tank cars to the tanks, and gauges arranged on the back of the plant show the amount of oil in each tank. It takes about forty minutes to unload a car of 6,500 gallons. Each of our tanks will hold about 17,000 gallons, and under the present conditions of operation this will last about half a month, affording us a fair storage capacity. There are two $3 \times 2 \times 3$ duplex steam pumps mounted on an iron frame standing about three feet six inches high. These pumps draw the oil from the storage tanks through a one and a half-inch iron pipe, and discharge it through a one-inch pipe into a small chamber about 14 inches in diameter by two feet six inches long, placed between and slightly above the pumps. The oil enters this chamber at one end, passing through a partition of very fine wire gauze into the other end of the chamber, where it comes in contact with a heating coil heated with the exhaust steam from the pumps. This runs the temperature of the oil to about 145 degrees Fahrenheit, being the proper temperature at which the oil atomizes freely. The gauze screen or partition is used to strain the oil and keep back sand and dirt, which, if allowed to pass the burners, would in time stop up the small openings through which the oil passes. The pump being a double one gives us a reserve in case of accident.

Experiments have been made with two burners, one known as a straight-blow burner and the other known as the cross-blow burner. Thus far we have been unable to see that one burner has any special advantages over the other as regards economy or ease of manipulation. In the straight-blow burner there is a central brass casting with a small bore through which the oil passes. The outside of this casting is fluted like the rifling of a cannon, and outside of this is another brass tube. The steam passing through this space and the fluting gives it a whirling motion so that

as the oil flows out of the inner bore it is caught by the whirling steam and atomized. It is considerable work to set this burner in place, as there are many changes to make in the brick work of the furnace. In order to atomize the oil thoroughly, the bridge wall of the furnace has to be reconstructed and a sort of grille work or fire brick put in its place. The grate bars are lowered about one foot in the fire-box, and a double row of fire brick laid on top in such a manner as to form an air chamber between them through which all air must pass in order to reach the furnace, the idea being that the air becomes heated before coming in contact with the fire. There are two of these burners under each boiler, each one being set in the fire door, and the door bricked up solid, except a small hole for looking into the furnace. When once set up it is rather difficult and expensive to change back to coal. The cross-blow burner is constructed somewhat differently from the straight-blow burner. It consists of a small casting with an overhanging top perforated with small holes arranged in a semi-circle on the underside. Just below these holes is a slot in the burner through which the steam issues in a sheet, and the oil being forced through these holes comes in contact with the steam and is atomized. This burner is put through a hole between the fire doors, using only one burner to a boiler. The grate bars are left in the same position as when coal is used, and are covered with a layer of fire brick laid in mortar. These bricks cover the entire grate except a few inches in front for air, and the bridge wall is left as used for coal. The furnace doors remain unchanged. The principle of an oil burner is that the steam comes in contact with the oil and atomizes and separates it as widely as possible. To convert a furnace from coal to oil will take from two to three days, and to convert to coal again from two to three minutes, where the cross-blow burners are used. After being once equipped for oil, however, and then converted to coal, it would be reconverted to oil again in about one hour.

In the use of fuel oil it is necessary in order to get economical burning, to have the oil flow to the burners at a steady pressure. Our first experiments demonstrated the necessity of this, as our fires were often put out through unsteady pressure. With a steady pressure of steam at the burners, if the oil pressure decreases, the steam is likely to blow out the fire, while if it increases, more oil comes through the burners than could be properly atomized, the result being, 1st, The fire smokes badly; 2nd, the excess oil runs away in the ash pit, causing liability to explode; 3rd, it fills the tubes with a soot that is much harder to remove than coal soot; 4th, the oil that is not atomized and flows away is lost. In order to insure a steady pressure of oil it is necessary to provide an auxiliary air chamber. Connected to this air chamber is a small safety valve which, in case the pressure runs above the point required, returns the excess oil to the storage tanks. To start the burners it is simply necessary to turn on the steam and a small supply of oil, and throw a piece of burning waste into the fire box, and we immediately have a full fire. To regulate it properly it is necessary to adjust the supply of both steam and oil until the fire burns without any smoke; and, if properly regulated we get a complete combustion of the oil and avoid almost entirely the presence of soot in the tubes and smoke from the stack. It is also possible, by simply increasing the supply of both steam and oil, to force the boiler to any extent. Care must be taken, however, in selecting burners to get one that thoroughly atomizes and distributes the oil so as not to confine the fire to any one part of the shell and burn the boiler.

The boilers are provided with peep holes in the back to enable the fireman to see the condition of his fire. Care must be taken to watch the fires very closely, and in case they go out for any reason to shut off the oil immediately, as the gas from the oil, combined with the air in certain proportions, is very explosive. Cases of this kind have been known where an explosion has occurred which took the damper up the chimney and blew out the front of the boiler. The statement has been made that it takes about four per cent. of the steam generaed to operate the oil apparatus. We have made no experiment to demonstrate the accuracy of this figure, but our observations go to show that this percentage is large. In a small plant like this, which is subject at times to a total shut-down, in case the steam of all boilers goes down, it is impossible to start the fire, in which case an auxiliary steam generator must be employed, or the fire brick be removed from the grates and coal be used to get up steam.

In installing this apparatus it is necessary to comply with certain rules and regulations of the insurance companies in order to prevent an increase in insurance rates. These rules, however, are not in any way unreasonable, but are necessary to afford ample protection to the plant. Their principal requirements are: 1st. That the storage tanks shall be buried four feet under the ground and ten feet from the building; or, if located more than one hundred feet from the building, may be put above the ground or only partially buried, in which case they must be surrounded by a brick or earth embankment forming a reservoir of sufficient capacity to hold double the contents of the tank. 2nd. They must have a gas-tight manhead at the top. 3rd. They must not be filled in excess of ninety-eight per cent. of their capacity. 4th. They must have a two-inch vent pipe. 5th. The highest point in storage supply must be at least two feet below the level of the furnace where oil is to be burned, thereby preventing gravity feed to the boilers.

What the saving has been per horse power of kilowatt hour as compared with the use of coal it is impossible for us to tell, as prior to the present ownership of this plant, which changed hands last fall, no records have ever been kept of the kilowatt output or the tons of coal used per month, so that comparisons are impossible to obtain. There is no question, however, but that there is a very large saving in the use of fuel oil. It is claimed by the advocates of fuel oil that four barrels of oil, forty-two gallons to a barrel, are equal to one ton of good bituminous coal. Experiments have been made by the Water Works Company at El Paso, and some very accurate figures have been obtained. The results of these tests show that the cost of burning fuel oil is exactly half the cost of burning coal, the coal costing $5 per ton, and fuel oil costing 70 cents per barrel. The coal used prior to the installation of fuel oil was San Antonio coal from New Mexico.

SPECIFICATIONS FOR MATERIAL AND WORKMANSHIP FOR STEEL STRUCTURES.

MATERIAL.

1. Steel shall be made by the open-hearth process.

Chemical and Physical Properties	Structural Steel	Rivet Steel	Steel Castings
Phosphorus Max { Basic...	0 04 per cent.	0 04 per cent.	0.05 per cent.
Phosphorus Max { Acid....	0.08 "	0.04 "	0.08 "
Sulphur maximum.....	0 05 "	0.04 "	0.05 "
Ultimate tensile strength	Desired	Desired	Not less than
Pounds per square inch.....	60000	50000	65000
Elongation: min. % in 8". {	1,500,000* Ult. tensile str'gth	1,500,000 Ult. tensile str'gth	
" " " 2".....	22		18
Character of Fracture	Silky	Silky	Silky or fine granular
Colds bends without fracture.	180° flat†	180° flat‡	90°

*See paragraph 11. †See paragraphs 12, 13 and 14. ‡See paragraph 15.

2. The yield point, as indicated by the drop of beam, shall be recorded in the test reports.

3. Tensile tests of steel showing an ultimate strength within 5,000 pounds of that desired will be considered satisfactory, except that if the ultimate strength varies more than 4,000 pounds from that desired, a retest shall be made on the same gauge, which, to be acceptable, shall be within 5,000 pounds of the desired ultimate.

4. Chemical determinations of the percentages of carbon, phosphorus, sulphur and manganese shall be made by the manufacturer from a test ingot taken at the time of the pouring of each melt of steel and a correct copy of such analysis shall be furnished to the engineer or his inspector. Check analyses shall be made from finished material, if called for by the purchaser, in which case an excess of 25 per cent. above the required limits will be allowed.

5. Plates, Shapes, and Bars: Specimens for tensile and bending tests for plates, shapes and bars shall be made by cutting coupons from the finished product, which shall have both faces rolled and both edges milled to the form

shown by Fig. 1; or with both edges parallel; or they may be turned to a diameter of ¾-inch for a length of at least 9 inches, with enlarged ends.

6. Rivets: Rivet rods shall be tested as rolled.

7. Pins and rollers: Specimens shall be cut from the finished rolled or forged bar, in such manner that the centre of the specimen shall be 1 inch from the surface of the bar. The specimen for tensile test shall be turned to the form shown by Fig. 2. The specimen for bending test shall be 1 inch by ½ inch in section.

8. Steel Castings: The number of tests will depend on the character and importance of the castings. Specimens shall be cut cold from coupons molded and cast on some portion of one or more castings from each melt or from the sink heads, if the heads are of sufficient size. The coupon or sink head, so used, shall be annealed with the casting before it is cut off. Test specimens to be of the form prescribed for pins and rollers.

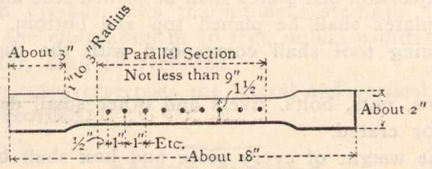


Fig. 1.

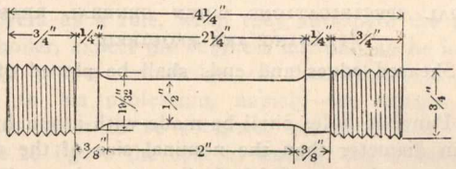


Fig. 2.

9. Material which is to be used without annealing or further treatment shall be tested in the condition in which it comes from the rolls. When material is to be annealed or otherwise treated before use, the specimen representing such material shall be similarly treated before testing.

10. At least one tensile and one bending test shall be made from each melt of steel as rolled. In case steel differing ⅜-inch and more in thickness is rolled from one melt, a test shall be made from the thickest and thinnest material rolled.

11. For material less than 5-16-inch and more than ¾-inch in thickness the following modifications will be allowed in the requirements for elongation:

(a) For each 1-16-inch in thickness below 5-16-inch, a deduction of 2½ per cent. will be allowed from the specified elongation.

(b) For each ⅛-inch in thickness above ¾-inch, a deduction of 1 per cent. will be allowed from the specified elongation.

(c) For pins and rollers over 3 inches in diameter the elongation in 8 inches may be 5 per cent. less than that specified in paragraph 2.

12. Bending tests may be made by pressure or by blows. Plates, shapes, and bars less than 1 inch thick shall bend as called for in paragraph 2.

13. Full-sized material for eye-bars and other steel 1 inch thick and over shall bend cold 180 degrees around a pin the diameter of which is equal to twice the thickness of the bar, without fracture on the outside of bend.

14. Angles ¾-inch and less in thickness shall open flat and angles ½-inch and less in thickness shall bend shut, cold, under blows of a hammer, without sign of fracture. This test will be made only when required by the inspector.

15. Rivet steel, when nicked and bent around a bar of the same diameter as the rivet rod, shall give a gradual break and a fine, silky, uniform fracture.

16. Finished material shall be free from injurious seams, flaws, cracks, defective edges, or other defects, and have a smooth, uniform, workmanlike finish.

17. Every finished piece of steel shall have the melt number and the name of the manufacturer stamped or rolled upon it. Steel for pins and rollers shall be stamped on the end. Rivet and lattice steel and other small parts may be bundled with the above marks on an attached metal tag.

18. Material which, subsequent to the above tests at the mills, and its acceptance there, develops weak spots, brittleness, cracks or other imperfections, or is found to have injurious defects, will be rejected at the shop and shall be replaced by the manufacturer at his own cost.

19. A variation in cross-section or weight of each piece of steel of more than 2½ per cent. from that specified will be sufficient cause for rejection, except in case of sheared plates, which will be covered by the following permissible variations, which are to apply to single plates.

20. Plates 12½ pounds per square foot or heavier:

(a) Up to 100 inches wide, 2½ per cent. above or below the prescribed weight.

(b) One hundred inches wide and **over, 5** per cent. above or below.

21. Plates under 12½ pounds per square foot:

(a) Up to 75 inches wide, 2½ per cent. above or below.

(b) Seventy-five inches and up to 100 inches wide, 5 per cent. above or 3 per cent. below.

(c) One hundred inches wide and over, 10 per cent above or 3 per cent. below.

22. Plates will be accepted if they measure not more than .01 inch below the ordered thickness.

23. An excess over the nominal weight, corresponding to the dimensions on the order, will be allowed for each plate, if not more than that shown in the following tables, one cubic inch of rolled steel being assumed to weigh 0.2833 pounds.

24. Plates ¼-inch and over in thickness.

Thickness Ordered	Nominal Weights	Width of Plate: Up to 75 inch.	75" and up to 100"	100" and up to 115"	Over 115"
1-4 inch	10.20 lbs.	10 per cent.	14 per cent.	18 per cent.	.....
5-16 "	12 75 "	8 "	12 "	16 "	.....
3-8 "	15.30 "	7 "	10 "	13 "	17 per cent.
7-16 "	17.85 "	6 "	8 "	10 "	13 "
1-2 "	20 40 "	5 "	7 "	9 "	12 "
9-16 "	22.95 "	4½ "	6½ "	8½ "	11 "
5-8 "	25.50 "	4 "	6 "	8 "	10 "
Over 5-8 "	.....	3½ "	5 "	6½ "	9 "

25. Plates under ¼-inch in thickness.

Thickness Ordered	Nominal Weights Lbs. per square ft.	Width of Plate: Up to 50"	50" and up to 70"	Over 70"
1-8 " up to 5-32"	5.10 to 6.37	10 per cent.	15 per cent.	20 per cent.
5-32" " 3-16"	6.37 " 7.65	8½ "	12½ "	17 "
3-16" " 1-4 "	7.65 " 10.20	7 "	10 "	15 "

Inspection and Testing at the Mills.

26. The purchaser shall be furnished complete copies of mill orders, and no material shall be rolled, nor work done, before the purchaser has been notified where the orders have been placed, so that he may arrange for the inspection.

27. The manufacturer shall furnish all facilities for inspecting and testing the weight and quality of all material at the mill where it is manufactured. He shall furnish a suitable testing machine for testing the specimens, as well as prepare the pieces for the machine, free of cost.

28. When an inspector is furnished by the purchaser to inspect material at the mills, he shall have full access, at all times, to all parts of mills where material to be inspected by him is being manufactured.

WORKMANSHIP.

29. All parts forming a structure shall be built in accordance with approved drawings. The workmanship and finish shall be equal to the best practice in modern bridge works.

30. Material shall be thoroughly straightened in the shop, by methods that will not injure it, before being laid off or worked in any way.

31. Shearing shall be neatly and accurately done and all portions of the work exposed to view neatly finished.

32. The size of rivets, called for on the plans, shall be understood to mean the actual size of the cold rivet before heating.

33. When general reaming is not required, the diameter of the punch for material not over ⅝-inch thick shall be not more than 1-16-inch, nor that of the die more than ⅛-inch larger than the diameter of the rivet. Material over ⅝-inch thick, except minor details, and all material where general reaming is required, shall be sub-punched and reamed as per paragraph 61, or drilled from the solid. Rolled beams and

channels used in floors of railroad bridges shall be sub-punched and reamed, or drilled from the solid.

34. Punching shall be accurately done. Slight inaccuracy in the matching of holes may be corrected with reamers. Drifting to enlarge unfair holes will not be allowed. Poor matching of holes will be cause for rejection at the option of the inspector.

35. Riveted members shall have all parts well pinned up and firmly drawn together with bolts before riveting is commenced. Contact surfaces to be painted (see paragraph 65).

36. Lattice bars shall have neatly rounded ends, unless otherwise called for.

37. Stiffeners shall fit neatly between flanges of girders. Where tight fits are called for the ends of the stiffeners shall be faced and shall be brought to a true contact bearing with the flange angles.

38. Web splice plates and fillers under stiffeners shall be cut to fit within ⅛ inch of flange angles.

39. Web plates of girders, which have no cover plates, shall be flush with the backs of angles or project above the same not more than ⅛ inch, unless otherwise called for. When web plates are spliced, not more than ¼ inch clearance between ends of plates will be allowed.

40. Connection angles for floor girders shall be flush with each other and correct as to position and length of girder. In case milling is required after riveting, the removal of more than 1-16 inch from their thickness will be cause for rejection.

41. Rivets shall be driven by pressure tools wherever possible. Pneumatic hammers shall be used in preference to hand driving.

42. Rivets shall look neat and finished, with heads of approved shape, full and of equal size. They shall be central on shank and grip the assembled pieces firmly. Recupping and calking will not be allowed. Loose, burned or otherwise defective rivets shall be cut out and replaced. In cutting out rivets great care shall be taken not to injure the adjacent metal. If necessary they shall be drilled out.

43. Wherever bolts are used in place of rivets which transmit shear, the holes shall be reamed parallel and the bolts turned to a driving fit. A washer not less than ¼ inch thick shall be used under nut.

44. The several pieces forming one built member shall be straight and fit closely together, and finished members shall be free from twists, bends or open joints.

45. Abutting joints shall be cut or dressed true and straight and fitted close together, especially where open to view. In compression joints depending on contact bearing the surfaces shall be truly faced, so as to have even bearings after they are riveted up complete and when perfectly aligned.

46. Holes for floor girder connections shall be sub-punched and reamed with twist drills to a steel template 1 inch thick. Unless otherwise allowed, all other field connections shall be assembled in the shop and the unfair holes reamed; and when so reamed the pieces shall be match-marked before being taken apart.

47. Eye-bars shall be straight and true to size, and shall be free from twists, folds in the neck or head, or any other defect. Heads shall be made by upsetting, rolling or forging. Welding will not be allowed. The form of heads will be determined by the dies in use at the works where the eye-bars are made, if satisfactory to the engineer, but the manufacturer shall guarantee the bars to break in the body with a silky fracture, when tested to rupture. The thickness of head and neck shall not vary more than 1-16 inch from the thickness of the bar.

48. Before boring, each eye-bar shall be properly annealed and carefully straightened. Pin holes shall be in the centre line of bars and in the centre of heads. Bars of the same length shall be bored so accurately that, when placed together, pins 1-32 smaller in diameter than the pin holes can be passed through the holes at both ends of the bars at the same time.

49. Pin holes shall be bored true to gauges, smooth and straight; at right angles to the axis of the member and parallel to each other, unless otherwise called for. Wherever possible, the boring shall be done after the member is riveted up.

50. The distance centre to centre of pin holes shall be correct within 1-32 inch, and the diameter of the whole not more than 1-50 inch larger than that of the pin, for pins up to 5 inches diameter, and 1-32 inch for larger pins.

51. Pins and rollers shall be accurately turned to gauges and shall be straight and smooth and entirely free from flaws.

52. At least one pilot and driving nut shall be furnished for each size of pin for each structure.

53. Screw threads shall make tight fits in the nuts and shall be United States standard, except at ends of pins and for bolts over 1½ inches in diameter, for which six threads per inch shall be used.

54. Steel, except in minor details, which has been partially heated, shall be properly annealed.

55. All steel castings shall be annealed.

56. Welds in steel will not be allowed.

57. Expansion bed plates shall be planed true and smooth. Cast wall plates shall be planed top and bottom. The cut of the planing tool shall correspond with the direction of expansion.

58. Pins, nuts, bolts, rivets and other small details shall be boxed or crated.

59. The weight of every piece and box shall be marked on it in plain figures.

ADDITIONAL SPECIFICATIONS WHEN GENERAL REAMING AND PLANING ARE REQUIRED.

60. Sheared edges and ends shall be planed off at least ¼ inch.

61. Punched holes shall be made with a punch 3-16-inch smaller in diameter than the nominal size of the rivets and shall be reamed to a finished diameter of not more than 1-16 inch larger than the rivet.

62. Wherever practicable, reaming shall be done after the pieces forming one built member have been assembled and firmly bolted together. If necessary to take the pieces apart for shipping and handling, the respective pieces reamed together shall be so marked that they may be reassembled in the same position in the final setting up. No interchange of reamed parts will be allowed.

63. The burrs on all reamed holes shall be removed by a tool countersinking about 1-16 inch.

SHOP PAINTING.

64. Steel work, before leaving the shop, shall be thoroughly cleaned and given one good coating of pure linseed oil, or such paint as may be called for, well worked into all joints and open spaces.

65. In riveted work, the surfaces coming in contact shall each be painted before being riveted together.

66. Pieces and parts which are not accessible for painting after erection, including tops of stringers, eye-bar heads, ends of posts and chords, etc., shall have a good coat of paint before leaving the shop.

67. Painting shall be done only when the surface of the metal is perfectly dry. It shall not be done in wet or freezing weather, unless protected under cover.

68. Machine finished surfaces shall be coated with white lead and tallow before shipment or before being put out into the open air.

INSPECTION AND TESTING AT THE SHOPS.

69. The manufacturer shall furnish all facilities for inspecting and testing weight and the quality or workmanship at the shop where material is manufactured. He shall furnish a suitable testing machine for testing full-sized members if required.

70. The purchaser shall be furnished complete shop plans, and must be notified well in advance of the start of the work in the shop, in order that he may have an inspector on hand to inspect material and workmanship. Complete copies of shipping invoices shall be furnished to the purchaser with each shipment.

71. When an inspector is furnished by the purchaser, he shall have full access, at all times, to all parts of the shop where material under his inspection is being manufactured.

72. The inspector shall stamp each piece accepted with a private mark. Any piece not so marked may be rejected at any time, and at any stage of the work. If the inspector, through an oversight or otherwise, has accepted material or work which is defective or contrary to the specifications, this material, no matter in what state of completion, may be rejected by the purchaser.

FULL-SIZED TESTS.

73. Full-sized parts of the structure may be tested at the option of the purchaser. If tested to destruction, such material shall be paid for at cost, less its scrap value, if it proves satisfactory.

74. If it does not stand the specified tests, it will be considered rejected material, and be solely at the cost of the contractor, unless he is not responsible for the design of the work.

75. In eye-bar tests the ultimate strength, true elastic limit and the elongation in 10 feet, unless a different length is called for, shall be recorded.

76. In transverse tests the lateral and vertical reflections shall be recorded.

BOILER SETTING.

Employers as a rule, when they anticipate the purchase of a new boiler, expect the engineer not only to be in possession of the proper knowledge of that which is directly analogous to his profession, namely—the design, quality, etc., of the boiler to be accepted, but he is also expected to be able to figure the cost of setting, the material to be used, and many times to be able to draw up the proper plans and specifications for the work to be done. In fact this is true of the advent of any added improvements to the machinery department which the engineer may be compelled to ask for, says "Practical Engineer." Of course there are exceptions to this rule, but the reader of this article will agree with me that the exceptions are rare indeed. In writing this article it is the intention to, as nearly as possible, place the engineer in possession of the proper knowledge of the methods used in the construction of the average boiler setting; of the material used in the work, and such other tips as will be valuable in accomplishing such a job.

In setting a horizontal tubular boiler never use any but the hardest brick obtainable; they already having been subjected to such a heat that they are not liable to disintegrate under the heat from the furnace fire. Always reckon on the first quality of fire brick for the furnaces; lay the hard brick in lime and the fire brick in fire clay mortar. In placing the boiler in position it should set on an incline to be one inch to the ten feet in length of the boiler; this is to incline all sedimentary collections to the rear or cooler end of the boiler, thus preventing such matter from precipitation upon the plates immediately over the fire. The forward lugs of the horizontal boiler should rest directly on lug plates placed on the walls, and the rear lugs on expansion rollers placed crosswise between the lug and the plate. Pockets must be built around all but the front lugs so that the boiler will have absolute freedom of motion during the action of expansion and contraction, otherwise the walls will crack. From the top of the bridge wall to the under side of the boiler the distance should be six inches, in boilers up to three and one-half feet in diameter, and eight inches in boilers that are larger. The curve of this inverted arch of bridge wall should be drawn with a radius equal to the diameter of the boiler to be set. For ordinary jobs only the furnace bridge walls and the rear walls, upon which the fire directly impinges, are lined with fire brick. However, all strictly first-class jobs should be lined with fire brick the entire length of the flue and from the under side of the lugs to the grate bars as well. In many cases the conditions are such that a flue will have to be returned over the top of the boiler; of course, fire brick are not necessary there, a flat arch of brick can be sprung from the side walls, in which case heavy brick stays and tie rods should be used, as the arch has a tendency always to spread to the side walls. It is, no doubt, a better plan to run up the side walls about twelve inches above the top of the boiler and cover the top straight across with wrought-iron plates about two feet wide of number 12 iron—these plates to be supported by 3½ or 4-inch wrought-iron T girders, and the whole covered over with two thicknesses of brick laid flat in loose sand. This plan permits an easy access to the top of the boiler at any place, and at all times, and prevents the spreading of the side walls as well.

When the size of the boiler to be used is known, you can, by the aid of the following data, ascertain the number of bricks, etc., that may be required in the setting. Let us take, for an example, a boiler three feet in diameter by twelve feet long, with a return flue over the top, set in twelve-inch walls. Allowing one foot front connection and two feet for back, would make the length of side walls sixteen feet over all, and eight feet high; hence 16×8=128 cubic feet, or 256 cubic feet for both side walls; rear walls 3¼ feet wide by 8 feet high equals 26 feet, or for both back and front walls 52 cubic feet. The bridge wall should be 3.25 feet wide, and an average of 3½ feet high x 1 1-3 feet thick, or fifteen cubic feet, making a total of 323 cubic feet. This multiplied by 21, the number of brick in a cubic foot, gives us a total of 6,783 brick, 5 per cent. of which should be fire brick for lining furnace, bridge wall and back connection wall. If full length of side walls are lined, allow 10 per cent. for fire brick. The superficial area to cover the return flue on top is 16 feet long by 5¼ feet wide over all, equals 84 feet, 4½ bricks to the superficial foot when laid flat, equals 378 bricks, two thicknesses 756, floor of ash pit, 3¼ x 5, equals 16; 25 feet equals 73 brick, or a total of 7,612.

21 bricks, when laid up ..... 1 cubic foot
14 bricks, when laid up ..... 8-inch wall
7 bricks, when laid up ..... 4-inch wall
4½ bricks, when laid flat ..... 1 superficial foot

For setting a thousand brick in lime mortar, 1 barrel of lime, 4 of sand. For setting a thousand brick in cement, 1 barrel of cement, 2 of sand. Rubble, 1 barrel of cement, 2 barrels of sand, 3 barrels broken stone. Height of chimneys, about 26 times their diameter.

CANADIAN TRADE ENQUIRIES.

The following are among the recent enquiries relating to Canadian trade received at the Canadian Government Office in London. The names of the firms may be obtained by applying to The Canadian Engineer: The names of parties in Canada able to ship ore for German steel works. A firm of merchants and agents at Calcutta, desirous of interesting themselves in Canadian trade, are anxious to correspond with parties in the Dominion with a view to business.

—A famous firm of Edinburgh engineers has received instructions to make a survey and prepare plans for a canal between the Forth and Clyde, through which the largest vessel afloat may safely pass. A syndicate of responsible London financiers is at the back of the plan. The scheme has grown out of the selection of St. Margaret's Hope, in the Frith of Forth, as a naval base.

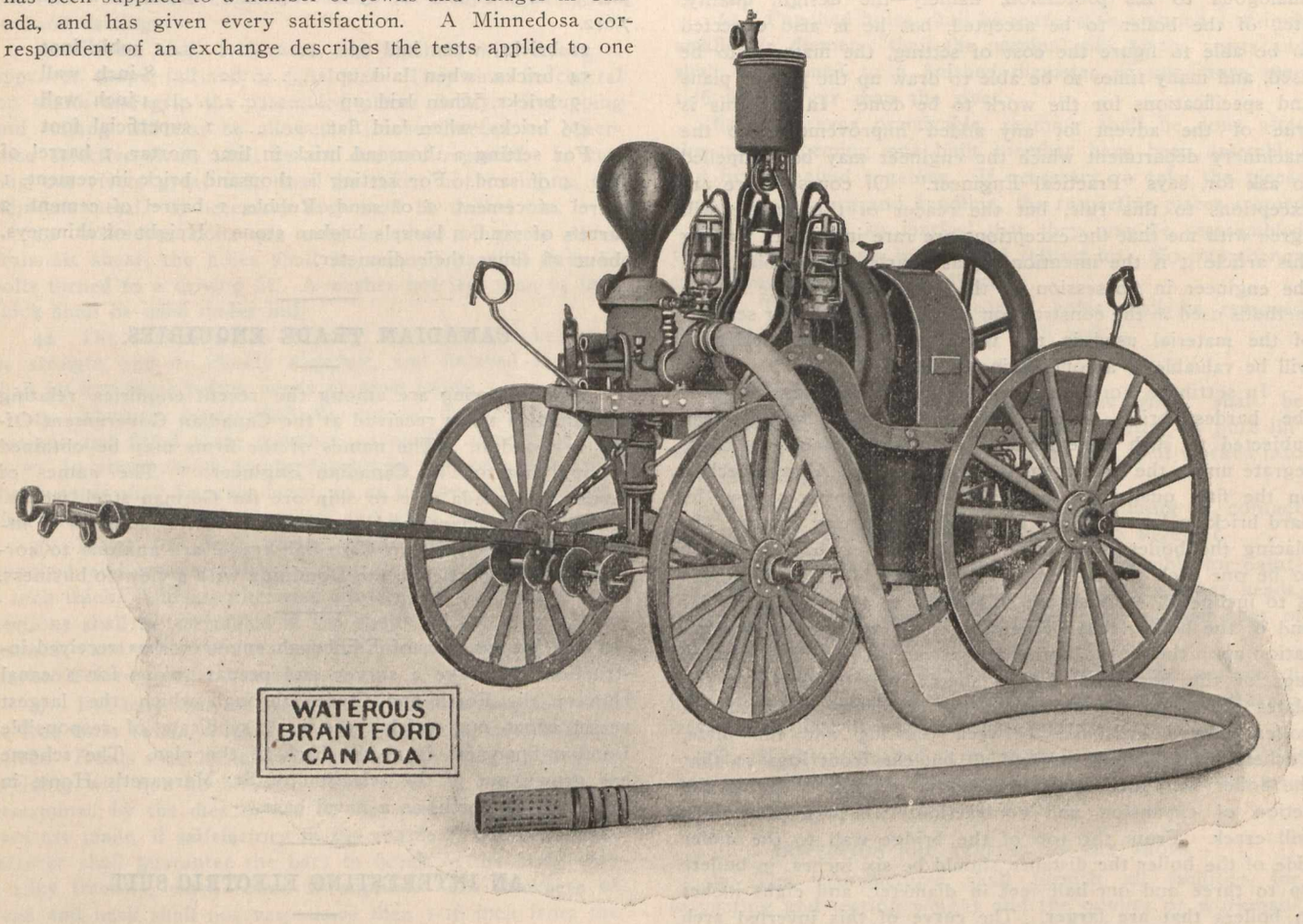
AN INTERESTING ELECTRIC SUIT.

When the Ottawa Electric Company, which consists of several companies doing lighting and power business in the city of Ottawa at one time, was allowed to consolidate under one management, the city council passed a by-law authorizing the consolidation under certain conditions. The principal condition was to the effect that the companies so consolidated would permit the Corporation, or any person or company authorized by the Corporation, to use their poles for electric purposes, on paying such compensation as in the event of the parties being unable to agree should be determined by arbitration. The Ottawa Electric Co. later refused this permission to the Consumers' Electric Co. on the ground that the stringing of the Consumers' wires on its poles would impair the efficiency of its service. Proceedings

were then taken in the High Court to enforce the agreement. After hearing argument of counsel Sir William Meredith, the presiding judge, decided that the question was so technical that it had better go to arbitration, and so referred it with consent of both parties. Accordingly James B. Cahoon, of New York, was appointed by the court; R. S. Kelsch, of Montreal, by the Consumers, and H. D. Bayne, of Montreal, by the Ottawa Electric. These arbitrators recently brought in their finding, which gives the Consumers' Co. the right to string wires on the poles of the Ottawa Electric on payment of a rental of $1 per pole yearly. The Ottawa Electric is assured a corresponding use of the Consumers' poles. The cost of the arbitration proceedings is equally taxed upon both parties, while the cost of the legal action which preceded and resulted in the arbitration, must be wholly borne by the Ottawa Electric Company, defendants in that action. The arbitrators were unanimous on four of the six points in dispute, Mr. Bayne, the Ottawa Company's arbitrator, dissenting on two points, viz., the question of costs of the suit and the question of sufficient pole space for the Consumers' Company on all of the poles.

A GASOLINE FIRE ENGINE.

The illustration shows a gasoline fire engine, which is now being manufactured by the Waterous Engine Works Co., of Brantford, Ont., and St. Paul, Minn. This engine has been supplied to a number of towns and villages in Canada, and has given every satisfaction. A Minnedosa correspondent of an exchange describes the tests applied to one



sold to that town as being very satisfactory, and a test at St. Cunegonde gave like results. The weight of the machine is from 2,500 to 2,700 lbs., and the cost is less than half that of a similar engine run by steam. It is adapted for the use of large factories, where waterworks or steam fire engines are not available. It can be drawn by hand and does not require a skilled engineer to run it. It is guaranteed to throw water in from 1½ to 3 minutes. A plant consisting of a 250-gallon per minute gasoline engine, 500 or 1,000 feet of 2½-inch hose, two hose reels, branches and nozzles, is within the means of small corporations, and with such an equipment it is well provided for coping with ordinary fires.

THE LAND SLIDE AT FRANK, B.C.

Editor of the Canadian Engineer.

Having seen and been witness to a number of land slides—at Quebec in 1841 when some three hundred feet of the cliff opposite what has since been erected into Dufferin terrace gave way, and over forty lives were lost—one at St. Valiers, near St. Michel, of twenty years ago—the second Quebec land slide at the foot of the citadel in 1889 when 83,000 tons of rock fell over, demolishing a dozen houses on the river side of Champlain street, with the loss of fifty-three lives—the land slide at Ste. Anne de la Perade, extending some 2,000 ft. along the river of that name, 500 feet in depth, and an average of from 20 to 60 ft. in thickness (nearly one and one-half millions cubic yards)—the land slide or wash-out at Chicoutimi of half a million tons of earth, and being at present engaged as consulting engineer on law suits arising out of recent land slides at Ste. Anne de Beaupre, below Quebec, I had much satisfaction in reading your correspondent's description of the land slide at Frank, from the so called Turtle Mountain. It will of course have struck you and your readers, that if, as stated, the debris reached away so far from the mountain, or to a horizontal distance equal to several times the height of the mountain, and even up the incline on the opposite side of the valley, this would not occur through the natural tendency of the rock to be propelled so far, and hence, it must be conceded that some explosive and therefore repulsive force was exerted from behind the mass to thus thrust it almost as far as if it had fallen down the slope of a hill. This question of, approximately at least, how far the rock fell forward, or to what horizontal distance it was projected or rolled over, must be made known, to prove whether or not the force acting in rear of the mass was anything more than to just move it forward or beyond the vertical.

The Quebec land or rock slide of 1889 was brought about as explained by the writer in a memoir on the subject, read before the Society of Civil Engineers of Canada, and published with diagrams in the Society's Transactions, by percolation for years, of water from the Citadel ditches above, into and between the strata of the cliff. This water on freezing in winter and expanding, thrust the almost vertical strata

(or which from their primary horizontal position had been tilted up by seismic action, so that they actually leaned backwards), apart, when in the course of years, or may be centuries, the foliations or separate layers opened out at top until the portion of the rock that fell over projected, before the thing occurred, not less than 6 ft. beyond the vertical, or overhung the ground beneath by that number of feet. The push forward which the fallen cliff experienced at the moment it fell was but one of 6 inches or less, due to hydrostatic pressure by the water in a crevice at a distance of some 80 feet from the portion which was by that in rear of it pushed forward, and the debris from a height of cliff of say 100 ft. was only projected, and that, down hill or to the level of the wharves, some 40 ft. below, to a horizontal distance of not over 250 ft.

Therefore again I say that if the sketch you give of the general features of the occurrence be reliable, some additional force of an explosive nature must have been at hand to thrust the debris to the distance shown in the engraving. If at any time some precise data are offered of how the cliff behaved, a vertical cross section, for instance, of the slide or fall or avalanche to scale and showing thickness of deposit along the route, be forthcoming, I hope you will reproduce the same in your ever increasingly interesting and instructive journal, for, as says my paper on "The Instructiveness of Failure," nothing in view of explaining fuaure happenings of the kind, and, if possible, of guarding against them, can be so pertinent as when the exact cause of failure is made known; and only by failure are we really made wise, for if a structure holds its own, it only teaches that it is strong enough to do so, while its weakest part may be many times stronger and more costly than it need be.

C. BAILLARGE, C.E.

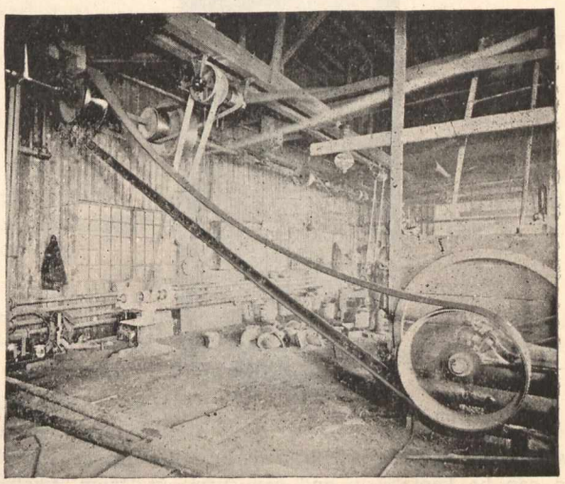
Quebec, June, 1903.

DOUBLE TESTS FOR GAS METER.

The Ironmonger tells of a double test applied to all gas-meters supplied by the corporation in Manchester. This double test was commenced on July 1st, 1902, and has since been continued. As showing how readily consumers may be robbed by meters, certified as correct, the report prepared by a committee of the Manchester City Justices states that two such meters were found, when submitted to the index test, to register 50 feet of error for every 100 feet of gas consumed. It is high time that this double or supplementary test were made compulsory, says the Ironmonger, as there can be little doubt that unfair registration is often made by the meters supplied by gas companies.

THE NEW BELT KNOWLEDGE.

One of the first principles governing the use of belts for transmission of power has been that a belt must be run tight to transmit its load. It was self-evident and the evils that were bound to attend this rule must be put up with. What were the evils? They were friction evils—losses. No belt can be run under high tension without producing high friction in the bearings, and this tension gradually pulls the fibres of which the belt is composed further and further apart without giving them a chance to get back. This inevitably pulls all elasticity out of the belt—kills it. Then this tension must be borne by the shafting, with the result that it gradually creeps out of line—even breaks, and the tension on the belt at the machine plus the tension of every belt from the engine to the machine has to be overcome and carried by the engine, and all beside and in addition to, the regular working load of the plant, which requires much more coal than would the working load alone. This never ends, it is a daily trial and expense. What is the alternative? An article has been steadily advancing in use in Canada called Cling-Surface. It is described as two things in one—a food for belts and a preventer of slipping. Belts need food to work. They need a preservative oil to keep them pliable, elastic and to prevent cracking, in short to put off the premature age which hard work brings to belts as to men. This Cling-Surface does by penetrating among the fibres and keeping each one surrounded with this needed food. It does not stay on the surface like belt dressings do, but as it penetrates it leaves the surface clinging. This surface is clean, no deposit on the belt, and not sticky. There is no sticking of the belt to the pulley, but the belt grips the pulley with a slipless grip and then leaves it as easily as your hand leaves a tool handle. The result is that, slipping is prevented and the belt pliable, that wasteful tension is not needed, and the belt can pull its full load running easy or slack. That cuts off at a blow all those expenses and losses attending



the old tight belt method. And more, because the belts have a greater wrap on the pulleys when slack, and as the more wrap the more power there is transmitted, the New Belt Knowledge and new law appears; more power comes out of an easy belt than the same belt tight can deliver. Cling-Surface has had about seven years' hard testing in Canada and has been endorsed by some of our largest concerns. It is made by the Cling-Surface Mfg., Co., Buffalo, N. Y., and they have much interesting matter to send enquirers.

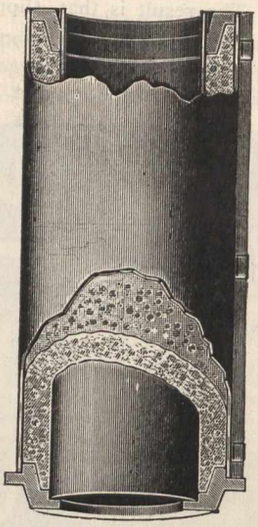
A WONDERFUL CLOCK.

The machinery and hands for the greatest clock in the world, the dial of which will be 120 feet in diameter, is being built at Milwaukee for the Lousiana Purchase Exposition next year. The dial is to be a brilliant bed of flowers. The clock will be placed on the side of a hill north of the agricultural building. The minute hand will be sixty feet long, and the ring at the end, which will be fastened to the machinery, will be eight feet in diameter. The minute hand will move five feet every minute. The numerals marking the various hours will be fifteen feet in length and made of bright colors. In a broad circle surrounding the dial will be twelve flower beds, one opposite each hour, each two feet wide and fifteen feet long. At night the time piece will be illuminated with two thousand incandescent lights.

CONCRETE TILE FOR ROAD MAKING.

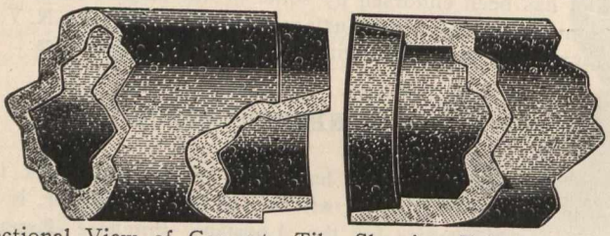
Among the uses to which concrete is now applied is the manufacture of tile to take the place of timber in culverts on roads, or for farm purposes. The Sawyer & Massey Co., Hamilton, have added to the machinery they supply, steel moulds for the manufacture of concrete tile, which have the hearty endorsation of A. W. Campbell, Commissioner of Highways for Ontario; Warden Bradley, president of the Eastern Ontario Good Roads Association, and others. Moulds for making concrete pipes are durable, simple in construction, easy to operate and require no repairs. They consist of an outer mould, two and a half feet long, and an inner collapsible core. The space between, which holds the concrete, is two inches in the smaller size up to three inches in the larger. A cast iron ring grooved to fit the mould is set on a solid plank. Into the space between the mould and core the concrete composed of three parts of fine gravel and sand, but free from dirt and loam, and one part of good cement, is rammed in solid. An iron ring of the same nature as the bottom shapes the top. This device makes a good

telescopic joint without any swell, and allows the pipe to lie smoothly in the bottom of the trench. In good weather from two to four pieces of pipe can be made in a day with one mould. The work can be expedited by having an extra bottom ring, as the mould and core can be removed and used again before the tile can be moved off the bottom ring. By



Concrete Tile and Mould.

having four moulds, which may be of different sizes, two men can be kept busy, and can turn out from twelve to twenty feet of each size in a day. Properly made and laid, they are indestructible, water or frost having no effect on them and the longer in use the stronger they become. Where sufficient depth cannot be obtained, it is better to use two or more of a smaller size than to have to raise the road as would have to be done if larger were used. If more than



Sectional View of Concrete Tile, Showing Telescopic Joint.

one is laid, they should be placed a foot or more apart and great care taken to tamp the earth solidly between and around them, so that no water may work its way around the outside. It makes a neater and more finished job if a mouth shaped abutment is constructed over the end of the tile. This can be made of cement or stone as is most convenient. The tile can be made on the spot. Municipal councils by providing themselves with these moulds can furnish tile for their roads at cost.

PEAT GAS FOR FUEL.

Peat gas has been employed as fuel at the Motala Steel Works, Sweden, for the past thirty years, originally for the puddling furnaces, and to a still greater extent for the open-hearth furnaces. The peat is obtained from the further side of Lake Wetter, across which it is brought in sailing vessels and unloaded directly into large storehouses, whence it is trammed to the gas producers. The yearly consumption is from 13,000 to 16,000 cubic yards of dry kneaded peat, costing about 75 cents per cubic yard delivered at Motala. Two large gas producers are used, from which the gas is led to the open-hearth furnaces through a condenser for ridding it of some of its moisture. Although the peat gas, owing to the distance the peat has to be brought, is dearer than coal gas, it is used preferably in most Swedish steel works in consequence of the insignificant amount of sulphur and phosphorus it contains. In the rolling mill there is a smaller peat-gas producer for one of the plate furnaces, and thin steel plates especially scale less in rolling when the furnace is fired with peat gas.

A FAMOUS SEWER FARM.

Pasadena, Cal., maintains a sewer farm of 300 acres, one of the largest known. The city sewage is used both as fertilizer and for irrigation. Sixty acres are planted in English walnuts, which is a good crop, though rather slow, and alfalfa in large quantities has been raised for the city's horses and for sale. A herd of 100 pigs has been raised, and the number is to be increased to three hundred. They are fed on corn and pumpkins raised on the farm. The farm utilizes horses of the fire and street departments that have become too old for active city work, but can do slower work. And not least of the points of the farm is that it pays about $25,000 a year profit, which is almost $3 for each inhabitant.

BESSEMER AND HIS WORK.

Forty-eight years ago the metallurgical world of that time was greatly startled by the announcement that Hy. Bessemer proposed to read a paper at the meeting of the British Association on the manufacture of steel without fuel. It was natural that such a paper should evoke general interest and much incredulity. The only descriptions of steel then produced were the crucible and puddled varieties, both of which required a large consumption of fuel. The total quantity of steel produced throughout the world was not more than 150,000 tons. More than one-third of this quantity was produced in Great Britain. The remainder was made chiefly in Russia, France, Sweden and Germany, the United States producing none at all. The cost of the manufacture of steel previous to this was so great that it could only be supplied in homœopathic doses to such industries as cutlery, where the selling price of the ultimate product was very high. The idea of producing steel without fuel in these circumstances opened up a vista of possibilities that have since then been more than realized. To-day a single average American Bessemer plant will produce almost as much steel in a single month as all the countries of the world then produced in a whole year. The cost of producing steel prior to Bessemer's invention was from £30 to £70 per ton, according to its quality. By the Bessemer process, steel equally suitable for many purposes is produced for £3 per ton, and the railroads of the world are almost universally laid with rails made by Bessemer's process.

LARGEST DAM IN THE WORLD.

British engineers in India propose to dam the Tungrahbadra Rvier, which flows through Madras, for the purpose of irrigation. The dam is to be built at Hospet, which is near the centre of the southern portion of the Indian peninsula, and will be nearly a mile long and 150 feet high. This will form a lake 40 miles long, with an area of 150 square miles, and impound 200,000,000,000 cubic feet of water. As compared to the great dam at Assouan, Egypt, the Tungrahbadra dam will be a quarter of a mile shorter, but about twice as high, and will impound six times the amount of water.

TAPPING WATER MAINS.

Geo. A. Caldwell, representing the H. Mueller Mfg. Co., of Decatur, Ill., is giving exhibitions in Canada of their machine for tapping a water main and making a connection without the loss of any water or having to shut off the water. The method is somewhat new in Ontario, but is in general use throughout the U. S. Heretofore the plan has been to drill partially through the pipe and then drive in a brass nipple, but with the new method the machine is placed on the pipe, which is drilled clean through and then the drain is tapped into it, after which the drill is withdrawn and a corporation cock is inserted, which allows closing off at the main. About twenty places in Ontario have adopted the machine, among which are Ottawa, Prescott, Brockville, Belleville, Toronto, Galt, Southampton and Mount Forest.

IS MUNICIPAL OWNERSHIP OF THE TELEPHONE SERVICE DESIRABLE ?

By F. Dagger, Telephone Engineer, Toronto.

The general dissatisfaction which prevails throughout the Dominion in regard to the telephone service has resulted in the suggestion of many remedies for the existing condition of affairs, not the least important of which has been that the municipalities should own and operate the local telephone systems in the interests of the people. Without desiring to enter into a controversy as to the desirability or otherwise of adopting this policy, it is the purpose of this article to deal with facts as they exist, and to leave the public to draw their own conclusions therefrom, rather than to introduce theories which, owing to the short time that municipal telephony has been in actual operation, would be more or less open to the attack of the opponents of competition in telephones and of municipal ownership in particular. There is no doubt, however, that the ideal telephone service of the future will be controlled locally, either by the municipalities owning and operating the exchanges, or by independent local companies acting in perfect unison with the municipal councils, the long distance lines being under the control of the State. At the present time it must be admitted that the use of the telephone has not yet become so much a universal necessity as to come under the same category as water, lighting, or traction; hence it is more easy to convince capitalists that there is money in independent telephones than to persuade municipal councils, in the face of the arguments of the monopoly and opponents of municipal ownership in general, that it is desirable to adopt municipal telephones. Further than this, municipal ownership, unless adopted by a substantial majority in the council, and supported by a large section of the electors, is never proof against the attacks of its opponents, who, with the help of the monopolies, may at any time succeed in reversing the policy of a preceding council, as in the case of Tunbridge Wells, England.

It should be perfectly clear to the average business man that any municipality able to borrow money at 3½ or 4 per cent., and having the sole control of its streets, which employs the same methods of construction and operation as the most successful independent companies in the United States, is in a position to give the best service, at lower rates, than any incorporated company, having to pay the municipality for its right of way, and incurring heavy promotion expenses, in addition to the actual cost of the plant, upon all of which it is expected to earn a dividend of 8 per cent.

Already "municipal telephony" is being tried in several parts of Canada, particulars of which, up to date, are as follows :

FORT WILLIAM AND PORT ARTHUR.

Referring to the municipal telephone systems in these towns the Renfrew Mercury makes the following concise statement, and in view of the fact that a description of these systems has already appeared in this journal it is unnecessary to add thereto.

"Something over a year ago the people became disgusted with the service the Bell Telephone Company was giving and determined to instal a system of their own. The Bell Company exerted their every effort to avert the calamity which threatened to overtake their system here, but without avail, and the result of the struggle for supremacy was a victory for the people and a magnificently modern telephone plant, having an exchange of 250 subscribers and orders for instruments filed which, when all are installed, will give an exchange of 300 subscribers. At the same time the neighboring town of Fort William installed a municipal system, and have an exchange practically as large as the local one. The towns joining hands in this venture have a free exchange between them; that is, a subscriber in Port Arthur has, free from further cost than the yearly rate paid this town, the privilege of exchange with subscribers in Fort William, and vice versa. For this splendid service, with over 500 telephones, a uniform rate is charged by each town, namely $24 per year for business phones and $12 per year for domestic phones. The outlook is that a handsome profit will be had, though, as the system has been in use for only a few months, just the amount of profit cannot definitely be stated. The telephone system has cost each town about $12,000 up to the present, but naturally as the lines are extended the total expenditure on capital account will increase in proportion. It is interesting to note that the Bell Company, in the endeavor to break the town's system, offered phones free, with practically no takers, and the sight of a Bell Company phone outside of the railway offices is indeed rare."

The following are the statistics up to date regarding the Port Arthur telephone system :

Population, 5,000. Date of installation, November 1, 1902. Rates: Business, $24 ; residence, $12. Number of phones: Business, 205; residence, 100. Total, 305. In addition there are over fifty applications for phones unfilled at this date. Amount of investment, $12,000. Number of Bell phones before competition, 136. Number of Bell phones at this date, 50 to 60. Bell rates before competition: Business, $30; residence, $25. Bell rates at this date: Business, $24; residence, $12.

NEEPAWA, MANITOBA.

The secretary-treasurer of this enterprising municipality has been good enough to furnish particulars of the telephone service in the following letter :

F. Dagger, Esq., 742 Broadview Ave, Toronto.

Dear Sir,—Replying to your letter of the 12th inst., this town started to operate its own telephone system four years ago. We had one hundred subscribers at that date, and our switchboard capacity was 150. We have since had so many additional subscribers that it has now become necessary to put in a larger switchboard, and we meditate putting in a 400 drop board. The cost when first installed was some $8,000, but, as we run it in connection with the electric lighting system, which is also owned by the town, it is difficult to give quite the exact cost of installation and of operation. Our charges are: For domestic purposes, $10 per year; commercial, $20. These rates are sufficient to enable us to give a good all-night service, which has proved entirely satisfactory, and to pay both interest and sinking fund and show a cash surplus. There is no question but what we can operate it both satisfactorily to the subscribers and also profitably to the town. The fact that we have installed one telephone to every eleven of the total population of our town shows that it is well patronized by the ratepapers. The Bell Telephone Company had a plant installed here prior to our own venture, but when we opened up they withdrew entirely, took out their poles, lines, etc. These rates, I believe, were $25 to $35. They afterwards reduced them to $15 and $25, but they found they could no longer do business here once our system was started. Our system is "metallic circuit," put in by Ness, McLaren & Bate, Montreal. The population of our town at last census was some 1,600. In addition to the above we own our electric lighting system. Both were put in at the same time. We have been equally successful in this line. We now are about to enlarge our plant. We have some 2,000 lights wired, and are now putting in an additional 3,000 light machine.

Yours truly,
JAS. W. PATTISON,
Secretary-treasurer.

Neepawa, Man., Aug. 17, 1903.

GREAT BRITAIN.

Municipal telephony in Great Britain is at present in its infancy, no system having been long enough in operation as a completed plant to show the actual profits earned in one year.

GLASGOW.

The best example on record is that of Glasgow, where an analysis of the accounts for nine months ending May 31st last shows that 4,718 direct exchange lines, yielding an average rental of $10.22 for the nine months, enabled the department to meet all legitimate charges and carry forward a profit of $1,940. Had all these lines been earning revenue during the whole period which the accounts cover, at the municipality's annual charge of $25.60 the profits would have been very much higher, but as a fact this rate was not fixed

with a view of producing a profit, over and above the payment of interest and redemption of loan.

Before the establishment of the Glasgow municipal exchange the rates were $48.70 in the city and $97.40 to $121.75 in the suburbs. The telephone area of the municipal system is 143 square miles, and the rate is $25.60, or $16 per annum, and two cents per outgoing call. The system now numbers 9,000 subscribers, or more than the monopoly have secured in twenty-two years' existence, and at a recent meeting of the city council it was decided by 48 votes to 9 to borrow an additional $400,000 to enlarge the plant to a capacity of 15,000 lines. Many misleading statements upon this subject, copied from the English papers, have appeared in the press here. It is needless to say that these articles were the work of inspired writers, written for the purposes of discouraging the municipal ownership of public utilities. These statements have been amply refuted by Sir Samuel Chisholm, ex-Lord Provost; Mr. A. R. Bennett, M.I.E.E, General Manager of the Glasgow Telephone Department; Messrs. Thompson, Jackson, Gourlay and Taylor, Glasgow city auditors, and Mr. T. Eaton Robinson, C.A., City Registrar for the Corporation of Glasgow.

The following statistics are taken from the official report and accounts as on May 31, 1902, issued by the Glasgow Corporation Telephone Department:

Population	847,000
Telephone area (square miles)	143
Number of switchrooms	9
Completed lines	5,479
Number of junction lines	306
Partially completed lines	8,787
Pairs of wires in cables	14,572
Miles of trenching	94
Miles of single pipe or duct	104½
Capacity of pipes or duct in pairs of cable wire (spare 12,428)	27,000
Miles of cable	113¾
Miles of pairs of wires in cables	11,061
Total cost of underground plant	$555,773
Cost per mile per pair of cable wires	$50.25
Total cost of plant	$938,418
Number of employees	628

The statement of revenue and expenditure for the year ending May 31, 1903, which has just been passed by the Telephone Sub-Committee, shows the following result of the year's working:

Total revenue		$271,395
Working expenses		77,759
Net revenue		$193,636
Less interest on loan	$32,346	
Sinking fund	28,276	
Post-office royalties	16,582	
Terminal fees	7,292	
		84,496
Balance		$109,140
Add surplus from 1902		1,938
		$111,078
Deduct proportion of rentals applicable to year 1903-4		100,877
Surplus carried to Reserve Fund		$10,201

The capital expenditure for the year was $382,568.

TUNBRIDGE WELLS.

Municipal telephones have been in operation in this town for about the same period as the Glasgow system. The following are the facts regarding this exchange:

The telephone area covered 250 square miles, the average charge to subscribers being $22.27 per annum. The number of subscribers grew so rapidly that on January 1, 1902, their number had reached 650, and the municipality made application to the Local Government Board for permission to increase its borrowing powers from $48,700 to $121,750. The fact that this permission was granted, after an exhaustive enquiry by the Government inspector, notwithstanding the evidence of expert witnesses and the arguments of eminent legal counsel employed by the National Telephone Company and the Ratepayers League, is sufficient proof of the financial success of the system. The report of the Tunbridge Wells Borough Accountant of February 10, 1902, which was produced at the enquiry, and certified by the Local Government Board auditor, showed an excess of income over expenditure (including interest and redemption of loan) of $3,190. The competition had the effect of bringing down the National Company's rates from $48.70 per annum to $19.44 for direct lines, and to $1.25 and sixty cents per month for two party and ten party lines respectively. The National Telephone Company have recently succeeded in making a deal with the Town Council by which the municipal system is transferred to the company upon their agreeing (1) To pay the municipality the amount expended upon the plant to date. (2) To assume all liabilities in respect of the system. (3) To give service to all subscribers at a rate not exceeding $29.22 per annum for the term of twenty-five years. As the municipal license was granted for a period of 25 years, and as the National license expires in 1911, the company hoped that this arrangement would enable them to operate for the municipal term, viz., until the expiration of the twenty-five years' license. The Postmaster-General, however, refused to sanction the transfer, except upon the following conditions: 1. That the company observe all the conditions of the municipal license. 2. That the municipal license cease and determine on the same date as the National license in 1911. The victory is, therefore, an empty one for the National, as, although they have disposed of a competitor, they have been compelled to reduce their rates permanently and forfeit the privileges which their own license conferred upon them.

Tunbridge Wells is a purely residential town, with a population of 35,000, having no industries, and of no commercial importance. The residents are composed principally of wealthy people, who are stockholders in such corporations as the National. It is, therefore, a matter of little surprise to those acquainted with the locality that the municipality fell an easy prey to the company.

PORTSMOUTH.

A municipal telephone service was recently established in this town at the following rates: For unlimited service, $28.61 per annum; message rate, $17.05 and one cent per outgoing call, or $12.18 and two cents per outgoing call. There are now 1,250 subscribers, and the original estimate of $124,185 having already been expended on construction, the Town Council have decided to borrow an additional $58,440 to increase the capacity of the exchange to 2,000 lines. Last month the profit was $390, after all expenses had been met, and with an increasing income better results are confidently anticipated. All wires in the town are underground. The rate charged by the National Telephone Company before the establishment of the municipal exchange was $48.70 per annum.

BRIGHTON.

A municipal telephone system is in course of construction at Brighton, the rates charged being: For direct lines, $24.75; two-party lines, $20.45; four-party lines, $14.61 per annum. The estimated cost of construction for 2,000 subscribers is $210,341, all work being underground. The working expenses are estimated at $49,908.

OTHER TOWNS.

Municipal exchanges are in course of construction in the ports of Swansea and Hull, the rates charged being less than half of those made by the National Telephone Company. In the cities of Manchester and Norwich the municipalities are arranging with local companies to operate the telephone service, the city in each case being the licensees of the Postmaster-General, and being responsible for the carrying out of the conditions of the license.

Over fifty cities and towns in Great Britain and Ireland have adopted the principle of municipal telephones. Many of these have applied to the Postmaster-General for licenses, while the remainder are awaiting with interest the result of the working of those systems already in operation. It must

be admitted that the organized attack on municipal ownership, made by the monopolies, through the London Times, and the subsequent transfer of the Tunbridge Wells telephone system to the National Telephone Company has resulted in a temporary lull in the municipal telephone movement. If, however, the results of the actual working of those systems now in operation are such as the promoters anticipate, we may look for renewed energy on the part of the municipalities, and every city and town of importance will have its municipal telephone system, or one operated by a local independent company under municipal control.

The following are particulars of the licenses already granted by the Postmaster-General for municipal telephone systems in Great Britain:

Town.	Period of License.
Glasgow	March 6, 1900, to Dec. 31, 1913.
Belfast	Feb. 28, 1901, to Dec. 31, 1911.
Brighton	April 30, 1901, to April 30, 1926.
Chard	Dec. 13, 1901, to June 24, 1922.
Grantham	Sept. 18, 1900, to Dec. 31, 1911.
Huddersfield	Feb. 22, 1901, to Feb. 28, 1926.
Portsmouth	Sept. 21, 1901, to June 30, 1926.
Hull	Aug. 8, 1902, to Dec. 31, 1911.
Swansea	Sept. 27, 1902, to Dec. 31, 1920.
West Liverpool	Sept. 30, 1902, to Sept. 30, 1927.
Oldham	Dec. 31, 1902, to Dec. 31, 1920.
Scarborough	Dec. 31, 1902, to Dec. 31, 1911.

GUERNSEY (CHANNEL ISLANDS).

Although not a strictly municipal system, the telephone service of the Island of Guernsey, in the English Channel, may be mentioned as furnishing a good example of what can be done where the people own and operate the local telephone service. Guernsey, although forming one of the British Isles, is a self-governing community, and the State Government obtained the consent of the British Postmaster-General to establish its own telephone service. The island, which has a population of about 40,000, mostly farmers and fishermen, is covered with telephone lines, connecting every town and village with each other. On December 31st last the number of subscribers' lines was 1,073, or equivalent to one line for every thirty-seven inhabitants, thereby making it the best telephoned area in Great Britain. The following statistics are taken from the report of the State Department for the year ending December 31, 1902:

Expended on construction	$91,796 41
Expended on land and buildings	10,918 28
Cost per line	85 55
Revenue ($15.80 per line)	16,963 78
Working expenses	3,959 13
Office expenses	1,117 15
General expenses, including management, rent, rates, taxes, interest on loan, Post-office royalties, etc.	7,321 64
Set aside for depreciation and sinking fund	4,700 60
Net profit	765 21

Subscribers.	Number.	Increase.
Rate No. 1. At $7.31 per annum and two cents per outgoing call	814	136
Rate No. 2. At $24.35 per annum, allowing 3,200 outgoing calls	52	13
Rate No. 3. At $10.96 per annum, and one cent per outgoing call	71	18

There is no doubt whatever that the success of this service is entirely due to the popularity of Rate No. 1, and it further demonstrates the fact that the successful telephone system of the future will be the one which adopts the only rational method of charging for the use of the telephone, viz., a low rental per annum, and a small toll charge of one or two cents for each call made. It may here be stated that the Guernsey rates have been adopted by the towns of Portsmouth and Swansea, while the municipalities of Glasgow, Brighton, and the London post-office telephone system have adopted this means of charging, but with a higher annual rental.

In addition to the 1,073 working lines there were several hundred partially completed spare lines. The number of subscribers' and public calls was 533,039, or an increase of 153,697 over 1901. The number of telegrams, express and ordinary letters telephoned to and delivered through the Postal Telegraph Department was 4,070, or an increase of 1,697.

EUROPEAN COUNTRIES.

Norway. The towns of Christiania (population, 151 000) and Vrondhjem (population 30,000) own and operate the local telephone systems. The first-named municipality took over the service in 1901, and the figures to hand for the first eight months of 1902 (the only ones available) show a much heavier traffic for the service compared with 1901. The rates are: For one connection, $21.62 per annum; for second and subsequent connections, $16.23; for a second telephone on the same line, $7.11. Subscribers requiring only six months' service are charged $16.23. In Vrondhjem the municipal telephone service has been in operation since 1889, and the profits earned equal 4 per cent. on the capital expended. The rates are: Business, $12.18 per annum; residence, $6.09.

HOLLAND.

Amsterdam (population 503,000).—Prior to the establishment of a municipal system in Amsterdam the rates charged by the company, were $47.28 in the city, and from $60.13 to $100.19 in the suburbs. The municipal rate is $36 after payment of $10 for the first year's entrance fee. Hotels are, however, charged $46 per annum.

There is no accessible record of the accounts later than 1898, but the figures for that year are:

Revenue	$93,470
Expenses	28,800
Surplus	$64,670

The surplus was expended as follows:

Interest on loan	$11,518
Redemption of loan	15,487
Municipal treasury	19,480
Net profit used on extension, thereby keeping down bonded indebtedness	18,185
	$64,670

I may add that the expenditure included a contribution to a pension fund for the employees.

ROTTERDAM.

The municipal telephone rate in Rotterdam, population 300,000, is $30 per annum, for distances up to 3⅛ miles, instead of $47.27 within the city limits. For the year 1897 (the latest accessible figures), the net profit was $27,111 on a total capital expenditure of $312,168.

RUSSIA.

St. Petersburg, 1,300,000.—On November 1st, 1901, the twenty year's concession of the International Bell Telephone Company expired. At that date the rate charged was $127 per annum, the highest in Europe.

The number of subscribers averaged 27 per 10,000 inhabitants, as against 900 per 10,000 in Stockholm, Sweden. The Russian Government called for tenders for a new concession for a term of eighteen years, and the municipality was successful in obtaining the concession. The city have taken over the old Bell plant at a valuation of $182,000, and they are now constructing an entirely new underground system, with a capacity of 34,000 subscribers, or ten times the number of Bell phones. The rate charged by the municipality is $28 per annum, or $99 less than the old rate, within a distance of 1⅞ miles.

Under the terms of the concession the system must be completed and in operation within three years from November 1st, 1902. The cost of construction is estimated to be $7,000,000.

SOUTH AFRICA.

The municipality of Durban (Natal), has decided to establish a municipal telephone service, but there are no details to hand regarding it.

MARVELOUS SUCCESS OF INDEPENDENT TELEPHONY AT FORT WILLIAM, ONT.

The complete success of the independent telephone exchange at Fort William, Ont., the rapidly increasing number of subscribers, and the unqualified support given it by the people in the face of the most adverse and unfavorable outside circumstances, clearly demonstrate the great advantages and benefits of independent telephony. The plant, which was established by the municipality about a year ago in opposition to the old company, and fully described in our issue of January last, was completely destroyed by the burning of the town hall, in which was located the central office equipment, on March 10th, as mentioned in a former issue. Immediately after the exchange had been destroyed, and it was known that it would be absolutely impossible to give any service whatever for a time, the old company (Canadian Bell), used every effort possible, first to induce the subscribers of the new system to allow the installing of their service, and when it was seen that the subscribers could not be secured even at this advantage, they endeavored to induce the officials to dispose of the lines, offering to take the property at a good figure and to make practically any concessions asked. Notwithstanding the most attractive offers from the old company, and the fact of not being able to make any connection with railway companies on account of the existing anti-public Bell-Railway compact it was decided unanimously to re-equip the plant at the earliest date possible. At a meeting of the councillors and committee, the Mayor was authorized to proceed with the work. A telegram was at once sent the International Telephone Mfg. Co., Chicago, the manufacturers of the equipment first installed, to duplicate the original order for central office apparatus at the earliest date possible, on account of fire, and a contract was let for a new building, it having been decided to place the central office in a special building for the exchange. The building was constructed absolutely fire-proof. It was finished ready for the central office, the equipment installed and the plant put in complete operation in about sixty days from the time the first plant was put out of service. It is said that the system has been such a marked improvement in service over the old company's plant, and has given such complete satisfaction, that the municipal plant is constantly increasing, while the old company has very few paying subscribers remaining.

INTERNATIONAL FIRE PREVENTION CONGRESS.

The International Fire Prevention Congress, held in London in July, passed a number of resolutions, which doubtless will bring about good results in the direction of fire prevention. Some of the matters referred to in these resolutions, which covered the papers and discussions of the congress, were as follows: The use of the term fireproof, as applied to many buildings and systems, was deprecated, and the term fire-resisting recommended as more correct; the standards of fire-resistance recommended are: 1. The temporary protective class; 2. the partially protective class; 3. the fully protective class; the metric system of measurement, weight and temperature was recommended in all reports dealing with questions of fire-resistance and tests; the establishment of testing stations for fire-resisting materials, and the adoption of a universally recognized method of testing was recommended; building regulations to accord with the results obtained by the investigation of fire-resisting materials and methods of construction were recommended; it was recommended that courses of study should be provided in universities, technical colleges and schools for the instruction of engineering and architectural students in the fire-resistance of building materials and the methods of construction as based on investigation; the attention of the technical professions and the fire service was directed to the amount of damage caused by lightning and the necessity of protective measures; more interest in the work of fire brigades was suggested, inasmuch as the result of the fire brigade officers' experience in actual fire practice, if suitably applied in conjunction with the work of architects, engineers and public officials, would be most useful for the organization and development of precautionary measures; the congress expressed an opinion that in the public interest it is of the utmost importance that on the occurrence of every fire an investigation should be immediately made by an official, duly qualified and empowered to ascertain the cause and circumstance connected therewith, reporting the result of such investigation to a public department for tabulation and publication.

Industrial Notes.

The Manitoba Iron Works have made their first castings.

The Aqueduc de Boucherville Co. has been auhoriztd to increase its capital to $20,000.

The Ogilvie Mills Co. will increase the number of their elevators in the North West to one hundred.

The grain elevator at Prescott, which cost $150,000, was sold for $28,000, and is being fitted up for use.

The branch of the Deering works at Brockville has been closed and the employees removed to Hamilton.

The Page-Hersey Co, of Guelph, is erecting a large building, 12 by 60 feet, for a galvanizing plant.

The movable property of the Granby Enamelware Works has been sold at auction, and realized only about $800.

New buildings for the Dominion Cartridge Company are projected at Lachute, which would double their capacity.

The Fernie Manufacturing Co. has started work in its new sash and door factory. They have also built a dry kiln.

The Fosston Wind Stacker Co. will commence the manufacture of stackers in Winnipeg, with C. L. Larson in charge.

Richard Keay & Co. will build a saw mill at Duck Mountain, Manitoba, where they have bought the Hamburg timber limit.

Austin Berry, of Warden, Que., has formed a company to manufacture a hot air furnace, of which he is the inventor and patentee.

The International Harvester Co. ran the first heat in connection with their malleable iron department at Hamilton, on August 4th.

The increased demand for engines and boilers in Canada has led the Waterous Engine Co. to double the capacity of its works at Brantford.

The Brush Co. has decided to remain at Waterloo, Ont., and has commenced on a new factory. The Kuntz Brewing Co. are enlarging in the same town.

The Pingston Creek Lumber Co., of Revelstoke, B. C., will build a water power sawmill with a capacity of 20,000 feet a day. J. A. Kirk is managing director.

Mott, Son & Co., have sold their lumber mill at Fernie to the Elk Lumber and Manufacturing Co. This company contemplates the erection of a mill at Hosmer.

The A. R. Williams Machinery Co., of Toronto, has bought out the business of the Winnipeg Machinery and Supply Co. W. H. Young, of Toronto, will be in charge.

There is some talk in Montreal of capitalists starting a tack, nail, and horse shoe factory at Hamilton. The Ontario Tack Co. may enlarge its London works, and not rebuild at Hamilton.

The Westport, Ont., Milling Co. has let a contract for $7,000 for a stone addition, and will install new machinery throughout for their roller mill. They will also improve their water power, and generate electricity.

The American Shovel and Stamping Company, of Lorain, Ohio, are in correspondence with Iroquois in regard to locating a branch of their industry there, to employ from 300 to 500 hands.

The Kemp Mfg. Co. is about to erect a six story brick factory building at Winnipeg.

M. R. Miller is establishing a plant near Westbourne, Man., for the manufacture of cement building blocks.

A company is being formed at Keewatin, Ont., to establish a new flour mill there. It is said that the buildings and power plant of the old reduction works will be used.

The R. E. T. Pringle Co., holding a Dominion charter, has increased its capital from $50,000 to $100,000, and has had its powers extended so as to include the generating of electricity, the manufacture of electrical supplies, etc.

Ten airship builders intend to compete for the $100,000 prize offered for aerial cars at the St. Louis Purchase Exposition. A mining engineer of Monte Vista, Col., is building a machine of aluminum, 30 feet in diameter, with a length of 150 feet.

Business in iron and steel and their products in the United States has visibly slackened and in some producing regions furnace men have found it advisable to close. Car shortage, fuel shortage and labor disturbances are all exercising adverse influences upon the market.

The Massena, N.Y., Mineral and Filler Co. are erecting a $56,000 plant at Massena to be run by power from the St. Lawrence. The principal materials handled are clays for the paper trade, colors for the paint trade, fluorspar and feldspar for the glass trade, and barytes for the rubber trade.

The Belleville Rolling Mills have been purchased from their former owners, Kirkwood and McKinnon, by a syndicate composed of C. Carbonneau, of Paris, France; Dr. Alf. Wills, of Dawson City, and M. Jackson, of Paris. It is the intention to put the mills in first-class repair and operate them to their full capacity. A smelter may be added.

The new furniture factory at Collingwood is to be of brick, three stories high, 60 x 150. There will also be engine rooms, dry kiln, oil and varnish houses. On the first floor will be the offices, shipping-rooms, etc. The second floor will be devoted to manufacturing, and the third to finishing. The building will be fitted throughout with automatic sprinklers, hoists, etc.

Alexander Graham Bell has solved for all practical purposes the airship problem, says a despatch from Baddeck, C. B. He has succeeded in having his kites remain stationary in the air, and has himself soared in one of his airships at some distance from the ground. Prof. Langley, of the Smithsonian Institute, Washington, will be associated with him in some further experiments.

A short time ago, the Dodge Mfg. Co., of Toronto, received an order from England for nearly 5,000 wood split pulleys, varying in size from 5 inches to 5 feet. It required five full sized standard box cars to load these pulleys for transportation to the seaboard. This order is not the largest received by this company, but is probably a larger order than has ever before been received by any other maker of wood pulleys for export shipment. The Dodge Mfg. Co. have an exhibit at the Toronto Exposition, where a representative display is made of the power transmission lines manufactured and sold by them.

The Ontario Department of Labor, in reply to enquiries, has learned that during last year some 120 new manufacturing industries were started in the province, including eleven sawmills, five foundries, five furniture factories, three evaporators, three lighting plants, three clothing factories, two each, carriage, vinegar, house supplies, spools, canning, oatmeal and flour mills, and one each of the following: Tools, machinery, iron pipes, windmills, artificial stone, brewery, gloves, cement, cream separator, gasoline launches, boxes, birches, steamfitting, picture frames, planing mill, snow shovels, cement, pipe organs, medicine, spring pump, planters, stoves, woolens, hosiery, biscuits, machine shop, radiators, show cases, woodturning, plumbers' supplies, beds, beet sugar, linseed oil, heating apparatus, automobiles, shingles, suspenders, flax, varnish, wire nails, asphalt, mattresses, cordage, brooms, ploughs, refrigerators, tin-plate decorations, tannery, wagons, harness, hoops, and soda water.

The New Brunswick Petroleum Co. will erect a refinery near Moncton, N. B.

The Brakman-Ker Co. will add another story to their oatmeal mill at Strathcona, N. W. T.

The Central Milling Co., Peterboro, is building a new elevator to increase its storage capacity.

The name of the Hart-Emery Wheel Co., Hamilton, is changed to the Hart Corundum Wheel Co.

The Dominion Fish Co. are establishing a factory at Selkirk, Man., for the conversion of fish offal into oil and fertilizers.

The brickmakers of Vancouver have advanced their prices $2 per thousand, making the cost of brick now $11.

An engineers' agent, having an office in London, desires to secure the representation of one or two good Canadian firms. The address may be obtained from the Canadian Engineer.

The Sun Portland Cement Co., Owen Sound, has installed another large rotary kiln, which will increase the capacity of the plant several hundred tons daily. Additional boilers and engines will also be installed.

The following extra provincial companies have been authorized to do business in Ontario: Long Lake Gold Mining Co., P. E. Mackenzie, Rat Portage, Attorney; The Canadian North West Steamship Co., Thos. Marks, Port Arthur, Attorney.

Eugene Haanel, Superintendent of Mines; Donald Locke, Government Chemist; O. Higman, Government Electrician; William Cross, auditor of the Great Northern Railway, and William Simpson, a capitalist from Ottawa, have been at Lockport, N.Y., looking into the Marcus Ruthenburg electrical process of steel making. The system is likely to be tried at the proposed new works at Welland.

A circular sent out by E. W. Day, secretary of the Employers' Association, to all the prominent manufacturing firms in Toronto, elicits the fact that there is a very serious skilled labor famine. One man says he could use 100 more men with advantage. Mr. Day calculates that there is now room in Toronto's factories for at least 5,000 skilled and reliable workmen. The building trades are also very short of help.

The smoke stack on the car wheel works at Perth was to be painted, but how to get the first rope to the top for the scaffolding was a problem. Kites were tried and failed; a bow and arrow likewise proved useless, as the space at the base of the stack was not sufficiently large to permit a bow strong enough to be used, a rifle with a string attached to the ball was also tried, but this was also useless. After many attempts a scaffold was placed.

The Iron Age says: "There have been interesting developments in the Canadian wire rod trade, in which English mills are trying to secure a footing since the withdrawal of the Germans and their surrender of it to the Americans. They have been offering rods at £5 17s. 6d., at Montreal, which is under the price made by our mills. European mills have been asked to figure on some pretty large lots of steel rails for Gulf and Pacific Coast delivery, and it is thought possible that they may secure some of the latter. There is likely to be a struggle, too, over some Mexican and Canadian rail business now in the market."

A new industry, the first of its kind in the country, has been established at Orillia, by the Dominion Wrought Iron Wheel Co., who manufacture wrought iron wagon, cart, wreel-barrow, traction engine, truck, and other wheels. The goods they turn out have broad tires and are therefore just the thing for use on roads. They also make a low standard wagon and wagon skeins. Their factory is a new building, 200 by 48 ft., two stories high, and they employ about 20 hands. J. B. Tudhope, M.P.P., is president of the company, J. D. Knox, of Toronto, representing the Merchants' Cotton Co., vice-president, and T. H. Knox, one of the patentees, secretary-treasurer and manager. They expect shortly to manufacture other lines and to enlarge their works.

Calcutt's brewery at Peterboro is to be enlarged.

St. Boniface, Man., has voted a bonus to a linseed oil mill.

Tait & Dick, of Clarksburg, Ont., will erect a new brick moulding shop .

The Imperial Peat Co., Guelph, are almost ready to begin making peat.

The Jarvis Concrete Machines has changed its name to the Jarvis Concrete Co.

The Superior Copper Co. has been authorized to increase its capital from $1,500,000 to $2,000,000.

A company is being formed in Buffalo to extract radium from the uranium ores of Utah.

It is reported that the flint glass factory at Wallaceburg, Ont., recently burned, will be rebuilt at once.

There is being installed in the I.C.R. shops at Moncton, a Babcock & Wilcox water tube boiler and economiser plant.

The Silicate Brick Co., at North Sydney, N.S., is now turning out 6,000 bricks a day, and will increase their output.

The Cramp Steel Co. is making preparations for the manufacture of wire rods on an extensive scale at its plant at Collingwood.

The Union Foundry and Machine Works, composed of Geo. H. Waring and Wm. Bruchof, have taken over the Allan foundry, at St. John, N.B.

The American Seeding Machinery Co., of Springfield, Mass., and a metal roofing company, of New York, are looking for locations for factories in Canada.

The People's Coal Co., doing business in Toronto, and elsewhere in Canada, has surrendered its charter. It is succeeded by the Connell Coal Co., which has purchased its mines and business.

The Marstrand Company, Vancouver, is about to make additions and improvements to its brewery at a cost of $20,000, including a two-story addition for storage, and a 20-ton ice-making plant.

Flavelle & McLaughlin, of Lindsay, are contemplating the erection of a flour mill at Fort William, Ont., with a capacity of 2,000 barrels a day, to be operated by electricity, also an elevator.

The B. C. Copper Company of Greenwood has let a contract for 4,000,000 bricks to be used in the erection of a brick smoke stack 120 feet high to replace the steel stack now in use in the company's smelting works.

The Richmondt Conduit Mfg. Co., which manufacture fibre and metallic conduits for carrying electric wires through buildings and underground work, and all kinds of brass tubing, are about to erect a factory at Niagara Falls, Ont.

The John Inglis Co., Toronto, has made a somewhat unique settlement with the moulders' union. They have arranged with their foreman that he is to supply all the labor and they are to supply the material, the work being contracted for at so much per ton. In this way the firm has been relieved of the labor problem.

The British Columbia Official Gazette announces that in the event of horse-power of steam plants operated by engineers holding service certificates being increased beyond the limits of such certificate, a special certificate covering such increase may be issued upon the recommendation of the owners of the steam plant and the Inspector within whose jurisdiction such plant is being operated, on payment of a fee of two dollars and fifty cents.

A new chimney being built by the Toronto Electric Light Co. will be the third largest in Canada, being surpassed only by those of the Canada Foundry Co., and Toronto Railway Co. It is 180 feet high, contains 300,000 bricks, is octagonal in design, with bore 9 feet in diameter, and rests on a bed of concrete, which is placed upon 300 piles driven fourteen feet into the ground to rock bottom. It weighs about 2,100 tons, which, with 500 tons of cement, makes a total weight of 2,600 tons on the piles. In the erection of the chimney four bricklayers have been engaged about four months. Its cost is about $10,000.

Municipal Works, Etc.

Vankleek Hill proposes to raise $3,275 for drainage.

St. John's, Que., has voted some $30,000 for permanent roads and sidewalks.

The Forest City Paving Co. has secured a $15,000 contract at Niagara Falls, Ont.

Burk's Falls has voted $30,000 for waterworks. Work will be commenced this fall.

Galt is considering the erection of a new single-span bridge over the Grand River.

Parry Sound has voted $10,000 for water works improvements, and $3,000 for piers for a new bridge.

Edmonton has decided to build a wharf on the river front, to encourage steamboating on the Saskatchewan.

Coaticook will lay concrete sidewalks at a cost of 60 cents a square yard, the corporation making ready the surface.

Lanark county council has arranged for the purchase of the toll roads in the county, three in number, at a cost of some $19,000.

The Bell Telephone Co. will put its wires on the principal streets of Woodstock, Ont., underground, and probably in Galt and Guelph.

The completion of the Nile works within the time specified has, says Sir John Aird, resulted in a saving to the Egyptian Government of $4,000,000.

The Maritime Contracting & Mining Co., Charlottetown, P. E. I., has been awarded the contract for a waterworks system at Shediac, N.B., at a cost of $7,500.

Robert McCallum, provincial engineer, has prepared plans and specifications for a new steel bridge across the Winnipeg River at Rat Portage. There will be three 135 foot truss spans on concrete piers.

The Hamilton Spectator pronounces the tar macadam roads made in that city five years ago a great success. Ferdonia, New York, has a different tale to tell. The stones are working up through the surface, making the roadway rough.

Winnipeg is expending over $500,000 in public works this year, which includes new sewers, pavements, sidewalks and boulevards. In addition over ten miles of new waterworks piping will be laid, and extensive improvements made to the plant.

A new water main from St. George's pond to the eastern part of the city is to be laid in connection with St. John's, Newfoundland, waterworks, at a cost of $10,000 or $12,000. Engineer Ryan is preparing plans. Mr. Rice, hydraulic engineer, has been asked to give an opinion on the whole water system.

The plan prepared for New York city's terminal at City Hall Park embraces a campanile 42 stories high, a huge park with only the City Hall in it, and an underground station with three floors of car tracks and five office floors above, the estimated total cost of all which is $30,000,000. The campanile of the plan rises to a height of 650 feet and the building is to be devoted entirely to office use.

The New Brunswick department of public works has announced the following contracts: Clinch's Mill bridge, Musquash, recently destroyed by fire, Wm. R. Fawcett of York Co.; covering Stanley bridge, in York Co., W. Brewer, of St. Mary's; the covered span over Little River Bridge, Madawaska Co., Geo. R. Pelletier; county line bridge, between King's and Queen's counties, destroyed by spring fires, Wm. Howe, of Welsford; building stone substructure for the steel bridge to be erected at Buctouche, J. D. B. Simmonds, of St. Mary's; superstructure of Ward's Creek bridge at Sussex and the River Charlo bridge at Colbourne, Restigouche Co., Chas. D. Buddock, of Chatham. The steel bridge at Buctouche will be the largest structure of its kind put up in the province this year. The total cost is estimated at $22,000.

Some extensions are to be made on the Hamilton waterworks.

The waterworks at Southampton, Ont., are to be extended.

A bridge over the Magpie River, Michipicoten district, is asked for.

A floating bridge has been built at Gannon's Narrows, County of Peterboro.

Work has been begun on a system of sewers for Glace Bay, N.S. Bithulitic pavements will follow.

The Ontario Power Co. has constructed a road for driving from the ferry landing to the Horse-shoe Falls, Niagara, under the cliff.

A topographical survey of Lake Temagaming is being urged upon the Government, in view of the fact that it is likely to become a great resort.

Windsor, Ont., will purchase a new waterworks pump from the Snow Pump Co., of Buffalo, for $17,619, guaranteed to supply 5,000,000 gallons in twenty-four hours.

Springhill, N.S., has decided to have waterworks, at a cost of from $80,000 to $100,000. The source of supply will be the Meccan river, seven or eight miles distant.

The Dominion Iron & Steel Company is making surveys for a new dam at Sydney River just below the site of the present one, which is thought to be unsafe.

The C.P.R. has determined to proceed with irrigation works in the Northwest, by which some two million acres will be reclaimed. W. Whyte, assistant to the president, has the scheme in charge.

The report of Willis Chipman, C.E., places the cost of waterworks for the town of Carleton Place at $89,000, and of sewers, $79,000. Of the latter, about one-half would be repaid by frontage tax. The ratepayers are considering the report.

Lethbridge, N.W.T., and Gananoque, Ont., are calling for tenders for water works and sewers. Regina, N.W.T., has resolved to have water works, sewers ,and electric lights to be operated by the city, and Moose Jaw is making a similar move.

There has been a big fight at Ottawa over a bill relating to the Toronto & Hamilton Railway, which would have deprived Toronto and other municipalities of the control of their own streets. The municipalities had the obnoxious clauses struck out.

S. B. Kramer, formerly chief despatcher, has been appointed master of transportation of the Eastern Division of the Grand Trunk Railway. He will have charge of the distribution of passenger and freight equipment subject to the instructions of the car service agent, and have supervision over train movements. A. J. Nixon succeeds Mr. Kramer as acting chief train despatcher.

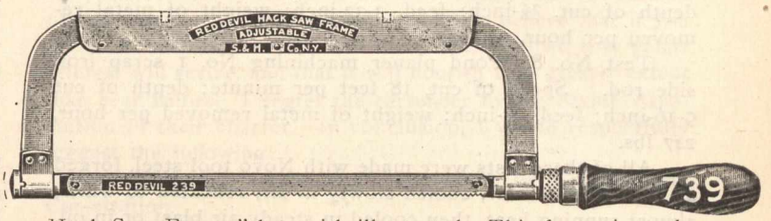
A number of lawsuits have been brought at different times against the Gananoque Water Power Co. by farmers along the Rideau and Gananoque rivers, who alleged that their lands were flooded by the company's dam at Marble Rock. These suits have never resulted satisfactorily and now some of the injured have taken the law into their own hands, and blown up the dam with dynamite. If discovered they will be prosecuted.

The annual meeting of the Western Ontario Good Roads Association will be held in the Board Room of the Toronto Exhibition Association, on the 8th and 9th September. Among the topics for discussion are: The Making of Good Roads; The Abolition and Commutation of Statute Labor, and The recent act for the Improvement of Highways. Col. W. H. Moore, President United States Good Roads Association, and other public men have been invited to deliver short addresses.

Robert Coleman, fireman on the steamer America, met his death in a peculiar manner. He was tightening a bolt about the engine, using a large wrench, when the wrench slipped, throwing him backwards. His head struck a corner of the base of an electric dynamo with such force that the skull was fractured, and death followed almost instantly.

HACK SAW FRAME.

Among the many new models and improvements on the old tools that have been made by the Smith & Hemenway Company, of 296 Broadway, New York City, during the past six months, none has been more widely and generously commended, and universally used than their "Little Red Devil



Hack Saw Frame," herewith illustrated. This frame is made of the finest tool steel, nickle plated. The back is extra heavy, and so constructed as to make it absolutely rigid. The company will send upon request, their catalogue, the Green Book of Hardware Specialities, wherein full description and price of this tool will be found.

NOTES ON HIGH-SPEED TOOL STEELS.*

By Henry H. Suplee, of New York.

The following notes represent officially verified data as to the use of high-speed tool steels in the works of the Union Pacific Railroad at Omaha, Neb., and as such are offered as a brief contribution to the subject. As is now well-known, these steels are similar in constitution to the Mushet air-hardening steel, the principal difference being that a much higher temperature is used in the tempering process. The steels contain both chromium and tungsten in varying proportions, as well as molybdenum. The method of treatment consists in heating the tool up to about 2,000° F., then cooling rapidly down to about 1,700° F. in a lead bath, and then slowly in air or lime. These steels, of which the Taylor-White is the best-known and earliest example, are able to maintain a cutting edge even when operated at speeds producing a red heat; and, in fact, unless such speeds and temperatures are maintained, they do not give satisfactory results. These tools should be used only for roughing purposes, and the great economy resulting from their use appears when it is found that the forgings can be made with less care as to size, the roughing down to finishing dimensions being made more rapidly and economically in the machine processes than in forging.. Small chips can be turned from car-wheel tires at lineal speeds of 5 feet to 8 feet per minute, the weight of metal removed being about 8 lbs. per hour; this is with ordinary tool steel. Turnings, such as the turnings from a locomotive tire, are made with high-speed steel at a speed of 24 feet per minute, removing 100 lbs. to 120 lbs. per hour; while heavy chips are taken at 18 feet per minute, removing 450 lbs. per hour. This latter cut was too heavy for the powering of the lathe, however, and the rate could be maintained for only a short time, but the tool showed no signs of distress.

The following are authenticated records made in the Union Pacific shops at Omaha, Nebraska, U. S., for which the author is indebted to Mr. R. Emerson, secretary of the Union Pacific Railroad Board of Tests, the work being done on a wheel lathe, a planer, and two boring mills, with "Navo" Air Hardening Steel.

Test No. 1. Pond lathe machining soft cast iron piston valve bushing. Speed of cut 74 feet per minute; depth of cut ½ inch; feed 3-32 inch.

Test No. 2. Pond lathe machining No. 1 scrap iron 4-inch piston rod. Speed of cut, 18 feet per minute; depth of cut, ¾-inch; feed, 1-16-inch.

Test No. 3. Pond lathe machining No. 1 scrap iron crank-pin. Speed of cut, 26 feet per minute; depth of cut ½-inch; feed, ⅛-inch.

Test No. 4. Niles vertical boring mill machining steel locomotive driving tire. Speed of cut, 40 feet per minute; depth of roughing cut, ⅛-inch; feed, ⅛-inch.

Test No. 5. Bullard vertical boring mill machining cast iron piston head. Speed of cut, 20 feet per minute; depth of cut, 13-32-inch; feed, ⅛-inch.

*Paper read before the Institution of Mech. Engineers at Leeds, July 28, 1903.

Test No. 6. Bement-Miles horizontal cylinder boring mill machining very hard cast iron 19-inch locomotive cylinder. Speed of cut, 18 feet per minute; depth of cut ⅜-inch; feed, ⅛-inch.

Test No. 7. Pond driving wheel tire lathe turning down hardened driving tire. Speed of cut, 24 feet per minute; depth of cut, ⅜-inch; feed, 3-32-inch; weight of metal removed per hour, 90 lbs.

Test No. 8. Pond planer machining No. 1 scrap iron side rod. Speed of cut, 18 feet per minute; depth of cut 9-16-inch; feed, ¼-inch; weight of metal removed per hour, 247 lbs.

All of these tests were made with Novo tool steel, forged at high lemon color, cooled slowly in air, reheated to white, almost running heat, then cooled in steady air blast or in oil, the latter giving the best results.

Light, Heat, Power, Etc.

Lethbridge has voted $120,000 for waterworks and sewers.

The Fredericton, N.B., Gas Co. has sold its electric light plant to the city for $15,500 Some new machinery is to be installed.

The Canada Furniture Manufacturers, owning and operating the Wiarton electric light system, has offered to sell the plant to the town.

The Cape Breton Coal, Iron and Railway Co. is reported to have purchased a complete electrical mining equipment, the first in the province.

Moosomin has accepted a proposition from the Acetylene Construction Company of St. Catharines for the installation of a street lighting system.

The St. John, N.B., opera house has contracted with a Montreal electrician for the installation of a thoroughly new and modern electric plant, at a cost of about $12,000.

To further facilitate the prompt filling of orders, the Sawyer-Man Electric Company have recently established a distribution depot in New York, where over a million lamps are kept in stock, so that all calls may be speedily and completely answered. They have similar depots in Philadelphia and other centres of trade.

The New Brunswick Telephone Co. having raised its rates in St. John, Joseph A. Magilton is trying to secure one thousand subscribers for a new system. The present rates are $40 for business houses and $23 for residences, while the proposed new plant will furnish instruments for an average rate of $22.

The Clergue and Jenison interests, which have amalgamated, are about to develop the water power at Kakabeka Falls to supply current for lighting and other purposes at Fort William and Port Arthur. They promise to purchase the present town plant, and to furnish power for $15 per horse-power per annum. 5,000-h.p. is to be available in eighteen months.

The German Wireless Telegraph Company, recently formed by the amalgamation of the Slaby and Braun systems, claims to be able to intercept Marconi messages. It says all that is necessary is to erect a strong station on the shores of the Baltic or the North Sea, attune its receiving wires to the Marconi station at Poldhu, Cornwall, and it would be impossible for Marconi to receive transatlantic messages.

The Ontario law for the regulation of automobiles goes into effect September 1st. All machines must register with the Provincial Secretary, paying a fee of $2, must carry a number prominently displayed, and lamps at night, be provided with a gong or horn, and not exceed a speed of ten miles an hour in town, or fifteen miles in the country, except on streets set apart for the purpose by municipal councils.

E. J. Watts, Marconi's representative, has gone to Labrador, with a view to selecting five or more sites for wireless stations for the benefit of the fishermen. It is hoped to have them in operation before navigation closes.

The Canadian Pacific Telegraph Co. has just completed the laying of forty miles of cable between Bamfield and Alberni, on the west coast of Vancouver Island. This will give the company an alternate connection between the land and cable lines, and prevent delays through accident.

Telephones at $6 a year, and one cent a call, electric light at 8 cents per thousand watts, and electric power at about 5 cents per 1,000 watts, are the rates proposed for Toronto by the Stark Electric System, recently described in the Engineer. A canvass is being made for subscribers, and as soon as 5,000 are secured a company will be formed and the work proceeded with. The system has been installed at Massey's Dentonia Farm, near the city, where it has been inspected by a number of Toronto and Hamilton aldermen, who express themselves as very favorably impressed. As Mr. Stark is not in a position to instal the system on a large scale at once, the Hamilton city council have made a new contract with the Bell Company for five years. The Stark system is that in which the same wire is used for light, telephone, telegraph, etc.

Telephone lines, owned by individuals, municipalities, and local companies, are steadily growing in number in Ontario. Port Arthur, Fort William, Sturgeon Falls, Rat Portage, and St. Joseph Island have them, and there are farmers' lines in the vicinity of Markham, Beaverton, Shelburne and Grand Valley, (Dufferin County), East Luther, (Wellington County), Harrietsville, (Middlesex), Fonthill in the Niagara District, Prince Edward County, and elsewhere. The construction of these lines is simple and inexpensive. In the case of farmers' lines, a single line is used. The average is No 12 copper wire, weighing 105 pounds per mile, and costing 16 cents per pound. Poles placed 150 feet apart, cost from $1.50 to $2 in place; cross arms cost from 20 cents to 35 cents, according to size and the number of pins, the latter price, 35 cents, providing for ten wires. The insulators cost 1¼ cents each. Stringing the wire costs $5 per mile. Telephone instruments cost from $10 to $14 each.

Toronto City Council has secured reports from R. J. Parke of Toronto and Alex. Dow of Detroit, two electrical experts, on the question of electrical transmission. R. J. Parke estimates that at present 18,425 horsepower will be required for the city. Regarding the annual charges, Mr. Parke, after consultation with the City Treasurer, has allowed interest on the bonds for 20 years at 3.75 and he has also added 7 per cent. for sinking and depreciation fund. This can be safely reduced to 5 per cent., which would decrease the annual cost to $35,712 per annum. Mr. Dow states that assuming it will be $10 per horsepower at Niagara Falls, he estimates that it will amount to $18.96 delivered at the city limits, that is providing for 13,500 horsepower. To increase this 50 per cent., making it 20,000 horsepower, would bring the cost down to $16.48 delivered at the city limits. If the Toronto Railway Company will agree to take their power over the same line it would be reduced to $15.23 per horsepower. Taking the highest figure, the horsepower at city limits will cost $18.96. Adding distribution, losses and the expense of distribution, brings the total amount to $38.16. Those figures show that the city should receive an average figure for power distributed sufficiently in excess of $38.16 per annum to prevent any possibility of loss. If we can find a market for 25,000 horsepower, he is of the opinion that this estimate can be reduced to $33. Assuming that power will cost an average of $8.136 per horsepower, and comparing this price with the present rate charged in this city for electric light and power a very large saving will be effected. F. H. Rust, city engineer, stated that power costs the city $50 per horsepower at the waterworks and city manufacturers about $56 per horsepower. P. W. Ellis, Toronto, declares that power at $15 a horsepower, as was predicted, was equivalent to coal at $3 a ton.

A by-law is to be submitted to the ratepayers of Renfrew to provide $88,390 for the purchase of the power and electric lighting plants.

The Prince Albert, (N.W.T.), Electric Light & Power Co. is to have its name struck off the register of the N.W.T. and be dissolved.

The Stratford Gas & Electric Light Co. has been re-organized, with Dr. S. A. King, of Windsor, as president. Extensions will be made.

The telephone cable connection between Brier Island and the Nova Scotia coast is to be renewed. The wire, 3,000 ft. long, has been shipped.

The town of Windsor Mills, Que., has engaged the services of an expert electrician, to report on the best way to obtain power and electric light for the town.

Mackenzie & Mann propose to install a system of wireless telegraphy, with stations between Toronto and Port Arthur, for the benefit of the steamers.

The Yukon telegraph line is being thoroughly overhauled. Much difficulty has been experienced from leakage. J. B. Charleson, who superintended the construction of the line, will look after the repairs.

A recent premature explosion in the Canadian Niagara Power Company's wheelpit seriously injured a number of men. It is said to have been caused by one of the men packing a charge of dynamite with a crowbar.

Owing to an expensive break in the machinery, the Madoc electric light plant has been closed down permanently. This plant is owned by private parties, and there is now an agitation to instal a municipal plant.

A company is being formed to develop the water power at the McPherson Falls on the Vermillion River, a few miles from Sudbury. A large electrical plant will be installed from which energy will be transmitted to the mines in that vicinity. Specifications for the electrical machinery have been prepared.

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

The fourteenth annual convention of the Canadian Association of Stationary Engineers was held at Berlin, Ont., on the 25th and 26th of August. By the courtesy of the Mayor and Town Council, the Council Chamber was placed at their disposal. The following officers and delegates were present: President, W. Oelschlager; vice-president, H. Terry; treasurer, J. Ironsides; secretary, W. Inglis; doorkeeper, N. Beam; conductor, J. Struthers.

Delegates present: Toronto, No. 1—G. C. Mooring, N. V. Kuhlman, A. M. Wickens, J. Huggett; Toronto, No. 18—J. M. Dixon; Brantford, No. 4—J. Ogle; Dresden, No. 8—T. King; Waterloo, No. 17—J. R. Uttley; Berlin, No. 9—J. Walker; Brockville, No. 15—A. M. Turkington; Hamilton, No. 2—W. F. Crockett, F. Sculthorpe.

After roll call, the president, W. Oelschlager, read his annual address, as follows:

PRESIDENT'S ADDRESS.

Brethren,—In welcoming you to this, the fourteenth annual convention of our Association, I would impress you with the fact that this will be the most important session held since its inception. It will also devolve upon you to decide whether the Association shall be carried on. I sincerely hope that it will be kept alive, and to this end that some means may be suggested that may broaden the way of organiation and bring the bulk of stationary engineers into the order. I suggest the following: The continuation of the lesson papers and to make them progressive, that is, lead them up gradually from the primary to the mathematical problems required to be answered by certificate examintion. While this is not intended as a criticism of past lesson papers, I must remind you that the several attempts referred to generally ended with the primary. Let the engineers in their respective localities go direct to their employers and ask them to contribute to your individual lodges, and you will get it. As an example, within the last two days I was asked by several of our largest manufacturers if we needed financial aid towards our convention expenses, to which I replied in the negative, but told them that we wanted a more cenral place for the meetings of our local lodge and was assured of their support to that end. I confidently believe that if you decide to keep the executive of the C.A.S.E. afloat, that public interest will revive, and that it will flourish to a greater extent than ever before. I regret the surrender by the Sarnia Association of their charter. In conclusion, I would respectfully suggest the following:

1st—That our preamble be reinserted in Charter and Constitution.

2nd—That a sum of money be voted towards the expenses of visiting defunct lodges with the object of reorganizing same.

3rd—That the educational leaflets be pushed more vigorously, and a charge covering printing expenses of same be made.

4th—That our employers be informed that we are hereby asking a cash contribution of them.

Thanking you for your kind attention, let me once more remind you of the important bearing this convention has on the future of our order, W. OELSCHLAGER.

The address was referred to the Committee on the Good of the Order.

The following standing committees were appointed and the convention adjourned until 2 p.m.

Good of the Order—J. M. Dixon, J. Ogle, J. Walker, J. Ironside, H. E. Terry, A. M. Turkington.

Ways and Means—N. V. Kuhlman, W. F. Crockett, G. C. Mooring, T. King, A. M. Wickens, W. Inglis.

Mileage—N. Beam, F. Sculthorpe.

Audit—N. V. Kuhlman, F. Sculthorpe.

Credentials—T. King, A. M. Turkington.

Afternoon Session.—The convention reassembled at 2 p.m. President J. Walker, of Berlin, No. 9, invited the delegates and friends to the banquet on Wednesday night, the 26th. The minutes of the last convention were read by Secretary W. Inglis. Moved by T. King, seconded by J. Ogle, that the minutes be adopted. Carried.

Notices of motion were handed in by G. C. Mooring and W. A. Crockett, and referred to Committee on the Good of the Order.

Report of the treasurer was read and referred to Audit Committee.

Report of the secretary was read and sent on to the Audit Committee.

Some questions were asked regarding the Legislation Committee, appointed at the last convention, and several pertinent remarks were made, re the C.A.S.E., and the part the International Union of Steam Users had taken in the matter, and also as to where the Trades and Labor Council had come in, participated in by Messrs. Crockett, Mooring, Terry, Wickens and others, with considerable vigor. Adjourned till 8 p.m.

Convention resumed at 8.30 p.m.

Report of Committee on Ways and Means—Moved by J. M. Dixon, seconded by J. Walker, that report be received and discussed clause by clause.

Report of Committee on Good of the Order—Moved by W. Inglis, seconded by W. Sculthorpe, that it be left over till the following day.

Report of Mileage Committee was received and adopted on motion of A. M. Wickens and J. M. Dixon.

REPORT—WAYS AND MEANS.

Clause 1.—That we view with alarm the general tendency towards withdrawing from this Association during the previous year. We beg to recommend that twenty-five questions be formulated, and that the executive give a cash prize for the best solution to them.

Clause 2.—We also recommend that every secretary of a subordinate Association be instructed to write to every sister Association the progress that has been made in this regard, and give a synopsis of the work done in this respect.

Clause 3.—We also recommend that wherever possible,

a better intercourse be initiated with each other by means of a system of fraternal visits.

Clause 4.—We also recommend that we use every legitimate effort to build up the Association, and that the sum of $10 be granted to any member who shall organize a new Association or resuscitate a defunct one.

Clause 5.—We also recommend that every Association be instructed to be as aggressive as possible, so as to build up their membership.

Clause 6.—We would also like to see a fraternal spirit shown between members of each Association, and that each individual member aid and assist those who are not so well versed as themselves in the different lines of work.

All of which is respectfully submitted.

Committee—Bros. Colville, Crockett, Mooring, King, Wickens, Inglis.

The various clauses were adopted, except clause four, which recommended the appointment of district deputies. Clause four, as appears in the above report, was substituted.

Adjourned at 10 p.m.

The convention resumed on Wednesday, 26th, at 8.45 a.m.

Report on Good of the Order was taken up, as follows: In reviewing the president's address, there is some wholesome advice as to how the progress of our Association

H. E. Terry, President, C.A.S.E.

might be made more certain and emphatic in the future. Suggestion 1.—That our preamble be inserted in Charter and Constitution is a special requirement, with the exception that said preamble might be amended to suit the present position of the Association. Suggestion 2.—That a sum of money be voted to cover expenses of visiting lapsed lodges, with a view of resurrecting the same. It is impossible to over-rate the wisdom of this, as by a judicious expense the Association would be held firmly together and members of small districts could be specially educated in the brotherhood of the society. Suggestion 3.—Re monthly leaflets. We believe that this would be another source of keeping in touch with lodges of a lukewarm character. Suggestion 4.—Let our employers know we are hereby asking a modest cash contribution from them. In this matter we would leave this to the localities in which our Assocition has branches.

Notice of Motion.—That Toronto, No. 1, after this session will withdraw from this executive of C.A.S.E. We sincerely regret that such a resolution should emanate from Toronto, No. 1. It has been the parent of the Association, has fostered and expended money and effort on the development of its life, and now when our existence is seriously imperilled, such attempt at desertion of our ranks is at least reprehensible. But while we deplore this, we would beg to refer the members of No. 1 to that portion of the Constitution on Subordinate Lodges, Sec. 2., Article 3, which states that five members in good standing can object, and according to our interpretation can hold all assets belonging to and existing under the charter. Again, in the executive power, any subordinate lodge failing to return capita tax and other returns specified, shall forfeit its charter. Under these conditions, we would consider it unwise for this present convention to take notice of such motion. All of which is respectfully submitted.

Committee—Brothers Ironsides, Turkington, Walker, Ogle, Terry, Dixon, chairman.

The various statements were carried, and with reference to the last, the executive secretary was instructed to ask Toronto, No. 1, to reconsider its resolution. Clause 1 was, however, referred to a special committee who brought in the following report:

Your special committee, upon the wording of a suitable preamble for our Constitution, beg to recommend the following: This Association shall not at any time be used

N. V. Kuhlman, President, Toronto No. 1.

for religious or political purposes, always recognizing the identity of interests between employer and employee, and always keeping in view the furtherance of mechanical and expert training for its members, thereby proving its close accord with their employers, believing that cultivated brain power is always in demand at fair figures of remuneration.—A. M. Wickens, chairman.

The auditors' report was adopted unanimously.

Adjourned till 2 p.m.

On reassembling at 2.10 p.m, the report of special committee re preamble was adopted unanimously.

The secretary read letters from Brandon, Calgary, and Quebec, and on motion of W. A. Crockett seconded by A.

W. A. Crockett, Hamilton.

M. Wickens, a copy of the Canadian Engineer, containing report of this annual convention, was ordered to be sent to the different subordinate Associations, and to prospective Associations. The election of officers next took place with the following results: President, H. E. Terry, acclamation; vice-president, John Uttley; secretary, W. Inglis; treasurer. J. M. Dixon; conductor, F. W. Sculthorpe; door-keeper, J. Ogle. Hamilton was chosen as the next place of meeting.

The new executive officers were then installed by past presidents Wickens and Moseley.

Two dollars was voted to the caretaker of the hall for his services.

A vote of thanks was tendered to Berlin and Waterloo

and acknowledged by past president Oelschlager and J. Walker, and to the local press and the city council for courtesies extended.

$25 was voted to the executive secretary, and $5 to A. M. Wickens for lesson papers supplied by him. Presentation of a jewel to past president, W. Oelschlager, was made. Votes of thanks were passed to A. W. Smith, Canadian Engineer; C. Young, of the Electrical News, and D. McEvoy, of the Fairbanks Co., who acted as special artist.

Moved by A. M. Wickens, seconded by J. Huggett, that a want advertisement department be placed in the columns of the mechanical press.

The new president gave a splendid address to the meeting before they adjourned, urging them to get together for the good of the order.

The following are the officers of the subordinate lodges indicated :

Brantford, No. 4—A. Ames, president: J. B. Forsyth, vice-president; T. Pilgrim, conductor; A. McKinnon, doorkeeper; C. Walker, treasurer; Joseph Ogle, secretary.

Brockville, No. 15—W. T. Chapman, president; W. Robinson vice-president; J. Grundy, recording secretary.

Toronto, No. 18—W. Inglis, president; Jos. Hughes, vice-president; J. M. Dixon, recording secretary; A. W. Vance, treasurer; G, Gracey, conductor; A. Smith, doorkeeper.

Toronto, No. 1—N. V. Kuhlman, president; W. D. Bly, vice-president; H. E. Terry, recording secretary, 52 Bellevue Ave.; W. Webb, Lawlor Building, corner King and Yonge Streets; Charles Mosely, treasurer; A. Kirby, conductor; W. Cheney, doorkeeper.

Hamilton, No. 2—J. Donaldson, president; — Kennedy vice-president; W. A. Crockett, recording secretary, Hamliton P.O.; J. Cornish, treasurer ; — Stevens, conductor; — Dorland, doorkeeper.

Dresden, No. 8—W. F. Jamieson, president; Thos. King, vice-president; Willis Burnett, secretary ; T. M. Steeper, treasurer; Wm. Bear, conductor; Harry Bishop, doorkeeper.

In the evening the annual banquet took place at the Walper House, presided over by W. Oelschlager, the president. The following was the toast list: The King, Canada, Our Home, responded to by Dr. H. G. Lackner, M.P.P. Song by J. M. Dixon, Manufacturers, responded to by D.McEvoy and T. King. C. A. S. E., responded to by Messrs. Terry, Inglis, Dixon and Ogle. Sister Associations, responded to by W. H. Cone, of the Canadian Electrical Association. The Press, responded to by Messrs. Young, of Canadian Electrical News; Lutz, of the Berlin News-Record; Smith, of the Canadian Engineer, and Eby, of the Berlin Telegraph. Our Host, responded to by G. O. Philips. The banquet was a most enjoyable function. The menu for the banquet was a blue print, suitably embellished and cleverly drawn by W. Oelschlager.

NOTES.

A visit was paid to the sugar factory on Tuesday.

Dermot McEvoy, special agent of the Fairbanks Co., greeted old friends and made new ones. He is a member of Toronto, No. 1., C.A.S.E. Our illustrations are from rough sketches by his pen.

A visit to the button factory was enjoyed by many.

Geo. O. Philip, of the Walper House, was an ideal host. He comes of an engineering family.

The Berlin News-Record's good work through their representative was appreciated greatly, and their city editor, Solon Lutz, was very popular.

C. H. Heuther, of the Berlin Lion Brewery, gave a splendid drive around the town and treated the visitors handsomely.

President Hill, of the Great Northern, has discovered that the tunnel recently constructed through the Cascade Mountains at an expense of $3,000,000, still carries too high grade in comparison with another route which his engineers have recently discovered. He can by the proposed new plans save about 25 feet in grade which he argues is sufficient to reduce operating expenses of the tunnel. Hence, the tunnel will in time be abandoned.

Railway Matters.

The Winnipeg Street Railway Co. is now building its own cars.

About 60 miles of the railway grade between Arcola and Regina have been completed.

Tracklaying on the Rosendale extension of the Canadian Northern Railway has commenced.

The Canadian Pacific Railway Company is inaugurating its own cartage service at Vancouver.

Inquiries are being made in Canada for 3,000,000 hemlock ties for the South African railways.

The Peterboro Radial Railway Co., which takes over the present line, is to have 5 miles in operation by July 1st, 1904.

Surveys are being made for the C. P. R. high level bridge across the Saskatchewan, at Edmonton.

The construction of G.T.R. freight sheds and offices on the site of the old parliament buildings, Toronto, is to be proceeded with at once.

A radial railway is proposed starting from Port Stanley and passing through St. Thomas, London, Woodstock, and Brantford to Hamilton.

It is estimated that the proposed Government railway from Winnipeg to St. John will be 1,652 miles long, or 253 miles shorter than the Canadian Pacific.

Thirty-eight new locomotives have been added to the rolling stock in the freight service of the C.P.R., between Winnipeg and Fort William.

Mackenzie & Mann have bought the Middleton & Victoria Railway in Nova Scotia, and will make it part of their Halifax and Southwestern system.

A railway from Hudson Bay to Buenos Ayres is projected, and the Pan-American Co., just incorporated in the United States, is said to have it in view.

It is understood a still faster service will be inaugurated on the Grand Trunk between Montreal and Toronto, the day express to make the 333 miles in six hours.

The Metropolitan Railway, Toronto, is making a survey for an extension of its road northerly from Newmarket to some point on Lake Simcoe, probably Barrie or Sutton.

John Bertram, of Toronto, has been appointed chairman of the Transportation Commission. The other members are Messrs. Reford, of Montreal, and Fry of Quebec.

A survey party is to explore the valley of the Blanche river from the present terminus of the Temiskaming Railway, northwards to a junction with the G.T.P. line, some 70 miles.

A collision between two freight trains at Kingston, on the G.T.R., did considerable damage. It was caused by the engineer running past the semaphore, which was up against him.

A signal station, which will have to be maintained by the Vancouver, Westminster & Yukon Railway where its track crosses the C.P.R. in New Westminster, will cost the new company about $40,000.

An agreement has been made with the Hamilton Radial Railway to lay a double track on a section of their line, to accommodate the employees of the Deering Harvester Works, and the Steel Works.

The Cape Breton Electric Company, and the Glace Bay Railway Company, of Sydney have placed orders with the Ottawa Car Company for five 20-foot car bodies, three for the former and two for the latter.

The Grand Trunk and Canadian Northern announce themselves in a position to handle the grain trade of the Northwest without delay. The harvest is ten days earlier this year than last, so they will get a good start.

Fifteen freight cars in the yards of the C.P.R., at Toronto Junction, ran away and broke into two sections. The first section struck the stop post and was derailed, and the second section ran into it, damaging eleven cars.

Work has been commenced on the new shops of the C.P.R., at Winnipeg. The engineers live on the spot, and the work is being rushed. The contract has been let to the Manitoba Construction Co. The work will cost about $250,000.

New G. T. R. shops are to be built at Allandale.

Cars have commenced running on the Berlin & Galt Electric Railway.

Considerable extensions are being made on the St. John, N.B., street railway.

Work has begun on the tramway between New Aberdeen and Bridgeport, C.B.

The town of Collingwood is interested in no less than seven electric railway charters.

The Halifax Electric Tramway Company is spending about $200,000 in improvements.

Tracklayers have been laying rails on the old Hudson's Bay Railway, out of Winnipeg.

The New Brunswick Coal & Railway Co. will run trains from Norton to Newcastle in a few days.

The Hudson's Bay Company has the contract for supplying the survey camps of the Grand Trunk Pacific in Northwestern Ontario.

The C.P.R. is making extensive improvements to the roadbed west of Brandon with a view to increasing the weight and speed of trains.

The Grand Trunk Pacific has 14 gangs of 20 men each in the field, between North Bay and the mouth of the Temagamie, and along the valley of the Sturgeon river.

A contract has been let for the grading of a branch of the Canadian Northern Railway from Swan River to Thunder Hill, a distance of 20 miles. John Kennedy has the contract.

The courts having decided that the Montreal Park and Island Railway could not legally build an electric line on the main road of Longue Pointe municipality, to connect with the lines of the Chateauguay and Terminal Railways, the Northern Railway Company has offered to do the work.

As commissioner of railways in the Orange River Colony and the Transvaal, Sir Percy Girouard, the well-known Canadian engineer, states the railway receipts on his systems for the year ending June were £5,349,230, and the expenditures £2,825,253, leaving a handsome surplus.

John Judge, for 28 years on the Kingston and Pembroke Railway, has been appointed superintendent of construction of the Temiskaming Railway, at a salary of $1,200 per year, with a prospect of a responsible office when the road is completed.

The two large Grand Trunk iron bridges across the Don River at Toronto were moved about 35 feet in opposite directions without interrupting traffic, and the company will build two new bridges and lay four tracks. The old bridges will be used for shunting and freight trains, while the new ones will be exclusively for passenger trains.

General Manager Chamberlain, of the Canada Atlantic Railway, has announced that the extension of that system to Sault Ste. Marie will be prosecuted without delay. The survey will be begun early in the winter. The starting point of the new line will be Brule Station, between Whitney and Depot Harbor, 180 miles west of Ottawa. The survey will follow the height of land north of Lake Huron and Georgian Bay to the Soo, and the line will be about 300 miles in length.

Under the charter which used to be known as the V., V. and E., the Great Northern Railway is continuing construction work at the Vancouver end of the Coast to Kootenay railway, there being a thousand men at work between New Westminster and Sumas. The Great Northern is building a number of small lines which will make a sort of network over the rich farming section of the lower Fraser valley, and connect with Vancouver. The bridge under construction at New Westminster will afford a number of roads a connection.

Two plans are proposed in connection with the project for an Australian trans-continental railway. The Government's proposal is to subsidize the road by giving large tracts of land to the company undertaking its construction. The representative of a big syndicate has made an alternative proposition, by which his company offers to buy £7,000,000 worth of lands from the Government, at the latter's own price, the road to be constructed by the Government with the money thus obtained. The project is being considered by other big financiers, including a well-known firm of Canadian capitalists who have been active in railway construction in Canada.

A street-car in Ottawa got beyond control and dashed into another. The motorman had his leg broken, a lady passenger was so injured that her foot had to be amputated, and two others were injured. An investigation showed that the accident was caused by a short circuit, though the motorman forgot himself afterwards, or he might have stopped the car.

Councillor Devlin, of Pembroke, says the Observer, has invented an automatic signal for railway crossings. It provides for a bell at the crossing to which are attached wires extending along the track on both sides. Some distance from the crossing there is a trip device on the rail, and when a train strikes the trip it starts the bell ringing and keeps it ringing till the train has passed.

A dining car, which was being shunted on to a siding at Merriton, on the G.T.R., ran away through the brakes being out of order. The brakeman did his best to stop it and finally jumped. Five colored waiters also jumped, and the car ran on to Port Dalhousie, seven miles from where it started. A telegraph message was sent ahead, and a switch was opened for it so as to avoid a collision with other cars. It ran to the stop-block, which it broke through and ran off into a marsh where there was about six feet of mud and water. It was hauled out without having sustained much damage.

One of two locomotives which are being built at the Baldwin Works in Philadelphia, for the Canadian Copper Co., at Sudbury, will be a mechanical novelty in its way, as parts will be composed of nickel steel, making it cost $4,000 more than the ordinary locomotive. An important feature of the boiler from a mechanical standpoint will be that every 100 pounds of steel in it will contain from three to four pounds of nickel. The other parts which will be of nickel steel will be the frames and rails, driving axles, crank-pins, piston rods and other important parts. The International Nickel Co., which controls the Canadian Copper Co. will provide the nickel.

Personal.

James Speight, a prominent wagon manufacturer, of Markham, Ont., is dead.

Jno. Macmichael, for some years manager of the James Robertson saw and lead works, Toronto, is dead.

John H. Shaw, C. E., of North Bay, has been commissioned to survey two townships, one hundred miles northwest of Lake Temiscamingue.

Frank Barr, assistant general manager of the Boston and Maine Railway, has been appointed general manager in place of the late T. A. Mackinnon.

F. H. Badger, superintendent of the Montreal fire alarm department, is dead. He had previously been in the same service in Boston, and was an expert electrician.

Lieut. F. N. Gibbs, of Port Arthur, late of the 3rd Canadian Regiment, consulting engineer for the J. C. A. Henderson Mining Company, of Johannesburg, South Africa, is in this country looking up the very latest mining machinery. He says there will be great railway developments in South Africa very soon, and is enthusiastic over the mineral wealth of the Transvaal.

P. M. Arthur, chief of the Brotherhood of Locomotive Engineers, whose tragic death at the grand lodge meeting, in Winnipeg, was announced in the last issue of the Canadian Engineer, was succeeded by A. B. Youngson, of Ohio, who also died after filling the office thirteen days. W. S. Stone, of Iowa, is his successor. He will continue to carry out the policy of the late Mr. Arthur.

Geo. Shattuck Morison, one of the foremost civil engineers on the continent, died recntly in New York. His reputation depended largely on his success as a bridge builder, he having constructed ten bridges across the Missouri and five across the Mississippi. His bridge at Memphis, Tenn., which has a single truss span of 790 feet is surpassed only by two bridges in the world—one in India and the Forth bridge in Scotland. Mr. Morison was a member of the Isthmian Canal Commission.

W. J. Barrett, of Philadelphia, manager of the American Conduit Co., manufacturers of bituminized fibre conduit, paid a recent visit to Canada in the interests of his firm.

The Syracuse Smelting Works, Montreal, manufacturers of babbitt and raw metal, have appointed Geo. B. Frank contracting agent for the province of Ontario. Mr. Frank is well known to the machinery and jobbing trade throughout the Dominion, having represented an American firm, both in Canada and the United States, for several years.

John Abell, founder of what is now the American-Abell Engine and Thresher Company, died last month, at Toronto, at the age of 81. He had been in ill-health for two or three years, and death was not unexpected. He was a native of England, and came to Canada as a young man. He established at Woodbridge, in 1845, the manufacture of agricultural implements, first making plows and wagons, then reapers and mowers. In 1847 he built one of the first separators made in Canada. It was operated by horse-power, and in 1863 and 1864 he manufactured the first portable threshing engine built on this continent. He had to give a bond against loss by fire and secure the farmers before being permitted to thresh by steam. In 1874 the first Abell threshing outfits were shipped to Manitoba, having to be transported by wagon from St. Paul, Minn., into Manitoba. In 1874 the plant at Woodbridge was destroyed by fire and rebuilt in the same year. In 1886 the factory was removed to Toronto, and organized into a joint stock company.

The Eastern Telephone Company is considering extending the service from Hawkesbury to Port Hood, Mabou and Inverness. They will lay a cable across the Strait of Canso from Hawkesbury to Mulgrave.

The Great Falls Power Co., has offered to supply Winnipeg with 10,000 horse-power within two years, if the council will take one-quarter of this at an annual rate of $50 per h.p. A ten year monopoly is asked for.

The steamer Westport has received her machinery, and taken her place on the St. John-Yarmouth line.

Clayton, Ont., now has telephone communication with the outside world.

Davis Jardine, shipowner, has given £10,000 to found a chair of Electrotechnics in connection with the engineering department in Liverpool University.

James Hendry, a C.P.R. engineer, of London, was run down and killed at Windsor, while riding on a railway velocipede.

The Vancouver, B.C., Electric Co., has begun work on its new power-house at Lake Beautiful. Two transmission lines are being constructed, either of which will be sufficient if one gives out.

Two persons were killed by electric shock in Ottawa one day recently. One was holding an incandescent lamp, looking for leaks in the water service, when by some means a circuit was established. The other received a shock while on a pole repairing a line.

The Wolvin syndicate, otherwise the Great Lakes and St. Lawrence Transportation Co., has six steamers between Quebec and Duluth, bringing grain from the West, and will have four more before the season closes. They are the largest carriers on the St. Lawrence canals.

The new surveying ship Eleanor, which is to take the place of the Gulnare, has arrived at Charlottetown. She is a handsome three-master steam yacht, purchased by the British Government from the Prince of Monaco, whose private yacht she was. She will start at once the admiralty survey of Newfoundland.

The Tadousac, an iron grain carrier of 20,000 bushels capacity, has been launched at the Bertram Co.'s works, Toronto, and the Midland King, with a capacity of 200,000, from the Collingwood ship-yard. The former was built for Waldie & Wright; the latter for the Midland Navigation Co. The Tadousac is 260 feet long, 43 feet beam, and 28.6 feet depth of hold; the Midland King, 375 feet long over all, 48 feet beam, and 28 feet depth of hold.

TOWN of LETHBRIDGE

DISTRICT OF ALBERTA

Water Works and Sewer Works

Notice to Contractors

Sealed tenders will be received by the Secretary Treasurer of the Town of Lethbridge, Alta., until 8 p.m., on

Thursday, Sept 12th, 1903,

for the construction of a System ol Water Works and Sewerage Works according to plans and specifications to be seen at the Secretary Treasurer's offlce, Lethbridge, or at the office of the Chief Engineer, Toronto, Ont.

No tender necessarily accepted.

WILLIS CHIPMAN, Civil Engineer, 103 Bay Street, Toronto, Ont.

W. OLIVER, Mayor, Lethbridge, Alta.

C. B. BOWMAN, Secretary Treasurer, Lethbridge, Alta.

Town of Gananoque

Province of Ontario.

Water Works and Sewerage Works.

NOTICE TO CONTRACTORS.

Sealed tenders will be received by the Mayor of the town of Gananoque, Ont., until 6 p.m. on

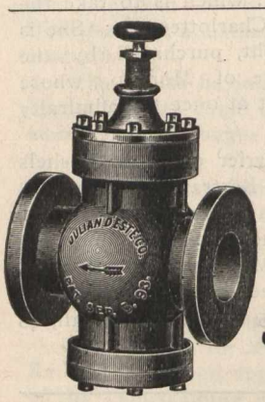
Tuesday, Sept. 15th, 1903,

for the construction of a System of Water Works and a Sewerage System, according to the plans and specifications to be seen at the office of the Chief Engineer at Gananoque, and at Toronto.

No tender necessarily accepted.

WILLIS CHIPMAN, C.E., Chief Engineer, 103 Bay Street, Toronto. Ont.

W. N. ROGERS, Esq., Mayor, Gananoque, Ont.



CURTIS ENGINEERING SPECIALTIES.

IMPROVED

STEAM PRESSURE REGULATOR

To Automatically reduce Boiler Pressure to any desired Low Pressure for Heating, Drying, Running Engines, Mining Machinery, Pumps, and Controlling Hydraulic and Air Pressures. Send for Complete Catalogue.

Julian d'Este Company,

24 Canal St., Boston, Mass.

For Sale.

Advertisements under these headings two cents per word each insertion. Advertisements twelve words or less, twenty-five cents.

FOR SALE—One Three H. P. Marine Gasoline Engine—4-Cycle Type, complete with shaft, propeller. batteries, etc. This engine has never been used. Further particulars can be had by addressing, A. W. SMITH, 75 Collier Street, Toronto.

FOR BLACKSMITHS AND MACHINISTS Scientific tool tempering and hardening to a standard by Toy's colored charts, A. and B., explaining tempering in oil, water, or tallow. Tells what each tool will stand; gives 75 new methods and recipes on forging and welding all the new steels, and 10 for the best steel welding compounds for welding all new steels. Thermite welding explained and tells how to make the compound. Thermite is the coming weld. All of the above for one dollar. Samples free. 40 years a factory steel worker. W. M. Toy, Sidney, O., U.S.A.

STEAM ENGINEERS' LICENSES.—40 page pamphlet containing questions asked by Examining Board of Engineers sent free to any person desiring to obtain a City, State or Government license to operate a steam plant. GEO. A. ZELLER, Publisher, 135 South 4th St., St. Louis, Mo., U.S.A.

TEN CENTS PER COPY will be given for each of the following back numbers of the Canadian Engineer:—May, September and November, 1893; April, July and August, 1894; May, June and July, 1896; August and November, 1898, April, 1901. Please give full name and address when sending any of above numbers.

Situations Wanted.

EXPERIENCED technical and commercial manager wants situation, thoroughly understands flax, hemp and jute culture, spinning, twisting weaving, sack-making, etc. Good judge of fibres and yarns; practical engineer, fluent French, efficient correspondent; successful salesman. First class English, French and Russian testimonials—copies at this office. Highest references. European and American. Apply "LIN," Canadian Engineer Office, Toronto, Ont.

PARTNERSHIP WANTED.—Civil engineer of wide experience in hydraulic and steam machinery, a successful designer and builder of turbine water wheel, wishes to correspond with party having good business ability, with the object of establishing large machine works in a good location. Party must be able to contribute capital. — Address, "Machine Company," care Canadian Engineer, Montreal, Que.

It's Cheaper To "Chuck" Things

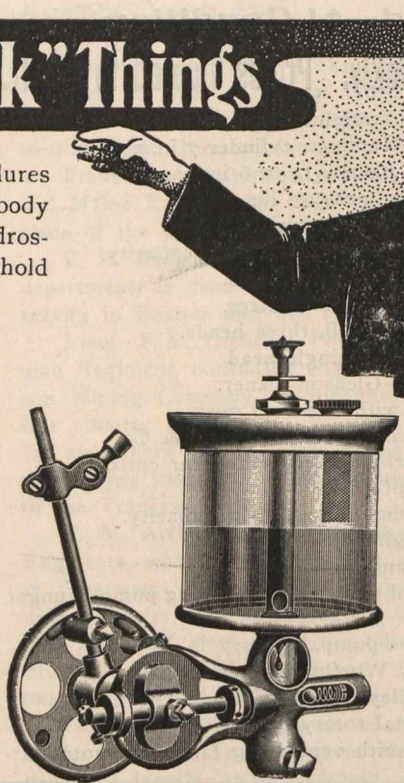
than to bother with their failures and their uncertainties. Everybody is warranted in discarding a hydrostactic lubricator if he can get hold of a

Manzel Sight Feed Automatic Oil Pump,

and for good reasons, too. The feed is positive and is regulated by the speed of the engine. There's no uncertainty about it, for when the engine moves the oil must be pumped and when the engine stops the feed stops.

Would you like one on trial for 30 days?

BRITISH AGENTS: Rimington Bros., Carlisle.



MANZEL BROTHERS.

46-48 Broadway···BUFFALO, N.Y.