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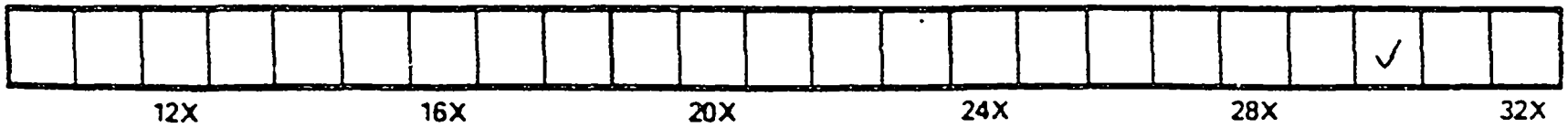

The Canadian Engineer

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This is to certify that we have printed and mailed TWO THOUSAND copies of THE CANADIAN ENGINEER for the month of February.

MONETARY TIMES PRINTING CO. OF CANADA (LIMITED).

Per A. W. LAW, Sec.-Treas.

Toronto, March 1, 1894.

HARBOR IMPROVEMENT SCHEMES.

The people of Moncton, N.B., have before them a scheme for the creation of a floating dock in Hall's Creek, which runs through the suburbs of that city. To the mariner the phrase "floating dock" is scarcely intelligible, since all docks, except dry docks, are supposed to contain water enough to float a vessel, but at Moncton the term has a meaning. The visitor to Moncton, if he is led to the wharves of that port when the tide is out, is surprised to see every vessel settled in the earth, while to the right and left stretches a wide trail of red mud, where recently there seemed to be a river. If he waits long enough he will at length hear the sound of rushing waters, and looking down the Petitcodiac's muddy trail he will see the waters sweeping up towards the town—sometimes, at high tides, coming on like a great wave—and in half an hour the ships that were stuck in the mud are floating lightly in a deep, wide river. This is the effect of the enormous tides of the Bay of Fundy—tides which rise and fall 50 to 60 feet, and are equalled in only two or three other places in the world—and the action of the water is locally known as the "bore," though what the word is derived from has not been satisfactorily explained. The ships come up and down the river with the flow and ebb of the tide. Hall's Creek is a branch of the Petitcodiac, and it is proposed by J. L. Harris and other local men to excavate a dock in which the tide waters would be held, or which would be filled by the waters of the creek. The latter would be certainly the only feasible method of filling it, as the deposits of mud from these tidal rivers would be such as would soon fill up any dock. However, the scheme is worth investigating by those interested in the prosperity of Moncton.

Moncton's nearest Nova Scotia neighbor, the enterprising town of Amherst, has also a plan for improving its shipping facilities. Nominally a sea port, few vessels, except small wood boats and hay boats, ever go up there, because the La Planche, a small tidal river by which the town is reached, takes so many curves over the marsh flats that it is hard to navigate by wind alone. In two places in particular the river makes a detour of two to four miles, returning almost to the place whence the curve starts and forming what is described as an "ox-bow." In one case only a few feet of land separates the two banks, and in both cases the excavations would be very small. The cost of cutting off these ox-bows is a very small matter, but a more difficult question is the settlement of the riparian rights possessed by the owners of the marsh land around the river. These lands have been reclaimed from the sea by dykes—which will be described in an early number of THE CANADIAN ENGINEER—and are governed by a special code of regulations. The Provincial Government has jurisdiction over the land question involved, while the Dominion Government has control of questions connected with navigation, of which such a work would be one; so that legislation necessary to carry out the work would have to be adopted concurrently by both parliaments. Though these are difficulties in the way, a number of able men in Amherst believe it can and should be carried out, and efforts are being made to form a local company for the purpose.

BRIDGE SUPERSTRUCTURES.

In a paper to the Association of Civil Engineers, Cornell University, Geo. S. Morrison, the designer of the Memphis Bridge, has dealt with the question of bridge superstructure. American practice in bridges, he said, became established about fifteen years ago. Cast iron has disappeared from bridges, and the practical importance of stiffness, rather than the theoretical advantage of the determinateness of the stress, was recognized. The top chords and the floor connections are now made with riveted joints, and the noisy rattle, common in American bridges twenty years ago, is seldom heard at the present day. Plate girders are used up to 100 feet or more, and may in future be used for longer spans. For longer spans, pin-connected trusses, though very different from the American pin-connected bridges of twenty years ago, are in general practice. The superstructure of such trusses should be as complete as possible in itself. In deck bridges the two trusses may be braced together for the full depth of the truss, but in through bridges this cannot be done, hence the same result may be got by bracing, making the bracing between opposite verticals as deep as possible, and using a deep, rigid connection between the floor beams and these verticals. This is as necessary near the ends of the span as elsewhere, and though with inclined end trusses this is difficult, still it can be done by using a stiff portal overhead, and making a rigid connection between the inclined posts and the end floor beam. The old plan of omitting this beam and allowing the

end stringers to rest direct on the masonry, was bad. In light bridges, the bottom chord might easily be put in compression by overstraining the laterals, and hence, in such bridges, the bottom chords should be rigid for their whole length, and in other cases the end panels should be stiff. The practice of using a thin wall plate of wrought iron or steel was bad, and expansion rollers were often made too small in diameter. His own practice was to use in the first place a heavy cast iron wall plate. Above this came a stout plate of wrought iron, to which were riveted a series of steel rails. After riveting, the tops of the rails were planed smooth and level to form a bed for the rollers. By this construction the rollers were not clogged with dust, as any that collected fell between the rails, where it could be swept out. The rollers were segmental, 12 in. in diameter and spaced at six inch centres. Above them came a cast-steel bearing plate, and then a rocker plate, which was a steel forging, having ten cylindrical surfaces at right angles to one another, one of which took the load of the truss from the upper bearing plate fixed at the end of the truss, while the other transferred it to the bearing plate immediately over the rollers. This construction insured a distribution of load, even if the bottom plate were not quite level. With respect to the system of single triangulation as compared with double triangulation, Mr. Morrison holds that for moderate spans the former is best, as there is then no doubt as to the distribution of the stresses. In case of large spans, however, the connections become clumsy, and the double system of triangulation is to be preferred. In that case the members of one system can be used to stiffen the other system. The use of curved or broken upper chords is objected to by Mr. Morrison, though it saves weight. With this only the single system of triangulation can be used, as the web strains become indeterminate at the points where the lines of the chords change. The work is very much lightened, but counters are required through nearly the whole span, and the distortion of the span is greater than when straight chords are used. As regards cantilever bridges, they had advantages where the fixing of false work was difficult or impracticable, but though the main span was lighter than an ordinary main span of the same length, this saving of metal was made up for by the additional metal required in the anchorages and the outside limits of the main span.

ST. JOHN AS A SHIPPING PORT.

The citizens of St. John, N.B., and the Provincial Government have spent enormous sums of money equipping that port in the best style for the handling of all classes of freight. This they have done without calling for aid upon the Dominion Government, and they now think they have a right to ask for the support of their countrymen in the west in securing at least a part of the winter traffic which now goes to United States ports. With this end in view a special committee of the St. John Board of Trade has compiled some information as to the capabilities of their city for doing a large export and import trade.

St. John, New Brunswick, is situate at the mouth of the River St. John, which is 500 miles in length, and its harbor is known as the only one on the Atlantic coast, north of Charleston, S.C., which has such deep water and which does not freeze in winter, never having been known to have had ice in it to interfere with navigation. The Board is in possession of numerous certificates from masters and pilots of steamers and sailing vessels as to the ease of access to, and safety of, the Bay of Fundy and Harbor of St. John.

H. M. S. "Blake," Admiral Sir John Hopkins, 9,000 tons displacement, 20,000 horse power, drawing 26 feet of water, one of the largest vessels of her class in the British Navy, visited St. John recently. The Admiral and his officers gave it as their opinion that "it is an excellent harbor, easy of access, and perfectly, *absolutely* safe, and has plenty of water for the largest ships of the British fleet. On the anchorage ground in the harbor the depth of water is from 70 to 123 feet at low water. The tide rises and falls from 24 to 28 feet, which is the means of keeping the harbor entirely free from ice in winter.

The only Atlantic deep water terminus of the Canadian Pacific Railway owned by it, is now at St. John, 481 miles from Montreal, and running on its own rails 3,600 miles from Victoria, British Columbia. Freight can be discharged into vessels from cars on both sides of the harbor. The Intercolonial Railway has two deep water termini here, receiving and delivering freight by cars and from and to vessels at the wharves along the harbor front, thus saving transfer and cartage charges.

The Canadian Pacific Railway Company, assisted by the city and the Provincial Government, has recently completed a first-class grain elevator fitted with all the latest improved machinery for hoisting, weighing and shipping, and is now ready to receive and ship grain, the size and capacity of which is a total storage room of 301,716 bushels, and can deliver 15,000 bushels per hour. The average receiving capacity of elevator is about 53,000 bushels per day. The first cargo has just been shipped from the elevator, consisting of 34,000 bushels of peas, 1,000 tons of hay, and a quantity of deals. Vessels drawing 27 feet of water when loaded, can lay afloat at low water at the Canadian Pacific Railway and corporation wharves; general merchandise can be landed from vessels or received from the cars into the warehouse on the wharves.

There is now a well managed and very successful line of passenger and freight steamers, whose capacity is from 10,000 to 13,000 barrels, each carrying goods and passengers from China, Japan and the western provinces of Canada, running from St. John to the West Indies, carrying the West India mails under contract with the Dominion Government, calling at Bermuda, St. Thomas, St. Croix, St. Kitts, Antigua, Montserrat, Dominica, Martinique, St. Lucia, Barbadoes, Trinidad, and Demerara, and leaving St. John every 28 days and returning to St. John via the same ports.

There is also a regular and very satisfactory line of steamers (the Furness Line) running between St. John and London, G. B., also under contract with the Dominion Government, which leaves each place simultaneously about every 16 days. There are several lines of schooners running to all ports in the Bay of Fundy, which can deliver flour and other produce on through bills of lading at a lower rate via St. John than by way of Boston, New York or Portland.

Vessels of all sizes (steamers and sailing vessels) are open for charter at St. John at all seasons and at lowest rates. Atlantic insurance on vessels and all kinds of merchandise can be effected in St. John with reliable companies at the same (and occasionally at less) rates of premium as from New York, Boston, Portland or Halifax. Vessels can always depend on being

able to fill up with deals, timber and other freight to close out part grain cargoes at all seasons of the year. Steamers can be supplied promptly with first class steam coal at reasonable prices. Vessels of any size can be loaded and discharged very expeditiously at St. John.

There are no worms in the harbor of St. John, consequently vessels can lay in safety any length of time afloat, free from these pests; the large rise and fall of tide giving peculiar facility for the repair and reclassing of vessels. Vessels bound to St. John can always find first class pilots on the lookout 80 or 100 miles at sea.

The coasts on both sides of the Bay of Fundy from its mouth to St. John are plentifully supplied with lighthouses, fog whistles and automatic buoys, by which the greatest safety is secured. The registered tonnage at St. John amounts now to 560 vessels, 155,221 tons.

St. John is the distributing centre for a large number of trunk and branch lines of railway, and of steamboat lines, in New Brunswick, Nova Scotia, Quebec, Ontario and the northern part of the State of Maine. The board of trade can point with much satisfaction to the very exceptionally low average of losses on vessels arriving at and departing from the port of St. John during a period of ten years, as made up by the entry and clearing department of the custom house, viz.:

1st. The percentage of loss of tonnage of steamers as compared with total tonnage of steam vessels entered and cleared is ..... .08 of 1 p.c.
2nd. The percentage of loss of tonnage of sailing vessels as compared with the total amount of tonnage of sailing vessels entered and cleared is..... .41 of 1 p.c.
3rd. The percentage of loss of cargoes of steam vessels as compared with the total amount of imports and exports is..... .002 of 1 p.c.
4th. The percentage of loss of cargoes of sailing vessels as compared with the total amount of imports and exports is..... .05 of 1 p.c.
5th. The percentage of loss of tonnage of both steam and sailing vessels as compared with the total tonnage entered and cleared is..... .26 of 1 p.c.

One who has closely studied boiler construction says: Fault is found with the behaviour of steel in boilers, not only in the shell, but also in stay-bolts and other parts. Locomotive practice shows that steel stay-bolts break off far sooner than bolts made of good brands of iron. The fault lies in the crystalline structure of the steel and the repeated bendings under expansion to which they are subject. The trouble seems to be incurable.

THE CHILIAN METALLURGICAL EXHIBITION.

In our last number we gave a paragraph announcing that a mining and metallurgical exhibition will, by order of the Government, be held in Santiago during the coming September. Mr. G. B. Day, of Montreal, the Consul for Chili, now gives us some further particulars. The exhibition will be organized and conducted by the Board of Directors of the National Mining Society of Chili, who have the idea of collecting in one spot—which, by the way, is the centre of one of the richest mineral districts in the world—all the elements best conducive to the effective development of the mining industries. With this international end in view, they have arranged specially generous facilities for foreigners. The Exposition Committee will defray the whole cost of transit, to and from Chili, of the machinery and other articles exhibited, as well as of the passage of the workmen who may be necessary to instal and take charge of the exhibits. They will also supply free all necessary motive power. The exhibition will be divided into eight sections, as follows: (1) Motive Power; (2) Electricity; (3) Extraction Machinery; (4) Mechanical Preparation of Minerals; (5) Metallurgy; (6) Chemical Industries; (7) Statistics and Plans, and (8) Production of the Working of Mines and Metallurgy. Further information may be obtained of Mr. Day, Imperial Building, Montreal, to whom application should be made by those wishing to send exhibits.

CANADIAN IRON INDUSTRY.

BY GEORGE E. DRUMMOND, OF THE CANADA IRON FURNACE COMPANY

(Continued from last issue.)

Raw Material.—While in the actual work of proving and developing her mines, Canada has up to the present accomplished comparatively little, yet the careful preliminary explorations already referred to, have made it most evident that in raw materials nature has unquestionably endowed Canada with everything necessary to success.

Market.—Satisfied as to the possession of raw materials, the next most important question for Canadians is the market for the finished product. All facts and figures go to prove that for many years to come Canada's natural market for iron products lies within her own borders, side by side with her mines and forests.

According to the best authorities, Canada uses to-day upwards of 250 lbs. of the products of iron per capita. This in a population of say five millions, means, roughly speaking, an annual consumption of 600,000 net tons.

In his report of the "Bureau of Mines of Ontario" for 1892, Mr. Arch. Blue estimates the consumption to equal (after making all due allowance for waste in converting pig iron into finished iron and steel) say, 604,252 tons for 1891-2. To better realize the accuracy of these figures, it must be remembered for instance that Canada possesses to-day not less than 15,000 miles of railway, standing high among the nations in this particular regard. When her 15,000 miles of railway line is laid with standard 72 lb. rails (the rail of the future), she will have at 113 tons per mile, in round figures, 1,500,000 tons of steel rails. The average life of a rail is 15 years, therefore renewals are being made continually, and as a matter of fact the Dominion is using in this department alone 100,000 tons of the product of iron annually.

During the past year one of our great trans-continental lines alone imported 36,000 tons of steel rails. The Canadian railway companies, if they follow the example of their American rivals, will heartily support the production of steel rails from Canadian ore by Canadian labor. The revenue to be obtained from the carriage of raw materials to the furnace, and of the finished product to the market, as well as through an increased passenger traffic, will more than compensate for the extra price they will be called upon to pay for rail equipment during the first few years of the industry.

All the rails used in Canada to-day are of foreign make.

As a further illustration, the rolling mills at Montreal, Hamilton, Swansea, New Glasgow, N.S., and

elsewhere, are producing annually, at a fair estimate, 80,000 tons of the products of iron. Unfortunately the raw material for this output is very largely foreign, although there is no good reason why within the next few years every ton of this should not be supplied by Canadian labor from Canadian ore.

Our iron founders use annually about 80,000 tons of pig iron in castings, such as stoves, agricultural implements, and machinery of all classes, one-half only of the material used in this class of work being the production of Canadian furnaces.

Aside from these leading lines, the country consumes each year a large quantity of such products as band and hoop iron, special quality bar iron, steel boiler plates, steel sheets, sheet iron, chain cables, slabs, blooms, bridge and structural iron, railway fish-plates, rolled beams, nail and spike rods, wire, locomotive tires, iron and steel for ships, steel ingots, bars, and other forms of iron too numerous to mention, but almost wholly the product of foreign labor.

In railways and shipping Canada pretty well holds her own, proportionately to population, with either Great Britain or the United States.

Possessed of the necessary raw materials, and reasonably protecting her own home market, there is no reason why she should not, in proportion to her population, hold an equally prominent position in her iron industries.

The history of the Canadian iron industry dates back to the establishment of St. Maurice forges by the French government about the year 1737. This was followed at various periods by the erection of iron works at Batiscan, L'Islet, Hull, Baie St. Paul and Mosaic, in the Province of Quebec; Furnace Falls, Normondale, Marmora, Madoc and Houghton, in the Province of Ontario; Woodstock, in New Brunswick; Moose River, Nictau and Bloomfield, in Nova Scotia. In the course of time each and every one of these enterprises had to succumb to the competition of foreign iron, then admitted free of duty into Canada.

In addition to the difficulty of competing with the more advanced industries of other countries, Canadian pioneer furnace men labored under many grave disadvantages. The records in every instance speak of small outputs, lack of capital, lack of shipping facilities, mismanagement—good and sufficient reasons in any country, or in any branch of industry, for ultimate failure.

In not a single case has it been shown that lack of raw materials necessitated the closing down of a Canadian furnace. It is true that an almost absolute want of proper shipping facilities in these earlier days made it troublesome and costly to procure raw materials and deliver them at the furnace, but this difficulty has long since been removed by the easy shipping facilities afforded through the network of railways now in operation all over the country, not to speak of the perfect waterways and splendid system of canals now possessed by the Dominion.

Passing over the pioneer stage, we come to perhaps the most important epoch in the history of the iron industry in Canada, viz., the introduction of the protective tariff on iron, which came into force in 1887. The tariff as then framed, and still in force, was based upon the American tariff of import duties on iron and steel, and their products, in the proportion of about two-thirds of the said American tariff, and unquestionably the Dominion Government designed the tariff with a view to protecting native Canadian labor against the cheaper labor of Europe and the better equipment of the United States. It was evidently the intention of the Government in doing this to afford, at least approximately, an equal ratio of protection to labor, in whatever branch of the industry it was employed, as this is the system upon which the American tariff is undoubtedly based, and the only system possible of complete success.

Unfortunately the Dominion Government made one mistake, viz., the admission of wrought scrap iron, as the raw material for the manufacture of bar iron, at a less rate of duty than puddled bars, blooms and billets, with which it came into competition. This exception is, as Sir Charles Tupper once said, the "one blot" on the tariff, for it has ever since deprived Canadian furnacemen of a home market for their forge iron, a class of iron which in the order of things they must necessarily produce from time to time, and which should be used by Canadian rolling mill men as their raw material for bar iron, either in the shape of puddled bars, or soft steel billets, as the trade may demand.

The admission of scrap iron at a low rate of duty has resulted in two evils. First—It has retarded the progress of the manufacture of pig iron from Canadian ores, inasmuch as the ironmasters cannot afford to produce puddled bars or steel billets at competitive prices with cheap wrought scrap. Secondly—It has caused the Canadian rolling mill proprietors to make investments in special plant for the manipulation of scrap, and brought about a condition of affairs in the rolling mill business that would be greatly disturbed by any sudden change in the tariff with regard to the admission of wrought scrap.

It is the plain duty of the Government to rectify the mistake it has made, but to do so with due regard to the vested interests of all sections of the industry.

This may be done in several ways, for instance, by naming a definite date, say within from three to five years, when wrought scrap, the present raw material for Canadian bar iron, shall be placed at the same rate of duty as puddled bars, or steel billets, with which it comes into competition, and that in the meantime a sufficient bounty be granted, either to the rolling mill companies on such iron and steel as they may produce from the products of Canadian blast furnaces, or to the blast furnace companies direct, as an inducement to them to produce steel billets and puddled bars, so that they may shortly be in a position to supply the mills (at a reasonable living profit to themselves) with all the raw material necessary for the manufacture of bars and other finished iron.

It is not improbable but that a comprehensive arrangement on some such lines would result in the rolling mill companies considering the question of going into blast furnace work on their own account, with most beneficial results to the whole Dominion, or they may adopt the course of erecting plant for the manufacture of steel billets and puddled bars from Canadian pig iron.

In the face of many difficulties the pig iron industry has continued to make creditable progress since 1887, and especially has this been the case within the past two years.

At the close of the calendar year 1891, the total production of pig iron in Canada was only 23,891 tons. Within eighteen months, that is to say, at the close of the fiscal year 1892, the output had increased to about

51,000 tons for twelve months, a gain of upwards of 95 per cent. Sixty thousand tons will be a fair estimate of the output to the close of the present fiscal year.

The following will show the furnaces now in blast, with capacity and output:

LONDONDERRY IRON CO.

Londonderry, N.S.

DESCRIPTION OF PLANT, WITH CAPACITY.

36,000 acres of freehold land.

Ore Mines	yield from 50,000 to 70,000	gross	tons
Limestone Mines	" " 12,000 to 15,000	"	"

Railways—about 12 miles, company's own property.

2 Blast Furnaces	capacity about 40,000	gross	tons.
1 Rolling Mill—silent	" " 8,000	"	"
1 Pipe Foundry—silent	" " 5,000	"	"
Make of Pig Iron, 1892	28,052	net	tons.
Ore charged (partly bought)	64,430	"	"
Coke "	41,006	"	"
Coal " (all bought)	1,740	"	"
Flux	14,907	"	"

Number of men employed, about 350

Maximum number which has been employed when running all departments full..... 807

The Londonderry Company purchase from outside sources a very large proportion of their ore and coke. It is, therefore, altogether fair to credit them with the hands employed in the production of this material, in all some 450 men. This gives a total of 800 employees connected directly and indirectly with the operations of the Londonderry Company.

THE NEW GLASGOW IRON, COAL AND RAILWAY CO.

Ferrona, Pictou Co., N.S.

Ore Mines—Limonite and Hematite, yielding 60,000 to 75,000 tons per annum.

Coal Mines—Limestone quarries.

Railways—The property of the company, about 13 miles in length, connecting the furnace with the mines.

One Blast Furnace—65 feet high, bosh 23 ft. 6 in., hearth 9 ft. 5 in. Capacity 100 tons per day.

Battery of copper kilns.

Number of men employed, 425.

Iron produced in 1893, for nine months' campaign	22,500	net tons
Ore, about	50,000	"
Coke, "	30,000	"
Flux, "	13,000	"

The company purchase all the coal required for the operations of the furnace. Last year they bought, washed, and consumed 90,000 tons of coal. It is only fair to credit the industry with the men steadily employed in the fuel department, viz., 150 men and 50 boys, giving a total average of 625 employees in connection with the Ferrona Works.

Allied with this company, and as an important consumer of its forge iron, is the Nova Scotia Steel and Forge Co., Ltd., of New Glasgow, N.S. The following description will show the great importance of this steel industry.

The plant consists of 2 Siemens' melting furnaces, 20 tons capacity each; 3 gas heating furnaces; 5 reverberatory heating furnaces; 26 in. reversing cogging mill with train of live rolls; heavy vertical hot billet shears with live rolls; 1 20 in. plate mill; 1 16 in. bar mill; 1 12 in. bar mill; 1 9 in. guide mill; 10 pairs shears, 40 tons and smaller; 1 5-ton steam hammer, with 15-ton hydraulic crane; 4 smaller steam hammers.

Machine shop 175 ft. x 75 ft., with 30 ton travelling crane commanding whole shop, equipped with 24 in. slotter, 6 drills (one a 9 ft. radial, 5 in. spindle), 9 lathes, one of which will take in 50 in. over carriage, and 8 in. x 10 in. in the gap, will take 37 ft. between centres; small shapers, etc., etc. Power is supplied by some 50 steam and 10 hydraulic cylinders. Entire works are lighted by arc and incandescent light plant. Output, 100 tons of steel ingots per day, all of which is worked up into bars, sheets, axles and other forgings. Over 97,000 axles of this company's make were supplied to Canadian railways.

This company employed in 1893 an average of 425 men at the works, and expended in wages to this staff $185,471. Aside from this, they should be credited with the labor necessary to mine and raise the average quantity of ore required per day, in all one hundred men, giving a total of 550 men connected with the Nova Scotia Steel and Forge Co., Ltd. The company consumed 36,000 tons of coal in 1893. It may be mentioned also that they paid in 1893 for freights, inwards and outwards, $86,667.61.

THE PICTOU CHARCOAL IRON CO., LTD.

Bridgeville, N.S.

Ore mines—Brown hematite and limonite, in the immediate vicinity of the furnace.

Wood supply—The company controls 8,500 acres of hardwood lands, yielding principally yellow beech and maple. This land is situated 15 miles from the furnace.

One blast furnace—55 ft. high, 11 ft. bosh, built of red brick. Capacity 5,000 tons charcoal iron per annum.

Charcoal Kilns—19 Beehive kilns, capacity 50 cords each.

This company has barely commenced operations. So far only 700 tons of iron have been produced. Working full blast, however, it will give employment to 300 men in the woods, mines, and at the furnace.

JOHN McDOUGALL & CO.,

Drummondville, Que.

Ores—Bog ores secured within a radius of 12 miles of Drummondville.

Charcoal Fuel—Soft wood, principally balsam and spruce, secured in practically the same district as the ores.

Two furnace stacks—both built of stone—35 feet high. Capacity about 6 tons per day each. 200 men employed.

At present the whole of the output is used in the manufacture of car wheels at the company's works in Montreal. The campaign is therefore largely regulated by the requirements of the car wheel department.

THE CANADA IRON FURNACE CO., LTD.,

Radnor Forges, Champlain Co., Que

Ores, Bog and Lake—The company control 100,000 acres of ore-bearing lands in the district of St. Maurice and Three Rivers; also Vaudreuil, Joliette, St. Ambrose de Kildare, Point du Lac, Gentilly and Beconcour, including the important deposits of lake ores at Lac-a-la-Tortue and Lac-au-Sable, which the company hold in fee simple. Also magnetic iron mines at Sherbrooke, St. Jerome, and other points in the Province of Quebec.

Wood Supply—Freehold and royalty rights on hardwood lands, extending throughout the country north of Radnor Forges.

The supply of wood is practically inexhaustible.

The company's location at Grandes Piles, securing to them the "key" of the St. Maurice River, and the control of most valuable hardwood lands on either

bank of the river for seventy miles of the navigable waters of the St. Maurice. The wood is principally hard maple, birch and beech.

Charcoal kilns.—A battery of 11 kilns on the furnace property at Radnor Forges, capacity 55 cords each.

A battery of 14 kilns at Grandes Piles—capacity 55 cords each. Charcoal also made in pits in the Swedish manner.

Limestone Quarry.—The company own what is perhaps the most important limestone quarry in the Three Rivers district. This lies within 50 yards of the furnace.

Railways.—A railway line from Piles Branch, C. P. Railway, to the furnace. This, together with switches three miles in extent, all the property of the company.

Car wheel foundry located at Three Rivers.

Furnace—Iron shell, height 40 feet, bosh 9 feet diameter. Crucible and bosh from mantle down is encased and protected with a Russel Wheel and Foundry Company's water jacket. The furnace is complete with all modern accessories. Hot blast stove, Drummond pattern. Steam and water power. New Weimer blowing engine, also complete auxiliary plant blowing engines, steam and force pumps, ready for use at any moment should the permanent plant become disabled. Capacity forty tons per day of high class charcoal iron, specially adapted for the manufacture of chilled car wheels.

This iron stands an average breaking strain of 63,000 pounds per square inch, the test being on standard bars 1 inch by 12.

During 1893 the company produced 7,423 net tons of charcoal pig iron. They made all their own raw material, not alone for the production of the quantity of iron named, but also for sufficient stock to provide for a largely increased output during the present year, 1894.

The average number of men employed is 650, with about 400 horses.

During the winter months when the company require to cut all the hardwood necessary for the year's production of charcoal, and when they take delivery of a great deal of the ore made during the summer months, they often find it necessary to employ a staff of upwards of 860 men with about 550 horses. Of this large staff of men at least three quarters are drawn from the ranks of the farmers or habitants, and the operations are carried on by them over a very large territory.

Politicians will do well to notice that each and every one of the Canadian blast furnaces is located in a rural district, and that in a very peculiar degree the pig iron industry is one closely identified with the interests of the farmer.

The coke furnaces of Nova Scotia draw a large proportion of their employees at mines and furnace from the farming class. In many instances farmers take work in the mines, while other members of their families look after their agricultural interests.

The charcoal iron furnace, especially, may well be classed as a farmer's industry. For example, in the case of the Canada Iron Furnace Company already cited, out of a staff of 850 men employed at the present time, 700 at least of the employees are farmers or habitants, who work for the company during the winter months, and in their slack seasons between seed-time and harvest.

These men find that the arduous work of clearing their land is no longer unprofitable, as it has been in the past, but that, on the contrary, they are now able to derive a very good living from the earliest days of settlement by supplying wood to the charcoal kilns.

Another ready source of employment is the raising of ore on portions of their own and neighboring lands, which would otherwise be wholly unproductive.

The successful re-establishment of this charcoal iron industry at Radnor Forges has greatly improved the condition of the farmers of the historical Three Rivers district. They now find ready and profitable employment on their own land at all seasons, a steady market for their farm products, and ample work for the horses.

During the present season the Canada Iron Furnace Co. are using in their camps and ore fields upwards of 500 horses, 80 per cent. of which are the property of the farmers.

This close identity of interest between the farmer and the manufacturer is also characteristic of the work done at Drummondville, in the Province of Quebec, and will no doubt prove equally true with regard to the operations of the Pictou Charcoal Iron Co. at Bridgeville, N.S.

It will be largely in the interests of the farmers of Ontario and Quebec if the charcoal iron industry is allowed to grow and prosper. What has been possible in the case of Sweden is equally possible with the Provinces of Ontario and Quebec, where the raw materials and market lie side by side.

In 1890 Sweden had in blast 154 charcoal iron furnaces, producing 456,102 metric tons, an industry of which that nation may well be proud.

(To be continued.)

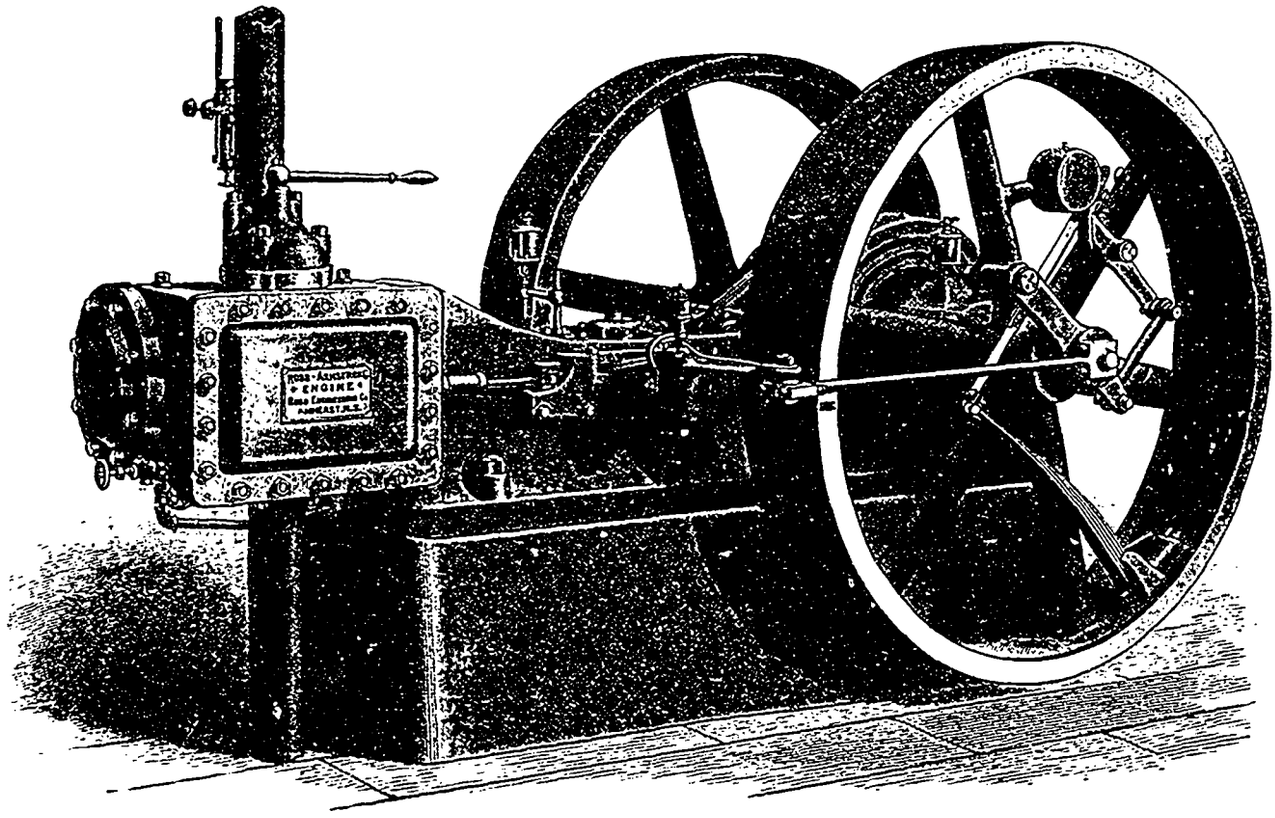
MOULDING WHEELS.

It is now possible to cast a wheel in sections in the same mould so that the various parts, when finished and bolted together, will fit with perfect accuracy. In the ordinary types of wheel-moulding machines the block is carried round the mould on a radial arm, supported on a column in the centre of the mould, or the mould itself is rotated while the block remains stationary, the centre of rotation in either case remaining fixed. It is obvious that if the whole of a wheel required to be cast in two sections were moulded at once in a machine having a fixed centre of rotation, it would be found when removed from the mould, and the edges planed up, that each of the two parts would be less than a semi circle, to the extent of the metal removed by planing, so that the whole would not form a true circle. Consequently it has been customary to mould each half separately in distinct moulds. In a new machine which has been invented by an English engineer of Salford, the radial arm is mounted on an axis which may be set at any required degree of eccentricity to the centre of the pillar, so that, while the axis of rotation of the radial arm is in one position, any desired portion of the wheel can be moulded. The axis of rotation may then be altered to another position, and then another portion of the wheel moulded until the requisite sections are completed. In this manner, although each section of the wheel will have the same radius, an interval is left between the sections corresponding to the displacements of the axis of rotation of the radial bar, and this allows for any metal which may be planed off the edges of the sections when

they are being adjusted together. In applying the same principle to machines having rotating moulds, the centre of rotation of the mould is so arranged as to be capable of displacement in a similar manner as the radial arm, slides or eccentrics being provided for adjusting the displacement of the axis of rotation, and provision made for causing the radial mould to rotate about the displaced centre of rotation. Suitable means are also provided for raising and lowering the block or pattern as the successive portions of the wheel are moulded. The inventor claims that this process is applicable not only to moulding circular objects, but can be applied to the moulding of elliptical tooth wheels or other articles which it is desirable to mould from a block or pattern moving upon one or more displaceable axes. Besides securing perfect accuracy in the finished wheel, there is another advantage, in that the whole of the sections are cast in precisely the same metal and at the same heat, thus insuring a more perfect equality of metal in the completed wheel than is possible under the old process.

THE "ROBB-ARMSTRONG" ENGINE.

We illustrate on this page a new single-valve automatic engine recently brought out by the Robb Engineering Co., of Amherst, Nova Scotia. In general appearance it does not differ greatly from several popular high-speed engines, and no radical departure has been made in principles of construction, the aim being to combine as many as possible of those points which have proven best in practice, with such improvements



in details as have been suggested by observation and experience with other engines. In other words, it is not an attempt to develop a new species, but to advance one step in the evolution of that already highly developed machine, the American high-speed engine. The following is a brief description of the main features :

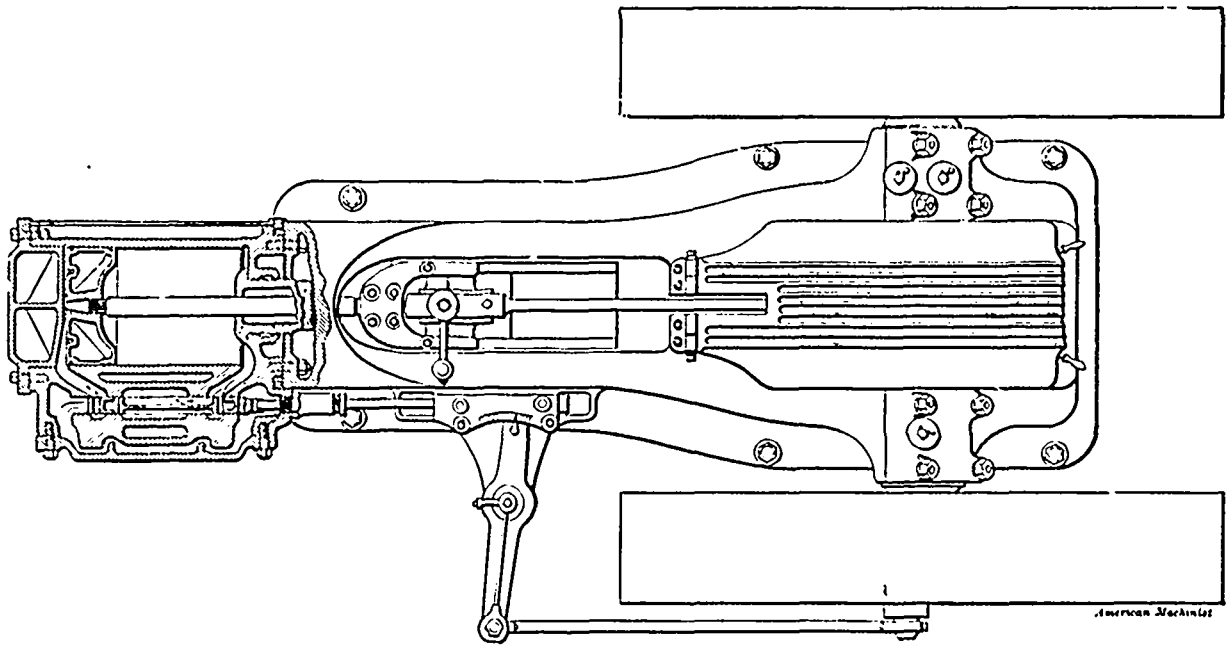
The frame is of the "Porter" type with double-disk crank; it has considerable sectional area, carried well above the centre line, and is particularly thick at the top, thus bringing the metal in the direct line of strains between the cylinder and shaft bearings. The engine weighs a little over 100 pounds per horse-power, not an unusual weight, but the metal is distributed to give the greatest attainable stiffness, and without much regard to the "anvil principle," the foundation being expected to furnish all the weight required in that direction at less cost.

The crank is "built up" of cast disks and forged steel pin and shafts, the peculiar arrangement of the crank permitting the fits of the shafts and pin in the disks to be very long, without separating the shaft bearings unduly, as is shown in the cross-section at the right of Fig. 2; the counter-weight is of equal moment with the reciprocating parts. The shaft bearings run in cast-iron shells, babbitted; they are not provided with means of adjustment for wear. The bearings are finished by grinding operations of great delicacy, and are round and parallel within a limit of variation smaller than the average machinist will usually detect, even with the aid of the micrometer. The shafts are made to gauge, and the shells are interchangeable, as are the other parts of the engine; hence, a duplicate set of shells may be kept for emergencies. The crank is covered by a cast-iron case, shutting it completely in except at the slot through which the connecting rod works. The crank disks are without the usual finished flanges on the periphery, the crank case being designed to have a substantial and finished appearance, and free access is given to the crank-pin box, when the hinged crank case is raised. The crank-pin is oiled through two half-inch holes, one extending from each side of the crank to the centre of the crank-pin, all oil wasting from the inner ends of the shaft bearings being instantly carried to the crank, while all oil wasting from the outer ends of shaft bearings is caught, and by a ring riding on the top of shafts and dipping into the oil below, is returned again and again to the bearing, until

it finds its way to the crank-pin and escapes to the crank pit, to be drawn off and filtered. In practice the crank-pin does not need oiling other than as stated, but a sight-feed oil cup is provided in addition to those oiling the shaft bearings, which will, if desired, feed oil direct to the crank pin through one of the half-inch holes before mentioned.

The fly-wheel governor is a modification of the "Straight Line," and, together with the valve, is used by arrangement with the Straight Line Engine Co.; the oiling devices mentioned will also be recognized as essentially "Straight Line."

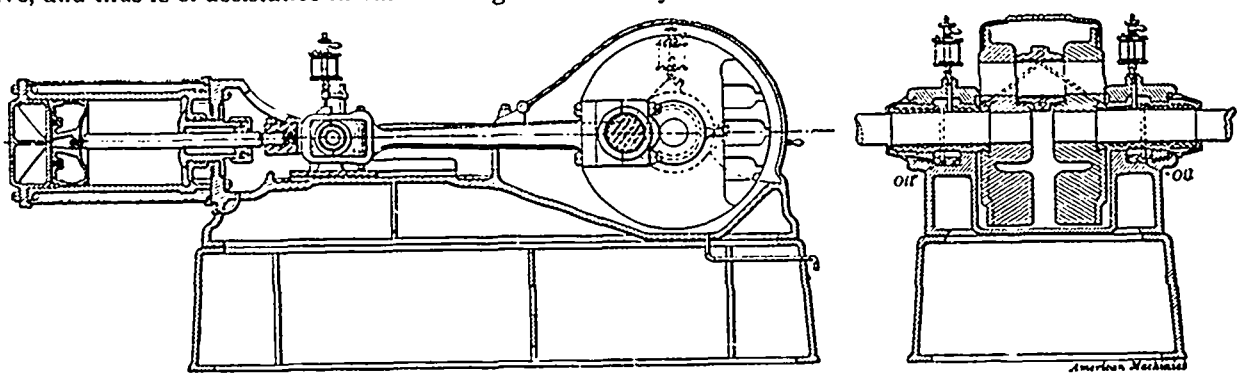
The crosshead is a single steel casting, of the "Slipper" type, the bottom of the slipper being babbitted. The piston rod is secured by being gripped in two places, about two inches apart, one place being threaded and the other a parallel fit. The crosshead is split and is gripped on to the rod by bolts; this proves very good, in that it can be taken apart and put together again without getting out of line more than permissible in the highest grade of engine work—a point in which the usual methods of securing piston rods to crossheads (with the exception of the taper fit and key) are often faulty. The crosshead pin is of cast iron, as



The eccentric rod, so called, although there is no eccentric, has ball and socket bearings at each end, the balls being case-hardened and ground, and the sockets or boxes of phosphor bronze. The rocker arm, by which the eccentric rod drives the valve, is horizontal, with a vertical axis; there is no twisting strain on either of its bearings, a straight line passing through all three of them. An index finger attached to this arm, as shown in plan view, Fig. 3, shows by the graduations over which it passes, the movement of the valve, and thus is of assistance in valve setting.

it is believed that, in connection with the large and long bearing, it is the best material for the place. The connecting rod is a steel forging, the crank end being of the "Marine" type, while the crosshead end is mortised for boxes, which are cast iron, lined with babbit. The adjustment is by a wedge and adjusting screws.

The babbit used in the engine is made from eight parts Banca tin and one part each of antimony and copper. The piston is a single casting with sprung rings; it is made extremely light, both to save the cylinder from wear and to make it the "breaking-down"



A small sight-feed oil cup, directly over the centre of the rocker arm, supplies oil through a tube to the outer end of the arm. The eccentric rod is hollow, being, in fact, a piece of hydraulic pipe, and through it the oil passes to the eccentric pin, any oil finally escaping being caught and held in the flanged fly-wheel.

The centre bearing of the rocker arm works in a bath of oil so arranged that it is constantly flooded, and so that no oil can escape to the floor, any overflow draining to the cross head guide, and finally to the crank pit.

piece; though amply strong for all legitimate loads, it is expected to be weaker than other parts, the idea being that it is the best thing to break, when experiments to determine the compressibility of water are being made with it. The exhaust passages are jacketed by air spaces from the cylinder, and from the live steam in the steam chest. The throttle is a modification of the "Coffin Valve" used by the Straight Line Engine Co.; but is operated by a lever instead of a wheel, or ball handles.

The workmanship is intended to be equal to that of any other engine built. The firm also build cheaper

automatics, but this engine was brought out to fill a demand for which they have previously been obliged to import the best and highest priced American engines. The engine was designed by E. J. Armstrong, who is now with the Ames Iron Works, Oswego, N.Y.

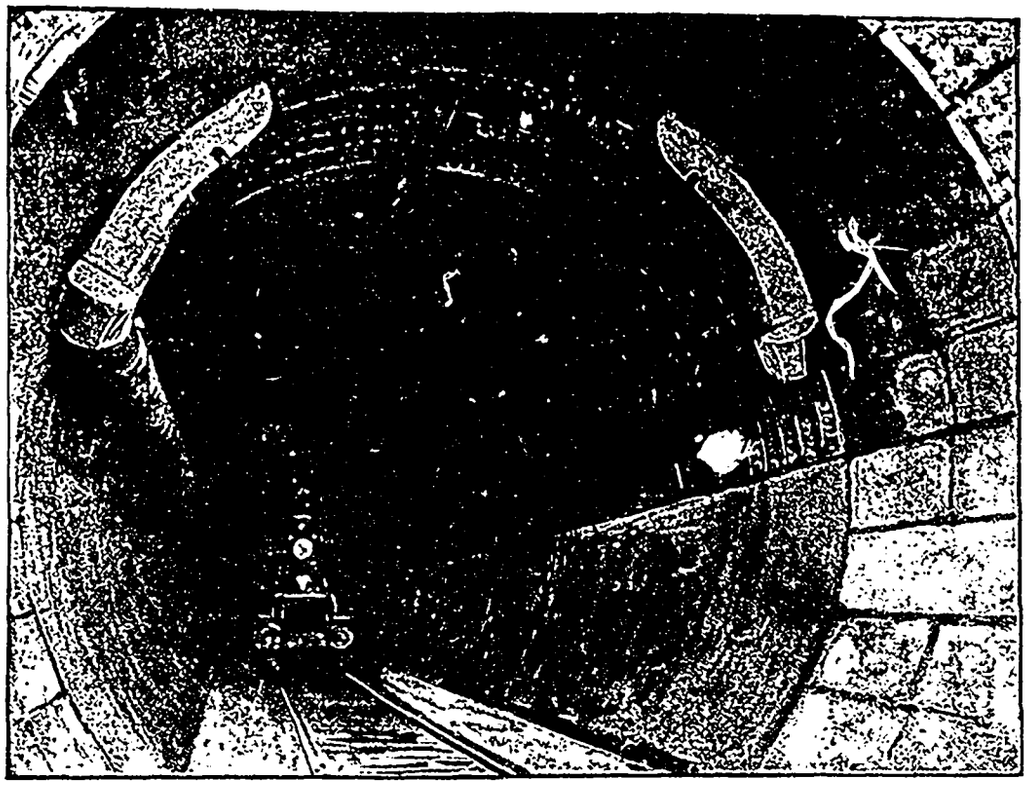
THE ST. CLAIR TUNNEL.

The Grand Trunk Railway, in order to establish communication between Sarnia and Port Huron, constructed an immense tunnel under the St. Clair River, which is one of the finest examples of engineering work in this country at the present day. The length of

One of the accompanying illustrations gives some idea of the course of the tunnel and the steep grades on either end.

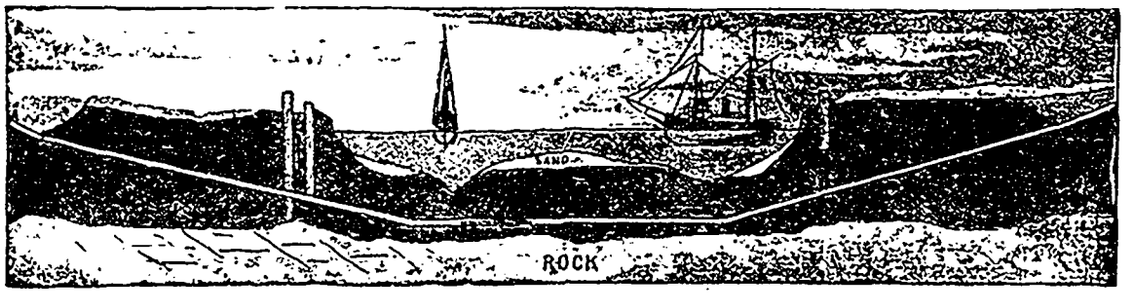
The rails of the track rest on a bed of brick and concrete, filling the bottom of the tubing. The engines used to pull trains through the tunnel and up the steep grade are the largest in the world, having ten driving wheels and weighing nearly 200,000 pounds, with cylinders 22 inches in diameter, with 28-inch stroke.

The cost of the tunnel was $2,700,000. Four thousand cars can be daily moved through it, which shows its immense superiority over the old ferry. The



the tunnel proper is 6,025 feet, and of the portals that form the approaches 5,605 feet in addition, or more than two miles in all, being the longest submarine tunnel in the world. It is a continuous iron tube 19 feet 10 inches in diameter, put together in sections as the work of boring proceeded, and firmly bolted together, the total weight of iron aggregating 56,000 pounds. The tunnel commenced in September, 1888, was opened for freight traffic in October, 1891, and passenger trains began running Dec. 7th, 1891. Work was commenced at both ends, the two sections meeting in mid river with perfect accuracy. The tunnel passes through blue clay, except an occasional pocket of quicksand and water and a few boulders. Borings were made by cylindrical steel shells, with cutting edges driven forward by hydraulic rams.

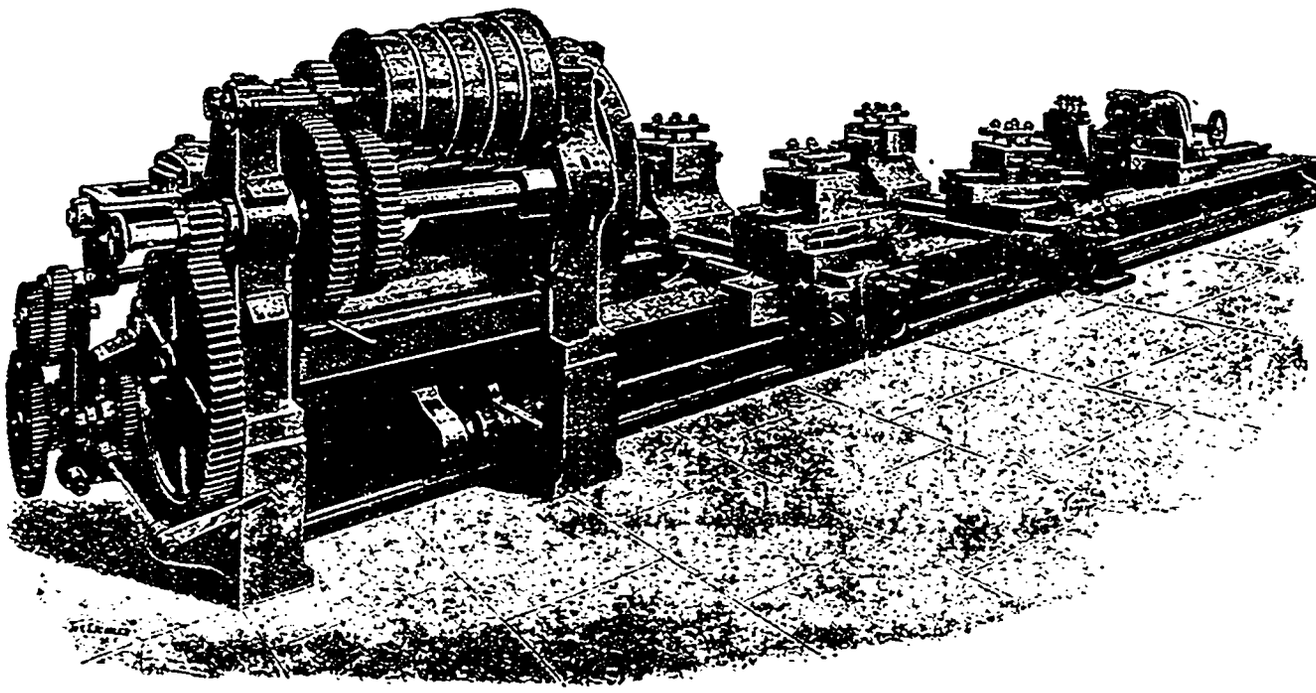
enterprise was promoted by Sir Henry Tyler, of England, president of the Grand Trunk Railway, assisted by Sir Joseph Hickson, late general manager. The engineers were Joseph Hobson, chief; T. E. Hillman, first assistant, and M. S. Blakelock, secretary. We are indebted for the above particulars and for our illustrations to the *Electrical World* of New York.



SPECIAL TRIPLE GEARED LATHE.

This lathe has been specially designed by a Glasgow firm for turning marine propelier shafts and heavy general work. We are indebted to the *Engineer*, London, for our illustration and the following particulars: The height of the centers is 30 in., and it admits 40 ft.

between the centers. The driving is effected through five speed cones direct on to the face plate, and two series of double and triple gear, giving twenty-five speeds to the spindle, all properly graduated to suit the different diameters admitted by this lathe. There are two saddles, each having a set of duplex compound slide rests; and there is also a compound slide rest on the loose headstock for turning the coupling flanges, so that five tools can be in operation simultaneously. The front slide rests are fitted with swivels for taper work. Further, each saddle is so fitted that by means of change wheels, tapers of any length and inclination can be automatically turned, this arrangement being of great



convenience for turning the tapered ends of propeller shafts, gun tubes and similar work. The saddles and loose headstocks can be rapidly adjusted on the bed by power motion, and throughout every convenience is provided for quickly manipulating the various motions in the lathe.

In all respects this machine is throughout of the most massive character, and it has been specially designed to take heaviest cuts possible. Its weight is about 60 tons.

ATTRIBUTES OF A GOOD TURBINE.

BY J. HUMPHREY.

As a safe, desirable and cheap motor, good and properly developed water power is unequalled Its moderate cost, which in many instances is less even than the expense for attendance of a steam plant, has not led to economy usual in other things, but has tended to the neglect of systematic investigation requisite for the general understanding of the best means for its improvement. Yet in most places where power is in demand, its value equals the cost of its equivalent as obtained by other and more expensive methods, and its fullest development becomes a matter worthy of attention. While great advance has been made during the last half century in the improvement of turbines, *until they have practically superseded other forms of* water-wheels, yet there are certain essential principles pertaining to their construction which should be better understood by users, especially as they are apparently unappreciated, or sadly ignored by many builders. As a first, and by no means unimportant element of a good turbine, the water should be applied to the running wheel with the greatest attainable velocity and force, and with proper direction for its best action upon the floats. This requires chutes or induction channels with sufficient space and correct form for the natural contraction of the vein of water in accordance with the laws of accelerating motion, in which most turbines are manifestly deficient, thereby causing more or less waste of energy of the water before it reaches the wheel.

Another quite as essential and rather more difficult part of turbine designing is in making the floats or pressure vanes of the running wheel of proper form to take the maximum force from the water, and transfer it to the work. This requires length and curvature of floats corresponding to the varying conditions of velocity, as the water is reduced from its highest initial speed to a very low one at its departure from the wheel, as it must be if high efficiency is reached, and as such length and curvature of float is variable under different conditions of use, as for different heights of fall and variable work or water supply, it is hardly reasonable to suppose that one form of float will suit every condition, or that the proper forms are likely to be determined by mere tentative experiment, as by the "cut and try" plan, which has been the system generally pursued by most turbine designers. Although fairly good results may have been attained in that way, with perhaps occasional excellent chance hits, yet the method is far from reliable in general practice, especially with the uncertainties which have attended methods pursued by advertising the efficiency of wheels for which evidently extravagant claims are made, and which are by no means warranted by philosophical examination, or practical use. Very few indeed of the many wheels now in use show either chute or float construction indicative of scientific design, or capable of highest efficiency.

A third, and quite important, feature in the economy of a wheel is the proportion of its discharge area to *the quantity of water applied.*

As it is certain that no more power can be obtained from the water than the difference between what it has at its application and that retained at its exit from the wheel, and as it is a well established and immutable

law of nature that the energy of motion is as the square of its velocity, it is evident that wheels discharging water at nearly or fully one-half of its entering velocity must waste a large percentage of the power of the water in that way; and this is a prolific source of loss in many of the popular varieties of turbines now in the market, which are readily sold to inconsiderate buyers at somewhat less price perhaps than those of more honest proportions, though their cost to the user, who needs the power they waste, is often many times that of properly proportioned wheels.

THE ASBESTOS FIELDS OF PORT AU PORT, NEWFOUNDLAND.

BY C. E. WILLIS.

The metamorphic rocks, and serpentines, of the Eastern Townships of Quebec, and the Gaspe Peninsula, in which the Canadian asbestos, or more correctly speaking, chrysotile, is found, dip under the Gulf of St. Lawrence, appear again on the west coast of Newfoundland, and extend many miles inland, probably entirely across the island, though in places, specially on the great elevated central plateau, they are capped with granitic rocks, and seemingly have disappeared.

Here and there, also, are great mountains of magnesian limestone, and in the region of the Grand Lake, and other isolated sections, are found carboniferous basins, with small seams of very good bituminous coal. Still this entire area, extending about 100 miles north and south, and the entire width of the island east and west, can be safely called a serpentine country, and contains, according to Mr. James P. Howley's estimate, 5,097 square miles of serpentine rocks.

The region is exceedingly rugged and picturesque. Cut by deep gorges and ravines, with towering and precipitous mountains, and craters of extinct volcanoes, with streams and lakes of the most crystal clearness, and everywhere cascades, of from a few feet to many hundreds of feet in height, combine to make a district of surpassing grandeur and interest, not alone to the mining engineer, but to anyone who loves nature in its wildest moods.

The serpentines, with the granulite dykes which everywhere intersect them, contain vast deposits of minerals, and are to-day nearly virgin fields, except on the immediate coast line, for the prospector and miner, and certain to become in the immediate future the seat of great mining operations.

That the country has not long ere this taken a first rank as a mineral producer, is due to its former isolated position, its difficulty of access, except in small sailing vessels, and other ulterior causes; but now, with regular and frequent steam communications, the prospector and engineer are forcing their way into the country, and soon it will be the scene of prosperous mining camps, and a large mining industry. The minerals met with are copper, which is found everywhere, magnetic, hematite, chromic and specular iron ores, coal and petroleum, gold, silver and lead, nickel, iron pyrites, antimony, marbles, gypsum, mica and asbestos; and it is to the latter that I shall devote a few remarks.

The existence of asbestos in this great belt of serpentine has long been known, or supposed, and several well known geologists, in their writings as far back as ten and fifteen years ago, have predicted that it would be discovered in quantities sufficiently large to be of economic value, but it has only been within the past three years that the attention of the miner has been turned in this direction, and it is now attracting much interest in the Island. On the eastern coast of Port au Port Bay, rising out of the sea to a nearly vertical height of 1,800 feet, is a mountain known as Bluff Head. This mountain determines the southern boundary of the serpentines. For many miles north the coast line is precipitous and lofty, culminating at Cape Gregory in a bluff nearly 2,500 feet high. At Bluff Head, and extending for about one mile north, the beach is composed of conglomerate, very hard, and highly polished on the surface by the action of the surf which breaks upon it. The beach is strewn with boulders of all sizes which have fallen down from the cliffs, and nearly all of them contain seams of asbestos, while the conglomerate of the beach itself is filled with it. It was here the asbestos first really attracted much notice. Long known to the fishermen of the neighborhood as "cotton rock," it came to the knowledge of the Hon. Daniel Cleary, of St. Johns, who some three years ago equipped a small expedition to do some prospecting in the nighborhood.

The success met with was so immediate and marked, that other claims were immediately secured, till in a short time some 30 square miles were taken up by prospectors and speculators, and the past summer has witnessed a large amount of development work. Much of this work has been of the most satisfactory nature to the owners, and proves the field to be a large and valuable one, but from my observations a very large part of the district now held under leases and licenses will be valueless as far as asbestos is concerned, but this always is the case in a new mining country where speculators rush in, and secure claims, without having previously been on the ground. About one year ago I visited the district and secured claims on what promised to be valuable asbestos ground, and with this as a basis to start on, the Halifax Asbestos Co. (Ltd.) was organized. The property consists of two areas of 640 acres each, each containing one square mile, and situated on both sides of a deep gulch, or ravine, the dividing line being lengthwise through this gulch. The ravine mentioned runs in nearly a true north and south course, from the shore inland for about five miles, where it is cut at right angles by the valley of the Fox Island River, and terminates at the inner end in this valley. The sides of the gulch are very precipitous, having more slope where we have been working this summer than elsewhere, and rise to an elevation of 1,700 feet on one side, while on the other they in places reach to a height of over 2,000 feet. The walls are nowhere, I think, in the entire length of the valley, less than 600 or 700 feet high. It might be said of the property, that it is an ideal one for mining, as no hoisting engines, or pumping, will ever be required in the future operations of the company. The claims are about three and one-half miles from the sea by the gulch, though but little more than two miles in a straight line from the shore; we will, however, reach the shore in the future through the valley of the Fox Island River, which, though it makes a somewhat longer route, brings us to the shore at a fine shipping point, and admits of the building of a road with very easy grades, in fact none whatever to speak of.

The Government of Newfoundland being keenly alive to the necessity of fostering its mining industries, has undertaken to construct a good road by the route

we desire, to connect with the point of shipment, the government railway, now under construction, and the settlements of Port au Port and Bay St. George. This road will accommodate all the claims in the district. Active development was started on the 7th July and continued till late in October, with the most satisfactory results. The work extended over many hundreds of feet along the gulch, and some ten or twelve large cuts were made in the mountain side, through the surface drift. In each opening quantities of asbestos were found as soon as the rock was reached, while the surface drift, which varies from three to twelve feet in depth, is everywhere filled with loose fibre, entirely free from the matrix, the result of the decomposition of the serpentine, through the action of the frosts and weather. The fibre runs up to 2½ inches in length, and is of the most beautiful quality, and difficult to distinguish from the Canadian product. In fact, the peculiar green tinge of the asbestos, the color and composition of the serpentine, the granulite dykes and many other geological peculiarities, go to prove the remarkable similarity of this region with the Eastern Townships of Quebec, where the Canadian chrysotile mines are located. The company is much pleased with the success which has met its first efforts, and will begin mining operations on a large scale in the early spring. In many places where the cliffs are denuded, seams of asbestos can be seen running through the rock, and as these exposed places can be found from the foot to the top of the hill, it proves the entire mountain side to be asbestos bearing.

There are three remarkable water-powers on the property, from any one of which a head of from 1,000 to 1,200 feet can be obtained to operate power drills and necessary machinery for dressing the short fibre. While we have been developing our property, we have had as neighbors the Newfoundland Mineral Syndicate, an English company, who own the areas next our own, and who started operations a short time previous to our beginning. They also have met most satisfactory results, and I was informed by the engineer in charge they were more than satisfied with their season's work. Their areas also contain very large deposits of copper hematite and specular ores. One vein of specular, some 20 feet wide, is cut in many places by seams of asbestos, which, to myself at least, is unique, and I should be glad to hear if such a thing has heretofore been observed. A large amount of work has also been done on the Cleary claims, where a like satisfactory result has been met, while owners of other areas have been looking over their ground, and have done some prospecting on a small scale.

The summer's work proves the value of the field beyond question, and it will at once come to the fore as a factor in the world's supply. Labor is both abundant and cheap, and supplies can be readily obtained and landed from vessel within a short distance of the mines. With water transportation at hand for the product, cheap labor, and being much nearer the European markets than the other sources of supply, the operators will successfully compete with mines in other countries.

METAL IMPORTS FROM GREAT BRITAIN.

The following are the values in pounds sterling of shipments of metals, etc., from Great Britain to Canada, as shown by the British Board of Trade returns for December, and for the whole of last year, compared with those periods of 1892 :—

	Month of December.		Year.	
	1892.	1893.	1892.	1893.
Hardware and Cutlery	£ 6,461	£ 5,202	£ 95,634	£ 93,830
Pig iron	275	932	79,024	56,817
Bar, etc	1,800	2,289	37,255	28,556
Railroad	927	7,390	373,550	503,656
Hoops, sheets, etc	2,610	2,005	83,469	67,514
Galvanized sheets	1,184	1,203	60,367	71,170
Tin plates	13,754	17,464	225,789	226,323
Cast, wrought, etc., iron	6,076	5,076	102,742	120,025
Old (for re-manufacture)	1,934	—	80,209	103,883
Steel	7,041	5,390	135,110	110,360
Lead	212	560	30,730	16,362
Tin, unwrought	823	4,923	39,804	35,408

Silver to the value of £740 was sent from Canada to Great Britain during the past year, whilst during 1892, £1,332 worth was shipped. Of copper ore, £30,616 worth was exported from Canada to Great Britain during 1893, against £38,841 worth the previous year.

THEY HAVE NAILED THEM ALL DOWN.

In the manufacture of nails it is not an easy matter to bring out an article that is at once a novelty and an improvement. The introduction of the wire nail effected a remarkable change in this trade, but after the first rush of its popularity, it gained on the cut nail more slowly, this slackening being due to the superior holding power of the old cut nail. The barbing of bright wire nails was then adopted, but the barbing of these nails was not an unqualified gain, owing to the way in which the fibre of the wood was torn in driving. Last year James Pender & Co., Ltd., the well-known nail manufacturers of St. John, N.B., introduced a distinctly new form of wire nail which, when scientifically tested, proved to be a remarkable advance over any other form of wire nail. The feature of this nail—to which was given the well-deserved name of "Bull-dog,"—was that the surface was slightly roughened, and by this process an immense gain in holding power was achieved The gain was sixty per cent. over the bright wire nails, thirty per cent. over the barbed wire nail, and slightly more than the cut nail. The difference was such that it enabled the consumer to use a smaller nail, or otherwise a smaller number of nails of the same size, and still give better results in holding power. The success of the roughened nail was so unquestioned that other manufacturers acknowledged it by bringing out nails as nearly like the "Bulldog" as could be made. This year James Pender & Co. are putting on the Canadian market an article which, it is safe to say, will create a revolution in the nail trade. This nail, which is called the "Improved Bulldog" is made roughened as before, but is coated with a peculiar preparation, which not only increases its holding power enormously, but acts as a preservative from rust. A representative of THE CANADIAN ENGINEER, a few days ago, made a test of this nail and was astounded at the result. While a three inch nail was easily drawn from a piece of white-wood, it took all his strength to pull a smaller sized "Improved Bulldog" nail. Our representative writes that a simple test is all that is needed to show that the new nail is as much superior to the Bulldog of last year, as that nail was superior to other forms, and his opinion is that James Pender & Co. have hit the nail on the head more effectively than ever before

REVIEW OF THE METAL TRADES.

MONTREAL, March 1st, 1894

The market remains unchanged, and trade is so dull that there is practically nothing to report. Scarcely enough business has been carried through during the last few weeks to pay ordinary office expenses It is reported that the Montreal Rolling Mills will be closed down for a while. Reports from England show a somewhat brighter tendency, though things there even yet are far from what they should be.

Kuhlow's German Trade Review speaks thus of the prospects for mining in the Dominion. "In Canada mineral resources of enormous wealth are only just beginning to be seriously worked, and there is a fine opening for British capital and industry in connection with the coal, iron, nickel, petroleum and gold deposits of the Dominion There is good reason to believe that Canada has reached a new stage in its development, and that its progress is likely to be far more rapid in the future than it has been in the past."

CANADIAN ASSOCIATION STATIONARY ENGINEERS.

A regular meeting of Montreal No 1 was held on Feb 15, 1894 The resignation of the president was the all-absorbing topic, and was discussed for fully an hour and a half, caused chiefly by the president persisting in his resignation being accepted. He consented, however, to let it lie on the table for a time His chief reason for wishing to resign was the lack of interest shown by the majority of the members in not attending the meeting.

The dinner committee made their final report, showing a small deficit It was accepted as read, and a vote of thanks tendered the committee. A vote of thanks was also tendered to Bro York, who acted as secretary to the committee. The case of one member who had been expelled for drunkenness was taken up and fully discussed. It was unanimously decided to carry out one of the objects of the association by allowing none but sober men to ramain within the ranks. Mr. Gilbert Jones was unanimously elected an honorary member of the Association. Two candidates who had made application for membership were rejected, one of them not having passed a satisfactory examination Some disappointment was expressed at the action of the Montreal Street Railway Co. in not calling throughout Canada for applications for the position of Chief Engineer. The Canadian Association Stationary Engineers, however, not being a labor organization, took no steps in the matter An educational meeting was held on the 22nd ult., when the following questions were found in the box :—

(1.) Why does water put a fire out? This was left over till the following meeting.

(2.) Wanted a rule to find the height of a chimney suited for a plant of given horse-power.

Many rules and formulæ were submitted and worked out on the blackboard by different members, and very fully discussed Afterwards it was decided that the following rule, with a good admixture of practical experience, would be the most suitable for general practice.—

$$\frac{\text{Grate area, sq. ft} \times 120}{\sqrt{\text{height in feet}}} = \text{area in inches.}$$

One of the members then submitted sample of a boiler tube which had burst. Considerable discussion took place as to the reason of this, but an expression of opinion on the matter was post poned to a future meeting

TORONTO BRANCH NO. 1.—At a meeting of the Board of Examiners last month, matters were discussed relating to the present state of the law, and J. Tait, M.P.P., has consented to introduce the required amendments to the Act at the next session of the Legislature.

Electrical Department.

ELECTRICAL INVENTIONS.

The industry of the world, whether mechanical, electrical or chemical, is based on the invention of some inventor, and may be very old or very young, as the case may be. The extraordinary developments that have within very few years taken place in electricity, says G. E. Hesse in the *Electrical Age*, have shown the world what an inventor can do when his genius is used in the right direction and backed up with a good technical education. There is hardly anyone that requires such a thorough scientific training as our electrical engineer of to-day, and this fact is recognized more and more as time advances. It is a young industry, and, like the men that work in it, young, vigorous and pushing. Capital to the extent of many hundred millions has been invested and is continually going in for new and various applications of the science. Nothing is too good or sacred here, and a thing that a year ago was considered perfect has to-day to give way for something still better. One would naturally think that it would be a very risky business to engage in, but this does not seem to be the case, judging from the ease with which capital can be secured for it. This is a fact, because every electrical concern keeps up with the times and does not stand still. Problems relating to measuring, transforming, transmitting, heating, etc., have been presented and quickly solved in many different ways, and so far very satisfactorily. Once. now and then, the inventor comes across a stubborn and intricate question, and it looks as if all the skill and patience bestowed upon it were thrown away for nothing. It has to be solved, nevertheless, it being too important to let rest, as every new departure means honor and increased business to those who are working on it. In this category we have to class production of electricity direct ; an economical way of storing it, which probably will be radically different from the present way ; electric traction without any overhead construction, and a more reliable lamp, with the same or higher efficiency than the present makes for out-of-door illumination. They are very hard to solve, some of these problems, and they require both capital and intelligent labor if anything good shall be accomplished. There are capitalists willing to invest money in just those things, but how shall the inventor know where they are? That is another problem, and sometimes almost as hard to solve as a difficult electrical one. This obstacle ought to be done away with in some way. An engineer is very seldom also a business man ; he has in fact no time to think about money matters, and must consequently be associated with some one who understands that part of the business, which indeed is very essential, if eventually the problem is successfully solved.

It is not generally known that lepers are proof against electricity, and in this connection a story is told by H. Diamond in the San Francisco *Examiner* which will prove of interest : " Down at Honolulu," he says, " I had a battery and worked the innocent Kanakas with the old trick of the five dollar gold piece. That is, I'd place the piece in the bottom of a jar of water connected with the battery. Then I'd tell the native boys that they could have the money if they'd pick it out of the jar and hold the handle on the other pole of the battery at the same time. Of course the moment their hands struck the water the circuit was completed, their fingers would be doubled up and they couldn't touch the money if their fortunes had depended on getting it. I had many a laugh and achieved quite a reputation among the boys as a wizard who controlled the devils in the water. One day when several young ladies were in the office, a lad came in, pushed on by a number of companions who had attempted to secure the five dollars and failed. He had been persuaded to try for the money, and I explained the trick to the ladies in an aside as I arranged the apparatus. The boy took the handle, and we all prepared for a great laugh. He put his hand into the water, slowly drew out my fiver and quietly walked off with it, while I stood with my mouth open, afraid to face those girls, and praying for a volcanic eruption to turn the trend of thought. The boy had the leprosy, and the electricity didn't affect him."

A brick manufacturer in Auburn, Me., has arranged an electric motor to do the work of horses in grinding. In all yards where horses are used it is an established fact that one of the greatest troubles experienced in the windlass and treadmill is the rapid decline of the horses, as the strain upon their shoulders is so great that they succumb in a very short time. Other New England manufacturers are adopting the use of electricity in their plants, and with such excellent results as to promise the opinion that it will soon become universal.

Electric Flashes.

Elmira and West Montrose, Ont., will likely be connected by telephone.

Toronto Electric Street Railway Co have now placed motor cars on their all night routes.

The Holmes Electric Co., Toronto, are transferring their appliances to new and larger premises.

Winnipeg Electric Street Railway has now made its fare 12 tickets for 25 cents, or 50 for $1, a move in the right direction.

A boiler at the St. John, N.B., light and power station broke down last month, and the lighting and car systems became disorganized.

Messrs Ahearn & Soper, of Ottawa, have received an order from the Toronto Railway Company for forty additional Westinghouse equipments.

The Electric Light Co., Windsor, N.S., are increasing their plant, and have ordered a 150 horse-power tandem compound Robb-Armstrong engine.

In the British Columbia Parliament, permission has been asked to introduce a bill for the incorporation of the Consolidated Railway and Light Company.

The new transfer ticket is now in force on all the Montreal Street Railway's routes. Some slight alterations in the routes traversed have been made.

The Canadian General Electric Co.'s new electric rock drill was tested recently at the Sault Ste. Marie Canal, and is said to have given highly satisfactory results.

The Knights of Labor, of Montreal, adopted resolutions condemning the insufficient insulation of electric wires, which had caused innumerable injuries to linemen.

TELEPHONE communication between Sydney and Victoria, B C, was formally opened about the middle of last month.

E W SAYER has been elected president, and W Sutton, vice-president of the Montreal Junior Electric Club. The secretary is H. O. J Overton. Montreal

VICTORIA, B.C., city council has called in an expert to report as to the condition of their electric light plant, with a view to its being put into a more efficient condition

A 13-STATION Eco Watchman's Regulator has been installed in Mair, Son & Co 's confectionery factory, Halifax, by John Starr, Son & Co., manufacturers of electrical supplies of that city

JOHN STARR, SON & Co., Halifax have sold between 45,000 and 50,000 of their make of incandescent lamps in Canada, and the "Star" trade mark is now quite a familiar sign on electric lamps.

THE Montreal Street Railway Co have been authorized by Cote St Antoine Council to put a double track through Glen Bridge to connect the St Catherine Street and Notre Dame Street lines

EUGENE BALDWIN, to whom we have referred in a recent number, has succeeded in regulating the electric current produced by wind power He has now fitted up his residence with the electric light.

A A WRIGHT & Co 's electric light station, at Renfrew, Ont., has been undergoing renovations, and is described by the *Mercury* as being the neatest and best-kept dynamo rooms now in the Province

IT has at length been decided at Cote St. Antoine that the route of the proposed Mountain Electric Railway shall be by Mountain Avenue, from Sherbrooke street to the Boulevard, and thence to Montarville

THE Hamilton Radial Electric Street Railway Co are applying to Legislature to increase their capital stock from one to two million dollars for the purpose of extending their lines to Mimico, Elmira and other places

ARRANGEMENTS are being made to connect New Westminster with Steveston, Lulu Island, by an electric tramway It will be of great benefit, says the *B C. Commercial Journal*, to the farmers on the island and also to the cannerymen

JOHN STARR, SON & Co., manufacturers of telephones, Halifax, have fitted up a new warehouse system of telephones in Stair, Son & Morrow's new establishment, Halifax, also a similar system in G. H. Hamilton & Co 's large biscuit factory, Pictou, N. S.

THE Spring Bank Electric Railway Co., who propose to construct an electric railway from London, Ont., to some point on the River Thames, where a hotel and recreation grounds will be laid out, are applying for incorporation. The leading spirits in the enterprise are H A. Everitt and S. R Brake.

THE storage batteries and electric light plant of 17 h p at Mimico Asylum, which is capable of supplying 175 lights, are in a ruinous condition We understand that Bennett & Wright have received the contract for a new plant of 60 horse power, capable of giving 600 lights. The cost is stated to be $14,000.

THE Montreal Park and Island Railway Co. propose to establish a night freight service to run between midnight and 5 a m to Back River. They think they could bring dairy products to the city and take coal and manufactured articles to the former at cheaper rates than those at present in force on the C.P R.

CARLETON PLACE, Ont., council are discussing the granting of a bonus to T. W Ness & Co., Montreal, in return for this firm's operating an establishment there for the manufacture of electrical apparatus, employing an average of 100 men per year. The bonus asked for consists in property valued at $20,000 and exemption from taxation for fifteen years.

IT has been decided by the directors of the Galt and Preston Railway to make the rails of the ordinary weight in use in regular railway construction, and the gauge the same The rolling stock also is to be such as is used on ordinary railways, and close connection is to be observed with the trains on the main line The scheme thus makes the electric railway a sort of branch of the other, thus saving the trouble of transhipment

FROM the annual report of the Bell Telephone Co. of Canada, it appears that 2,639 subscribers were added last year, the total number of instruments in use being 26,806 The company now owns 275 exchanges and 256 agencies. Over 1,600 miles of wire were added to their long-distance system during the year, the total long distance system now in operation being 12,071 miles of wire on 5,068 miles of poles. It has also now made exclusive contracts with all the larger towns in Ontario. The report was considered highly satisfactory by shareholders

THE Royal Electric Company, Montreal, have brought an action against the Electric Street Railway Company for $27,626, on the ground that the railway company's action in placing the return wires in their system under ground had rendered their own wires useless. The Royal Electric Company claim as damages the expense of placing new return wires above ground.

THE new power-house to be built at Stoney Creek for the Hamilton, Beamsville and Grimsby Electric Railway, will be of brick and stone with asphalt roof The engine and dynamo room will measure 40 x 60 feet, and the boiler-room 40 x 30 There will be two dynamos and two boilers, provision being made for an additional boiler. The stack will be 115 feet high

A GOOD many people have expressed surprise at the title of the Boynton Bicycle Electric Railway, reference to which was made in our last number. To such, the following, being Mr Boynton's claim for his invention, will give fuller information: 1st—A railway line constructed with a single supporting or bed rail supported by a suitable structure for retaining the rolling stock on the bed rail 2nd—A railway structure open on one side and adapted to support and guide rolling stock. 3rd—A railway structure adapted to support and guide rolling stock, formed of bent rails or beams to encircle the train. 4th—A railway structure adapted for a quadruple single rail line, two of which are surface tracks 5th—A railway structure adapted to support and guide "bicycle" rolling stock, the overhead guide rail being so placed at the curve as to tilt the train towards the radius of the same, for the purpose, and substantially as set forth. 6th—A railway switch constructed and operated to shift the bed rail and guide rail simultaneously.

LITERARY NOTES.

We are glad to welcome a new and nicely gotten-up periodical called the *Technical World*, the publishers of which propose to give abstracts of chemical information from trade and scientific journals. The new journal will endeavor to glean the scientific field thoroughly, to separate the wheat from the chaff; but at the same time it does not pretend to render the original sources of its information unnecessary. It will merely draw the reader's attention to subjects in which he may be interested, and then tell him in an accurate manner where further information may be obtained. The *Technical World* is published at 1410 G Street N W., Washington, D.C.

The *Halifax Critic*, which built up an enviable reputation as the exponent of the mining, manufacturing and commercial interests of the Maritime Provinces, has entered upon an advanced field of usefulness, having made its last appearance as *The Critic* with its issue of February 9th. It has been absorbed by a limited company with capital and influence to maintain and rapidly promote the high aims of the founder of that journal, and it will hereafter appear as the "Canadian Colliery Guardian, Critic, and Journal of the Iron and Steel Trades" No doubt the *Guardian* will have even a wider circulation than it had in its old form. The subscription price is $1, or $1.50 when not paid in advance.

We are in receipt of the "Papers read before the Engineering Society of the School of Practical Science, Toronto," published (by order of the society) by the J E Bryant Co.npany, Toronto. The papers have mostly been contributed by students and graduates of the school, and are upon such interesting subjects as "Bridge Specifications," "Sewage Filtration," "Electric Traction," etc.

CARE OF BOILERS.

A writer in *Power* says "During my twenty years' experience with steam boilers, I have taken note of the following points A boiler should never be blown out while hot. Portable tubular boilers should stand at least twelve hours after the fire is out before letting out the water. Stationary boilers should stand long enough to allow the brick walls to cool. I usually let my boilers stand from eighteen to twenty four hours, and by so doing I keep the dirt in solution and can wash it out without any trouble. In case there is any scale I use a boiler pick and a good scraper. When there is any lime in the water, the latter should pass through a good purifier before being pumped into a boiler. Water should never be pumped into a boiler cold, as it makes hard firing and allows all the impurities in it to enter the boiler. In case the scale is hard, and cannot be easily removed, saturate it with coal oil before filling the boiler with water. This will loosen the scale without harm to the boiler A good skimmer properly constructed and properly attended to will do much toward keeping a boiler clean, but cannot be relied upon All boilers should be opened and thoroughly cleaned at least once in two weeks, as they are often burned by relying on some automatic device for keeping them clean that fails to do its work."

POLISHING IRON RAILS, PATTERNS, ETC.

Railings, patterns and other iron castings can be greatly improved in appearance by a simple preparation of oil of turpentine and oil of vitriol. Take any required quantity of the former, and add gradually, drop by drop, the oil of vitriol. The acid will produce at first a dark precipitate in the former, but add the latter until this ceases After this pour off the liquid and wash the deposit with water, it is then ready for application to the iron, which should first have been cleaned and gently heated

TO MEND IRON VESSELS OR BOXES.

Sometimes small holes, cracks or seams are made in iron vessels, and a simple method of repair may be appreciated An easy way is to melt, say about ¼ pound of sulphur in an iron pan over the fire, and this done, add, say 2½ ounces of fine black lead The mixture should then be blended thoroughly by stirring, after which it should be allowed to harden. When wanted for use break off a piece of the mixture, put it on the part to be mended, which, by the way, should first be thoroughly cleaned, and then use a hot soldering iron, as is done in tinsmith work.

Industrial Notes.

A. C WILSON & Co are establishing a pottery at New Westminster, B.C.

THE Deseronto Car Works are hard at work making box cars for the I. C. R.

Jos. JASMIN has the contract to build the new convent at Stanstead, Que., for $11,000.

J. L VIDAL & SON, machinery agents, Quebec, have assigned. Liabilities about $8,000.

NICHOLS & SON'S broom handle factory at Carleton Place, Ont., has started operations.

A NEW church is to be built at N. Germaine, Que., to cost $12,000. Tenders are invited.

THE iron foundry business of E. Chanteloupe & Co., Montreal, has been taken over by J. N. Fulton.

THE Mustard Roller Flour Mill, Wyoming, Ont., has been burned. Loss $12,000. Partly insured.

THE wholesale and retail hardware firm of Thos. Wilson & Co., Montreal, is said to be in business difficulties.

JOHN HEATH'S flour mill at Wardsville, Ont., has been destroyed by fire. Cause unknown. Loss, $4,000; not insured.

VAUGHAN'S saw mill, at Port Arthur, Ont., was another prey to the flames last month. Loss, $3,000; not insured.

THE Rathbun Co. are making a new engine of 250 horse-power for the cement works at Napanee Mills.—*Kingston News.*

THE Hart Emery Wheel Co., Hamilton, will in future sell their manufactures themselves instead of employing agents.

THE assets of the Hault Manufacturing Co., Ingersoll, Ont., amounting to $72,000, have been sold to H. A. Ellis for $16,000.

MACHINERY is being ordered for the Edmonton, Alta., Creamery, which, it is hoped, will commence operations about the end of May.

THE Dodge Wood Split Pulley Co.'s works at Toronto Junction, which had been shut down for some time, have now resumed operations.

THE Sylvester Manufacturing Co.'s implement warehouse at Winnipeg was burnt down early last month. Loss between $5,000 and $6,000.

THE Windsor, Ont, planing mill has been completely destroyed by fire, together with a large stock of lumber. Loss, $10,000; insurance, $5,000.

A MOVEMENT is under way at St. Thomas, Ont., to organize a joint stock company to operate the old Elgin Brewery, which has been closed for some years.

THE St Johns, Que., Stone Chinaware Co is now known as the John L. Cassidy Pottery Company. Application for incorporation has been made.

THE Albion Hotel, at Stratford, Ont, has been partially destroyed by fire. Loss, considerable. The building and furniture were insured for about $19,000.

ANDERSON & CALVERT, implement dealers, Winnipeg, have dissolved partnership. F. J. Calvert retires, and H. F. Anderson will continue the business alone.

A NEW steam fire engine is wanted by the Toronto authorities.

OTTAWA is to have a glass-blowing establishment. It will produce ornamental and colored glass.

A COMPANY is being formed under the name of the Ketchum Gas Co., Toronto, for the manufacture of gas machines and articles for the economical consumption of fuel.

THE "Ideal" Washer, Churn and Wire Mattress Co, St. Thomas, Ont., have liquidated. On settling up it was found that all that could be paid to creditors was 1 cent on the dollar.

LAWRENCE & SON'S sash and heading factory, planing mill and drying kiln, at Watford, Ont., have been burned. The fire originated somewhere between the boiler and the drying kiln Loss, heavy, with only small insurance

THE purchase price which the Windsor and Annapolis Railway Co. are to pay to the company operating the trunk line between Halifax and Yarmouth is £265,000, of which £130,000 is to be in 4 per cent. debenture stock, £50,000 in 5 per cent. preference shares of £20 each, and £85,000 in ordinary shares. The name of the road, says the Halifax *Herald*, will hereafter be the Dominion Atlantic.

JOSEPH GRAF'S saw and chopping mills at Chepstow, Ont., have been burned. Loss, $2,000; not insured.

NANAIMO, B.C., is petitioning for a new drill hall, and for the early construction of the proposed fortifications.

THE Canadian General Electric Co., Peterboro', are going to engage in the industry of car building in addition to their other business.

TORONTO GAS Co. are being sued for $1,500,000, which, it is claimed, is the amount of money overpaid to the company by consumers since 1886.

THE James Morrison Brass Manufacturing Co.'s factory at Toronto was last month badly damaged by fire to the amount of $30,000. It was fully insured.

JAMES INGELLS, who has a large factory in East Jordan, Mich., for the manufacture of hame fasteners, is thinking of starting a branch factory in Windsor, Ont.

THE loss on E. C. Moore's nail factory at Cold Brook, N. B., which was destroyed by fire last month, will amount to $40,000, the insurance being about $16,000.

THE Bell Cigar Factory at St. John, N. B., has been completely gutted by fire. Cause of fire unknown. The loss will be heavy, with considerable insurance.

THE officers for the Richmond, Que., Water Power Co. are: President, Frank H. Nunns; vice-president, W. E. Jones; and secretary-treasurer, F. C Cleveland (Coaticook).

RICHARD SMITH, of Sherbrooke, in company with Mr. Rice, an American, contemplates the erection at Beebe Plain, Que., of an establishment for making paper with machinery.

OTTAWA capitalists propose to build a sanitarium for the treatment of chronic diseases, at a cost of $30,000. The building will be fitted up with vapor baths and all modern appliances.

THE water-works at Granville Ferry, N.S., were formally opened a short time ago. At a trial made in order to test their efficiency in case of fire, the service gave entire satisfaction.

THE Norris Roller Mills, St. Catharines, the Fyfe Mills, Thorold, both situate on the Welland Canal, and the steamer "Persia," all the property of the late James Norris, of St. Catharines, are to be sold.

THE L. H. Young Manufacturing Co. is applying for incorporation. It will manufacture and deal in iron, copper and other metals. Its capital stock is to be $500,000 and chief place of business will be Montreal.

HAZEN DALY, working in Ungar's Laundry, St. John, was caught in a belt, carried up to the shaft and dashed against the wall, where he would have been killed on the revolutionary shaft had not the machinery been instantly stopped.

THERE is a rumor that James Hay, jr., the Woodstock, Ont., furniture manufacturer, who has a $60,000 contract for supplying all the cases of the Singer sewing machines in Canada, is thinking of establishing a factory in Windsor, Ont.

MONTREAL City Hall is stated to be in a bad sanitary condition, and it is estimated that over $9,560 will be needed to make the necessary alterations. Of this, drainage will absorb $2,060; plumbing, $2,750; ventilation, $750, and tile flooring, $4,000.

S S. EDSALL'S hardware store at Bowmanville, Ont., was last month the scene of a gunpowder explosion. In the fire which ensued the stock was completely destroyed, besides some adjacent buildings being severely damaged. Loss on stock about $6,000. Partially insured.

CLEVELAND & NUNNS have received letters patent for their dam on the St. Francis River at Richmond, and a brick building suitable for manufacturing purposes has been erected. This awaits some capitalist who will avail himself of the opportunity to establish an industry of some sort there.

A. R WILLIAMS, a machinery dealer of Toronto, recently took action against the Temple Electric Company of Montreal for $1,006, for goods supplied The defendants tendered $750, claiming that Williams' work was inferior and the time charged for putting up the machinery excessive. The court was of the same opinion, and awarded Williams $725.

M. BRALLY & SONS, Welland, Ont., shipped last month to Messrs. Gilmour & Co. of Trenton, one 15-inch centrifugal pump to be used in connection with a 12-inch pump shipped them last fall at Dorset (Muskoka district), to supply water to the raceway they have built for floating saw logs over the height of land between the waters which empty into Georgian Bay and the Trent, Valley waters, and so enable them to get the logs to their mills at Trenton. The two pumps will raise 25,000 gallons per minute.

J. HANSON is erecting a saw-mill at Fort Steele, B C.

NEW bridges will be erected over Dignan's Creek at Delaware and Metcalf, Ont.

THE Peterborough, Ont , Hardware Company's fine new premises are now complete.

JOHN HEATH'S flour mill at Wardsville, Ont., has been gutted by fire. Loss $4,000, no insurance

THE new Catholic St. Bridget's school at Montreal, of which plans are being prepared, is to cost $60,000

ROBIN & SADLER, belting manufacturers of Montreal, are having plans prepared for a new four-story factory.

THE Strait Shore Rolling Mills and Pender's Nail Works are running extra time to fill orders —*St. John, N.B , Sun*

THE Royal City Creamery Company (Ltd), are going to establish a creamery at New Westminster, B.C., to cost $10,000.

THE Coleman Planing Mill and Lumber Company, Hamilton, Ont., are seeking incorporation The capital stock is $50,000.

THE Erie Glass Works, Welland, Ont., were sold by judicial sale for $10,100. The industry will probably be abandoned, however.

CLARK, SKILLINGS & Co 's spool factory at Newcastle, N. B., under the management of C. W. Murray, is running full blast, employing thirty men.

THE Dominion Wire Company have elected the following officers: President, James Cooper; vice-president, F. Farman, secretary, G. J. Simpson.

THE proposed new large hotel to be built at St. Hyacinthe, Que , will cost $35,000, and will be built on the site at present occupied by the Yamaska Hotel.

ARCHITECT BURKE has submitted plans for a new library and museum building in connection with the Sackville, N.B , College The cost is estimated at $20,000

HAMM'S bakery at North End, N.B , was the scene of a serious fire last month. Some valuable machinery was damaged. Insurance about $5,000 —*St. John Telegraph.*

THE work of rebuilding W P McNeil & Co 's implement factory, New Glasgow, which was burned down a short time ago, has been going on quickly. One of the engines has already started

THE Royal City Planing Mills, New Westminster, B C., has closed the largest contract in the shingle line on record in British Columbia. It is to supply an Ontario firm with 15,000,000 cedar shingles.

IN the investigation as to the cause of the death of McPherson in Finlay's machinery works, St Cunegonde Que., Government Inspector Guion advised all factory and mill men to adopt the loose pulley system in order to avoid disasters.

A BOILER in J. Warrin's saw mill at Byer's Corners, Eganville, Ont., exploded, fatally injuring J. Possetta, the engineer. The cause of the explosion is a mystery The boiler weighed three tons and was thrown over two and a half acres away

HARDWARE men in the Province of Quebec are proposing to form a branch association of the Montreal Board of Trade under the title of the Metal and Hardware Association, in order to consider the best methods for conducting their business in the future

DOBBIE & STUART are an enterprising firm of founders and machinists, at Thorold, Ont., who have not only built up a large business in contractors' plant and mining machinery, but have been aggressive enough to start a branch at Niagara, in the State of New York A further reference to this firm's work will be given in another issue

A SPECIAL boiler has been made by the Forest City Machine Works, London, Ont , for the London Bolt Works. It is described as being of the regular upright type, but round the shell are placed six domes and fire-boxes in which the iron is heated for making both bolts and nuts. The fire-boxes are placed inside the domes and surrounded by water, and connected to the main fire-box of the boiler by a number of tubes Under this arrangement, when the six furnaces are being fired, steam is easily kept up without any fire in the main fire-box, thus saving a very large amount of fuel.

THE Krupp gun works have a machine which is said to roll iron so thin that it would take 1,800 sheets to make an inch, whereas the thinnest tissue paper runs only 1,200 sheets.

VANADIUM, in the form of vanadic pent oxide, has been discovered in specimens of bituminous coal brought from the Argentine Republic. The coal is said to contain four pounds of this rare metal to the ton.

Mining Matters.

OWING to a reduction in wages, 583 miners in Lethbridge, N.W.T , have struck.

THE sale of stock in the Nelson, B C., Hydraulic Co is understood to have been a great success

THE Truro Gold Mine Company's mine at Caribou, N S , was sold last month to G. W Stuart, its former manager, for $4,950

MONTREAL city quarry at Outremont has been busily worked all the winter About ten thousand tons will have been removed

THOMAS McGUIGAN has completed the transfer of the American Boy to a company of Eastern men, who have bonded it for $15,000

THE Canadian Copper Company, Sudbury, Ont , propose to build another smelter. The mines will soon be run to their fullest capacity

THE brilliant reports from the Rainy River district are causing a good many Winnipeg prospectors to arrange a journey thither for the spring

I. N. PEYTON received advices from the Le Roi mine recently, stating that the ledge now shows seven feet of clear ore and is steadily improving.

T. J LEDYARD, of Toronto, is forming a company for the purpose of working the Ledyard gold mines at Belmont, Ont. The company's capital is to be $1,000,000.

W. H. WALKER'S plumbago factory at "Graphite City," near Buckingham, Que., is now practically complete Nearly $300,000 has been spent in constructing the works.

THE annual meeting of the Mining Society of Nova Scotia will be held at Halifax in the rooms of the society on the 14th inst The annual dinner will be held in the evening.

A COMPANY is applying for incorporation under the name of the Armstrong Lime Company, with a capital of $60,000, for the purpose of operating the lime kilns at Green Head, N.B

THE Londonderry Iron Co have elected officers as follows: President and managing director, A T Paterson; vice-president, D McInnes; secretary, James Phymister; and treasurer, F C Budden

SEVERAL rumors have gone the rounds in connection with Allard, the young man who claims to have discovered a process for hardening copper. Among these was the report that he had disappeared, no one knew where, but this, we believe, was afterwards contradicted. It is now said he is near closing with the British Government to sell his process for some millions of dollars.

THE Nelson Hydraulic Company this week let the contract for having their ground put in shape for working this coming spring. There were five tenders, but that of E A. Hodgins was the lowest The specifications call for the construction of a dam 75 feet in length, 3,000 feet of flume 2½ x 2 feet, with a grade of nine tenths of a foot in 100 feet; 1,000 feet of ditch; 500 feet of sluice boxes, 3 x 4, with a grade of 9 inches in 12 feet. By the terms of the contract Hodgins will be required to complete the work inside of forty-two days.—*Miner*

Railway and Marine News.

THERE is a bad break in the breakwater at Goderich, Ont.

AN ice-breaking boat will be used to ply between Montreal and Quebec.

SOREL, Que., has voted a bonus of $50,000 for the Montreal and Sorel Railway.

DOTY BROS., Toronto, have their hands full making compound engines for several tugs.

CHAS. HUTCHINSON is rushing construction work on the Irondale, Bancroft and Ottawa Railway.

J. O'BRIEN, Renfrew, Ont., has the contract for ten miles of O A. & P. S. R. construction west of Eganville

EFFORTS are being made for arrangements to begin work on the Pembroke Southern Railway early in the summer

IT is stated that the Michigan Central Co. are negotiating for the lease or purchase of the Niagara Central Road, and that they intend to extend the line to Port Dalhousie and connect with a fast steamboat service to Toronto, to be kept open the entire year.

A NEW ferry company to the Island is in course of formation at Toronto.

THE first train on the Victoria & Sydney Railway made its trip to Victoria on the 13th ult.

THE G T R. will build a new siding south of Berlin, Ont., Station, for freight conveniences.

THE Wier Boiler Works, Montreal, are building boilers for two dredges being built for the Dominion Government at Sorel, Que.

THE Canada Southern Railway Co. have been granted permission to build a branch line to connect their main line with Amherstburg.

THE packing box of the screw of the Furness Line steamer "Baltimore City" was repaired last month in the St. John, N.B. dry dock.

THE Sincennes McNaughton Steamship Co. now has for officers: President, G. H. Matthews; vice-president and general manager, F. Dupre.

THE Ottawa, Arnprior and Parry Sound Railway has been granted an extension of time for completing the two bridges across the C P R near Ottawa.

THE idea of building a railroad between Woodstock and Centreville N.B., has been finally given up, it having been superseded by the new direct Houlton line.

REID & Co, contractors for the new railway line in Newfoundland, have already built over a hundred miles. They have stopped work for a time.

OFFICERS for the Ottawa & Gatineau Valley Railway Company have been elected as follows. President, M. S Lonergan, and secretary-treasurer, H. L. Maltby.

THE owners of the Beaver Line of transatlantic steamers were asked to give steerage passengers free use of bedding, etc., but they have declined to accede to the request.

THE contractors of the Orangedale Railway, Inverness county, are preparing to prosecute building operations simultaneously, not in ten mile sections, as at one time was proposed.

W E REDWAY, C.E., seconded by Capt. Crangle, a shipowner, has suggested to the authorities the formation of a dry-dock at Toronto large enough to accommodate any lake vessel.

A COMPANY has been incorporated, under the name of the Pembroke Southern Railway Company, to build a line between Pembroke and Renfrew to connect with the O. A. & P. S. R at Renfrew.

AT a meeting in Montreal of the directors of the Great Eastern Railway Company, the following officers were elected. President, H. J. Beemer; vice-president, M. S. Lonergan; and secretary, G. H. Simpson.

THE following have been re-elected officers of the Ottawa River Navigation Co: R. W. Shepherd, president; J. J. Gibb, vice-president; R. W Shepherd, Jr., manager and secretary. Edward Scott, auditor.

IT has been proposed to build a branch spur on Longueuil Que., wharf, and passengers to Montreal from Sorel will be carried across the river by boat, in opposition to the Richelieu & Ontario Navigation Company.

THE steamer "Estelle," owned by A. Haslam, M. P., of Nanaimo, was last month completely destroyed by an explosion, the cause of which is utterly unknown, and, so far as known, all on board were killed.

THE survey of the Drummond County Railway from St. Leonard to Chaudiere, Que., has been completed. This extension is 45 miles long, one-half the length being through a dense forest. It is proposed to begin work in the spring.

C. P. R. ENGINEERS Duchesnay and Walkem are taking soundings just below Revelstoke bridge for the final selection of the location of the proposed steel structure over the Columbia, on which work will be commenced in the fall.—*Kootenay Star.*

ONE of the articles to be manufactured by the L H. Young Mfg Co., an item about whom appears in our "Industrial" columns, is a reversible safety nut lock used by railways to prevent the rails from spreading. It can be put in without removing the original nut. It is the invention of Mr. Young

THE directors' report of the Richelieu and Ontario Navigation Co.'s business last year shows that the total receipts were close upon $611,000. The expenses were nearly $584,000, leaving a balance of $27,268, which, added to the last year's balance of $84,500, amounts to about $111,000. Out of this, $29,000 was appropriated for interest, and $19,000 for accidents. There is a net surplus over all liabilities of $93,653.

THE purchase by an American syndicate of the Erie and Huron Railway having been consummated, the company is negotiating for the building of a steel transfer boat, capable of carrying twenty or more loaded cars and about 600 passengers to operate between Cleveland and Rondeau Harbor.

M. CONNOLLY has been elected president, and W. Wainwright, vice president of the Richelieu & Ontario Navigation Co. The following, in addition to the above, is the new board of directors. Hector Mackenzie, F C Henshaw, Jos Lewis, Jas. Swift, Rudolfe Forget, A. F. Clerk, W R Miller and L. J. Forget.

THE P. E. I. Steam Navigation Co. are asking government that the amount of subsidy for carrying mails across Northumberland Straits be restored to the original sum, $10,000. They claim to have improved the service very greatly last year by the addition of the "Northumberland," which cost them $200,000.

CONTRACTS have been signed for the construction of the railway from Sand Point, Shelburne Co., N S., to connect with the N S Central Railway at or near New Germany. Work is to begin before 1st May and be finished before 1st November A branch line from Liverpool to Indian Gardens is included, making 96 miles in all

THERE is a rumor that Robert Wright, who has filled the position of treasurer to the G. T R. for many years, will retire, and that the vacancy will be supplied by the present general freight agent, John Burton. A. H. Harris, at present eastern district freight agent, will take the latter's place. The district agency, it is stated, will be given to J J. Cunningham, Mr. Burton's assistant.

THE G. T. R. have awarded coal contracts as follows: Morgan Brown and Bain, Pittsburgh, 150,000 tons; Osborne & Sager, Pittsburgh, 150,000; C. N. Shipman & Co., Buffalo, 50,000 tons; Evan Morris, Youngstown, O., 50,000 tons, and Washington Coal Company, Pittsburgh, 50,000. The prices have not transpired, but they are reported to be somewhat lower than those of last year.

PETER LARSON has filed a lien for $400,000 against the Nelson and Fort Sheppard extension of the Spokane & Northern Railroad. The contract for the building of the extension was let to Larson, who completed his contract about two months ago. D. C. Corbin, president of the road, is now in New York to raise money to pay off this indebtedness. Meanwhile the road will continue to operate as usual.

C. A. & G. E. JAQUES, shipping agents of Montreal, and A. L. Mackay of Hamilton, have been making arrangements at Toledo, O., for a new steamboat line to connect that city with Montreal. They propose to run the "Acadia" and "Melbourne" so as to connect with ocean steamers to Europe, saving transhipment. The two boats mentioned have a capacity for one hundred passengers and six hundred tons of freight each.

MONTREAL, it is likely, will be honored by four new steamship lines during the coming season. The "Scandia" line will, in conjunction with the Hamburg line, run a weekly or fortnightly service there from Gottenburg, calling at Christiania. Another of the lines is the Johnston line from Liverpool, the American head office of which is at Baltimore. N. J. Fraser, foreign freight agent for the G.T.R., will perhaps become the company's manager, with offices in the Board of Trade building, Montreal. Another new line is the Head Line, to ply between Belfast, Ireland, and Montreal. It is owned by the Ulster Steamship Co., and its Montreal agents will be McLean, Kennedy & Co. The fourth line which, according to the report, is to call at Montreal, is the White Star.

AMONG the new railways to be constructed as soon as spring opens is a narrow gauge road from Yarmouth to Shelburne, N.S. This road will skirt along the south-western coast, taking in Pubnico, Barrington, and Lockport among other villages, and will be 91 miles long. It is called the Coast Railway Co. of N.S., and the officers so far appointed are: Thomas Robertson, of Yarmouth, president; A. F. Chandler, of Philadelphia, vice-president; and C. E. Ambler, engineer, the headquarters being at Yarmouth. Ten miles have been located, the whole route having been previously surveyed by Government. The Local Government have given a subsidy, and the only question remaining is that of a Dominion subsidy. Besides passenger traffic the chief trade to be opened up by the new road is in fish, lumber, and produce, which will be shipped chiefly to Boston by the Yarmouth Steamship Co. To the surprise of a great many Yarmouth people, a gang of men were landed there from Boston on the 3rd inst., with instructions to start on the survey of a rival road, which the promoters say will be broad gauge and built without subsidy. It is manifest that two roads will not pay there. Which will be built?

CAPT. THOS. DONNELLY, Inspector of Hulls, says that the Canadian canal at Sault Ste. Marie has two objections: (1) That the span for the drawbridge at the entrance to the lock is not wide enough, and (2) That at the entrance to the lock, the stone-work is built of very rough stone, instead of its being levelled.

Personal.

W. D. BISHOP has been appointed superintendent of the Dartmouth, N. S., water-works.

T. A. MACKINNON, general manager of the Concord & Montreal Railroad, has resigned and accepted a position with the Boston & Maine road

JAS. THORN, formerly in charge of the "Beaver" Line of steamships, has accepted the position of manager of the Hamburg-American Packet Co

WM W. KENNEDY, an old New Brunswick marine engineer, has been appointed engineer of the steamer "Lansdowne" in the place of the late James Morris.

JULIEN CHABOT, who recently resigned the position of general manager to the Richelieu and Ontario Navigation Co., was previously general manager of the Saguenay line.

ALFRED SMALLWOOD, manager of the Starr Manufacturing Co., maker of skates, Dartmouth, N. S., died of apoplexy on the 9th February. He had been connected with the company for 25 years.

N. H VERITY, founder of the plough works at Brantford, Ont., bearing his name, died recently at the age of 64. The business will be continued by his son He leaves a widow and twelve children.

WE are glad to hear that George A. Goodwin, the author of a paper on "Hoisting Machinery," extracts from which appeared in last number, has been elected president of the Society of Engineers, London, Eng.

E A AMOS, C.E., a graduate of the Royal Military College of Kingston, has joined the well-known firm of Mignault & Belanger, civil engineers and solicitors of patents, of Montreal. The new firm will take the name of Mignault, Belanger & Amos.

A. MCKENZIE, who has been for many years car service agent of the C. P R at Winnipeg, has accepted the position of general superintendent, at Montreal, for the Whitney syndicate of Nova Scotia Mr. McKenzie will occupy himself in winter, with the Dominion Coal Co's interests in Cape Breton.

Mr. Hy GRANGE, for many years purser of the R. & O. steamer "Spartan," has been appointed to the command of that boat The "Spartan" was always one of the most popular boats on the line, a fact that was principally due to Mr Grange's uniform polite attention to the care and comfort of all passengers, and now that this gallant officer has received his well-earned promotion, it is safe to predict that his ship will be even a greater favorite than ever. Both Captain Grange and the company are to be congratulated on the appointment.

THE PRESSURE OF WIND ON BRIDGE STRUCTURES.*

To the Editor of THE CANADIAN ENGINEER:

SIR,—With all the bracing of the falsework resting on the piles, and even had additional longitudinal bracing been put in, the swaying of the structure under wind pressure could not have been prevented except by transversely and longitudinally bracing the piles to a much greater depth from their upper ends. There was only some 16 feet of the upper portion of the piles braced, with 32 feet below unbraced, thus allowing this unbraced portion to give by bending or flexure at the level of the waling pieces just above the water level. The whole height and weight of the falsework above water was thus supported on so many stilts, exactly in the same way as the heavy trunk and head of a man can be swayed from side to side by his legs giving at the hip joint, which illustration any one can try for himself. It must have been evident to the builders, had they considered this feature of the falsework, that the bracing of the piles should have reached down from their upper level to a point much nearer to the river bed, which could so easily have been done by introducing eye-bolts through them at a few feet from the bottom of the river with iron ties reaching to above the water level.

The traveler is topheavy, and such a leverage, some 190 feet in total height, would require but moderate wind pressure to cause the whole to sway and the piles to give as stated.

Now, as to the argument that because none of the trees or structures in the vicinity and within 300 feet of the bridge were affected by the wind, and that the wind could therefore not have been powerful enough to overthrow the finished span from which the falsework was removed, my experience in Quebec is to the effect that in the midst of an otherwise not absolutely hurricane-like gale, there may be at a certain point a much stronger current and amounting in force almost to that of a cyclone. Of this I will give you an instance which occurred here some five years ago at Dufferin Terrace. This is a structure 1,500 feet in length at 182 feet above the level of the St. Lawrence. It runs along the face of the cliff immediately below the citadel and glacis. Along this terrace and on its outer edge there are five octagonal kiosks, or pavilions, each 20 feet in diameter, supported by eight cast-iron columns bolted to the terrace flooring. The roofs of these project 4 feet all around and are therefore 28 feet in diameter. The framework of the roofing, rafters and purlins is all of cast and wrought iron securely bolted together, and the whole thoroughly fastened to continuations of the columns reaching to 4 feet above their capitals, which rise to the roof level, and are braced the one to the other by the cast-iron spandrel pieces forming the arched heads of the openings between the columns, on the capitals of which they rest as on imposts. The structure is further braced by 4x4-foot cast-iron brackets from each column supporting the projecting eaves of the roof, and again the rafters are radially tied to the centre of the structure by wrought-iron ties of inch round iron. The entire iron framework of the roof is screw-bolted to the under structure and the whole is covered with galvanized-iron sheathing riveted to the rafter flanges and the purlins. On several occasions of very high winds, the sheet-iron covering just alluded to, the kiosk being open on all sides, has been partially or entirely blown away, exactly as the covering of an umbrella would be, and often is, torn from its steel or whalebone ribs in a gust of wind.

Now, on the occasion mentioned, and though the wind all along the terrace blew a very strong gale from the east, or towards the citadel heights, and while the sheathing of four of the kiosks (five of them, including the band stand,) stood the gale, the whole roof of the second pavilion from the west end of the terrace, framework and all, some 2½ tons weight, was bodily wrenched from its moorings, snapping and tearing asunder all the screw-bolt fastenings, and hurled a distance of some 250 feet and to a height of, say 20 to 30 feet above the terrace level, and deposited by the wind on the adjoining glacis, with the rafters broken into short pieces and the tie-rods twisted into every conceivable shape. Now, if the wind could not only lift the weight of the roof (2½ tons, as already said), but exert the much greater force required to tear all the bolts asunder; while, as I said before, not even the sheathing of the four other kiosks was blown away, no other conclusion can be arrived at than that in the midst of the gale there was, as with the Gulf Stream in the ocean, a more powerful and cyclone-like current at this particular point to produce the effect related. And yet such a thing as a cyclone, in the true sense of the word, is, so to say, unknown in Quebec, or even in any other part of Canada, though we have had barns and the like blown down and roofing torn away on not a few occasions.

Now, if we put the tensile strength of an inch round bolt at only 12½ tons, or 25,000 pounds, and as the roof of the kiosk was held in place by S ⅝-inch bolts, it must have required five tons to break each bolt, or some forty tons for the whole, and as the roof area of the pavilions is, say 640 feet, while that of the bridge flooring was 16,500 feet, or 25 times greater, and as 25 times 40 tons gives 1,000 tons, it would appear that a wind of like force—that is, of say 120 pounds to the square foot—might have produced the bodily lifting of the span and throwing it into the river. But what militates against this supposition is the fact that winds of such cyclonic power are seldom or never found to have a breadth or amplitude of more than 200 to 300 feet, while if the theory is correct the gale must have had an amplitude of at least 500 to 600 feet to bring about the blowing away of the span thrown into the river.

Again, while in the case of the Quebec accident, the wind had an upward lifting tendency by being deflected by the cliff from its horizontal direction, how can it be claimed that the wind blowing up the river between Louisville and Jeffersonville could have had any such uplifting tendency, there being nothing there to deflect it towards the vertical, and even if its direction could have been partly upward, say at an angle of 45 degrees to the horizon, the vertical component of its parallelogram of forces to be as much as 120 pounds, would have required the whole force to be 170 pounds, or in excess of that of any cyclone ever known.

I should rather incline to think if, as asserted, the span was blown bodily away from the piers into the river, that this was due

*Originally written with reference to the fall of the Louisville and Jeffersonville bridge.

to the direct horizontal force of the wind overcoming the frictional resistance of the mass of iron-work on its resting point on the piers, which a less force may have sufficed to bring about, since in the case of the destruction of the old Tay bridge in Scotland, the force of the wind is not estimated to have exceeded 56 pounds to the square foot. Some doubt seems to attach to these very high-wind pressures, as evidenced by Prof. Hernot, of the Melbourne University, in his paper on wind pressures read before the Australian Association for the Advancement of Science at Adelaide, when alluding to the anemometric results of some observations such as that of Bidstone near Liverpool, England, and at Sydney, recording pressures or velocities corresponding to pressures of 90 pounds or 100 pounds per square foot, while others, such as Greenwich, Edinburgh, Melbourne, and Adelaide, give results equal to only one-third of those just mentioned. Crosby from his experience inclines to believe in nothing much above a maximum of 30 pounds, and it will be remembered that only 26 pounds to the square foot was to be calculated on in designing the 1,200-foot tower proposed to be erected in London in imitation of the Eiffel.

C. BAILLARGE,
City Engineer, Quebec.

CANADIAN SOCIETY OF CIVIL ENGINEERS.

A meeting of this society took place in their rooms at Montreal, on the 15th ult.

There was some discussion on the question whether the society's rooms should remain open every evening, most members being in favor of their being open only on two evenings each week, Tuesday and Thursday, for example. It resolved to request the council to enquire as to the cost of lighting the rooms by electricity.

Mr. Irwin read a paper by James H. Kennedy, on the "Location and Construction of the Great Northern Railway in the Rocky Mountains." This line is composed of the old St. Paul, Minneapolis & Manitoba, Mountain Central, Eastern Minnesota, Fairhaven & Southern, and other railways. It is unique in being the only through line ever built over the Rocky Mountains without Government aid, either as a subsidy or land grant. The author of the paper confined himself to information limited to the Rocky Mountain section, the part between Havre on the east and Kalispell on the west side of the range—a distance of 260 miles—with special reference to mountain work.

Another meeting was held on the 1st inst., when there was a large attendance.

President Peterson read the report on the Engineering Congress of Chicago, giving the number of engineers representing each nationality. From this it appeared that there had been a considerable surplus resulting from the subscriptions of the various engineering societies of America and elsewhere, and that the share of the surplus to go to their own society would be about $80. The council would decide as to what was to be done with this money. The secretary then read a paper by F. A. Creighton, upon the "Dartmouth, N. S., Water and Sewerage Works," a carefully-written and interesting essay, giving full details of the working of that system. We will likely refer more fully to this paper later on.

MISTAKES ABOUT ASBESTOS.

In a paper recently read before the Montreal Natural History Society, Prof. J. T. Donald corrected a number of popular misconceptions concerning asbestos:

The first misconception is that asbestos is not destroyed by fire. This idea comes to us from classic writers, who state that napkins made from it were thrown into the fire and brought out cleansed. Charlemagne is said to have had a tablecloth (although it seems unlikely that people used tablecloths in those days) which, to the surprise of his court, he threw into the flames and it was not destroyed True asbestos would not burn, but when it is brought to a red heat, the water is driven off and the fibrous texture is destroyed, so that it will crumble up like soda biscuit.

The second misconception is that the Canadian asbestos is not the same as the Italian, and therefore, much inferior. When asbestos came first to be used in the arts it was only produced in Italy, and in the district where it was found, about 75 square miles, many small mines were opened, and about the time Canadian asbestos came into notice these mines were all combined into one

company. This company fought against the Canadian article, giving out that it was of a different composition and useless in the arts, but although many writers on the subject still circulate these untruths, Canadian asbestos has taken its place in the markets, and the Italian company own and operate a mine in Canada. The two minerals are practically the same in composition, as the following table will show —

	Italian	Canadian
Silica	40 30	40.57
Magnesia	43.37	41.50
Oxide of iron	87	2.81
Alumina	2 27	90
Water	13.72	13.55

The iron and alumina or clay, where the greatest differences occur, are only impurities which impair the quality. Canadian asbestos occurs in veins, while the Italian is found in lumps, wound and knotted. The latter is, therefore, longer in the fibre and more suitable for weaving.

The third misconception is that asbestos is a good non-conductor. It is, on the contrary, a very good conductor, as will be noticed by holding a piece of the mineral over a lamp. This mistake has arisen from believing that its non-combustibility arose from its being a non-conductor of heat. It may be made a good non-conductor by making a pluff which contains a quantity of air. It is the air that is the non-conductor, for solid asbestos is useless for that purpose; and the air to be a good non-conductor must be still air. Air in motion is not nearly so good. The smoothness of asbestos fibre permits a certain movement in the air, while the roughness of the fibre in hair covering prevents all motion and makes it less conductive, but it soon becomes charred with the heat, so that asbestos which retains its elasticity under all temperatures below red heat is better, being so much more desirable.

A fourth misconception is that chromic iron is always associated with asbestos This, like the other misconceptions, prevails among miners and is hard to eradicate, being repeated and repeated by each succeeding writer on the subject. So far all the iron found in connection with asbestos mines has been the magnetic form. Asbestos is mainly used in commerce for steam packing and boiler covering. It is spun into rope for covering steam pipes. It is also woven into cloth to be used for theatre curtains, some countries making it imperative that these should be non-combustible.

FAULTS IN STEEL.

A foreign steel manufacturer states that the usual causes of faults in steel are as below

Faults in the furnaces are generally—

(*a*) "Raw" heats, so-called, where the metal is not properly decarburized in the open-hearth furnace, and is cast at too low a temperature, which prevents the proper assimilation of the decarburizing elements and causes a non-homogeneous material.

(*b*) Cast at too high a temperature, causing boiling in the ingots, and blow holes and laminations in the plate.

(*c*) Cast at too low a temperature, causing lapping of the ingots' sides, and producing a film or lamination in the plate.

Some general directions were given as follows:

(*a*) Ingots for fire-box plates should be cast somewhat proportional to the size and thickness of the plates that they are to make. If this is not done the larger plates rolled from the same size ingots as the small plates will not be of as good quality, as there will always be a temptation to use the top, or bad part, of the ingot.

(*b*) It is preferable to heat the ingots that are to be hammered or squeezed, in a soaking furnace, by raising them from the temperaure at which they can be safely taken out of the ingot mould.

(*c*) In all cases enough of the top of the ingots should be cut off. The temptation always is to cut off too little.

(*d*) If the ingots are for high class steel they should be hammered or squeezed on all sides, and considerable of the top of the ingot cut off before the sheets are rolled. Many steel makers cast a thin ingot and pass it directly into the rolls without hammering or squeezing, and such makers rely more upon the chemical constitution of the steel to gain tensile strength than upon the work put upon the metal.

For high class fire-box steel the slabs should always be hammered or squeezed before being rolled, and should be first cross-rolled to a length equal to the width of the plate which is intended to be made. After this the slab should be reversed in the rolls and rolled cross-wise of the first rolling.

Some of the faults in rolling mills are:

(*a*) Improper cooling of plates by exposing to cold currents of air on one side, or by laying the plate on a cold metal surface.

(*b*) Reducing the thickness of the plates in the mills too quickly, thus reducing the cohesion of the particles in the plate, and thus reducing its toughness.

(*c*) Buckling of the plates, which produces intense local and internal strains.

(*d*) Rolling large plates at too low a heat, which permits the edges to cool before the middle and causes internal strains.

Some of the defects in working are:

(*a*) Working at a blue heat, which is the worst form of bad working.

(*b*) Local heating and working, which is almost as bad as working at a blue heat, unless the plate is afterward annealed.

(*c*) Bad annealing due to ill-constructed furnaces, which unevenly heat and unevenly cool the plates.

(*d*) Punching holes in an improper manner; that is, with improper punches and dies. This is not intended to apply to all punching, and is not intended to mean that drilling is necessary in place of punching. It only calls the attention to the fact that a good plate may be badly damaged by the use of improper dies.

An order has been issued by the British Admiralty for a battle ship 390 feet long and 75 feet extreme breadth, the largest vessel of her kind in the world.

In Thuringia, Germany, there is a whole district which is dependent for its support on the manufacture of artificial eyes; husbands, wives and children all working together at this same means of livelihood. And yet, though these simple German village people turn out their produce by the dozen, no two eyes are ever the same. No artificial eye has its exact fellow either in color or in size in the whole world. The method of the manufacture is not a very complicated art. There are firstly glass plates, which are blown by gas jets, then molded by hand in the form of an oval-shaped cup. Then there is the coloring of the eyes, which is effected by the means of tracing with fine needles, the tints being left to the taste of the individual worker, though the scope of their taste is necessarily limited to grays and blues, and browns and blacks, which colors are assorted together before being eventually despatched to their various destinations.

The Patent Review.

44,485 Arthur W. M Keen, Montreal, Que., connection for belting

44,488 Josiah M. Richmond, Raymond, Nebraska, steam motor machine.

44,493 James Charles Orr, Winnipeg, Man., boiler.

44,500 James Omir Oakley, Montreal, Que., extensible structure adapted for use as a bridge, scaffold, tower, or ladder and the like.

44,502 Hezekiah Casey, Birmingham, Ill., disk sharpener.

44,505 James H. Fitzgerald, Winston, N. Carolina, railroad gate

44,506 Joseph R. Stauffer, Scottdale, Penn., car coupling.

44,507 Alfred Holingren, Brooklyn, N.Y., cylinder and valve of steam, compressed air, and other reciprocating motors.

44,516 Wm. H. Howell, Thorold, Ont., journal lubricator.

44,519 George H. Ricke, Cincinnati, Ohio, hanger for trolley wire.

44,521 Longley L. Sagendorph, Philadelphia, Penn., metallic facing for buildings.

44,522 Robert W. Wyett, Garram, Victoria, Australia, fire guard.

44,524 Webster L. Mills, Condit, Ohio, axle box.

44,526 David A. Sprinkle, Pennsboro, West Virginia wood split pulley.

44,528 Thomas George Laney, Lima, Ohio, steam valve.

44,530 Samuel David Stephens, West Shoals, Indiana, cable arch support.

44,534 G. W. Roberson, Shushan, N.Y., car coupling.

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44,573 J B. Webber, Toledo, Ohio, steam shovel and excavator.

44,574 Wm. McShane, St. John, N B., automatic apparatus for water closets.

44,577 Thomas Critchley, London, Eng., process or method of producing metal barrel bodies or other article of bent form, and the machinery for carrying the same into effect.

44,578 John A. Markley, Clifton Forge, Virginia, car couplings.

44,582 Earle W. Seitz, Kansas, Miss, car coupler.

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44,588 John B. Riddle, Morganfield, Kentucky, car coupling.

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44,591 James A. Smith, Clearville, Miss., pipe wrench.

44,592 Seldon S. Casey, London, Ont., metal fabric tools.

GERMAN PATENTS.

List of patents compiled for The Canadian Engineer at the patent and technical office of Brockhues & Co., Cologne Information on all questions referring to this list is given gratis to our subscribers

Chimney-top or air-sucker; C. W. J Martens, Hamburg.

Draught-regulator with discharging pipe; Otto Horenz, Dresden.

Steam-water outlet pipe with floating-vessel and cylinder-slide; G. Reuter, Mannheim.

Charging apparatus for generators; R Nyblad, Papenburg

Movable grate cooled by water; E W. Orth, Hamburg.

Lubricating vessel for consistent fat worked by a spring; H. Ketel, Treves.

Adjustable crank-pin, J. Quirin, Cologne.

Means for simultaneously lubricating the step and neck-bearing of an upright shaft from one oil can; W. Lefeldt & Lentsch, Schoningen.

Machine for manufacturing hexagonal nuts by forging; A Urban & Sons, Florisdorf, near Vienna.

Safety-valve for steam-boilers; G. Moorman, Gestemunde.

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