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The Canadian Engineer

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MONETARY TIMES PRINTING CO.
OF CANADA (LIMITED).

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

Toronto, January 1, 1894.

THE records of the shipments of iron ore from the Lake Superior district for 1893, show that 5,837,000 tons were shipped by water during the year. The amount shipped by all-rail routes would bring the total up to about 6,000,000 tons, or only two-thirds of the amount shipped in 1892. Notwithstanding the depressed condition of the trade, and the remarkably cheap production recorded by the new Mesaba range of mines, the peculiarities of which have been described in this journal, and whose competition has made it hard for the other mines—still, the outlook for the coming spring is more encouraging than was anticipated three months ago.

A PROCESS of making pipes of cement and iron is now being tested in France. A framework of iron is imbedded in cement and mortar. Bars of an I section are used, which are rolled as long as possible and then wound into a helical form, the pitch of the helix being determined by the section of the iron and the pressure to be withstood. Tanks are also made on the same principle, the pitch of the helix being lessened at the bottom, where the pressure is greatest. The coefficient of the expansion of iron and cement being about the same, no trouble is experienced from changes of temperature. The cement protects the iron from rust.

THAT the partial collapse of the iron market in the United States would lead to exportation at prices hitherto unheard of in the American trade, was only to be expected, and we see that it is actually taking place, as the Louisville and Nashville Railroad is quoting through rates on iron from Anniston, Ala., to Derby,

Eng. The *Iron and Coal Trade Journal* of London views such competition with alarm, and while acknowledging that present figures are panic prices, points out that in the United States events move rapidly, and it is not safe to assume that the figures of yesterday are equally applicable to the present time. There can be no doubt that our American friends have done a great deal of late years to cheapen the cost of production. They have worked for unprecedentedly large yields, reduced the consumption of fuel, cheapened the tonnage cost of labor, secured more economical supplies of iron ore, and made arrangements for cheaper transport, and none of these movements have yet reached finality. The cheapening of production is now the watchword of American furnace practice. Fuel is much cheaper today than it has ever been in the industrial history of America, and it can unquestionably be sold in Pennsylvania and Alabama, with a profit, at a lower price than in any other part of the world. Having invested their capital so largely in the iron industry, American blast-furnace owners are likely to seek for foreign markets at any price, if they cannot find enough to do in their own.

In a letter to the *Empire*, Wm. Hamilton Merritt, of Toronto, argues ably in favor of starting a steel rail industry in Canada. The deputation of street railway men who waited on the Government asking that rails for street railways be placed on the free list, as steam-railway rails are, had reason on their side, but what Mr. Merritt, besides many others connected with the Canadian iron industry, maintains, is that both classes of rails should pay duty in order to develop a steel rail industry at home. In the course of his letter he says: "The United States, through a vigorous treatment of the iron and steel question, is ready for free trade in those articles to-day. We have not even formed a policy to bring them into existence to any extent, for with 'free steel rails' in the nineteenth century, it is impossible, unless a bonus system were adopted, or, indeed, unless the great interests which have brought about 'free steel rails' were compelled by the Government to lend their aid to the operation of steel making in Canada. If that were done, 'presto,' like magic the iron and steel industries would blossom like roses in Canada, and we should have a million more people in our midst. The street railway combination, which controls Montreal, Toronto and Winnipeg, and what other places I know not, is really, indirectly, an offspring of 'the Government' on wheels,' as the Yankees call the C.P.R. Why should not this great corporation have another offspring in the shape of works to smelt and roll their steel rails? As an indication of the importance of steel rails as a raw material, I would draw attention to the fact that in the fiscal year 1891-2 we imported 68,918 tons of pig iron, valued at \$886,485, and 83,000 tons of steel rails (free), valued at \$1,738,661. If the Government decided it was a good policy to create iron and steel smelting in Canada, instead of having \$12,000,000 a year imported, why should not the combined interests of the C. P. R.,

the G. T. R., and the street railway companies be politely but firmly directed by the Government toward the steel rail industry in Canada? It would be but a trifle for interests like these alone to lay the foundations for utilizing the great idle riches which lie dormant in our vast Dominion from the Atlantic to the Pacific, in suitable places for smelting."

THE Americans are certainly paying a great deal of attention to their new navy, and reports of the construction and testing work connected with each new ship are copied widely by the daily press as well as the scientific papers. To man and operate a modern navy requires a skill which is not attained in a day, and one difficulty the American Government finds is to get competent engineers to run their new vessels. Large sums are lost every month through breakages caused by unskilful engineering. The latest addition to the American navy, the "Columbia," built as a commerce destroyer, is thus described by the *Scientific American*: "She may be able to run away from any heavy fighting ship. In war her competitors would be the fastest ships of the British navy. Among these, at present, are the reserve ships 'Campania' and 'Lucania,' of the Cunard line, ships which day in and day out maintain speed approximating to the highest obtainable by the 'Columbia' on her trial trip, ships which from the conditions of their service are always kept in the best possible condition for instant service. Each regular trip consists of a run of some 3,000 miles, in which runs a gain of five or ten minutes over the record is eagerly striven for. It is not improbable that the 'Columbia,' driven under forced draught, straining every fibre under the action of the machinery, stripped and in the most perfect condition for a few hours' run with selected coal, will earn for her builders a premium of \$400,000. After all this she will not have been properly tried. She should be manned with a crew from the American navy, she should be coaled under ordinary conditions of quality of fuel, and her trial course should be the same as that of the Cunard ships or of the German or American line vessels—the course of about 3,000 nautical miles across the ocean. Then we could establish her true rating, and the trial would show whether she could compete in war with the 'Lucania' and 'Campania,' with the 'Furst Bismarck' or the 'Paris.'" As illustrating the progress and possibilities of marine engineering, it is interesting to note that while the American nation was singing its pæans in praise of the latest addition to its navy of that remarkable cruiser, the "New York," the British Admiralty had made provisions for the construction of two ships, as yet without peers in naval architecture. The engines of the "New York" are designed for 16,500 horse power, and her speed placed at 20 knots. The "Columbia" and "Minneapolis" mark a great advance, with their engines of over 20,000 horse power. The British cruisers, already named the "Powerful" and the "Terrible," are to have engines of 30,000 horse power, and to have a speed of 25 knots. In addition to this rate of speed, the armor protection and batteries will be correspondingly heavier and the fighting capacity of enormous volume. And so the modern marine engineer makes advances over previous achievements, with the possibility, by no means remote, of the next naval combat in history shattering at one broadside the latest productions of science, and sending enough scrap iron to the bottom of the sea to bankrupt a state or a nation.

DEVELOPMENT OF CANADIAN IRON MINES.

The present Canadian iron tariff has not been by any means universally popular either among the iron merchants or the iron manufacturers of the country, and it is to be feared that the schedule of duties framed upon only a partial view of the great interests involved. Without going into the question of the inequitable bearing of the duties on some lines of manufactured iron, it will no doubt be confessed by the Government that it was a mistake to bring into being a scrap iron industry while leaving the very source of a really prosperous iron trade—the development of our mines—at a disadvantage. The Government must extricate themselves from their own dilemma. They have put their hands to the plow, and no matter what the interests of tariff reform may demand in other directions, they cannot turn back on the iron question till those who have taken hold of the mining industry have had a fair field.

To show the essential importance of opening up our latent wealth in iron mines, it is only necessary to give a few facts regarding the bearing of such development, not only upon our manufacturing industries, but upon the agricultural interest itself—an interest which at first sight might seem to be only indirectly concerned. At the Radnor Forges in Quebec this winter there are 860 men and 550 horses employed in chopping wood for fuel, teaming, etc. Three-quarters of these men are drawn from the farming community of the region around, these farmers finding employment at a time when little else could be done by themselves or horses. And as to the profitable nature of the employment, we learn of a farmer who from this work cleared a forty-acre lot and made enough to pay for the land and put up a house in 1892, while in 1893 he had the whole forty acres in oats, which he sold to the company. This company paid during the past year \$50,000 in freight and \$250,000 in wages. Thus it will be seen how direct the iron mining industry bears on agriculture, not to speak of the bearing it has in creating trade and commerce, which would influence agriculture in a scarcely less vital way.

Canada is now using up about 500,000 tons of iron products annually, of which four-fifths are imported. If we could produce half of this at home, we should add \$5,000,000 to the annual wage bill paid out in the iron trade, and the capital required in the operation of an industry of such magnitude would be, at a conservative estimate, \$20,000,000. In the production of the pig alone for such a trade 12,000 men would be directly employed. The more the question is looked at from the standpoint of the general interests of Canada, the more evident it will be that in the iron trade, all protection, whether incidental or specific, is useless which does not begin at the mine. The old fisherman's proverb is that it is worth while to throw a sprat to catch a mackerel, but the Government in coddling the scrap iron interest above the mining have reversed the proverb, and thrown the mackerel to catch the sprat.

While the burden of rectifying their past mistakes falls upon the Dominion Government, no doubt the Provincial Governments may each aid the development of new iron mines by setting apart a fund to be used in prospecting. Besides lacking in enterprise, the owners of mining lands are in most cases too poor to do effective prospecting, and a moderate sum might be very profitably spent in this direction by most of our provincial governments.

We give Mr. Drummond's paper on this subject, read before the Quebec Mining Association, as it is desirable just now to remember what are the teachings of history in studying the development of the iron trade of England and the United States.

NEWFOUNDLAND RAILWAYS.

The *London Times* of a recent date had a short article on the railway development of Newfoundland. At present there is a line eighty-four miles long, from St. John's to Harbor Grace, with a branch line of twenty-five miles connecting with Placentia. Another railway has been in the course of construction for over two years toward the Exploits River and on to Hall's Bay, thus going northward through the centre of the island. About 140 miles of the railways are said to be completed, and the whole is expected to be laid down by the end of 1894. The new contract is for a railway of 250 miles to connect these railways with the west coast by way of the Bay of Islands, St. George's Bay, and Port Basque Bay, in the south-west corner. Thus the main part of the island, leaving out the long northern peninsula, will within a very few years be covered with a network of railways, which will leave no excuse for the non-development of the resources of the interior. That interior is in many parts almost unexplored, though it is believed to contain mineral and timber resources of which much could be made. What are the agricultural capabilities of the interior remain to be seen. Over the internal resources of the colony no foreign nation has any lien; and the unrestricted development of these cannot but place Newfoundland in a condition of prosperity which she has never yet attained. The contractors for the new line, who are also to work for ten years the Hall's Bay and Placentia Line, seem to have made a very good bargain for themselves. In addition to the cost of construction, they are to receive two and one-half million acres of land, with the mineral and timber rights upon it, along the new line, and a subsidy of \$36,000 per annum for the carriage of the mails. If they set to work in earnest in the development of their extensive property, the result cannot but be for the benefit of the colony at large.

THE PROFESSIONAL STATUS.

BY ALAN MACDOUGALL.

This report, which came before the Canadian Society of Civil Engineers on Dec. 21st, and again on the 4th inst., was the result of the distribution of a draft report on the present status of the profession of Civil Engineering. Among the suggestions offered by correspondents, etc., were the following:—

1. That Provincial and Dominion land surveyors should be prevented from practising as Civil Engineers, unless they belong to the Can. Soc. C. E.;
2. That an appeal should be made in each province to have members of the Can. Soc. C. E. of all grades recognized as professional men, with the right to collect and sue for fees;
3. That no practitioner be entitled to designate himself a Civil Engineer unless he belongs to the Can. Soc. C. E., pointing to the formation of a close profession. These have been answered in the affirmative by almost every correspondent.

The members resident in Toronto adopted the final suggestion of the draft report at an open meeting, which reads:—

"That at present it is advisable to promote a high professional standard of practice through the medium of the society, by issuing a code of ethics and regulations to govern engineering practice in the Dominion."

One correspondent is opposed to the formation of a close corporation with arbitrary powers in the hands of a "few members of our society," as entirely opposed to liberal and enlightened principles; he also objects to the proposal to ask universities to stop granting the degree of C.E., as likely to lead to a debasement of education in the profession.

One point has cropped up frequently in the discussion, says the writer, which underlies in a great measure the difficulty with which this movement would be confronted. The question is frequently asked: How can you define Civil Engineering as a profession? What is Civil Engineering? Many engineers who do not belong to the society have said to the writer: The Canadian Society is not a society of "Civil" Engineers, because it embraces in its membership all classes—mechanical, electrical and mining; and they say as they belong to one of these branches they do not consider themselves "Civil" Engineers, consequently they are not eligible for membership, and do not wish to become members. The next step of their argument is, that they are now in full practice in their respective branches of engineering; should a close profession be formed with protective rights to the Society only, they would be thrown out of employment, or be obliged to practise against the law, and be liable to prosecution.

It is also asked: What is to be the position of an engineer from a foreign country, in full practice, and belonging to one of the national societies or other great engineering associations in other lands; is this engineer to be debarred from practising, or how is he to be licensed? Must he pass examinations?

It may be somewhat difficult at present to give an answer which will satisfy every objection to the term "Civil" Engineer, as many objectors contend that the definition in the charter and by-laws goes beyond the limits of the "Civil" Engineer when it recites that it "shall mean all who are or who have been engaged in the designing or construction of railways, canals, harbors, light houses, bridges, roads, river improvements and other hydraulic works, sanitary, electrical, mining, mechanical or military works in the study and practice of navigation by water or air, or in the directing of the great sources of power in nature for the use and convenience of man." The objectors point out that the limits of the society are too elastic; they are opposed to mining, mechanical or electrical engineers being called "Civil" Engineers. Some members of our society practising in these branches have expressed doubts as to their right to belong to a society of "Civil" Engineers. There seems to be an under-current of feeling in favor of dropping the affix "Civil" and calling the society the Canadian Society of Engineers. Several practitioners, who are not now members, have expressed their readiness and willingness to join if the name could be changed as suggested above.

On the subject of education Mr. Macdougall would advocate the fullest use of the advantages now offered to students in our magnificently equipped and endowed universities; he has strenuously advocated a thorough

education through the means of these schools, and he is heartily in accord with the work they do in training our young men. On the point of the degree, he is in favor of dropping the C. E., and giving some other degree, as, for instance, in Applied Science, leaving the C. E. to be obtained from the Society after the graduate has fulfilled conditions to be laid down by the Society.

He would recognize the standing of an engineer who belonged to any of the leading well-known societies, and admit him to membership and right to practise on complying with some light formality. He would advocate reciprocity, rather than restriction; he admits that one consequence of the proposed new condition would be that an engineer could only practise as long as he paid his annual fees or dues to the Society; the rule obtains in other professions, there is no reason why it should not be successful in engineering. The writer fails to comprehend the difficulty which appears to have arisen in the minds of many members, that engineering cannot be so designated as to be called a profession; it seems to him that there is no more difficulty in defining Civil Engineering than there is in defining Law, Medicine or Theology.

With reference to the present position of the Society, the object and purpose, as set forth in the charter, is "to facilitate the acquirement and interchange of professional knowledge among its members, and more particularly to promote the acquisition of that species of knowledge which has special reference to the profession of Civil Engineering, and, further, to encourage investigation in connection with all branches and departments of knowledge connected with the profession." Under this charter we are, perhaps, unable to assume the more extended duties of controlling professional practice by licensing our practitioners.

"THE DIAMOND PROSPECTING DRILL IN MINING CANADIAN PHOSPHATE AND OTHER IRREGULAR DEPOSITS."

BY J. BURLEY SMITH, M.E.

It is generally held that the diamond drill is not of the same utility in prospecting and determining the position of irregular deposits as it is in minerals of more regular occurrence. This is more from the fact of the great results achieved in determining accurately the areas, extent, and depth of regular deposits scientifically located, than failure to discover the position of acknowledged uncertain deposits. However great the service rendered with regard to regular deposits, it will be remembered that the value of the diamond drill as a prospecting tool became first properly appreciated from the remarkable discoveries, made through its use, in the great hematite deposits of North Lancashire and Cumberland, England — deposits which from their apparent fitfulness and irregularity had been worked only on a small scale and as mere surface pockets occurring here and there over a considerable area of ground, and abandoned when apparently exhausted, until the boring operations of a few enterprising proprietors taught the lesson that, although the character of the ore seemed irregular, similar deposits occurred at much greater depths and of much greater magnitude, the irregularity, scientifically considered, being but another form of regularity, and the peculiar order in which these deposits were to be looked for. Subsequently, and chiefly owing to the use of the prospecting drill, these mines have been worked to a very great depth, and much more extensively, turning out, annu-

ally, many hundreds of thousands of tons. And the great number of successful results of recent years in such deposits in all parts of the world appears to indicate that the diamond drill is of even greater utility in prospecting these than in the more regular minerals referred to.

The very irregularity which makes some kinds of mining so uncertain shows the necessity of traversing and searching the zone of occurrence in many directions by some method much more rapid and less costly than by shafts and tunnels, and a tool like the diamond drill, capable of drilling from 20 to 40 feet per day, and bringing out cores of the material passed through, seems to fulfil, in a great measure, these required conditions. Through its use prospecting of a mineral property can be exhaustively and reliably carried out in a few months, and cross sections delineated, showing the number and size of the deposits, from the plotted profiles of which the quantity of ore contained may be approximately calculated, showing if the quantity discovered is large and near enough to bear the greater expense of sinking a shaft or driving tunnels to reach it.

Thus, by the expenditure of a few thousand dollars in the prospecting machinery, and the cost of the necessary boring operations, the owner of a property is able, figuratively, to cut his property into slices and see what is inside, the accuracy of which depends of course on the number of cuts made. And instead of risking a large sum in the purchase of a costly permanent plant and machinery to begin active mining operations for a mineral only doubtfully believed to exist, it may be ascertained by a properly arranged system of borings [practically constituting an approximately accurate underground survey showing the extent and location of detached and irregular deposits] whether it is advisable to lay out money in plant at all, or how much, and even if it is desirable to mine a property or not. If valuable, the very best machinery can be laid down without hesitation or risk, for the most economic method of sinking or driving to, and mining the mineral when reached.

At the same time an approximate knowledge of the quantity, making it feasible to determine, in advance, all the questions of transport and annual yield; the laying down of tramways and transport generally; and the use of available water, or other gratuitous power, to the best advantage.

Negotiations for sale or purchase would also be much simplified from the fact of the real value of the mining estate being established, the cores of mineral and country rock, with the accompanying chart and sections, being the best evidence of the character of the property.

In mining phosphate of lime in Canada the prospecting drill is certain to prove of the greatest possible service.

It is now pretty clearly demonstrated by those eminent Canadian geologists who have earnestly investigated the phenomenon of occurrence of this peculiar mineral, that it is found, with rare exceptions, in detached masses or pockets, sometimes resembling veins, in masses of pyrotene, which, originally considered as interbedded portions of the structure of the Laurentian rocks, are now generally acknowledged to be intrusive dykes, probably connected with the basic eruptions of Archæan date.

Very recent observations made in the actual mining of phosphate corroborate in a remarkable way these conclusions, and give at once a basis from which to start in searching for the mineral.

The question of irregularity and uncertainty of the phosphates is not disposed of, but the occurrence and form of the pyrotene are shown to be not irregular and it may be easily recognized.

It is well known that these pyrotene zones, belts, bands, or whatever name they are distinguished by, are readily found and their boundaries clearly defined.

Granting this, it will be seen the field of operations for the diamond drill prospector is not unduly large, and that a comparatively few carefully selected bore holes will show if the zone is rich in phosphate, or not, the character of the deposit, rich or poor, generally prevailing throughout, and if it is desirable to make further and more conclusive tests, or proceed to another field without loss of time or money.

If a number of vertical borings, placed at fixed intervals, with their situation carefully recorded on plan, are made, and a proper register kept, together with the drill cores brought to surface, a number of accurate profiles may be constructed, showing a faithful section of the ground tested and whatever it contains, and if parallel lines of borings be made at a convenient distance it will be seen that the area of these respective profiles multiplied by the parallel distances apart, will give approximately the quantity of material lying between, whether of unproductive ground or a deposit of mineral.

MINE TUNNELS AND TUNNEL TIMBERING.

BY W. A. CARLYLE, M'GILL UNIVERSITY, MONTREAL.

Location.—In the selection of the site for the tunnel-entry, care is taken to choose a place (1) as easy as possible of access by trail or road; (2) but chiefly at the lowest point, so that the greatest possible area of the ore deposit may be worked over-hand after the tunnel reaches it, and at the same time be drained naturally of water, all geological data having been sought out by surface examination and test-pits. Good and sufficient dumping-ground is also provided for, care being taken, by survey if at all doubtful, that the tunnel will be on the right territory, and that the waste rock on the dump will not fall so as to trouble other property or block public roads, or by any possible means incur litigation, or impede future mining operations.

Often in the early life of a claim, to develop the character and value of the ore-body, a tunnel is run at a point higher up, so as not to be, at first, of too great length and cost, but afterwards a longer tunnel is driven in at a much lower level after the upper one has proved the claim to be good, and enriched the mine too plentiful supplies in the company coffers. Again, a tunnel may sometimes be profitably driven, as from the other side of the hill or mountain, so that its mouth will be in a most advantageous position for connection with an aerial wire-rope tramway, by which arrangement, although the first cost will be more, the cost of transport of ore from the slope to mill or railroad will be so lessened as to quickly repay the extra initial outlay. For this reason, it may be wiser to use a tunnel instead of a shaft, even if the latter is much the more preferable for the mining of a deposit—and when work must be done below the tunnel level, this is now rendered very easy by sinking inclines and placing at their head rapid and powerful hoists operated by electricity or compressed air; and if water is encountered

pumps can now be got that will do, beyond peradventure, most efficient work with either of these sources of power.

In all cases the tunnel must be run right straight for the vein, and for this it may be well to call in the aid of the surveyor, whose directions should be then closely followed, for if even a slight deviation is made, say to work along softer ground, one's course is quickly lost under ground and a queerly shaped tunnel is the result. This direction is easily kept by lining in the miners with plugs driven into the centre of the roof and plumb-bobs suspended from them, or using stout screw-eyes in the caps of the timbering.

Timbering.—It is seldom that the rock in the tunnel will stand long without support, excepting some classes of granite, syenite, gneiss, or firm limestone or sandstone; and as the primary object of timbering is to *prevent*, not *check*, the movement of the ground, it is generally best to timber up at once if the rock is at all liable to be weak, as so often the rock under strong tension will collapse without any warning, or immediately after examination, and timbering will then be far more expensive in the end.

Spruce, pine and hemlock are mostly available for such service in our American mining, and then they are best if the trees have been killed, but not damaged by fire, and stand straight, dry and strong, as the green; wet stuff is very heavy to handle under ground. Such timber, cut above altitudes of 7,000-8,000 feet, was found in Colorado to be much inferior in strength to that from lower down, being less resinous and "brashy."

For the framing, good drawings were given the carpenter, who then made very accurate turnplates by which its different pieces were quickly marked and cut so that each set always fitted together perfectly. If a set ever did show signs of collapse, another was at once put in beside it, and where the tunnel had passed through some porphyry that afterwards swelled and forced the timbers all out of shape, the only relief was gained by every little while working away the rock behind the timbers until this swelling ceased. Where bad receiving ground is met with, the greatest care is imperative lest the men be suddenly overwhelmed or hundreds of feet of the tunnel filled up in a few minutes. The timbering being right up to the heading that threatens to burst in, this is prevented by slipping in the breast-boards or horizontal planks across the face between the last sett and the rock, then over the cap and behind the posts are driven out the chisel-pointed spikes, 3 in. x 6 in.-7', as far as they will then go. Next begin at the face by working around the top breast-board until it can be pushed ahead 6 in. to 12 in., and held there by props against the sett, and then the other planks down to the bottom. As soon as possible the "false sett" is put in place to prevent the spiling from closing in too soon, and I believe the best, handiest and cheapest form of false sett is that used by Mr. D. W. Brunton in this tunnel. When in the wash very difficult ground had been traversed by spiling, but the old method of keeping the heading open until a new sett could be put in, by holding the spiling out by any possible props or scheme, used a great amount of timber and allowed an immense deal of sand and mud to enter the tunnel. With this new device the work was wonderfully simplified and much better controlled. Two strong posts notched at the foot to crowfoot into the corners of the mudsill and posts, supporting on their top ends

a length of 5-in. gas pipe, bent to a shape to correspond with the timbering used, were fastened to the top of the last sett by turn-buckles and rods passing through near their heads. This last sett was tied back to the next sett with turn buckles and rods passing through bobs near the four collar-braces. Now when the breast-boards had been gradually and laboriously worked forward far enough and held by stays that could not obstruct the new sett, this was now set up, the bridging put on to keep the spiling from passing down directly on the timber and reserve a space through which the new spikes should pass, and then by loosening the turnbuckles the false sett was lowered until the enclosing shield of spiles rested on this new timber and four more feet were won. If a great flow of water and sand, under great pressure, is experienced, about all one can do is to let it drain until it lessens or stops, as will be the probable result. One detail in this kind of work must never be forgotten—a 100 feet or so back from the face, and perhaps again at 200 feet, is kept a supply of planks of proper length, so that should the breast suddenly give way, the miners running back, can at once build up a dam or bulkhead by laying these planks across the tunnel against the timbers. This is generally done in the dark, the sudden in-burst extinguishing the lights, and the treacherous sands may pour in as fast as the men can run. In a larger tunnel, in the same place, through neglect of this precaution, 600 feet of the tunnel was thus filled up and temporarily lost, necessitating much which might have been avoidable expense in the recovery.

CANADIAN IRON INDUSTRY.

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

"There is a tide in the affairs of men,
Which, taken at the flood, leads on to fortune;
Omitted, all the voyage of their life
Is bound in Shallows and in Miseries.
On such a full sea are we now afloat;
And we must take the current when it serves,
Or lose our ventures."

These lines apply with peculiar force to Canada in the present stage of her iron industry.

Events are transpiring from day to day in the neighboring Republic which demonstrate that the iron industry of that great country has now reached such magnificent proportions, under the wise protective policy so well maintained for the past forty years, that American iron masters are able to compete on equal terms with the world.

History repeats itself. As with England at the middle of this century, so now with the United States. Her iron industry has reached that stage when the Government of the country can consider the question of a reduction in its protective tariff with comparative safety to the industry itself.

Here in Canada the iron industry, still in the pioneer stage, although under Government encouragement showing an increase in actual output of nearly 100 per cent. in the past two years, broadening out day by day, making a place for itself in the home market, and in the face of many difficulties displacing gradually the products of American and British furnaces, finds itself, at the most critical stage of its existence, threatened by a premature demand for a reduction in the current protective duties, which, if acceded to by the Government, will surely prevent further progress, if indeed it does not altogether annihilate the industry, by exposing it,

before it is yet established, to the hostile competition of foreign producers, particularly to the competition of American furnacemen, who have of late been the chief, if not the only competitors for our most important territory, viz., the markets of western Canada.

To produce pig iron, the basis of all subsequent stages of the iron industry, a very heavy initial expenditure has to be made in the prospecting, securing, and development of mines, woodlands, limestone quarries, railways, shipping docks, etc., necessary to secure a constant supply of raw material.

The establishment of the plant itself demands a heavier outlay, in proportion to the value of the product, than is required for the production of any other staple. It is the experience of almost every iron master that in the early period of iron making, in all countries, the work is more or less of an experimental nature, and as it must be carried on upon a large scale, and if unsuccessful the investment becomes worthless, the risk of ruin to the first adventurers is great.

It has necessarily resulted from these causes that to start an iron industry on an important scale, in any country, however favorable its apparent natural conditions, State aid, either by direct bounty, by heavy protective duty, or by both combined, has been found necessary, and it is those countries where this has been *effectually done* which are to-day the large producers of iron, not only supplying their own wants, but also those of other countries.

To deal with this question intelligently, it is well for Canadians to view, as briefly as the importance of the issues will permit, the history of the establishment and successful development of the iron industry in other countries, and particularly note the broad, liberal policy of protection under which Great Britain and the United States alike built up the greatest and most successful industries of modern times.

The importance of the issues will perhaps in some measure excuse the lengthy references to the methods adopted by our competitors to bring about the successful development of their iron industries, and a description of the splendid equipment they now possess in furnace plant, shipping docks, and other accessories necessary to economical working, will perhaps not be out of place.

John Stuart Mill says: "To draw inferences is the great business of life." In the light of what has been accomplished by wise administration in other countries, particularly in Great Britain and the United States, Canada may be guided as to the best and surest course for the early development of the great mineral wealth with which God has blessed her.

GREAT BRITAIN.—The history of the British iron industry dates back to the days of the Roman occupation, as evidenced by the fact that in Kent, Sussex, Gloucester, Yorkshire, and many other parts of England large quantities of iron cinder, as old as the Roman era, have been discovered. This has been further proved by the finding of Roman coins, pottery and altars in connection with the cinder.

From the days of the Romans down to the middle of the 17th century, the furnaces and forges of England were operated altogether with charcoal as a fuel. Aided by the protection to native iron inaugurated by Edward III., during his reign, from 1327 to 1377, the iron industry made very good progress.

In the 14th century the ironsmiths of England had brought the trade to a fine art, aiding thereby to

establish the present industrial pre-eminence of England, locks, keys, hinges, and bolts produced during that period having never since been equalled in beauty of design.

In 1615 it is said that there were 800 furnaces, forges, or other mills making iron with charcoal, of which Dudley, a few years later, estimated that about 300 were furnaces, the weekly product of which was about 15 tons each.

The charcoal iron industry seems to have reached its height towards the close of the reign of Elizabeth, when the trade became so prosperous that instead of importing iron as she had hitherto done, England began to export it in considerable quantities, in the shape of iron ordinance. The extent of the operations, however, began to exhaust the forests of England about the beginning of the 17th century, and the British Parliament had to give its serious attention to the question.

In 1740 the production of pig iron in Great Britain was only 17,350 tons, her iron industry, at this time, having been almost destroyed by the decreasing supply of charcoal.

About 1750, mineral coal, in its natural state or in the form of coke, came into notice as a substitute for charcoal. The iron trade of England and Wales at once revived, while that of Scotland may be said to have been actually created by this new fuel.

Great improvements were introduced in the furnace plants of Great Britain, and the industry from that date forward advanced steadily.

In 1787 the British Government adopted a strong protective tariff for their iron industries, the duty on pig iron being placed in that year at 67/2 per ton, with higher rates for manufactured iron. This duty on pig iron was later on increased in 1819, and again in 1825, and the protective tariff in this department was maintained down to the year 1845.

The effect of the introduction of mineral coal, and of the protective duties levied on foreign iron, was most beneficial. The industry at once showed strength, and from that date continued to grow rapidly, until in 1796 there were 104 furnaces in England and Wales producing 108,793 tons of iron, and in Scotland 17 furnaces producing 16,886 tons.

In 1820 the total production had reached 400,000 tons; in 1825, 581,367 tons; in 1840, 1,396,400 tons, and in 1854, 3,069,838 tons, this quantity being then estimated as fully one-half of the world's production of pig iron.

In 1889 Great Britain's production of pig iron had reached 9,321,563 tons of 2,000 lbs. This with a population estimated at thirty-eight millions, gives the enormous production of 495 lbs. per head. Of this output Great Britain herself consumes 250 lbs. per capita.

(To be continued.)

THE CHEAT RIVER BRIDGE.

Cecil B. Smith read a paper on the 4th inst., before the Canadian Society of Civil Engineers, upon the masonry work of the Cheat River Bridge. This bridge was built during 1892-3, by the Baltimore and Ohio Railroad Company, at its crossing of the Cheat River, on the State Line Railroad, between Uniontown, Pa., and Morgantown, W. Va. The author of the paper gave a very full description of the work, and an understanding of the details was rendered easier by means of several plates showing plans of the piers and general

construction. However, the object of the writer was not so much to give matter of great interest to the older members of the profession, as to afford a little interesting reading matter to those who were only just beginning to turn their minds towards such structures.

A CUBIC YARD OF CONCRETE.

BY HENRY F. PERLEY, M. CAN. SOC. C.E.

A paper under the above title was read before the Canadian Society of Civil Engineers in Montreal on Thursday, December 7th. The writer, after a brief sketch of the changes that have been taking place in the matter of building materials, goes very thoroughly into the composition of cement, which is the most important ingredient in concrete. On analysis he shows that in a good cement, calcium oxide (lime) shows up first, with a percentage of about 60, silica coming next with about 22 per cent. of the whole. Then comes an analysis of a cement obtained from good "slag," from which it appears that there is a deficiency in lime, it only amounting to about 46 per cent. instead of 60, as in ordinary cement. The goodness of Portland cement, says the writer, depends:

(1) On the proper constituents of the materials employed.

(2) Upon their being properly mixed in the right proportions.

(3) On the exact amount of calcination.

(4) The degree of fineness to which the clinker is reduced by grinding.

(5) The thoroughness with which it has been sieved, to obtain only the finest particles, and the rejection of all coarse parts, and

(6) A careful air-slaking for at least one month, to permit the cement to cool and purge itself of free lime.

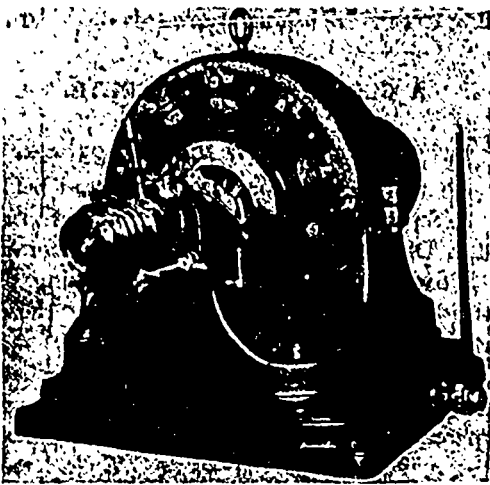
The writer then speaks somewhat exhaustively of the mechanical tests that are used in order to judge of the goodness of the concrete, such as its specific gravity, weight per cubic foot, fineness, tensile strength, adhesive strength, and compressive strength. In connection with the tensile strength tests, full descriptions are given of the various forms of briquettes used in the operation. After referring to "components," or the materials used with cement in the manufacture of concrete, a section of the paper is devoted to the subject of mixing, which forms a highly important factor in the final result. The paper concludes with information concerning the modes of depositing the concrete in the place it is to occupy, which vary very considerably, according to position and other circumstances. A report of the discussion which followed the reading of the paper will be found elsewhere in this as well as in our last issue.

An institution which we feel sure is destined to have a useful and prosperous career has just been started by J. C. Siebert, 47 Church street, Montreal, in the form of a school of electricity. Mr. Siebert has been for several years connected with the Edison, and afterwards with the General Electric Company, and has therefore had opportunities of obtaining a good practical as well as theoretical knowledge of electricity. A large number of stationary engineers and those of other branches also are now becoming students of electricity, and Mr. Siebert's school will afford such learners as well as general students an opportunity of acquiring a knowledge of the science on reasonable terms.

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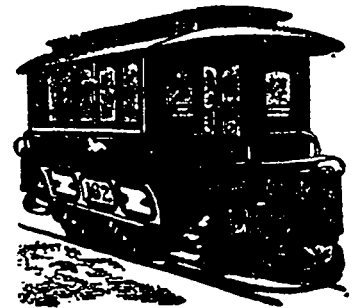
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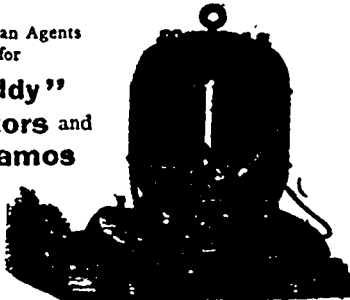
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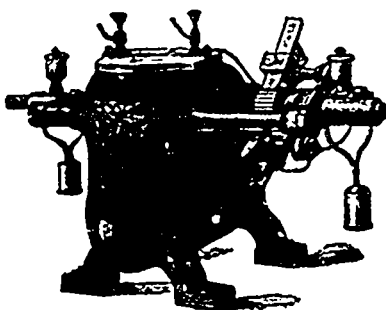
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STATE VOLTAGE REQUIRED

Electrical Department.

ELECTRIC lighting is expected to develop rapidly in Great Britain, now that the patents there on the Edison incandescent lamp have expired. A number of London firms have made extensive preparation for placing a large stock on the market at once. German and American lamps will be imported and the Edison and Swan Company are expected to reduce their prices very much in the attempt to retain their business, which is at present a monopoly.

THE question of having electric street cars provided with vestibules for winter service has been discussed a good deal in Toronto and Hamilton, and the decision of the management of those two systems against the vestibule car has been severely commented upon in many quarters on grounds of humanity to the motor-men. Bengough, in one of his witty cartoons, represented the Toronto manager as responding to the appeal of the motor-man by asking—"What do you take me for? Do you think I'm a d—d human being?" While we do not attribute motives of inhumanity to the manager of the Toronto street railway, we do not think that the objection made to the vestibules are such as to weigh against their advantage. The objection raised against the vestibule is that the glass becomes frosted on cold days, but we may point out that in Ottawa and Peterborough, where the winter weather is colder than in Toronto and Hamilton, vestibules are used with great success. In Ottawa the glass front of the vestibule is kept clear on the coldest days by a very simple expedient. The motor-man has a small cloth bag filled with salt, and this bag is rubbed over the glass each trip. This gives no trouble and keeps the glass quite clear during the whole trip. Another simple plan would be to have a double window constructed in the form of a bull's-eye at the front of the vestibule, which plan would keep the glass clear in all but the most severe weather. This much is certain, that the motor-man should at all times have perfect control over not only his faculties of mind, but also over every muscle of his arms, and this cannot be expected of a man who is half frozen. Business considerations alone, apart from humanity, should prompt electric railway managers to study the comfort of the motor-men to this extent.

ONE of the remarkable features of the extension of the electric street railways is their complete success as a means of transportation between large cities and their surrounding suburban towns and villages, not only for passengers but for freight. Their use is rapidly extending in all large centres of population on this continent, and in many cases they have entirely surpassed the steam railways as a medium of local traffic. A noteworthy instance of this development is to be seen at St. Paul and Minneapolis, in the United States. Before the introduction of the trolley lines between these two cities, which are only a few miles apart, the steam railways did a very heavy and profitable business, but since the electric railways have been started they have shown themselves to be so much more suitable and are so largely patronized that the steam lines have practically gone out of the business. The same change is going on in Canada, and our news columns

since this journal was started have given ample evidence of the rapidity of this change. Toronto has now a network of electric street railways connecting all the immediate suburbs, and lines have already been laid, or are being laid, to such places as Scarborough on the east, Mimico on the west and Richmond Hill on the north, with prospects of further early extensions. In Montreal a similar movement is going on and a line is now running to the Black River as the pioneer of a network of suburban electric railways to cover the island of Montreal. It is not alone in respect of its freight and passenger handling capacities that the electric road is superseding the steam road for suburban traffic, but its facilities for mounting steep gradients render it peculiarly suitable for the purposes of pleasure-seekers and tourists. An electric road has been projected for enabling visitors in Southern California to view the scenery of the Sierra Madre, it being intended to take the visitors several thousand feet above the sea entirely by a trolley line, with the exception of one lift of 3,500 feet from Rubio Canon to the summit of Echo Mountain. On this lift a cable car will be used, but even for that the cable will be run by an electric motor with power derived from one of the mountain streams. Montreal will shortly furnish another instance of this use of the electric road, as surveys are now being made for a line which will rise to near the summit of Mount Royal and enable the sight-seer to view the scenery from every side of that romantic eminence. It is only six years till the dawn of the twentieth century, but those who live for that short time will no doubt see still more wonderful changes wrought by electricity than have yet been accomplished.

Electric Flashes.

KNOWLTON, Que., people seem to be well pleased with their electric light

THE Peterboro' Street Railway Co. are putting electric heaters in all their cars.

THE electric light machinery at Arnprior, Ont., has lately been run by steam power.

THE Hamilton Electric Street Railway put in a new electric sweeper the other day.

THE Carleton Place, Ont., Electric Light Co.'s new 120 h-p. steam engine is now in position.

EDMONTON, Alta., was in darkness recently for a fortnight owing to the breaking of a shaft.

THE people of Claremont, Ont., want telephonic communication with Uxbridge, Pickering and Toronto.

THE Tilbury, Ont., Electric Light Co. have put in a new boiler purchased from Geo. White & Sons, London, Ont.

THE town of Dundas, Ont., has had a large fire alarm plant installed by T. W. Ness & Co., of Montreal and Toronto.

THE East Toronto Council has awarded the contract for its fire alarm system to T. W. Ness & Co., of Montreal and Toronto.

THE General Electric Co., Toronto, are considering the purchase of the three tramway lines of Vancouver and Westminster.

THE managers of St. Andrew's Church of Carleton Place, Ont., have placed their order for electric light wiring and fixtures with T. W. Ness & Co., Montreal.

It is stated that the power from Niagara Falls will be ready for use on Feb. 1st.

G. C. SIDBERT, electrical engineer, is starting an electrical school in Montreal.

THE Commercial Cable Company have declared a quarterly dividend of 1 $\frac{3}{4}$ per cent.

TELEPHONIC communication is to be established in Stanstead Plain, Que., by the Skinner Telephone Co.

THE I. C. R. electric light plant, at Moncton, has been increased by the addition of a 125 horse-power engine.

A COMPANY has been organized for the purpose of building a street railway between Rat Portage and Keewatin, Ont.

THE Bell Telephone Co have just completed the construction of a line between New Hamburg and Shakespeare, Ont.

M. MOODY & SONS, of Terrebonne, have recently had their place wired for electric light by T. W. Ness & Co., Montreal.

THE Bell Telephone Co. will apply for sanction to increase their borrowing power to 75 per cent. of the paid-up capital.

TORONTO STREET RAILWAY Co. are petitioning to extend their tracks on Dundas street to the north-westerly city limits, near Royce avenue.

THE new Saltfleet trolley car line will probably obtain its power from the Hamilton Electric Light and Power Company's station on the Beach.

ONE evening last month the armature of a Montreal street car burst, causing it to take fire. The blaze was extinguished before serious damage was done.

THE Edmonton, Alta. Electric Light Co., besides adding a new dynamo of increased capacity, are thoroughly overhauling their wiring and other plant.

CARLETON PLACE town officials will have free use of Bell telephonic advantages, and in consideration of this the company's property will be exempted from taxation.

THE Commercial Cable Co. have signed a contract with Siemens Bros. for laying the new Atlantic cable between Nova Scotia and Ireland, a distance of 2,200 miles.

THE Pontiac Telephone Co., which have central offices at Fort Coulogne, Bryson, Campbell's Bay, etc., will likely form a connection with the Bell system at Ottawa.

A JOINT STOCK company is being formed at New Hamburg, Ont., for the manufacture of a new air motor and electric dynamo for the lighting of residences in the district.

THOS. DAVEY, employed in the electric light plant at Holmes & Leighton's saw mill Harrison, Ont., was caught in the shafting and instantly killed, when no one was at hand to see.

CONSIDERABLE electric light wiring has recently been put in at M. Lefebvre & Co's beet root sugar factory, Berthierville. The work has been done by T. W. Ness & Co., Montreal.

THE Niagara Falls & Clifton Suspension Bridge Companies will petition the Dominion Parliament for the privilege to lay tracks for the purpose of running electric cable or horse cars.

THE Montreal Street Railway Co. now have in use four electric sweepers, an electric plow, and fifteen walk-away horse plows. Several leaders for saving life are now under the company's consideration.

GREAT is the power of the telephone! A livery-keeper of Toronto sued the Bell Telephone Co. for damages on the ground that the omission of his name in one of the company's subscribers' lists caused his business to fall off 50 per cent. during the period in question.

IN the Quebec Legislature clauses 2 and 3 of the Act relating to the Montreal Street Railway were struck out. These clauses empowered the company to consolidate with or acquire the franchise of any other company on the island of Montreal, and also to expropriate any real estate thereon.

F. W. DOANE, city engineer, Halifax, N.S., has been visiting several cities in the United States with a view to deciding as to the best system of rapid transit. He recommended the electric trolley system, and it is probable that before long some scheme will be put forward for constructing an electric street railway for Halifax.

THE trial trip of the Park and Island Railway Company's electric line to Sault aux Recollet took place successfully a few days ago. The cars are considerably larger than the ordinary street electric cars. The system will be extended to forty miles of track during next year. The present track is laid on a solid stone bed and is built entirely on ties, T rails only being used. The power is furnished by the St. Jean Baptiste Electric Company.

THE officers of the Hamilton Street Railway Co. are now as follows: President, B. E. Charlton; vice-president, E. Martiu, Q.C.

SIGISMUND MOHR, manager of the Quebec and Montmorency Electric Power Co., died a few days ago of inflammation of the lungs.

THE Montreal Electric Street Railway Co have bought up the privileges of the Standard Light and Power Co. in Ste. Cune-gonde and St. Henri.

THE Montmorency, Quebec and Charlevoix Railway Co. have obtained legislation authorizing them to change their motive power to electricity and to enter the city of Quebec.

FRED. HARE, a boy of 15, tried to jump on a Toronto street car whilst in motion. He missed his hold and slipped in front of the trailer, which passed over his body, killing him almost instantly.

G. & G. FLEWELLING are placing a dynamo in their wooden-ware and match mill, at Hampton, N.B. This will feed 100 lights in the mill, and about 100 lights more in the streets and private houses, etc.

THE Woodstock, Ont., Street Railway Co. are applying for a charter. It is said that their object is to obtain power from Niagara to run not only this line, but also electric railways to surrounding towns.

TORONTO electric cars were lately proposed as assistants in the collection of city mails, but the postmaster draws attention to the fact that the post-office and the Union Station platforms are not on any trolley line.

THE directors of the Hamilton, Grimsby and Beamsville Electric Railway Co. will ask for power to run their line to Burlington Beach, Smithville, &c., and also to run a light and power business, says the Hamilton Times.

ALBERT J. CORRIVEAU, a contractor well known in connection with the Montreal Park & Island Electric Railway, has gone into business at St. J. in Montreal as "The Canadian Electrical Construction Manufacturing and Supply Company."

TELEPHONE connection has been established between Vancouver, B. C., and Ladner's Landing, on the Fraser River. The line will ultimately be extended to Blaine, Wash., and there connected with the telephone system of several towns in that State.

By the completion of the metallic circuit system, the Bell Telephone Co. are enabled to make considerable reduction in their rates for long distance messages. This change has already given great satisfaction, and will, no doubt, result in a profitable increase of business.

OWING to the resignation of D. W. Higgins, C. T. Dupont has been elected president of the National Electric Tramway and Lighting Company, Victoria, B. C. Mr. Higgins will still retain the managership of the company's lighting business.

THE directors of the Hamilton, Grimsby & Beamsville electric road have placed an order for 1,300 tons of steel rails, and hope to have the line in operation by next July. If possible, connection will be made with the Niagara Falls River and Park Railway.

THE contract for the electric light wiring of the new Bank of Toronto building, corner of St. James and McGill, Montreal, has been awarded to T. W. Ness & Co. It is specified in this contract that the "Bishop" White Core Rubber Covered Wire is to be used, and the wires throughout the building encased in interior conduit.

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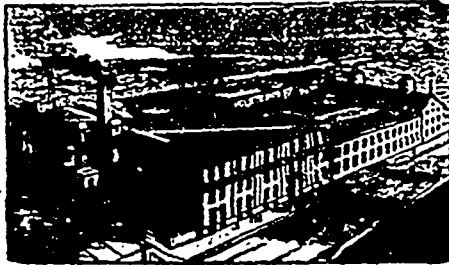
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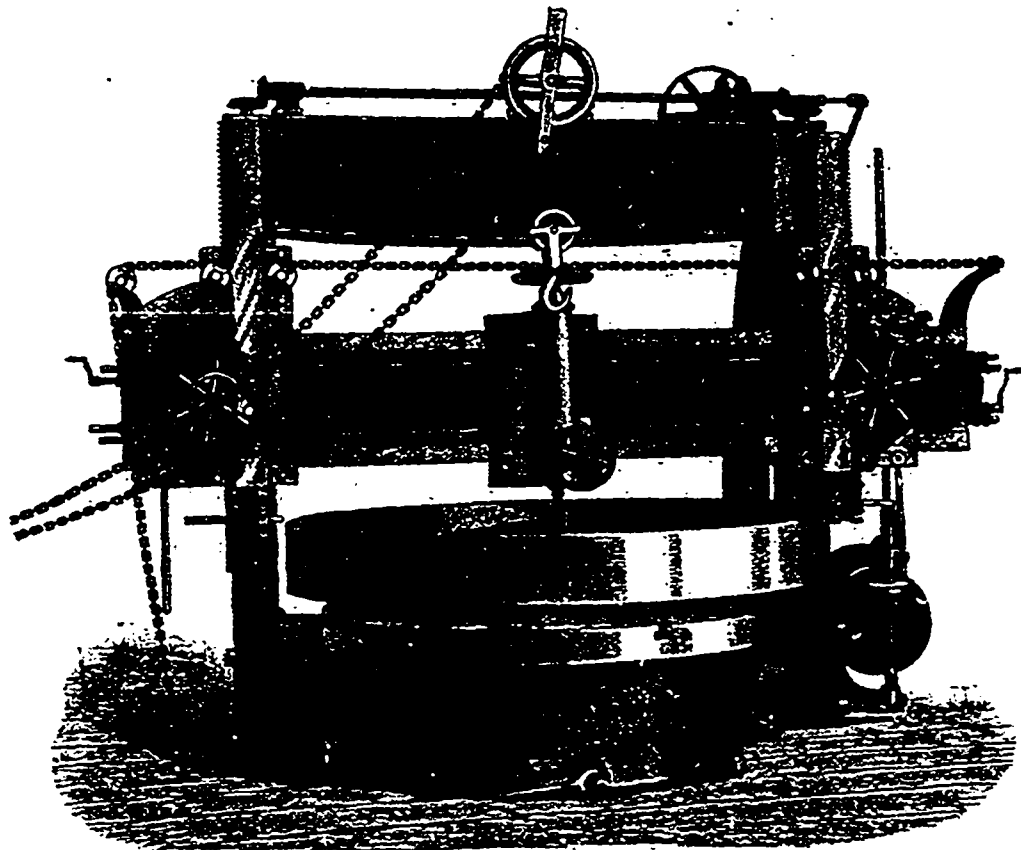


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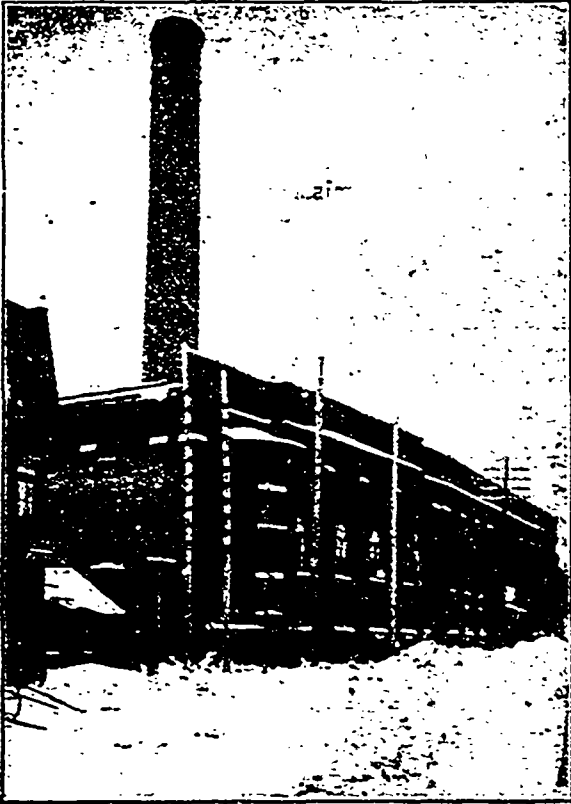
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THE MONTREAL STREET RAILWAY POWER HOUSE.

This power house, an illustration of the exterior of which appears herewith, will, when quite complete, be perhaps the finest of its kind on the continent. The engine house is two hundred and thirty-five feet long by eighty-nine feet wide. There are six 600 h. p. (nominal) engines, built by Laurie Bros., of Montreal. They are horizontal, cross-compound, condensing engines, with Corliss valves. Cylinders 24 inches and 48 inches by 48-in stroke, speeded to run 68 revolutions per minute, and guaranteed to develop above horse-power at the most economical point of the cut-off, with a boiler pressure of 125 lbs. The drive wheel is 24 feet in diameter with 54-in. face, double crowned, so as to drive two



belts. Each engine will drive two 200-kilowatt generators. The gross weight of fly-wheel is 40 tons, the total weight of the engines being about 85 tons. The foundations on which the engines are built are brick and cement and concrete, and were made by the contractors themselves, Ross & MacKenzie, Montreal, under the superintendence of James Hill. The depth of the foundations is about 15 feet below the floor level, and the weight fully six and a half times as much as that of the engines. The foundation bolts of the engines can be reached by tunnel in the foundations. The engines are raised 7 feet above street level, so as to keep them clear of possible floods in the spring time; and this accounts for the great depth of the foundations. In the basement below the engines there are Worthington condensers, one to each engine, and part supplied by Worthington and part by the Northey Co., Toronto. The water for condensing and steam purposes is drawn from the Lachine Canal in a 20 in. pipe. Connection is also made with the city mains, so as to supply water for steam purposes from that source should the canal be run off at any time. The boiler house adjoining the engine house is 117 feet long by 93 feet 6 inches at the back, and 118 feet in front. The firing floor was put in by Wm. Rodden & Co., Montreal. There are 12 Lancashire boilers made by Daniel

Adamson & Co., of Dunkinfield, Manchester; size, 28 feet long by 7 feet diameter, working pressure 125 lbs. Each boiler is capable of giving over 300 h.p. The shells are in 8 courses or rings of one plate each, $\frac{5}{8}$ in. thick. The flues are $7\frac{1}{8}$ in. to $1\frac{1}{2}$ in., ends of same $\frac{5}{8}$ in., and the circular joints of the flue rings are made with the makers' patent anti-collapsible flange seam with wrought iron strengthening strips between flanges, thus causing no rivets to be exposed to the action of the fire. Green's Economisers are built in the flue, and through them the feed water passes to each battery of boilers. The fire floor is raised in like manner to the engine floor, so as to avoid possible floods. The chimney stack is 186 feet above the level; 9 feet internal diameter. The main steam pipe is 18 inches in diameter. All the steam pipe has been supplied by McDougall Bros., of Montreal.

WIRE ROPE TRANSMISSION.

BY ALEX. R. GREIG, THIRD YEAR STUDENT, ENGINEERING DEPARTMENT, M'GILL UNIVERSITY.

Rope transmission consists in the use of an endless rope, running in grooved sheaves, instead of an ordinary belt, running on flat or crown pulleys.

Of late years wire rope has come into such general use on account of its great durability, and also on account of its having so little tendency to stretch, it has almost entirely superseded hemp rope for transmission of power.

The distance to which power can be transmitted by wire rope ranges from 60 feet upwards. Wire rope transmission comes into use where a belt or line of shafting becomes too long to be used profitably, and in point of economy it is much cheaper than its equivalent, either in shafting or belting. This method of transmission has been largely introduced, with great success, in Europe, for many years past, and is now developing rapidly in this country.

Power can, by this method, be transmitted in any desired direction, up or down hill, across rivers or around obstacles, thus bringing into use powers which have hitherto been comparatively useless. The ropes hang free in the air and require no protection of any kind, except an occasional coat of coal tar or raw linseed oil, which may be swabbed on when the rope is in motion. The coal tar may be heated and poured slowly into the groove in which the rope runs.

When put up properly, the rope runs perfectly smooth and noiseless on vulcanized rubber filling, and is not affected appreciably by atmospheric influences.

This system of power is especially applicable in mines for running hoisting, hauling or pumping machinery, in shafts, tunnels, or on inclines situated at a distance from the main plant.

This mode of transmission is also peculiarly adapted to the use of cotton gins, powder mills, etc., where it is desirable to have the engine placed at a considerable distance from the works. This system is coming into almost general use among the cotton ginners of the South.

In many localities where good water power can be obtained, and when steep or uneven banks prevent the erection of buildings in their immediate vicinity, rope transmission furnishes a complete remedy. It is sometimes necessary to carry the power across a stream. In such a case, where the stream is too wide to span, an intermediate station would be required on which to erect carrying sheaves.

In streams subject to heavy ice pressure, a stone pier similar in construction to a common bridge pier could be put in; or a timber crib could be erected on shore, and floated out to the proper place, where a bed has been levelled off for it; the crib is then sunk by loading it with cobble stones or loose rock. It should be constructed in the form of a triangle, so as to form an angle with the water vertically as well as horizontally. It is better to leave the timbers round on the inside, so that the stones may take a better hold on them. The timbers across the bottom should be placed about 10 to 15 inches apart, according to the size of the filling. The timbers are sometimes smoothed off on the outside and covered with rough planks. In streams not subject to heavy ice, an earth embankment or artificial island may be put in with loose stones, and on it may be erected the intermediate station.

There are many valuable water powers on streams that are subject to the extreme high waters, where the banks in the vicinity of the power are low, and at times covered with water. Here again the rope comes into play. The factory or mill may be built on a higher level above high water mark.

It often happens at a large water power, that there is more power than is necessary for one mill or factory. This surplus power can be carried by means of the wire rope to any distance, and be supplied to other factories.

It may also be employed with profit in pumping wheel pits, coffer dams, stone quarries, and all sorts of excavations. A current wheel may be placed in the stream, and the power conveyed to the pump or other machinery at a distance.

Where the power is transmitted for a short distance, shafting would be cheaper. This is on account of the rope being tighter than is usual, not having the weight of a long rope to give it the necessary friction, and the result is, it is increased on the rope and filling. But if a transmission for a short distance be put in, larger sheaves and thicker rope should be used than in a case where the same power is transmitted for a longer distance. To avoid the necessity of making the rope too tight, the lower one should be made the pulling one, thus making a larger arc of contact. This holds good for lines of any length, and helps to keep the lower rope from sagging too much. Care must be taken that the ropes do not touch, as this increases the wear.

In a well constructed transmission, with good supports, the shafts running in self-oiling boxes, the friction is very small, and is determined by the length of rope, size of sheaves, and the number of supports.

No slipping of the rope occurs on proper sized sheaves with good filling. It always proves more economical in time to use iron sheaves with rubber filling than wooden ones. If the wooden ones are exposed to the weather they soon give out. It is not necessary that the pulleys be on the same level. An ascent of one in four may be made.

If the rope will not clear the ground, or if there are any obstacles in the way which must be overcome then supporting sheaves must be used. If the motion of the rope be unsteady from any cause (which is rarely the case in well constructed lines), or in long lines to keep them from the ground, supporting sheaves must be used; but they should never be used as tighteners. The importance of having these sheaves solid and well constructed cannot be over estimated.

Speed is a very important item in this plan of carrying power, and experience has shown that wher-

ever the system has failed, the speed has been too high. The best results have been obtained by running the rope slowly on small sheaves. The speed may be easily increased by means of a counter shaft. This counter shaft may be placed in the attic, or higher up, in the cupola, if desired. By placing the counter shaft on a sliding base, the belts may be tightened when necessary, and thus avoid much trouble.

The sheaves are or should be made of cast iron, with high flanges and deep grooves. The bottom of the grooves are made in a peculiar shape, so as to retain the vulcanized rubber, which is made in sections of about two feet in length, dovetail shape.

After the rubber is once forced in its place it remains very firm. Vulcanized rubber is the best filling. It wears smooth, is noiseless, lasts for a long time, and is easily repaired. This is done by driving a new piece of rubber in place of the old piece, after rubbing it with soap and water. The sheaves must be well balanced and fitted true to the shaft. The sheaves must be in line.

Rope for the transmission of power should be made of the best Swedish iron over a hemp core, and made of seven strands, with seven wires in each strand. A smaller rope is preferable where the speed is high, because it is more flexible. Small sheaves should be used for high speed. Great care should be taken that the wire does not rub against the sides, as the wires are so small they will wear out easily. Galvanized rope should not be used, as the zinc soon wears off and then the rope rusts. Slipping should be avoided, as the rubber soon heats up with the friction.

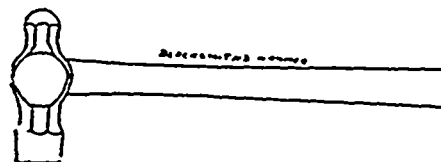
The splices made in the wire rope are all of the kind known as the long splice, and should be about 20 feet long. By use of this splice, the size of the rope is not increased perceptibly nor is the rope weakened, and after it has been run for a short time, the locality of the splice would be hard to detect.

POWER HAMMERS.

BY ARTHUR L. MUDGE, 4TH YEAR STUDENT, ENGINEERING DEPARTMENT, M'GILL UNIVERSITY.

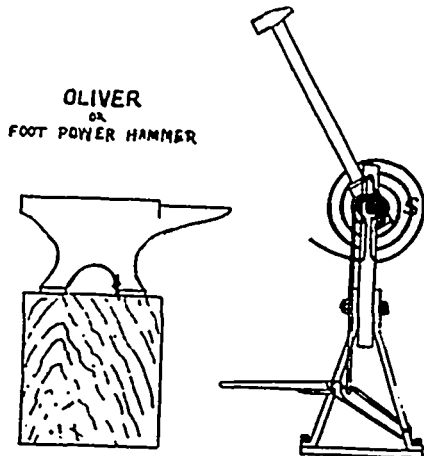
The hammer, it may be said with truth, is the oldest and one of the most important tools or instruments made by man.

Tradition says that Tubal-Cain was the first worker in metals. He must have used a hammer, therefore it is a tool of great antiquity. But the hammer was in all probability older than Tubal-Cain, as it is generally conceded that Adam used it to break coconuts, and put it to other domestic uses. Adam's hammer, however, consisted only of a stone. But a stone held in the hand was awkward. After a few generations had jammed their fingers with this primitive arrangement, some one bored a hole in the stone, and put a handle into it. In this behold our machinist's or blacksmith's modern hammer. See Fig. 1.



Sledge hammers with cast steel heads weighing up to 30 lbs. and swung by hand, were, and are still, much used for forging.

A modification of the hand sledge is the Oliver or foot-power hammer.



This is operated by a treadle, to which is fastened a strap, which is connected to a chain pulley on the shaft. On this shaft is also the handle of the sledge hammer. The latter is kept in place by an open coiled spring, S.

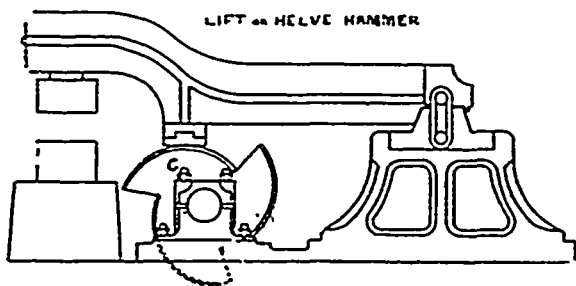
However, hand and foot hammers were limited in size and weight to the power of one man, and something larger was necessary to forge the large shafts, anchors, etc., used in fitting out ships, as well as other large forgings of various kinds.

The "Hercules" was the first power hammer invented. It consisted of a block of iron sliding between vertical guides, the hammer head being lifted by horses and afterwards by steam. This type of hammer is still extensively used in pile-driving, though for forging, on account of its slowness, it has been superseded by more modern types.

The "Hercules" had two redeeming points, which are not possessed by all subsequent hammers. They are:—

- (1) The intensity of the stroke could be regulated by varying the height of the fall.
- (2) The face of hammer was parallel to the face of anvil, whatever the thickness of the work.

The Helve and Tilt hammers were now brought into use; they were much better than the "Hercules," inasmuch as they were very much more rapid in their action.



This consists of a cast iron bar, with a head of wrought iron faced with steel. This is a lever, the fulcrum of which is at the opposite end from the head, and the power is applied by the cam-wheel C. This hammer is capable of giving 70-100 blows per minute.

Tilt Hammer.—This is lighter than the helve, also much more rapid, striking 300 blows per minute.

The fulcrum of the lever in this case is formed of trunnions at the centre of the beam; the power is applied at the tail of the lever, by a revolving wheel provided with cams, by which the lever is depressed and the hammer raised. There are, however, two serious faults which are possessed by the Helve and Tilt hammers.

(1) There is no means of varying the height from which the hammer falls, and as it is acted upon by the force of gravity only, the blow is always of the same intensity with the same thickness of work. The thicker the work is, the lighter the blow, because the hammer falls through a less distance. This is a very serious defect, as the reverse conditions are generally required.

(2) As the hammer head moves in the arc of a circle of which the trunnions are the centre, it follows that with only a certain thickness of work will the face of the hammer be parallel with the top of the anvil at the moment it strikes the work, and this want of parallelism will increase with thickness of work. This will cause greater compression on the side of work near the trunnions, while the other side will receive a very small proportion of the blow.

To remedy these defects crank hammers have been introduced, many of which are used at the present day. In fact, nearly all power hammers now used are worked by a crank.

Justice's Power Hammer is one of the above type.

A.—Spring.

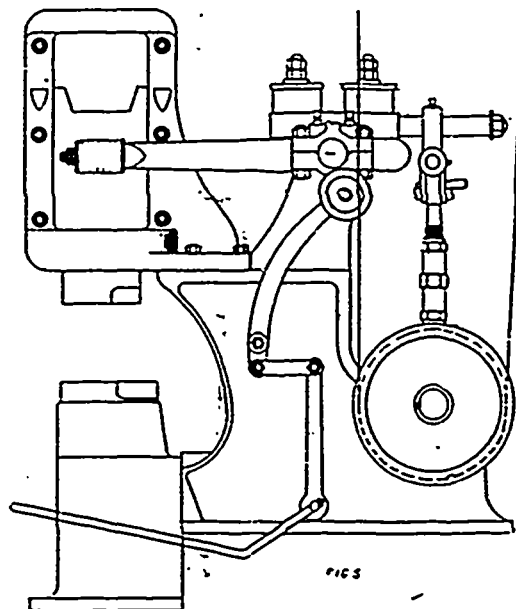
B.—Leather Strap.

The hammer head H runs in vertical guides at the back.

This machine works very well while it lasts, but is not a very durable form of hammer.



Another and very generally used form of crank hammer is illustrated in fig. 5. The machine from which this drawing is taken is used in Miller Bros. & Toms' blacksmith's shop, and was made by them. A hammer of this kind, by the same makers, is used in the blacksmith shop, Workman Building, McGill University.



This is generally considered a good type of hammer, as some of the defects noted in other hammers have been overcome.

The rapidity of blows varies according to the pressure on the treadle or foot lever, for the following reason: When the pulley B is pressed back against the belt, which is always in motion, it acts as a tightener. This starts the hammer, and the tighter the belt, the greater is the speed. This holds true only until the belt no longer slips on pulley A.

After the amount of pressure reached, no further pressure will cause increase of speed.

M. Chenot has invented an atmospheric power hammer of rather neat design.

The following is a description of the pneumatic part of this hammer:—

While the hammer is at rest the brake B holds the crank disc CD; but as soon as the lever L is pulled to the left the brake ceases to hold the crank disc and the belt tightener T causes enough tension in the belt to start the hammer.

Let it start from its lowest position, *i. e.*, with the hammer resting on the anvil.

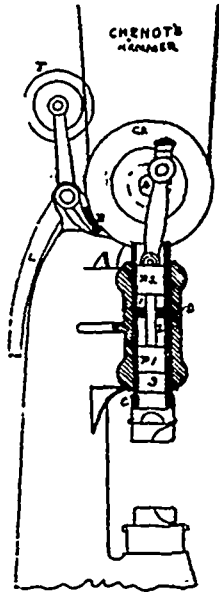
When the lower piston, P₁, rises, it compresses the air in 2. The cylinder C is started upwards through the action of the compressed air under the diaphragm D. The cylinder having once started continues its ascent, but during this time the crank passes beyond the upper dead centre and carries the connecting rod and pistons downward.

If it were not for the cushion of air in I, the diaphragm D and the upper piston P₂ would strike each other at this time, as they are moving with considerable velocity.

The cylinder C is impelled very forcibly against the anvil with a shock, which is stronger the quicker the shaft A revolves.

When the blow is struck the hammer at once rises. It regulates itself automatically, according to the thickness of the work, by the variation in the compression of the air in the cylinder.

The machine is controlled by the lever L, which will give greater or less velocity according to the pressure put upon it by the workman.



A small planishing hammer is shown in figure 6. It is used for copper, tin, sc, thes and other thin work.

The hammer weighs 15 lbs. and has a stroke variable from 2¼ to 9¼ inches, and makes 250 blows per minute.

The driving shaft A is fitted with fast and loose pulleys, the belt fork being connected to the pedal P, which when pressed down slides the belt on to the fast pulley and starts the hammer; when the foot is taken off the pedal, the weight on the latter moves the belt quickly on to the loose pulley and the hammer is stopped.

The fly-wheel on shaft A is weighted on one side, which makes the hammer stop at the top of its stroke after working.

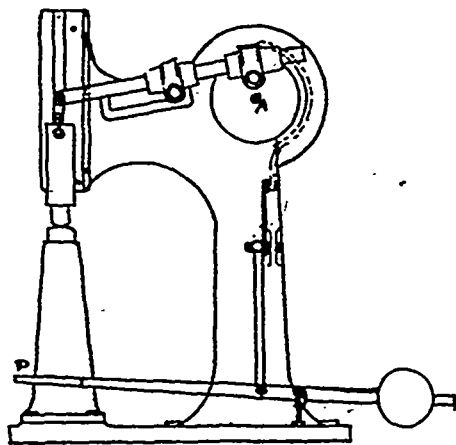
STEEL RAILS.

According to a report made to the British Iron Trade Association by J. S. Jeans, the total mileage of railroads (not including street railways) in the world in 1881 and 1891 respectively was as follows:

	1881.	1891.	Increase.
Europe	103,286	134,409	31,123
American continent	38,819	194,978	96,159
India and British colonies..	23,943	44,797	20,854
Egypt, China and Japan ..	1,018	2,556	1,538
Total.....	227,066	376,740	149,674

In round numbers 150,000 miles of new railroad were built during the ten years. The actual mileage of new track is difficult to ascertain exactly, but an allowance of 50,000 miles for second tracks, sidings, and for additional tracks built on older roads, is certainly a moderate one; this would make the total mileage of new track built during the ten years, 200,000 miles. A fair estimate of the amount of steel rails needed for the new lines is 100 tons to the mile. As the manufacture of iron rails had practically ceased in 1881, the new mileage must have been laid with steel rails, and on the estimate given above would have taken some 20,000,000 tons.

It is probably not unfair to assume that of the 227,000 miles of railroad existing in 1881, two-thirds, or about 150,000 miles, had been laid with iron rails, and that, allowing for second tracks and sidings, there were at that date nearly 200,000 miles of iron track. Judging from such statistics as are attainable, nearly 120,000 miles of the iron track of 1881 was replaced by steel during the ten years under consideration, requiring 12,000,000 tons of rails. To this must be added a considerable amount used for replacing rails too light for the traffic. Making all allowances it would appear that the consumption of steel rails for the ten years must have been from 33,000,000 to 35,000,000 tons. The future demand for steel rails must depend more largely than the past on new construction; and what that will be is somewhat difficult to predict. Europe, outside of Russia, Turkey and the Danubian states, is pretty well supplied with railroads; many parts of America are in the same condition, and while we still have room for more, we are not likely to see a repetition of the railroad building "booms" of 1870-72, 1882 or 1888-89. The Australasian colonies are overbuilt for the present; in Asia and Africa new lines are slow in coming, and in South America not much can be looked for till financial conditions improve. The most important new construction now in progress is in South Africa and Siberia; but the Cape lines are delayed for financial reasons, and the material for the Siberian road will come mainly, if not entirely, from the Russian



LONGWORTH'S POWER HAMMER WITH MOVABLE FULCRUM.

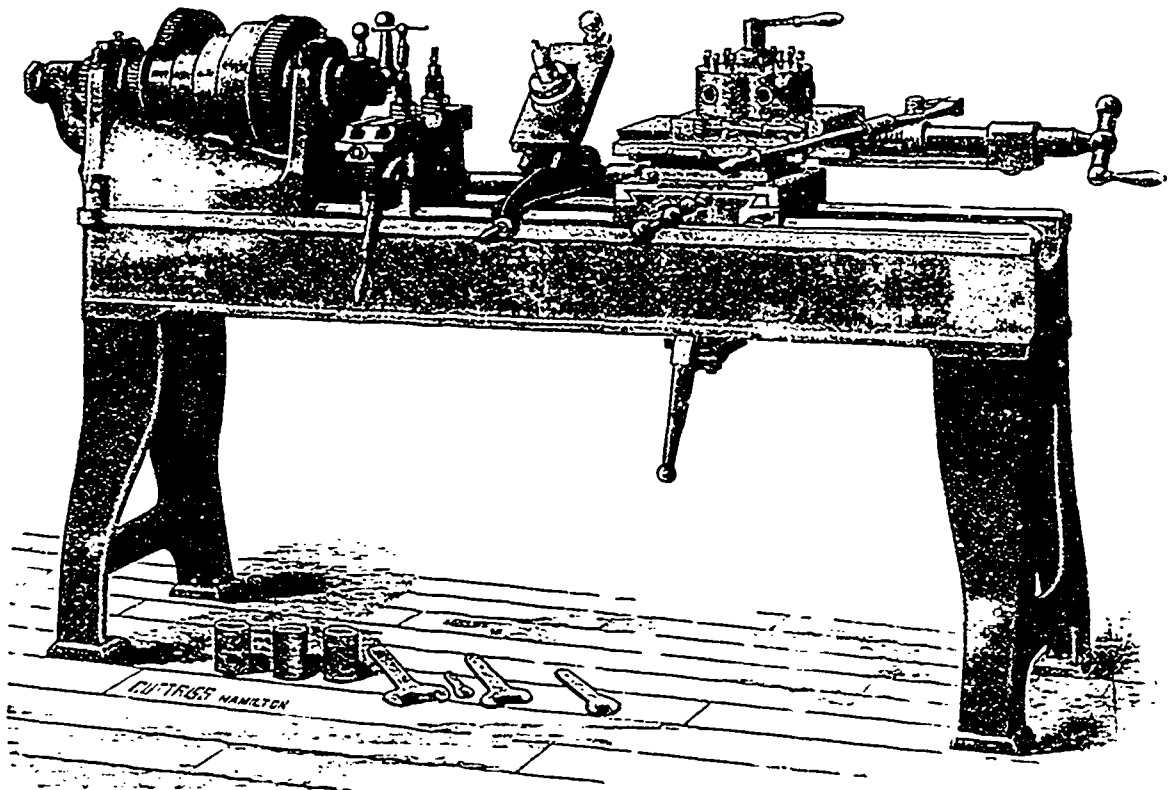
In fig. 6 the movable fulcrum hammer, designed by Daniel Longworth in 1877, is shown. The principal advantage of this hammer is that, while controlled by only one workman, it can produce blows of varying forces without alteration in their rapidity.

Hitherto, varying the force of a blow was accomplished by increasing or diminishing the velocity by tightening or loosening the belt by means of small tightening pulley.

mills. The element of greatest importance in the future of the trade is the demand for renewals. In a few years more iron rails will have practically disappeared; and this demand will depend upon the wearing out of the steel now in use. But the average life of a good steel rail under ordinary traffic has not yet been determined. They have worn out and given way under extraordinary traffic, as in the approaches to great terminal stations, and on sections of main lines where a very large number of trains are concentrated; but under such demands as are found on more than 95 per cent. of the railroads of the world it has not yet been proved that a good steel rail will not last for 30 or even 40 years. It is fairly certain that for a short time at least the sale of steel for renewals will decrease year by year and the demand will depend chiefly upon new work. Under these circumstances the steel rail mills cannot look forward to an early increase of business unless conditions change in a way that we do not now anticipate, and the probabilities are that some of them must remain idle or turn their attention to other work.

BRASS FINISHERS' LATHE.

We hereby present to the readers of THE ENGINEER an example of a large number of brass finishers' lathes, manufactured by John Bertram & Sons, of Dundas. Their list of this class of lathes comprises all sizes from 12 to 20 inches swing. This lathe we illustrate swings 18 inches over shears and has 6 foot bed.



18-INCH FOX MONITOR OR BRASS FINISHERS' LATHE

The cone has four speeds for a $2\frac{1}{2}$ inch belt, the largest being $9\frac{1}{2}$ inches, and the smallest $\frac{1}{4}$ inches diameter, and with back gear has eight changes of speed.

The spindle is of steel, the front bearing being $2\frac{1}{4}$ inches diameter and $3\frac{1}{2}$ inches long, and runs in bronze bushes, and has a $1\frac{1}{8}$ inch hole clear through. The head has swivel adjustment for correcting the alignment of the spindle.

The turret side has a stroke of 8 inches, and has depth gauges and swivel adjustment. The feed is by

lever or screw; the cross slide motion is sufficient to face 8 inches diameter. The turret has six holes bushed with steel $1\frac{1}{4}$ inches diameter.

The chaser bar and rest has stop collars, depth gauges and tapering attachment, and has hobs and chasers for 8, 11, 14, 18 per inch, or a like number of any other pitches required.

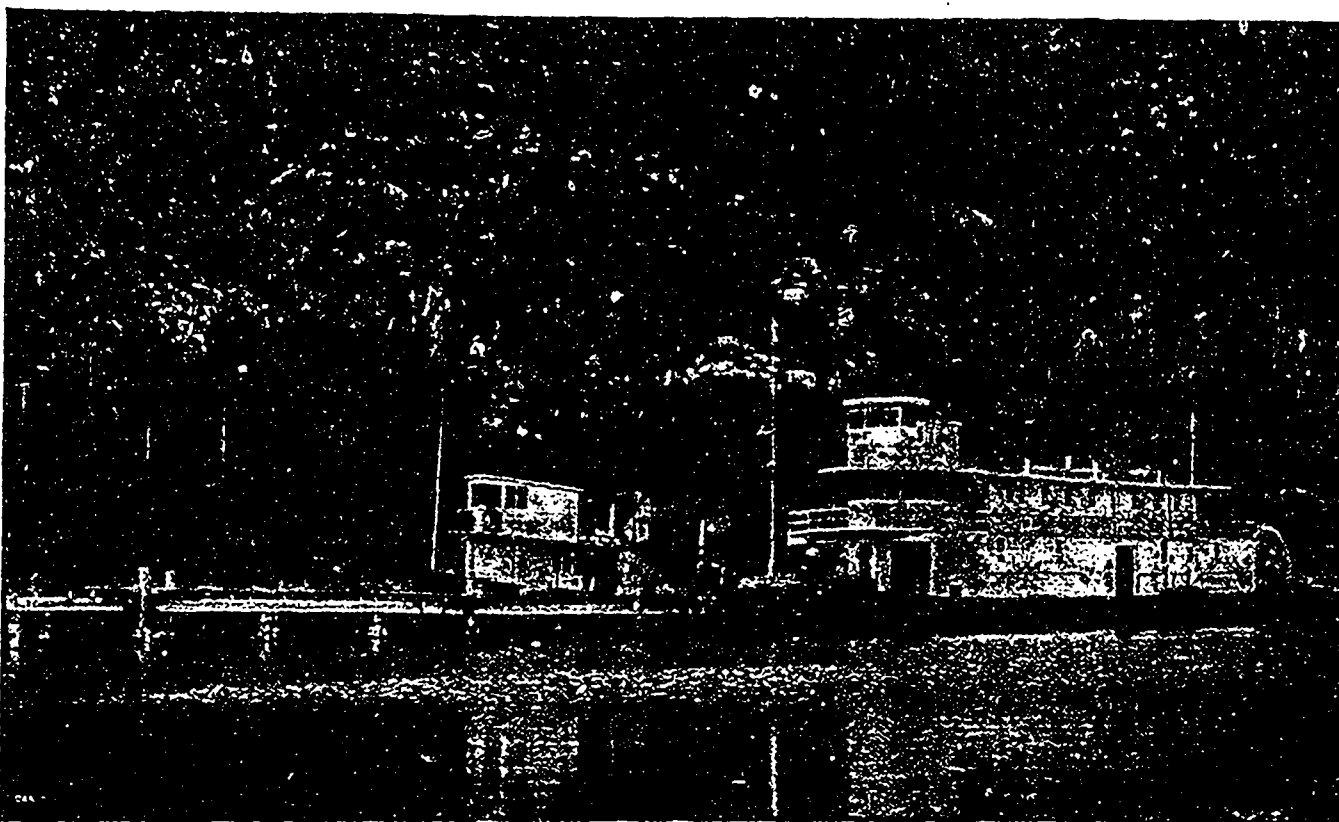
The lathe has a complete equipment of wrenches, double cutting-off tool, or if used exclusively on brass work, a compound and hand rest are furnished in place of cutting-off rest.

LITERARY NOTES.

We have received a little pamphlet drawing attention to the many uses to which Thorold cement may be put, such as in abutments, etc., for bridges, drain pipes, cellar-floors, sewers, aqueduct work, etc. We are glad to see that the consumption of this excellent hydraulic cement has been increasing since it was first brought before the public fifty years ago. It is made from a natural cement rock found at Thorold, Ont., where it is quarried, carefully burned, finely ground and shipped to all parts of the country. Among other great public works in which Thorold cement has been employed may be mentioned the Victoria Bridge, Montreal; the International Bridge at Fort Erie; the old and new Welland Canal, and on both the G. T. R. and C. P. R. Those who are interested may obtain further particulars, as well as testimonials from Government engineers, etc., by writing to Estate of John Battle, Thorold, Ont.

The Steam Boiler and Plate Glass Insurance Co. of London, Ont., have sent us a very pretty little New Year's souvenir in the shape of an almanac for 1894. It is embellished on the front with a picture of a model boiler room, and the arrangement of the calendar presents some novel and very useful features.

We are indebted to the Trade Company of Boston for a copy of "Dollars and Sense for Fifty Cents, the money-making booklet for business men of brains." It is written in bright style by Nathaniel C. Fowler, jr.,



STEAMERS ON ARROW LAKE, B. C.

Doctor of Publicity, and, apart from the soundness of its doctrines in advertising matters, ought to afford its readers a very pleasant hour's reading. It contains many instructive passages and useful hints both to newspaper publishers and to would-be advertisers. Among the subjects upon which the work treats may be mentioned "Continuous Advertising," in which occur the following lines: "No man can raise live stock by feeding it one day and starving it the next. . . . 'To be continued' is the motto of trade. . . . Advertising has two distinct values. First, the initial presentation of something, accompanied by argument. Second, the continuation of that argument. . . . Few people answer an advertisement the first time they see it, unless it be of a special bargain, or of some illegitimate article of trade."

Owners of boilers may get some very useful advice by perusing a little booklet circulated by the *Steam Boiler and Plate Glass Insurance Company*, of London, Ont. Among other valuable hints may be mentioned the following: "The man who handles steam handles power. As its danger increases, the knowledge necessary to protect yourself and property against that danger should be greater. Inspection is the best investment." And this is where the usefulness of such an institution as the S. B. and P. G. I. Co. makes itself felt, namely, in inspection, for in this lie safety to property, safety to life, saving in fuel, and longer life to the boiler. Lastly, after all precautions have been taken, if an accident SHOULD occur, the owner of the boiler has the satisfaction of knowing that he has done his best and that he will not lose money.

ALTHOUGH the Messrs. Bertram have for some time been proprietors of the Doty Engine Works, it is only recently that they have announced that the business is in future to be carried on under the name of Bertram Engine Works Co. The machinery put out of these works has enjoyed the best reputation throughout the Dominion for some years, and there is no doubt

that with an enlarged plant, and a re-organized staff, the firm will add to its previous record. The boiler shop is under the charge of J. J. Fletcher, who has been with the Polson Co. for ten years. The chief engineer of the Cleveland Ship Building Co. for the past four years has been secured as manager of the works. The staff and equipment promise the best of work, and the firm promise the fairest of prices.

OWING to the difficulties of transporting rough timber by land, rivers and streams have hitherto formed the only cheap outlet for the product of our forests in Canada. But the William Hamilton Manufacturing Company of Peterboro' are turning out for the Gilmours new machinery by which it is proposed to transport timber from the Trent to Muskoka overland. If these experiments prove successful, they will make available large tracts of timber-land which have hitherto laid idle. We hope to give our readers a description of this machinery in an early issue.

IN many cases the object of painting iron is to prevent its rusting, fully as much as to improve the appearance; but in a great many cases the main object is not attained, as the iron will continue to rust under paint. Especially is this the case with coal tar when applied to cold iron, and nearly always the case when oil paints are used, unless a special compound is employed. If oil paints are used on iron work exposed to the weather, special treatment is necessary if the paint is to adhere firmly and act as a preventive of rust. The first step is to clean thoroughly, and then if badly rusted to apply a thin mixture of lamp black with plenty of "turps" and dryers and a little oil, and after this dries, apply red lead with half oil and half "turps," with the requisite proportion of dryer, and each additional coat containing less "turps." This will give a lasting job, as the lamp black arrests and prevents the rusting, because the thinned coating penetrates deeper and makes it adhere, while the gummy coating left from the evaporation of the "turps" makes an efficient non-corrosive protective coating.

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 November, and for the eleven months ending with November, compared with the same periods of last year:—

	Month of November.		11 months ended Nov.	
	1892.	1893.	1892.	1893.
Hardware and Cutlery	£ 7,789	£ 5,564	£ 89,173	£ 88,020
Pig iron	7,484	7,764	78,749	55,885
Bar, etc	4,437	2,349	35,455	26,267
Railroad	20,668	1,617	372,623	496,266
Hoops, sheets, etc.	9,620	4,130	80,859	65,509
Galvanized sheets	8,285	5,551	59,183	69,877
Tin plates	38,389	25,846	212,035	208,859
Cast, wrought, etc., iron . .	7,849	8,958	96,666	114,949
Old (for re-manufacture) . .	7,757	5,988	78,275	103,883
Steel	13,467	10,040	128,069	124,970
Lead	2,090	1,020	30,418	15,802
Tin, unwrought	10,053	2,533	38,981	30,485

The copper ore exported from Canada to Great Britain during November was valued at £4,130, compared with £6,180 for November, 1892, the amount for the eleven months ending November, showing a proportionate decrease, the figures being £25,367, against £33,606 in 1892.

MINING ASSOCIATION OF QUEBEC.

Meetings of this society took place on Wednesday and Thursday, January 10th and 11th, at the Windsor Hotel, Montreal. During the Wednesday afternoon session, which was merely of a business character, the following officers were elected.

President—J. Blue.

Vice-Presidents—Col. Luke, G. E. Drummond, F. P. Buck, and J. B. Smith.

Secretary—B. T. A. Bell.

Treasurer—A. W. Stevenson.

Council—Capt. R. C. Adams, Montreal, J. J. Penhall, Black Lake; F. A. Halsey, Sherbrooke; E. R. Smith, Thetford Mines; James King, M. P. P., Quebec, G. P. Franchot, Buckingham, R. T. Hopper, Toronto, Hector McRae, Ottawa, and F. Cirkel, Ottawa.

A resolution was passed providing for the affiliation of the Association with the Mining Department of McGill University, Montreal.

It was resolved to present Secretary B. T. A. Bell with a gratuity of \$150 for the great services he had rendered to the association during the past.

The next meeting was decided to be held at Quebec.

On Wednesday evening a paper was read by J. Burley Smith on the "Diamond Drill and its Uses in Prospecting," which will be found elsewhere in this issue. Considerable discussion ensued, during which many members expressed the opinion that when so many holes had to be bored, the cost at, say \$2 per foot, was often more than the value of the property warranted.

Mr. Carlyle gave an instance of the successful adaptation of electricity to drill boring. Electricity reduced the expenses of boring very considerably, and was being used to a greater extent each year.

Mr. Carlyle next read a paper on the use and construction of tunnels in mining operations, abstracts of which we print elsewhere.

The next item on the programme was a paper by Mr. Obalski, on the mica deposits of the Saguenay district, which was read by the secretary. The writer gave a good deal of information about the development of mica mining in the Dominion, together with details concerning the various mines in the Saguenay and other districts of the Province of Quebec.

In the discussion Capt Adams stated that, judging from his experience, mica was not a very satisfactory mineral to mine for, at any rate during the prevalence of the present irregularity in market prices. Often when he had been working for phosphates, he had come across mica, but latterly, when he had been mining for mica, phosphate was the only thing to reward the exertions of the workmen. Except in isolated cases, he had found mica too irregular to show profitable results.

Hon. D. J. Flynn, who was present, said he wished some men of capital would come along and buy mica lots in the Province of

Quebec. He thought the price of mica would increase considerably before long.

THURSDAY.

The secretary stated with reference to the report that the German and other European governments had decided to send out experts to this country for the purpose of investigating into the state of mineral deposits, that it had been proposed to ask the Dominion Government for pecuniary aid in bringing out these experts. It was therefore resolved that the association should give no countenance in any way to such a proposition, as there were many Canadian experts who were perfectly able to do the work for themselves.

Dr. Adams then read a paper on "The Nature of Ore Deposits."

The writer stated that recent investigations into the nature and origin of ore deposits led to the conclusion that certain of these deposits were of igneous origin, meaning by this not merely that heat was connected in some way with their genesis, but that these deposits had cooled down and solidified from a molten condition. He then gave a resume of the results of the investigations made into this class of ore deposits by Prof. Vogt, of Christiania, as although it seems to be a comparatively small class, it is yet one which is especially well represented in Canada. Then followed a detailed description of titanic iron ores. Of these one of the best known deposits in this country was that near Baie St. Paul on the Lower St. Lawrence, where there was a great mass of gabbro, or anorthosite solid bodies of iron ore, 90 ft. in thickness, which had been traced for a mile or so. Other considerable deposits were known in the district north of Montreal, near Ste. Hypolite and Ste. Julienne, as well as at several other points in the so-called Norian gabbro area. In these deposits the iron ore occurred as a constituent of the gabbro, but was locally concentrated so as to be very abundant at those points. Another extensive deposit occurred on the River Saguenay between Chicoutimi and Lake St. John. There on the north shore of the river was a group of hills composed of titanic iron ore occurring in another great gabbro mass, having an area of not less than 5,800 square miles. This iron ore occurred principally in three bands, the most easterly of which was about 75 yards wide. It was evident that these great deposits of titaniferous iron ore contained true eruptive or igneous masses which were merely local and extremely basic varieties of the gabbro in which they occurred, due to the concentration in certain parts of the mass, of the most basic constituents of the rock. When it was once recognized that these deposits had the above origin, a solution was afforded to what had hitherto been a puzzling fact, namely, that all the iron ores occurring in the Norian series of the Laurentians, which was composed exclusively of eruptive anorthosite or gabbro, were rich in titanic acid, while in the same district deposits of magnetite free from titanic acid were found in the associated gneisses. The writer next devoted some space to the consideration of sulphide ores containing nickel, with special reference to the deposits at Sudbury, comparing them with those of Norway. He then concluded a valuable paper by giving a few instances of the segregation of metals in a free state occurring in igneous rocks.

Mr. J. T. Donald next read a paper on the "Sampling of Ores," in which he described his method of sampling.

THE IDEAL METHOD OF SAMPLING

The ideal method of ore sampling is to crush the whole parcel, and then let it fall in a steady stream through a machine which, working automatically, diverts at fixed intervals, and for a fixed length of time, a portion of the stream of falling ore. For instance, a stream of ore may be allowed to fall vertically for two minutes, then that which falls during the third minute is thrown automatically away from that which fell during the first two minutes, then for another two minutes the ore falls vertically, then again for one minute the stream is deflected, and soon in this way the whole parcel of ore is divided into two lots, one containing two-thirds of the original parcel, the other one-third. The latter part is then taken and put through the same machine, exactly as was the original lot, and similarly divided. The lot deflected from the main body in this second process now constitutes one-ninth of the original parcel. It may be put through the process a third time if desired; and in the latter case, the deflected part will represent one twenty-seventh of the original parcel. This portion is next spread out and quartered, and an equal quantity taken from each quarter. This portion is again quartered and a portion taken from each, and so on until a sufficiently small quantity has been obtained, and this last is considered a sample. I think no one will deny that a sample thus obtained will undoubtedly fairly represent the whole.

The method outlined is that which is in use in the large copper ore and matte sampling works in New York; but, of course, it cannot be carried out in the case of quantities of ore which have to be sampled at the mine or any point except the sampling works. Nevertheless, all sampling should aim to approach as closely as circumstances will permit to this ideal method.

There was here a good deal of discussion concerning the proposed confederation or union of the different mining societies of Canada into one general association for the whole Dominion. The matter was referred to the Council.

G. E. Drummond then read a paper upon "The Canadian Iron Industry." (See on another page.)

In the evening the members of the Association held a banquet at the Windsor Hotel.

CANADIAN SOCIETY OF CIVIL ENGINEERS.

A meeting was held on Thursday, December 21st, in the society's rooms in Montreal.

After the minutes of the previous meeting had been read by the secretary, the discussion on "A Cubic Yard of Concrete" was continued.

J. S. Armstrong, of St. John, N. B., wrote, making a few remarks upon the paper. He thought sand was scarcely an absolute necessity for the formation of cement, as some kinds had practically no sand in their composition at all.

Pres Hannaford related an interesting experience of his own, which occurred in connection with the building of a bridge at Fenelon Falls. The piers were sunk in eight feet of water on a rock foundation, the casing measuring about 30 ft. by 14 ft. Enough concrete was put in to bring the rock up to an even surface. Everything worked extremely well until one morning the workmen found that they had not allowed for the rise of the water. The timber, with its bottom of concrete, floated on the water. This showed the strength of concrete.

Mr. Irwin thought it a pity that Mr. Perley had not said more about lime, which has been used from time immemorial. He believed in using native lime, if possible.

Mr. Peterson said that under stress of circumstances he had used the Canadian limes, but had found them fail, structures in which they had been employed having often fallen to pieces. The native cements when used under water were useless. The really cheapest thing to do was to use the best, viz., Portland cement. Whilst the native cements would not properly set under water, he had seen Portland cement set as hard as limestone with the thermometer at zero, and when the cement had been mixed with cold water and cold sand.

Pres. Hannaford remarked that what had been said regarding the setting of native cements under water was quite true.

Mr. Peterson said that when the Toronto Water Works were built in 1873, native cement was ordered. Part of the well was built late in the fall, and the other part in summer. In the following spring bits could be picked out from the former portion, so friable had it already become. The use of that native cement had cost many times as much as would have been necessary had Portland cement been used in the first instance.

Mr. Irwin said he had not meant to recommend the use of Canadian native cements.

Mr. Peterson said no doubt the Portland cements now made by some manufacturers here were really better than the Portland cements of England, but he had intended to refer to the old forms. England sent out her worst cement to the colonies. The material existed in this country, and he did not see why the required skill in mixing should not be forthcoming.

Mr. Smith wondered why the proportion of cement to sand need be so great, if the other ingredients were so strong in themselves.

Mr. Peterson remarked that he had found the proportion of 2 to 1 sufficient.

A short discussion then took place with regard to a paper by Alan Macdougall on "The Professional Status," which will be found elsewhere in this issue.

President Hannaford said that the point was whether the Civil Engineers should or should not convert themselves into a close corporation.

The meeting then adjourned.

The annual meeting of the Society took place, at Montreal, on Tuesday and Wednesday, January 9th and 10th.

There was a short session on Tuesday morning, but the business transacted was of a merely routine character. Tuesday after-

noon, members of the Society were invited by Messrs. Ross and Mackenzie to lunch at the new Power House, on William Street, at which they visited the various departments of this fine establishment, inspecting the boilers, machinery, etc. A description of the Power House will be found elsewhere in this issue.

The members then visited the works of the Royal Electric Company, where they were much interested, especially in the manufacture of the various electrical appliances. They then proceeded to the Engineering Building, McGill College, and amongst other things, witnessed various tests made by Prof. Bovey, upon the strength of steel and timber.

In the evening there was a banquet at the Windsor Hotel, which was much enjoyed by the members.

WEDNESDAY.

On Wednesday morning the annual report of the Council was presented. This showed that the number of members was as follows: Honorary, 7; ordinary, 283; associate members, 133; associates, 60, and students, 150; total, 633.

There was considerable discussion as to the expenditure of \$800 in aid of the International Engineering Congress at Chicago.

The report was adopted.

Mr. Wragge suggested the payment of premiums for papers.

The report of the Committee on Professional Status was then received.

Alan Macdougall recommended slow progress in rolling the stone towards the goal by means of the lever of public opinion, which at present was in their favor. This would be better than any hasty action toward getting a close corporation. Civil engineers, members of this Society, ought to endeavor to raise themselves up to a high standard of honor and integrity, so that in future capitalists would be able to trust them, simply because they were members of such a high-toned Society.

Mr. Shanly did not recommend trying to get legislation until they were more sure of the result of such application.

Prof. Bovey wished to know whether provincial laws could be passed curtailing the rights already given to the Society by the Dominion Government.

Mr. Cunningham observed that the Society would have to define more narrowly the meaning of the title "Civil Engineer" before anything could be done with the charter. He thought that before they went to the legislature they ought to be sure that the legislature would not refuse them help.

Mr. Woolbank said the Provincial Legislature would probably not curtail their powers, but at the same time they might give the same powers to other bodies as well, which practically amounted to the same thing.

Prof. Bovey believed that each member should establish in the minds of the people a record for rectitude and honor, so that after a time only those who were members of the Society would really have any standing.

After some further discussion, it was resolved that the report on professional status be not included in the "Transactions," but be referred back to the Committee, the Committee to report not later than Nov. 1st, and that the report be distributed among members before Dec. 1st. It was also decided that the interim report of the Committee on the "Testing of Cements" be received and that the Committee be continued.

A draft report of the Committee on Professional Ethics was presented, but it being in a somewhat incomplete condition, it was decided that the Committee should have power to add to its number, and be required to report to the Council before October 1st.

The election for officers resulted as follows:—

President—P. A. Peterson, Montreal.

Vice-presidents—Herbert Wallis, Montreal; Alan Macdougall, Toronto; P. W. St. George, Montreal.

Treasurer—K. W. Blackwell, Montreal.

Secretary—Clement H. McLeod, Montreal.

Librarian—W. McNab.

Council—Prof. H. T. Bovey, J. Galbraith, H. N. Ruttan, P. S. Archibald, G. C. Cunningham, G. H. Duggan, W. Haskins, H. A. F. Macleod, J. T. Barnett, L. A. Vallee, H. Donkin, H. Peters, H. Abbott, G. H. Garden and O. Chanute.

The retiring president, E. P. Hannaford, gave an interesting address, in which he gave some useful information concerning the cost of various items in railway construction work, etc.

He then presented the Gzowski medal to Prof. J. T. Nicolson, for his paper on "The Transmission and Distribution of Power by Compressed Air."

It was resolved to apply to Government to make some provision for the establishment of bureaus for tests on cements, etc.

The following were appointed Nominating Committee for 1895. H. S. Poole, H. Irwin, G. H. Duggan, Alan Macdougall, H. N. Ruttan, J. M. Shanly and two past presidents.

After the usual votes of thanks, the meeting broke up.

Another meeting, with a very full attendance, was held on the 4th inst.

The discussion was continued upon Alan Macdougall's report as to the professional status of civil engineers.

In connection with this there was difference of opinion expressed as to whether it would not be better for the society to omit the word "civil" in their title, on the ground that it contained as members representatives of such a large number of other branches of the engineering profession, such as mining, mechanical, sanitary engineers, &c., &c.

Sec McLeod explained that the word "civil" was first used merely for the purpose of distinguishing from military engineers, and no doubt at the time their society was originated the term really included all the different kinds of engineers, and not exclusively those attending to railroad, bridge, and canal work.

Mr Sproule remarked that he could not help thinking that land surveyors were, on the whole, better educated men than the civil engineers. He believed in the society doing its best to keep up their connection with the land surveyors. At any rate the latter were a powerful body of men, whom he would prefer to have as friends of the society rather than enemies.

After some further discussion in which Messrs. Hannaford, Gower, Irwin, Beaudry, Cunningham and others took part, a paper was read by Cecil B. Smith on the "Masonry Work of the Cheat River Bridge."

A vote of thanks was passed unanimously, and then, after a short discussion, the meeting adjourned.

ROAD IMPROVEMENT.

Two very important movements were inaugurated by the Canadian Institute, Toronto, at the regular meeting on the 3rd ult. There was a very large attendance, the lecture room being full of enthusiastic and influential citizens. Prof. Ramsay Wright, the president, occupied the chair.

Alan Macdougall, of the Society of Civil Engineers, introduced a resolution respecting road reform, and in doing so, he referred at length to the systematic agitation in the press in favor of good roads during the past two years. The matter was now one recognized as of national importance, but the time had now arrived when action, as recently suggested by Andrew Patullo, of Woodstock, should be taken to bring about an organization of a good roads association. The Institute had on many occasions inaugurated movements which had borne good fruit for the people of the country, and it was fitting that it should do so now. Mr. Macdougall then moved, seconded by J. C. Hamilton:—

"That the Canadian Institute having followed the various steps which have been taken in the past few years to awaken an interest in road reform, and recognizing the inestimable benefit to the community arising from improved and well constructed roads, be it resolved that the Canadian Institute issue an invitation to all persons interested in road reform to meet in convention here on an early date for the purpose of forming a national road improvement association, and that the council be requested to make the necessary arrangements for holding said convention"

The motion was carried unanimously, and the Institute will shortly issue invitations for a convention to organize a good roads association. The meeting for such purpose will likely be held in February.

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Shellac	4 pounds.
Resin	1 pound.
Steatite	½ pound.
Lampblack	2 pounds.

Instead of lampblack, any other desirable pigment may be employed. The ingredients are thoroughly mixed together, and for thirty minutes subjected to a heat of 212 deg. F., and then allowed to stand for forty-eight hours. The mass is subsequently strained and ground in an ordinary paint mill.

CANADIAN SOCIETY OF STATIONARY ENGINEERS.

Montreal No. 1 has not grown in membership during the past month, but it is none the less wide awake. Several good questions have been discussed. Mr. York, the secretary, tendered his resignation owing to the want of time to fill the office satisfactorily. But the members, like good "City Councillors," gave it a six months' hoist. The members propose holding a dinner or social at an early date, of which due notice will be given.

REVIEW OF THE METAL TRADES.

MONTREAL, Jan. 13th, 1894.

The trade is engaged in taking stock, and consequently there is very little moving. During December and January so far there was comparatively little business transacted. Business has been further at a standstill owing to the anticipated changes in the tariff. Every one seems to be expecting a revision of rates which will have an important bearing upon the future of the trade, and this will be enough to keep business in an unsettled state until something more definite is known. There has been no upward tendency since our last report; in fact the tendency has been to weaken rather than to strengthen in values. In some lines, as we stated in our last report, the Americans have been in our market trying to place goods here at exceedingly low prices, on account of the quietness in their own territory, and this will take place to a much greater extent unless business across the line becomes soon very much brighter in its aspect than it is at present.

Personal.

T. E. LEATHER, of the Ontario Rolling Mills, Hamilton, has been visiting Montreal.

W. C. MILNER, retiring manager of the Joggins Railway, was presented by the employees of the road with an address and a handsome silver water set.—*Parrsboro Leader*.

BENJAMIN TOYE, late manager of the Great Northwestern Telegraph Company, is dead. He was very well known throughout America as an electrician, more especially as the inventor of an automatic repeater.

EDWARD HOLLOWAY, formerly connected with the Allan line of steamships, and, for the last few years, the foreign freight agent of the C.P.R., is dead. Mr. Holloway was 46 years old, and, when he died, had just come home from Hong Kong, where he had been for the last two years as C.P.R. representative for China and Japan.

"POWER" contains quite a sketch of an invention for which F.W. Mount, superintendent of the electric department of the St John, N.B., gas company's station, has obtained an American patent. The contrivance is calculated to make perfect regulation possible in automatic engines, which are run in pairs and connected by the usual shaft and clutches.

R. R. SAMUEL, late cashier of the *Gazette* Printing Company, has joined the ranks of trade journalism, having become business manager of THE CANADIAN ENGINEER, published by E. B. Biggar. Mr. Samuel was for fourteen years connected with the *Gazette* company, and during that time made a large circle of friends among the manufacturers and merchants of Montreal. His association with the commercial side of journalism since boyhood renders him admirably fitted for his new position, and his numerous friends will wish him a prosperous career.—*Montreal Herald*.

THE Technical School in Toronto is housed for the present in the old Wycliffe College building, which is, however, found too small for the rapidly increasing school, and a committee appointed to consider the matter of enlarging the premises, have reported that 546 students are enrolled, and that the attendance varies from 200 to 350; indeed one evening there were 377 pupils present. Influenced by the figures presented by the committee, the board decided to petition the City Council for enlarged accommodations. Prof. Galbraith and Messrs. D. J. O'Donohue and A. M. Wickens were appointed a committee to draw up such a petition.

A SOLUTION of 1 part sulphate of copper in 20 parts water, to which add 2 parts muriatic acid and enough solution of gum arabic so as to make a fair and even solution, can be used with a copper pen to write on bright tin. The addition of a small quantity of pyrogallic acid to this solution will make the writing appear black at once.

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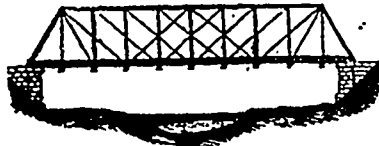
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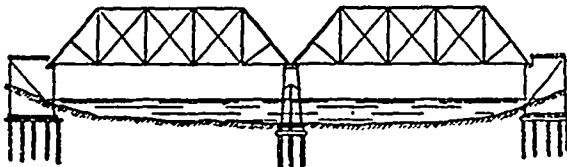
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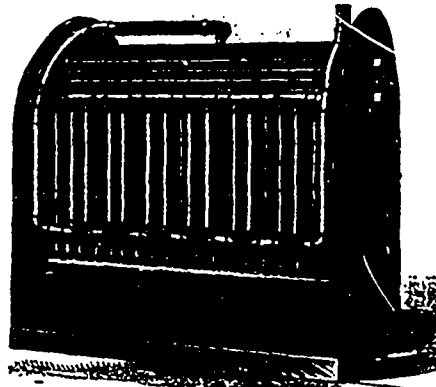
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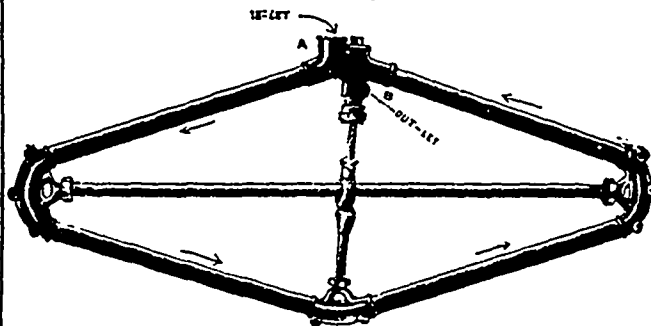
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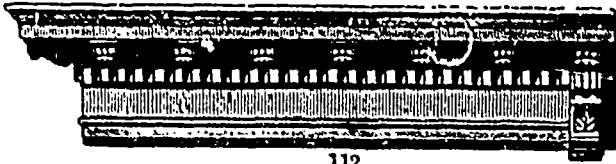
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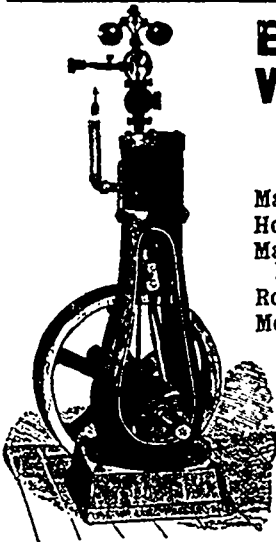
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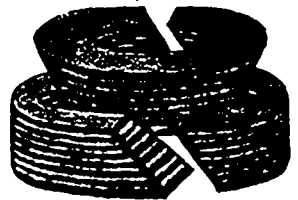
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Industrial Notes.

THE Laidlaw Mfg. Co. (stoves), Hamilton, has assigned.

THE Montreal Stave and Barrel Co. is applying for incorporation.

THE Hoop Factory at Conticook, Que., will start operations shortly.

IT is probable that a new fire station will be organized in Montreal.

LOCKBERRY'S iron bridge over the Waugh River, N.S., is now completed.

J. & G. L. LEONARD, Montreal, have registered a partnership as stonemasons.

W. BLADOW is building a new steam saw mill at Millaloe, Ont.—*Eganville Star*.

SMITH & O'NEILL will remove their saw mill from Stewiacke to Pembroke, N.S.

A SPAN of the St. Louis bridge, Richibucto, N. B., broke down one day last month.

L. FESINGTON is putting in a new water wheel at his tub factory at Fulford, Que.

A. C. WILSON is going to establish large pottery works at New Westminster, B.C.

THE capital of the re-organized St. John's, Que., Stone China-ware Co. will be \$250,000.

THE Fort William, Ont., *Journal* proposes the establishment in that town of a flour mill.

H. McELROY & SONS will build, in connection with their mill at Carp, Ont., a grain elevator.

MONCTON, N.B., has decided by a large majority in favor of expropriating the water-works.

GRAHAM, HORNE & Co. are contemplating the establishment of a saw-mill at Port Arthur, Ont.

JACOB SWEENEY, whose furniture factory at Yarmouth, N.S., was burned down recently, is re-building.

K. KENNEDY is rebuilding his grist mill at Hobart, Ont. The mill will be running all winter cutting custom logs.

THE county council of Simcoe, Ont., have voted a considerable sum of money to be spent on county bridges.

WEGENAST & Co. have put in an elevator, with a capacity of 3,000 pounds, at their furniture factory at Waterloo, Ont.

THE clerk of the township of Wallace, Ont., has been authorized to call for specifications for a new bridge at Ferguson's.

THE old Parker tannery building at Montreal was badly damaged by fire three or four days ago. Loss \$5,000; partially insured.

THE B. C. Cooperage and Jute Works, Vancouver, which were recently destroyed by fire, will be rebuilt at once on a larger scale.

MONTREAL Water Committee has been granted \$16,450 for a settling basin and suction pipes, and \$22,000 more for a new turbine wheel.

THE Globe Chemical Works, of Todmorden, Ont., have been burned down. Loss, \$5,000; no insurance. The cause of fire is unknown.

M. McCauley is erecting a 16 horse-power engine and boiler, with saw and shingle machinery, at Beaver Lake, Alta.—*Edmonton Bulletin*.

E. LECLERC'S door and window sash factory at L'Islet, Que., has been destroyed by fire. Loss \$5,000; no insurance; cause of fire unknown.

THE Briggs Mfg. Co. will establish a factory for making the Briggs Patent Press Feeder at Niagara Falls, Ont. The company has \$1,000,000 capital.

DR. W. JOHNSON has submitted plans of the morgue at Philadelphia, as the model for one proposed for Montreal. It is 55 x 32 feet, and three storeys in height.

HIRAM IVES & Co. are going to erect a glass factory at Windsor, Ont., and are asking for a bonus from the city in its aid. About a hundred and fifty men would be employed.

WILLIAM WILSON, stationary engineer in the Montreal Rolling Mills, was killed by being caught by the machinery. The coroner's jury returned a verdict of accidental death, but censured the company for failing to place guards round the belts and fly-wheels.

CHILLIWACK, B.C., proposes to establish waterworks.

SHULTZ & AMES are starting a handle and broom factory in Morrison, Ont.

W. REATH, St. Thomas, has the contract for rebuilding the Fulton, Ont., bridge.

A NEW Whitlock engine is being put in at T. A. Code's knitting factory at Perth, Ont.

NOAH BROCK, Racine, Que., has sold his saw mills to the Eastman Lumber Co. for \$4,750.

WITHIN a few days the work of rebuilding the Redbank bridge at Chatham, Ont., will be completed.

THERE is a probability of a wood-working factory being started at Oxford Junction, N.S., next spring.

THE cabinet factory at Aylmer, Ont., is shut down with the exception of the saw-mill department.

ALAN MACDOUGALL, engineer, Toronto, has designs ready for a new sewer at Belleville, to cost \$45,000.

THE Moncton Gaslight & Water Co. has declared a dividend of 3½% for the half year ending Nov. 30th.

THE Brockville *Recorder* reports that the Asylum buildings are progressing splendidly, and are nearly complete.

THE auxiliary boiler purchased recently for the Leamington, Ont., waterworks is now being placed in position.

THE Perfection Hook and Veneer Company, Toronto, have assigned with liabilities of \$11,000; assets about half.

JOHN STIRRETT has purchased the Luckham saw mill on the Brooke and Enniskillen town line.—*Petroleum Advertiser*.

THE Oliver Typewriter Co., Dubuque, Ia., are asking whether Toronto will offer them any inducements to locate there.

THE Moncton, N.B., Gas Light and Water Co. are negotiating with the city for a transfer of their property to the latter.

THE village of Waterville, Que., has advanced a loan of \$4,500 to the Dominion Snath Co. to establish their factory there.

A STOP-GATE is to be placed in the Montreal waterworks, at the entrance of the settling basin, where the aqueduct enters it.

HON. JOHN HAGGART has been petitioned to exert his influence with a view to the rebuilding of the Yamaska Bridge, Sorel.

THE Warren tannery at Oshawa, Ont., has been sold to Mr. Deering, of Weston, who will thoroughly overhaul the place.

A. R. DICKEY has bought Jones' saw mill, timber lands, etc., at Moss River, N.S., for \$18,000. R. Brownell, Oxford, N.S., will be manager.

S. F. MCKINNON has a permit for building a six-story brick warehouse on the corner of Jordan and Melinda streets, Toronto, to cost \$50,000.

WORK on the Beeton, Ont., waterworks is progressing with all possible speed. The plans were drawn up by John Galt, C.E., Toronto.

H. F. McCRAE & SONS, engine and boiler mfrs., Tilsonburg, Ont., will probably establish a branch at Tilbury Centre.—*Amherstburg Echo*.

THE McMaster Manufacturing Co. (agricultural implements), Orangeville, Ont., have offered the town of Brampton \$6,000 for the Haggart foundry property.

THE Chatham, Ont., Dredging Company have the contract for draining the large outlet to the Ouelette Drain in Dover township, Ont. The price is \$5,470.

THOS. DAVIDSON & SONS' tinware factory at Ste. Cunegonde, near Montreal, was on New Year's Day damaged by fire and water to the amount of \$25,000. The firemen were handicapped for want of water.

ADAM HALL, Peterboro', Ont., has just added to his plumbing shop an Empire testing machine. By this process smoke is forced through the sewer pipes, and should any leaks or defects be present, they will at once be detected.

THE Citizens' Gas Control Co. (Ltd.), Montreal, has been incorporated, with a capital stock of \$125,000. Its purpose is to manufacture and deal in governors and such appliances for regulating the pressure of gas, and other kinds of gas fixtures and plumbers' supplies.

ACCORDING to the Freeport (Ill.) *Journal*, the Stover Mfg. Co. of that city has arranged with Gould, Shapely & Muir, of Brantford, Ont., for the latter to have the exclusive right to manufacture and deal in their "Ideal" pumping wind mill and "Ideal Junior" sectional power mill.

PROPOSALS are coming forward for the construction of water-works at Berwick, N. S.

JETTE'S furniture factory at Montreal has been destroyed by fire. Loss \$11,000; insured.

HARVEY DU CROS, president of the Dunlop Tire Company, is organizing a factory at Toronto.

CIVIL Engineers Holt and Wetmore are preparing plans for the new bridge at St. Croix, N.B.—*Courier*.

NEWLANDS & Co., glove manufacturers, etc., Galt, Ont., are adding a hydraulic extractor to their plant.

THE masonry on the new steel bridge, at Alvinston, Ont., is about completed.—*St. Thomas Journal*.

THE town of Oakville will get \$3,000 from the county of Halton towards building an \$8,000 swing bridge.

THOMAS ROBERTSON, brick mfr., of Toronto Junction, Ont., has assigned. Liabilities \$32,300, nominal assets \$54,680.

A FACTORY is to be established in St. John's, Que., for the purpose of manufacturing small linen sacks to hold tobacco.

THE North Bay (Nipissing) Fire and Water Committee have purchased an additional pump for the pumping station.—*Times*.

N. McLEAN and Alex. G.W., of Fergus, Ont., have purchased a portable engine and boiler, and will establish a saw-mill at Eramosa, Ont.

A SYSTEM of dyking is proposed for Point Pelee Marsh near Mersea, Ont. It is stated that the value of the land, if reclaimed, would reach \$50,000.

LINDSAY, Ont., town solicitor, says the Waterworks Company have defrauded the town of \$25,000 through a jugglery in the company's stock.

THE spring roller and curtain pole plant of the Dominion Mfg Co., of Listowel, is advertised for sale by John Gabel, Listowel.

THE Masons of Montreal are contemplating the erection of a large Masonic Temple, to be the headquarters of the Order in the Province of Quebec.

WINTON & Ross have decided not to rebuild a shingle and rotary mill in place of those burned some time ago, owing to the depression in the market.

IT is reported that E. N. Dowie, late manager of Woodside refinery, is trying to organize a company to establish a new sugar refinery at Dartmouth, N. S.

THE Hotel Mission, at Mission City, B.C., has been gutted by fire. Loss, \$15,000. Insurance about \$4,000. The hotel will probably be rebuilt in the spring.

F. F. MEEHAN'S bottling works, formerly the old Calcutt brewery, Cobourg, Ont., have been totally destroyed by fire of incendiary origin. Loss \$3,000; only partly insured.

W. KENNEDY & Sons' machine shop office at Owen Sound, Ont., was entered by burglars the other day, who blew open the safe, only, however, to find a very small amount of cash.

THE Brockville Carriage Company and the Gananoque Carriage Company have amalgamated, and will continue business under the name of the Canada Carriage Company.

T. N. DENN, manager of the Strathroy, Ont., canning factory, has now, together with some local capitalists, purchased the entire plant, and will run it at full capacity next season.—*Age*.

NEGOTIATIONS are in progress with the Ferry Point Bridge Co. for the purchase of the bridge between Calais and St. Stephen, N.B. If these come to a head, the bridge will become free to the public.

ANOTHER opening seems to have been made for Canadian agricultural implements, such articles can now be admitted free of duty into the Argentine Republic, on application to the Minister of Finance.

THE following have been appointed officers of the Erie Glass Company, Welland, Ont. President, J. R. Wright, Toronto; J. Roe, Berlin. There appears to be chance of the factory being operated at a not very distant date.

CHARLES HAZARDOR, an employee of the Rathbun Co., Cedar Mills, Ont., was instantly killed, owing to a slab lodging in the saw and striking him with great force. C. Cronk, who was working at the saw at the same time, was seriously injured.

FIRE destroyed Stark & Thompson's mattress factory at Montreal last month. Loss \$5,000. At H. A. Wilder's furniture factory adjoining, water, smoke and fire did damage to stock to the extent of \$6,000 or \$7,000. All losses covered by insurance.

LEPHARDT & SHAFER are adding an engine and boiler at their factory in Berlin, Ont.

McELMON BROTHERS, Leicester, Ont., are adding to their saw-mill a Robb-Armstrong engine and Monarch boiler.

FIRE hydrants and about 1,200 feet of piping have been put in at Alvinston, and the village is now well protected against fire.

GOLDIE & McCULLOCH have the contract for a second steam boiler to be placed in the pumping-house at Galt, Ont.—*Reporter*.

THE new 250,000-bushel C.P.R. elevator at Quebec, was given a trial a few days ago, the machinery and whole work proving very satisfactory.

IT has been decided by Amherst, N.S., Baptists to build a new stone church at a cost of \$25,000 next spring. Plans are being prepared.

THE bridge over Twenty-Mile Creek, between Louth and Clinton, Ont., is completed according to specifications.—*St. Catharines Journal*.

HERBERT E. BOWMAN, town engineer of Berlin, and Thomas Hepburn are making a survey of Stratford with a view to a new sewage system.

THE Tavistock, Ont., flour mill has been burned down, together with 8,000 bushels of wheat. Loss \$23,000 on the building, insured for \$14,000.

A. LINDSAY'S flax mill at St. Thomas, Ont., has been burned. Origin of fire unknown. Loss \$3,500, no insurance. The mill will not be rebuilt.

THE Richelieu and Ontario Navigation Co. are re-building their workshops at Sorel, the city council having agreed to give a bonus of \$16,000.

IN our November number the Windsor Plaster Co. was referred to. This company carries on business at Windsor, Nova Scotia, not Ontario, as stated.

G. D. PRESCOTT is building a large saw-mill on the site of the old Turner mill, Albert Co., N.B., burnt down some years ago. He will put in a 100 h.-p. engine.

A. & E. LOIGNON, bridge builders, Montreal have now in hand the contract for the large steel bridge at St. Hyacinthe, Que. The contract will be finished this winter.

THE opera house at Woodstock, Ont., has been destroyed by fire, which was started by gas explosion. The building was insured for \$10,000, and it will probably be rebuilt.

A WHEEL on the heading jointer machine in Coates' stave factory at Blenheim, Ont., burst, causing the death of Sam. Hammond, an employee. Two others were severely injured.

A SPECIAL meeting of the Toronto Rubber Co. was recently held, to consider the enlargement of their works at Port Dalhousie, or otherwise their removal to St. Catharines or Toronto.

HUGH McCLAY has bought C. Warwick's saw mill, at South-wold Station, Ont., and will convert it into a chopping mill at Shedden, and expects to begin operations there about May 1st.

M. EMILE DURIE, of River Du Loup, Que., has purchased the lumber business carried on by the estate of the late F. C. Durie, and will continue business alone as lumber merchant and contractor.

THE Royal Victoria Hospital, at Montreal, a sketch of which appeared in our last number, was opened for patients on the 2nd instant, all parts of the building and equipment being then ready for their reception.

THE work of constructing the large sewers at Hamilton is being carried through. Most of the money voted for this purpose last spring, viz., \$12,800, has now been spent, but work will go on until the whole of it has gone.

MR. DAVIS, of a Chicago firm of manufacturers of creamery supplies, is considering the establishment of a branch factory at Guelph, Ont. He desires to take the drill hall free of taxes for ten years. About forty men would be employed to commence with.

ROBIN & SADLER, leather belting manufacturers, Montreal and Toronto, have received a handsome diploma and silver medal from the Eastern Townships Agricultural Association, awarded for their fine display of leather belting at the Sherbrooke Exhibition in September last.

THE *Canadian Journal of Fabrics* reports that a new cotton mill for the manufacture of hosiery yarns is being erected at Montmorency Falls. It will have a capacity of 750 spindles, and will be run by water power. It will be running about March. Chas. R. Whitehead, of the Montmorency Cotton Mill, is the principal promoter of the new mill.

McCOSH & REIDER have begun building operations for an electro-plating works at Paris, Ont.

THREE drop-water tube Kingsley boilers have been placed in the new C. P. R. Hotel at Quebec.

THE Cherry Hill cheese factory, near London, Ont., has been burned. Loss, \$25,000; fully insured.

G. W. AYER & Co.'s shingle mill at Magog, Que., has been burned. Loss about \$4,000; insurance \$1,000.

MANSON & BRIGHT'S grist mill at Magog, Que., has been destroyed by fire. Loss \$4,000; insured for \$2,000.

PURDY & WILLIAMS, Westminster, B.C., have been awarded the contract for building the reservoir at Vancouver.

HORACE BURNETTE, of the Chicago Canning Co., is considering the establishment of a milk-condensing factory at Montreal.

THE Victoria Wheel Works, Galt, Ont., have been so busy of late that part of their staff have been working overtime.—*Reporter*.

GILMOUR'S chair factory at Coaticook is closed, and the employees have removed to Waterloo, Que., where the industry will be continued.

CHATEAU FRONTENAC, the magnificent new C.P.R. hotel at Quebec, was opened on Dec. 18th. It is declared to be the most artistically furnished hotel on the continent.

THE Waterous Engine Co., of Brantford, Ont., have made arrangements whereby their steam mill specialties will be manufactured by the W. E. Hill Co., of Kalamazoo.

A COMPANY is applying for incorporation as the Drummondville Hydraulic Manufacturing Co. for the purpose of building dams and factories on the St. Francis River at Drummondville.

A CORRESPONDENT to the Montreal *Witness* says that it is proposed at Quebec to erect powerful elevators for the purpose of obviating the difficulties of ascending to the upper levels of that city.

A BOILER room, engine room, and coal shed are being built at the asylum at Lancaster, N.B.—"not before they are needed," says the *Argus*. A larger chimney also will probably be found necessary.

THE W. C. Edwards Co., Ottawa, has purchased McClymont's saw mill and McKay's grist mill, in New Edinburgh, Ont. The price for this property, including the "French" Woolen Mill, was nearly \$100,000.

CHOWN & CUNNINGHAM'S stove factory at Kingston, which has lately been operated by the J. Smart Manufacturing Company, Brockville, will shortly be sold by auction, owing to the foreclosure of a mortgage.

THE Board of Road Directors of Strathroy, Ont., recommend the calling of tenders for new bridges, one between Caradoc and Metcalfe and one over Dignan's Creek, between Delaware and Westminster.—*Age*.

PETER BERTRAM'S hardware store, at Hamilton, has been gutted by fire, which started near one of the registers connected with the furnace. Loss on building, \$8,000; loss on stock, \$20,000. Insured for \$14,000.

J. C. WILSON & Co., paper makers, Montreal, have purchased the entire plant of the late Star Collar and Box Co., of the same city, and will change their premises, which are too small for their requirements, to those occupied by the latter firm.

THE Underwriters' Association are holding a correspondence with Perth, Ont., town council regarding an increase of the safeguards against fire in that town, the former threatening to raise the rate of insurance unless something be done at once.

AMONG the new building enterprises proposed for Quebec is a large opera house in conjunction with a grand hotel, to be erected by B. Trudel, on the site of the present Royal Albion. The C.P.R. will, perhaps, build another large elevator on the Louise docks.

THE Record Foundry and Machine Co., Moncton, N.B., are extending their works, with the object of making iron bridge building a department of their business. They are putting in some new machinery for the same purpose and have already taken some orders.

AN American company suggests that the Montreal city council should pass a by-law compelling citizens to separate garbage from ashes. The company proposes then to convert the garbage into merchantable articles by use of superheated steam, the process being said to be entirely inoffensive and inodorous. One of the products of the process is grease, which is of value in soap-making, and the other contains a large amount of ammonia and might be used as a fertilizer.

J. T. HUBER, whose glue factory at Berlin was recently burned, has secured J. Cluthe's mills at Doon, Ont., and will in future manufacture at the latter place.

THE Aetna Cooperage Co.'s cooper shop at Brigden, Ont., was burned on the 29th ult., the outfit of the workmen and a good deal of stock also being destroyed.

FAWCETT'S foundry, Sackville, N.B., together with the nickel rooms, moulding shops, furnace and engines, was burned to the ground last month. Loss, \$75,000; insurance small. The fire originated from a watchman's stove. Forty men are thrown out of employment.

St. JOHN, N.B., though not pre-eminently a manufacturing city, now has 601 separate industries, employing 3,672 persons, and paying out \$1,200,000 annually in wages. The capital invested is about \$3,700,000, the working capital being \$1,000,000, and the finished product is worth \$4,400,000.

THE Canada Paper Co.'s pulp factory at River du Loup is now doing grand work; the mill has not stopped since last March, and is bringing large profits to its owners. It is one of the best located mills in Canada. The water-power is just grand, 48 in. turbine under a 90 ft. fall developing nearly 2,500 horse-power. It is said to be the strongest water-wheel in the world.

IN our October number we had an item to the effect that Ald Bell had proposed that the Toronto authorities should deposit ashes and such material under bridges so as to fill up the hollows to the street level, thus saving a considerable amount of money. The Renfrew *Mercury* now draws our attention to the fact that A. A. Wright some time ago made a similar proposition for that town.

HEDLEY J. DONAHUE, of Chicago, representing the McCallum Steel Wagon Co., of that city, has been visiting Hamilton with a view to starting a Canadian branch there. The company started by making steel wagon wheels, but now make wagons almost entirely of steel, and claim that the result is a lighter and stronger wagon. About 100 or 150 men will be employed in the Canadian branch, which number will be increased, as they propose to do an export trade from this branch. The *Times* says Mr. Donahue is an old Hamiltonian.

WHIPPLE & COOPER, who recently started business on Mary st., Hamilton, as brass founders and manfrs. of aluminum anti-friction metal, have already made more than a local name for themselves. Mr. Cooper, who has charge of the foundry, is a young man who has just entered his twenty-first year, yet he has turned out work which has been a surprise to his friends in the trade, and he bids fair to become a genius in this line. He recently turned out three castings in Foster bronze, weighing 1,800 pounds each, and the work was perfect.

THE *Eastern Chronicle*, New Glasgow, N.S., says: John Stewart, of this town, has the contract for the construction of four bridges in this Province; one at Lockeport, Shelburne Co., which is two spans, 85 feet 9 inches each, and a pivot span of 116 feet. This bridge is to be made strong enough to carry engine and cars over the proposed narrow gauge line; another bridge is Phinney's Bridge in Digby Co., 81 feet, one span, 16 feet roadway; another, Meisner's Bridge, in Lunenburg Co., 80 feet, one span, 15 feet roadway; another, Ball's Bridge, near Sydney, C.B., 80 feet, one span, and 15 feet roadway.

Mining Matters.

GOLD mining at Point de Bute, N.B., is reported to be progressing favorably.

ARCHIBALD BLUE, of the Ontario Mining Bureau, is making an official examination of Eastern Ontario mines.

A CORRESPONDENT writes us that there is a prominent outlook for nickel in one of the townships near Kingston.

FRED WELLS has discovered near Fort Steele, B.C., some gold-bearing quartz, sampling from \$400 to \$1,000 per ton.

THE St. George, N.B., granite works have shut down for the season, after the most successful season so far experienced.

ORE is being shipped regularly from the "Skylark," Boundary Creek district. Its leaseholders have now also leased the Dickman claim.

THE Halifax *Herald* says there is considerable excitement in Moncton, N.B., over the discovery of gold-bearing quartz about five miles from the city. Analysis shows \$3.80 of gold and 20 cents of silver to the ton. Millions of tons of quartz are in sight.

EIGHT feet of solid galena have been struck at the "Slocan Star."

H SÆROY, owner of the Black Prince claim near Trout Lake, B.C., has brought from the Lardeau district some specimens of Titanium ore.

MANY more gold areas have been taken up in the neighborhood of Westmoreland Point, N.B. The ground claimed now covers almost 300 acres.

MR. RUSSELL has put in a diamond drill at the Lava Mine, Bryson, Que., and the result is reported to be even better than was at first expected.

THE rate of production at the Sultana mine, Rat Portage, Ont., reaches now almost one gold brick each week, worth about \$1,300. —*Toronto Empire*.

THE new Kingston School of Mining, Kingston, lately assayed a specimen of galena from Eastern Ontario, which carried over 133 ounces of silver to the ton.

ALL the lime quarries in Nova Scotia and New Brunswick are reported to have been handed to a Boston syndicate, under the leadership of Hank Jones.

IT is reported that recent assays of ore from St. Stephen, N.B., nickel mines are so encouraging that further developments are likely to be in order next spring.

MAYOR JENNISON, New Glasgow, N.S., has purchased the "Tenny Cape," N.S., manganese mines; who, with a syndicate, will continue to operate them.

THE "Defiance" claim, Boundary Creek district, has developed a rich chute of ore and has been bonded to the Spokane and Great Northern Mining Co.

MUCH of the plaster from Mosher's quarries, at Newport Station, N.S., will be shipped *via* Windsor to the States as soon as the new connecting railroad line is finished.

THE Pictou, N.S., Charcoal Iron Company's Kilns will soon be put into operation, and as soon as a supply of charcoal is obtained the blast furnace at Bridgeville will be started.

A VALUABLE deposit of manganese has been found at Brookdale, near Amherst, N.S. Edward Curran, of Amherst, has taken out papers authorizing him to develop the property.

THE Memramcook mine seems to have been a well-paying concern since the new crusher was put in. A large building is now being built, to be equipped with the best machinery.

A BRICK of gold has just been formed, the product of 89 tons of quartz from the Cochrane Hill gold mines, Guysboro' county, N.S. It weighs 57 ounces 3 dwts. and 7 grains, and is valued at \$1,115.

A.L.D. W. N. PONTON, of Belleville, Ont., is agitating for the establishment of a museum and central bureau of information regarding mining and minerals, in connection with the Belleville Institute.

A GAS WELL was discovered at Oxford, Ont., a few days ago. A vein was struck at a depth of 80 feet, and before the gas could be capped it seems to have blown sand and stones hundreds of feet in the air.

THE C.P.R. Salt Well Company shipped their first lot of salt, consisting of ten tons, last month. It will be used for scouring purposes, as, owing to its having been the first pumping of the wells, the salt was very dirty.

IT is expected that by the end of the present month the output of coal at the Joggins, N.S., coal mines will be 100 to 125 tons per day. The coal at the bottom of the new slope is believed to be of better quality than that in the other workings.

MANGANESE shipped by Capt. Sargent to New York, from the mine on the Newcomb property, Albert Co., N. B., fetched \$50 per ton, and averaged 92 per cent. Four tons have already been shipped, and the prospects are excellent. —*Albert Maple Leaf*.

A. A. McRAE, Edmonton, Alberta, has in his possession about two pounds of gold nuggets, which he found in the Saskatchewan River above Edmonton. It is said to resemble Nova Scotia gold very closely—not at all brittle—and it is 24 carats fine.

A TERRIBLE accident occurred a few days ago in the Symonds-Kaye gold mine at Montague, not far from Halifax, by which four miners were killed. A gang working in one of the tunnels, having an idea that there was a distance of about 50 feet between them and an old working full of water, fired off a blast. Instead, however, of fifty feet, the distance was really only five feet, and the result was that a hole was driven through this thin partition, through which the water came pouring in to a depth of forty feet, drowning four of the workmen like rats in a trap.

WORK will probably be commenced next spring on the gold reefs in the Big Bend, B.C.

A. G. NELSON has located some likely looking rock on the head of Mission Creek, near Vernon, B.C.

CAPT. CORBETT and J. Macdougall report discoveries of gold in the neighborhood of Fort William, Ont.

THE Chapman Creek hydraulic, put in by the C.P.R. near North Bend, B.C., is now working full blast with good results.

MR. McNAUGHT, who recently bonded some of the Grady group, Slocan district, now has 13 men on development work.

THE quartz gold lead at Waverly, N. S., is turning out well, says the *Colchester Sun*. A large new crusher will probably be added soon.

THE preliminary work in connection with the Canadian Iron Furnace Co.'s new iron mine in East Sherbrooke, Que., is progressing satisfactorily.

B. STEEVES believes he has struck a valuable deposit of coal near Alma, along the line of the Albert Southern Railroad. A shaft has been sunk already.

HAYCOCK & GENDREAU are running a quartz crushing mill at Beauce, Que., with every prospect, says the *Saturday Budget*, of extracting a highly remunerative quantity of gold.

A GOLD-BEARING lead of quartz has been discovered at Big Bo-Bridge, near Mount Uniacke, on the Windsor, N.S., branch railway, and preparations are now being made to work it.

GREENLEES & BANFIELD, owners of the Black Prince mine at Lardeau, B.C., report the claim looking better as greater depth is attained. They expect to ship about 1,000 tons next summer.

THE "Mountain Queen," on the north fork of Carpenter Creek, is a high-grade claim belonging to A. Rodgers & Strathern Bros., and has a 23-inch ledge of dry ore, assaying 123 ounces to the ton.

THE "Golden Queen" claim, in Trail Creek district, has been sold to W. Alpers, of Spokane, and Paul Gatton, of Palouse City, for about \$7,000. The ore consists of copper sulphide, carrying gold.

THE following are the present officers of the Pictou Charcoal Iron Co.: President, J. D. McGregor, New Glasgow; secretary and treasurer, W. C. McDonald, Pictou, and manager, E. A. Sjostedt.

WILLIAM NIVENS and Albert Behne, part owners of the "Idaho," near Nelson, report prospects good, there being eighteen inches of ore in one of the upper tunnels and two feet in the other. Both tunnels are in about ninety feet.

F. C. CAMPBELL and Fred. Johnston, who have claims on the "Badshot" and "No. 25," in the same district as the above, have closed down for the season, but expect to ship ore in the summer. The ore assays from \$250 to \$1,100.

ORE has been passing out of the Slocan district, via Kaslo, at the rate of about 100 tons per week, the average value of which is over \$17,000, and mining men say that the record for the next month or two will show better than ever before.

THE Edmonton *Bulletin* reports the finding of a bright stone resembling a diamond, imbedded in earth looking very similar to that in which diamonds are found in the "fields" of South Africa. It was taken from the new coal drift at Fort Saskatchewan.

JOHN ASKWITH, of Ottawa, and a company with \$300,000 capital are preparing for extensive operations at the Robbie Burns Mine, in Spallumcheen district B.C. The ore is very rich in free milling gold, and an immense quantity is said to be in sight.

ON Boundary creek, in the Providence claim, ore is being packed out to the Colville smelter, some seventy-five miles away, at a good profit, and this and a number of other rich strikes along the Kettle River point to the location of a smelter in that district ere long. —*Victoria Colonist*.

THE "Mountain View," on Carpenter Creek, is said to be a true fissure vein of 12 inches, with an average assay of 310 oz. of silver to the ton. According to the *Kaslo-Slocan Examiner*, it will be a bonanza to its owners, Strathern Bros. and Alex. Rodgers, who intend to work it fully next summer.

IN connection with the Block House coal mine at Glace Bay, C.B., which has been idle for some years owing to losses, the *Halifax Herald* says that proceedings are being taken to foreclose a mortgage for \$77,000 to secure bondholders. Litigation is likely to ensue, as the representatives of the company, it is understood, will resist the sale.

J. B. HOBSON, Vancouver, manager of the Horse Fly Hydraulic Mining Company (Ltd.), says that there is an abundance of water and all other requisites which should ultimately transform the Cariboo mining district into one of the richest gold producing countries in the world. All that is required is sufficient capital to open up its vast resources.

THE Hastings Mining & Reduction Co. have introduced the Walker & Carter process at the Marmora, Ont., gold mines. By this process the arsenic and sulphur are separated from the quartz first, and in this particular case the arsenic alone is said to pay for expenses of working. The capacity of the mill is 10 tons per day, and the gold realizes an average of \$10 to the ton.

A LITTLE to the north of Bear Lake lies a dry belt of ore of considerable extent, and, if recent reports are to be believed (remarks the Nelson Miner), rich as well. Many of the owners in this district are too poor to do much development work, but, judging from the returns received on what shipments have already been made, this will be a wonderful camp when fully developed.

A DITCH is being constructed, ten miles in length, to convey water from Mussel Creek to the mines on Horse Fly River (Cariboo), which are under the management of J. B. Hobson and Mr. Warner. The water will be utilized for hydraulic pressure. Piping 8,300 ft. in length, 30 inches in diameter, has also to be constructed for carrying the water across deep depressions. The contract for this pipe has been awarded.

THE work up to date at the "Silver King" has given most satisfactory results, says the Nelson Miner. The main lead has been uncovered at various points for 2,000 feet. Drifting has been done each way from the winze which connects the upper and lower levels, the drifts being in solid ore and about 100 feet long. The greatest depth is obtained about 300 ft. below the surface. The desire is to get the mine in shape for a large force of men as soon as the tramway is constructed.

THE Ophir Gold Mine, Algoma, on the north shore of Lake Huron, has a vein well proved for a depth of 200 feet, and a length of 350 feet. Half the width of this vein is rich ore, assaying \$30 to \$50 per ton. A new mill of 20 stamps, which stamps from 40 to 50 tons per day, has been added to the plant. Henry B. Warren, of Victoria, B.C., an Englishman and a mining engineer of wide experience among the gold mines of Australia, has returned from a visit to this mine. He expresses himself astounded at the result of his investigation, and estimates the value of the gold in the Ophir mine, which consists of what was at one time a vast fissure in the rock, but now filled with untold millions of tons of gold-bearing quartz, at twenty-five million dollars.

A COMPANY is being formed for the purpose of developing the Hassard coal mine, Souris (Man) district. The present workings show an eight-foot vein of solid coal. Layers of valuable clay also are said to have been discovered, which will be utilized in the manufacture of bricks and tiles.

T. B. LeBLANC and D. Bourgeois are applying for a mining lease covering about 100 acres at Dover, N. B., where what they take to be a valuable deposit of gold has been discovered. Samples on analysis show \$3.80 worth of gold and 20 cts. of silver to the ton, and the crushing expenses are estimated as small.

THE Truro Daily News vividly describes the state of dilapidation in which the Jay's River, N.S., gold mine at present exists. Little now remains of the once complete and fine machinery but the larger articles difficult to remove. The seam of ore which gave a fortune to the first owners of the mine soon became exhausted; but, says the above-named journal, perhaps at some future time "other rich pockets of gold may be found, and the tradition of the mine revived."

Railway and Marine News.

A NEW fog-alarm station is to be established on Entrance Island, B.C.

THE old bridge at Lock 2, old canal, St. Catharines, Ont., has been pulled down.

OTTAWA City Council have passed a by-law granting \$150,000 for a bridge across the Ottawa River at Nepean Point.

THE Niagara Falls Park and River Railway will probably build a bridge from the Canadian side to Navy Island and thence to the American shore.

AT a meeting of the directors of the Coast Railway Company of Nova Scotia, at which Thomas Robertson was elected president and treasurer, it was decided that the location of the road from Yarmouth to Tusket should be commenced immediately.

IT is stated that the Windsor & Annapolis Railway Company are endeavoring to obtain control of the steamship line plying between the latter town and St. John.

THE Quebec Board of Trade are discussing the practicability of navigating the St. Lawrence at an earlier and later date in the year than under present arrangements. The opinion was expressed that the Federal Government should grant bonuses to the

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steamer that would attempt to navigate the river early in March and late in December.

NEGOTIATIONS have for some time been in progress between the Hamilton, Grimsby and Beamsville Railway and the Toll Road Company to allow the railway to make use of Main street. Difficulties have cropped up, however, and it is uncertain whether the matter can be arranged.

N. K. CONNOLLY, since his imprisonment, has sent in his resignation of the position of president of the Richelieu and Ontario Navigation Co., but he has been requested to withdraw it. Michael Connolly was appointed acting president during the absence of his brother.

THE Grand Trunk have decided to build the proposed single arch bridge across the Niagara. The new bridge will be a steel arch structure, which will rest upon two ledges of rock formed midway between the water's edge and the top of the bank. The bridge will be about six hundred feet long and cost about \$200,000.

THE Toronto Board of Trade, at a meeting recently, passed a resolution, by a very large majority, to the effect that a ship canal between Georgian Bay and Lake Ontario was financially impracticable, and, even if constructed, would be a useless expenditure of money.

THE Peterborough Navigation Co. are taking steps to secure a charter. They will build a large new steamer to ply on the Otonabee river to a park which the company propose to form about five miles down the river. R. S. Davidson, Peterborough, is the secretary and treasurer *pro tem*.

NEGOTIATIONS are in progress for the transfer of the Richelieu Ontario Navigation Co. to an American syndicate, headed by H. A. Everett, who was recently managing-director of the Montreal Street Railway. It is rumored that this important deal will eventually be found to include other river and lake companies as well.

THE Lower Laurentides Railway Company is asking the Provincial Government's permission, says the *Montreal Witness*, to change the route of their road from Grandes Piles to Grande Mere, which, they say, offers considerably fewer difficulties in the way of construction.

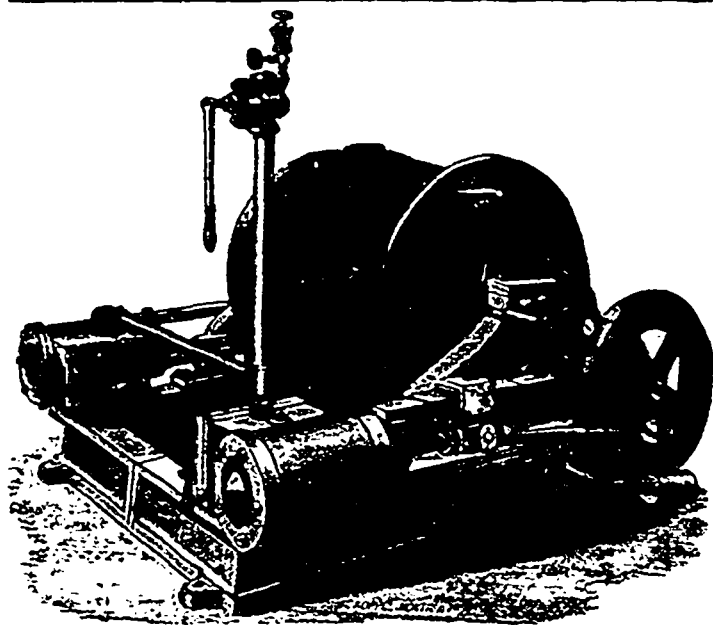
It is quite possible that the London & Port Stanley and the Lake Erie & Detroit River Railroads will be joined together by means of another-section of line, and run as one road.

THE new Bangor and Aroostook railway was opened last month. Speaking of this the *St. John Sun* says: "This is a memorable event and it means the completion of the greatest trunk line in New England to Houlton." Work on building the road further north will be resumed earlier in the spring.

THE Esquimalt Marine Railway Company are constructing in Esquimalt harbor a marine railway for docking and repairing vessels. The plan, which it is believed will be considerably cheaper than the ordinary dry dock method, will consist in floating the vessels on a cradle, where they will be fastened by patent blocking, then pulled up an inclined railway 700 feet long on six tracks by means of powerful machinery. The cost of the undertaking, including repairing shops, is estimated at \$60,000.

A. R. SUTTON, civil engineer, Chicago, proposes the establishment of a ship canal between the lakes and Hudson River, connecting with the latter at Troy or Albany, N.Y., and thus forming water communication with the ocean. The proposition is to change the course of the Welland Canal, in connection with the charter granted by the Dominion Government for its improvement, Mr. Sutton claiming that it will be much cheaper to divert the course of the canal from a point near Thorold east to Niagara River, midway between the rapids and Niagara town on the south, than to carry out the proposed improvements.

C. R. G. JOHNSON, of Montreal, fire insurance agent and broker, has been appointed resident agent of the Connecticut Fire Insurance Co., of Hartford, Conn., the cash capital of which is \$1,000,000, and net surplus, \$500,000. Mr. Johnson now represents the "British America," "Agricultural," of Watertown, N.Y., and the "Connecticut," three strong and reliable companies. In addition to his agencies, Mr. Johnson transacts a large brokerage business, and places risks with all the chief companies doing business in Canada and elsewhere, on mills, factories, elevators and warehouses, situated in any part of the Dominion, and gives such matters his personal attention.



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Brief, but Interesting.

THE bellows of the new organ in the Presbyterian Church at Orillia, Ont., are worked by a turbine water motor.

A MACHINE has been invented for making gas from wood. Besides 18,000 cubic feet of gas, it is claimed that it will produce from a cord of firewood thirteen sacks of charcoal and two gallons of tar.

THE Manchester Ship Canal, the construction of which has caused such deep interest throughout the civilized world, was opened for traffic on New Year's Day, although the formal opening will not take place till the spring, on account of the shortness of the day at the present season. Manchester's royal charter as a port is said to be the first issued under the Great Seal since almost mediæval times.

A FRENCH engineer proposes to build an Atlantic liner on a series of eight rollers. He argues that placing the vessel on wheels or rollers will greatly diminish the resistance offered by the waves and will enable the distance between New York and Southampton to be accomplished in four days. He proposes to arrange the rollers so that they will be about 26 ft. deep in the water, and will revolve within a platform placed about 24 feet above the water-level. The ship will have, therefore, a rolling instead of a gliding motion through the sea.

The Patent Review.

- 44,043 George Beverly Morrill, Canterbury, New Hampshire, axe or tool wedge.
- 44,045 Robert Monroe, Alleghany, Penn., water tube boiler.
- 44,046 Wm. J. Jones, Pinson, Tennessee, nut lock.
- 44,047 Frisram D. Brown, Canandaigua, N.Y., pail, pan, wash boiler, etc.
- 44,049 Wm. Humphrey Perrin, Merrickville, plow coulter.
- 44,050 Edmund F. Hartshorn, Newark, N.J., apparatus for manufacturing metal tubes.
- 44,051 Walter Melinus, Albany, N.Y., brush.
- 44,052 George Booth, Toronto, Ont., range boiler.
- 44,053 Samuel George Curry, Toronto, moisture pan for radiators.
- 44,056 Wm. Alfred Drewett, Brooklyn, N.Y., direct acting steam engine.
- 44,057 Aaron Kerry, Marysville, Mich., hand drill.
- 44,087 Joseph A. Murdoch, St. John, N.B., paper ruling machine.
- 44,092 Herbert A. Wagner, St. Louis, Mo., electric motor.
- 44,093 Charles L. Ourtman, Detroit, Mich., driving belt.
- 44,094 Charles Wilkin, Shenectady, N.Y., process of manufacturing electrical insulating materials.
- 44,095 L. L. Merrifield, Franklin, Mass., apparatus for manufacture of gas.
- 44,096 J. B. S. Booth, Manchester, Eng., telephone.
- 44,103 John T. Neil, Millersport, Ohio, metallic roofing.
- 44,104 H. Saamhopf, Brunswick Germany, automatic coupling for vehicles of all kinds.
- 44,105 Arnold Kohl, Centralia, Ill., binding post for electrical connections.
- 44,107 Wm F. Deweese, Chicago, Ill., method for making wood carvings.
- 44,112 F. Schneider, Dresden, Saxony, Germany, safety lock.
- 44,115 G. Seynour, Adelaide, South Australia, material for facing moulds used in the casting of metals.
- 44,116 Jacob R. Steitz, Cudaky, Wis., sprinkler.
- 44,117 F. H. Gandrie, Port Hope, Ont., can-labelling machine.
- 44,118 H. D. Woodworth, Berwick, N.S., brake for vehicle.
- 44,119 W. J. C. Doyle, Rochester, N.Y., fuse igniter.
- 44,120 David L. Dwimell, Montreal, Que., hot water heating system.
- 44,122 W. C. Cleveland, Rounthwaite, Man., belt holder.
- 44,123 C. F. Hardy, Scottsville, N.Y., bolting apparatus.
- 44,125 E. Thompson, Swanscott, Mass., regulator for dynamo.
- 44,127 S. A. Rosenthal, London, Eng., secondary battery.
- 44,128 W. Lawrence, New York, N.Y., electric machine for traction and stationary purposes.
- 44,129 Cyprien Mailloux, New York, N.Y., system of electric distribution.
- 44,130 O. G. Blunden, Middlesex, Eng., apparatus for, and the method of preparing peat and turf for use as fuel.
- 44,139 E. Seybold, Ottawa, Ont., electric heating coil.
- 44,131 M. W. Dewey, Syracuse, N.Y., electric heating apparatus.
- 44,133 C. W. Hazeltine, St. Louis, Mo., arc lamp electrode.
- 44,135 Thomas Crancy, Bay City, Mich., electrical bell.

AMERICAN PATENTS.

The following is a list of patents recently granted in the United States to Canadians. This list is specially furnished to THE CANADIAN ENGINEER by H. B. Willson & Co., Washington:

- Theodore N. Clark, Toronto, Ont., dental chair, No. 508,564.
- Robert B. Robinson and E. P. Conley, Sherbrooke, Que., card waste transmitter, No. 508,487.
- Robert B. Robinson and E. P. Conley, card waste transmitter, No. 508,488.
- Thomas Davidson, Montreal, Que., damper, No. 509,019.
- Richard Smith, Sherbrooke, Que., steam regulator for paper machines, No. 508,993.
- Thomas Renwick, Miami, Man., car coupling, No. 509,627.
- John G. Smith, Montreal, Que., stop-cock, No. 509,628.
- Henry Vachon, Golden, B.C., shoe fastening, No. 509,707.

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.

Recent applications for Patents in Germany:—

- Apparatus for absorbing, cooling or heating of gases by fluids; Franz Windhausen, in Berlin.
- Rail-cleaner, with automatic apparatus for strewing salt and sand; W. Greulich, Remscheid.
- Process and apparatus for the production of heating-gas; C. H. Knoop, Dresden.
- Electrolytic production of heavy metals by means of a fusing substance; South-German Electric Company, Beckmann, Schmitt & Co., Neustadt and Hardt.
- Process for making the thread-grooves in sewing-machine needles; Thos. Zimmerman, Aix-la-Chapelle.
- Patents granted in Germany:
- Means for diminishing the number of revolutions in reversed current friction—machines with magnetic revolving field; Siemens & Halske, Berlin.
- Universal shaping machine with horizontal shaping spindle; O. A. Petschke, Chemnitz.
- Machine for making horse-shoe nails from prepared pieces; Meyer, Roth & Pastor, Cologne.
- Three-sieve paper machine; E. Fullner, Warmbrunn, Silesia.
- Roasting-drum for coffee, etc.; L. Brandes, Wolfenbuttel.

PATENTS procured for Canada, United States, Great Britain, etc.
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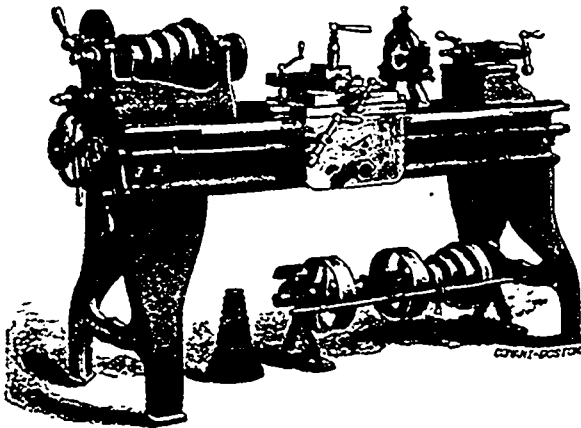
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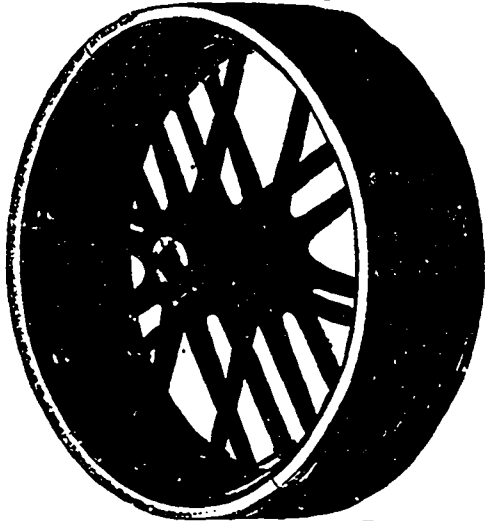
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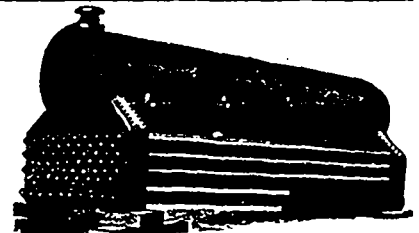
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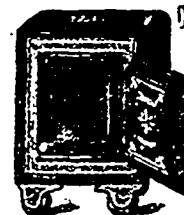
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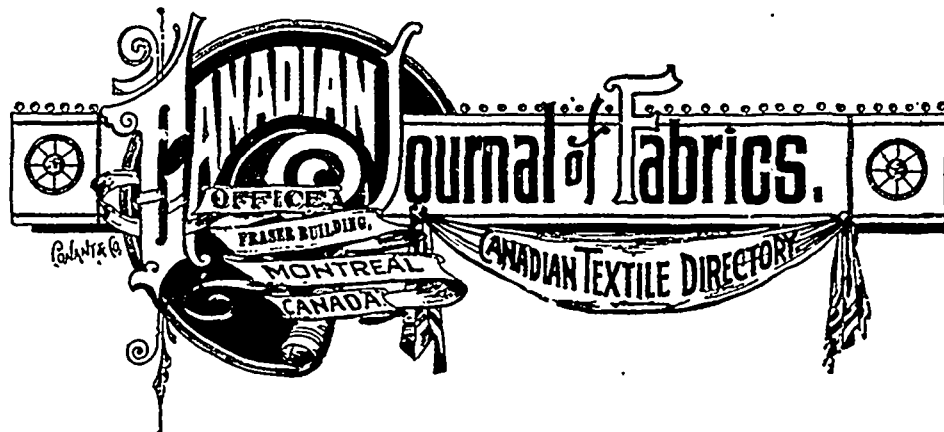
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