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The Canadian Engineer

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The Canadian Engineer.

ISSUED MONTHLY

BY THE CANADIAN ENGINEER COMPANY

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

MONETARY TIMES PRINTING CO. OF CANADA (LIMITED).

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

Toronto, December 1, 1893.

THE HAMILTON CANAL.

In the August number of THE CANADIAN ENGINEER a scheme was outlined for the construction of a canal from a point on Lake Erie to the City of Hamilton; this canal to be used for the double purpose of giving an increase to the water supply which the city now needs, and of supplying electric power and light to the manufacturers of Hamilton. Our usually well informed and public spirited contemporary, the Hamilton *Times*, after quoting our article, dismissed the scheme as one which had been discussed and exploded forty to fifty years ago. We credit the *Times* with deriving its information from local and biassed sources, and with a temporary forgetfulness that the world has moved considerably during the last forty years. Forty years ago a million dollars was a very vast sum compared with that amount now, in connection with public undertakings. Forty years ago the resources of the Ontario peninsula were comparatively small. Forty years ago the appliances for the rapid and economical prosecution of public works were nothing compared with those available to-day. Forty years ago the only use of such a canal would be in connection with navigation and water supply. If the question were one of navigation or water supply even now, we could understand the scepticism of the *Times;* but the developments of electricity during the last ten years have put upon this canal the aspect of an entirely new scheme. The fact is, as we have said before, that both for strategical purposes and for commercial purposes, the Welland Canal should have been built to the head of Lake Ontario, instead of near the mouth of Niagara, and. had such been done, the question of Hamilton's manufacturing supremacy amongst the cities of Ontario would have been settled. As it is, we have now to consider the feasibility of a canal to bring electrical power and water supply to Hamilton. Two or three engineers who have gone into the subject somewhat since our article appeared are fully satisfied of the feasibility of the scheme. The water of Lake Erie is of equal quality with that of Lake Ontario, while the water from such a canal would receive as much aeration in falling over the various locks and reservoirs as the waters of the Niagara River receive. The cost of the canal or tunnel, or combined canal and tunnel, is the only question to be settled, and a competent engineer is now going into the matter. This much is certain, that with the appliances now at hand for constructing such work, the cost will be far less than the figures given in any former estimates, and much less than the average citizen of Hamilton would suppose, while such a vast amount of electrical power as this canal would develop would have a wonderful influence on the industrial future of Hamilton. The increased value of real estate and industrial property which the completion of such a work would effect, would alone make the investment a desirable one for the city. We hope before long to be able to give some definite information as to the cost and plans of such a work.

THE KINGSTON SCHOOL OF MINES.

Under this heading we noticed in our last issue the creation of a new educational institution at Kingston, and we gave the *personnel* of the staff.

In the query, "Why should the Ontario Government pay two professors of mineralogy and maintain lectureships and laboratories when the one already in Toronto could do the work?" the writer overlooked the fact that the School of Mines, while an entirely distinct institution, in reality enjoys all the advantages of indirect partnership with a great University, viz., Queen's.

We also find on enquiry that the School of Mines, though very properly bonused by the Government of Ontario, is self-supporting, with a strong board of governors, and while a large amount of money has been raised by private subscription, it will be necessary for a considerable sum yet to be subscribed to ensure the school's success. It is sincerely to be hoped that there are enough admirers of Principal Grant's patriotic attempt to assist our mineral development to guarantee the permanent success of the school. Besides the education of mining engineers the school gives two months' courses to prospectors, mine foremen and assayers. This is an extremely commendable departure, for it is the prospector and the assayer that are the pioneers of mineral discovery, and too often the former works long and arduously in the dark through lack of

much desired knowledge. Now the School of Mines at Kingston has placed this within his reach, and it should prove an inestimable boon to the community.

The educationists interested, and the people of Kingston especially, are doing their best to build up an institution which will have an incalculable influence on the industrial future of this country; and as far as Ontario is concerned, Kingston is probably on the whole the most suitable of all places that could be selected for the purpose. A Kingston gentleman writing on the subject of the school to THE CANADIAN ENGINEER, says: "We should have had a mining school a quarter of a century ago. The governors of the school have raised $35,000, which they hope to increase soon to $50,000, while as yet no other place has done anything." While it is to the lasting credit of those Kingston gentlemen who have proven themselves so public spirited, it is to be hoped that manufacturers and men interested in our mining development in other parts of the country will not allow the burden to fall entirely on the shoulders of local men. This is an institution that may benefit thousands in the remotest parts of the province, and there is no channel of philanthropy so likely to bring back a stream of personal benefit to the man of bounty as this.

THE "LUCANIA'S" ENGINES.

In view of the startling "records" made recently by the "Lucania," the sister-boat to the renowned Cunarder "Campania," the following detailed account of her machinery from an English exchange will probably prove of interest:—

"Each set of engines has five cylinders—two high-pressure, one intermediate, and two low-pressure. The high-pressure cylinders are placed one at each end, above the low-pressure cylinders; while the intermediate is in the middle. In this way the great advantage pertaining to the balance of parts and of motion due to the three-crank engine is secured, while the adoption of five cylinders also enables the diameter of the low-pressure cylinders, and the pistons belonging to them, to be reduced to a size giving more satisfaction in working and upkeep. The diameters of the cylinders are:—High-pressure, each 37 in.; intermediate 79 in.; and low-pressure, each 98 in. The stroke of piston in each case is 69 in. Each pair of low-pressure and high-pressure cylinders, in tandem position, is connected with the ordinary sleeve stuffing box, having metallic packing. All the cylinders are steam-jacketed, and have automatic steam traps for the return of water to the hot well. The high-pressure piston-rods are not fitted with metallic packing in the ordinary sense, but with long brass sleeves. The cylinders and casings are borne by cast-iron frames, supported on a cast-iron bed-plate of the type which has already proved satisfactory in so many of the splendid vessels produced at Fairfield. The bed-plate, which is 5 ft. 6 in. deep, made up of box type castings, is bolted down to an exceedingly strong seating. The bolting of the engines to the seating had extra special attention, while the staying of the top weight of cylinders has been carefully looked to as regards bracing the several cylinders together fore and aft. From the base of the engines to the top of the cylinders the height is 47 ft. The valve attached to each of the high-pressure cylinders is of the piston type, having Buckley's packing. A slide valve is fitted to each of the low-pressure cylinders and to the intermediate one, the valve gear being of the usual double eccentric and link-motion type. The pistons of the high-pressure cylinders are fitted with Ramsbottom rings, while the intermediate and low-pressure pistons have each one ring fitted with Downie's packing. The piston-rods and connecting-rods were forged from steel ingots, each connecting-rod in itself weighing about 10 tons. As evidencing the precautionary care taken to secure homogeneity and continuity in the metal of which these important items are made, it may be stated that, in the rough, each connecting-rod forging weighed in itself 25 tons. The condenser, which is rectangular in section, and of cast iron, is built up in three parts, and divided into two main sections in such a way as to enable each low-pressure cylinder to have its own condenser. The condenser is fitted with brass tubes ¾ in. bore. Two air and two circulating pumps, each driven by a lever from each crosshead of the fore and of the after cylinders, are situated at the back of the condenser. From these crossheads pumps are also worked which lift water from the condenser to the feed-heater, which, with other of the accessories more properly connected with the boilers, will be described further on. An auxiliary condenser is provided in each engine-room for the needs of the air and circulating pumps, and for use when the vessel is in port and the main engine standing idle.

"There are two sets of circulating pumps and engines, each set comprising two centrifugal pumps in the middle, with one engine on each side. These have suction and discharge branches 20 in. internal diameter, and impellers 51 in. diameter, and engines of the tandem compound type. The collective quantity of water delivered by each set is about 16,000 gallons per minute, the speed when circulating being 100 revolutions per minute, and when pumping from the bilge 250 revolutions."

BEGINNING with our January number we propose to devote a page of space to a classified list of advertisers, giving each advertiser a line under one or more headings, and making a classification of subjects for the convenience of the reader. Our advertisers will oblige us and benefit themselves by sending us at once a memo of the different headings or subjects under which they wish their names to appear.

AT the recent street railway convention held in Milwaukee the Canadian delegates extended an invitation to the convention to hold its meeting for 1895 in Montreal. This invitation will probably be accepted. If the convention were held here now we hardly know how we could hide the Montreal street railway; but 1895 is still some distance off, and by that time no doubt the Montreal company will have something good to show. At all events American railway men will find in Montreal an interesting city and may make sure of not going away disappointed.

THE frequent enquiries we have for back numbers of THE CANADIAN ENGINEER from the beginners show that the journal is appreciated and valued. Two or three months ago we asked subscribers to send us any copies of the May number which they did not need, as the May issue was entirely exhausted. We are still having calls for back numbers and shall be glad to pay the full price for any copies of the May number sent to us. Subscribers who are not binding the paper and who can spare this number, will oblige us by sending us their copies.

Prof. A. B. Kennedy, F.R.S., recently delivered a lecture in which he said that nothing was impossible except perpetual motion and the transmutation of metals; and about the latter it is hardly safe to be sure, for Prof. Dewar might shortly tell them that at a temperature of about - 273 deg. everything was the same, the difference between gold and lead being only a matter of thermo-dynamic function. All the impossibilities were perpetual motions—attempts to get more out of something than was in it. He gave, as instances, the attempt to utilize the steam in an engine over and over again, and to make out of coal a fuel which had twice the value of the coal itself.

One of the greatest engineering feats of the century has been the construction of the Manchester ship canal. It was several years before Parliament would pass the bill giving power to the company to commence work, so great was the opposition of Liverpool, who feared she would lose her pre-eminence in the carrying trade, should Manchester become practically a seaport town. Work, however, commenced in 1887, and after the expenditure of an immense amount of money, the canal is at length complete, having been opened on the 7th inst. The public opening will take place on New Year's Day, with a great procession of vessels. What will prove of special interest to Canadians is the fact that the procession will be headed by the "Sophie Wilhelmine," from Parrsboro', N.S. The directors of the canal will pay her £100 for the delay incurred by her in waiting for the public opening, and for lowering her masts to pass under the bridges. The captain will receive a gold watch as a memento of the occasion.

What is possibly the oldest marine engine in the world—certainly the oldest in America—was taken out of the steamer "Sadie" at Oakville this winter by Doty Bros. & Co., to make room for a new engine. This steamer was formerly known as the "St. Jean Baptiste," and the engine in question was built at Birkenhead, Eng., in 1804. Parts of this engine were replaced from time to time, but other portions have been in use every year since the engine was built, and the longevity of this piece of machinery is one of the most remarkable on record. The publishers of The Canadian Engineer being anxious that such an interesting relic should be preserved, suggested the advisability of its purchase by the Ontario Government, to be deposited in the School of Science or some museum, but so far we believe no action has been taken. We understand that Doty Bros. are willing to give the engine for such a purpose at its value as old iron, say $240, and it would be a great pity if such a valuable historical relic should be lost for the sake of this small amount. Who will step in to save it?

SUCTION, AS APPLIED TO FIRE ENGINES AND PUMPS.

BY WM. PERRY, MONTREAL.

Just two hundred and fifty years ago, namely, in the year 1641, a mechanic in Florence received an order to make for the Grand Duke a pump, with a suction pipe extending between fifty and sixty feet between the valve and the level of the water. The pump was made and fixed, but, of course, when it was worked it raised no water. In the belief that the fact was due to some defect in the construction, the maker was told to take it to pieces. This was done repeatedly, and new attempts were made to get the pump to perform its duty. When nothing more could be done in this way, the superintendent of the Grand Duke's waterworks consulted Galileo, then eighty years old, blind and within a few weeks of death. The philosopher had never seen reason to doubt the truth of the opinion universally prevalent at the time, that nature "abhors a vacuum"; it was universally thought that the power which raises water in pumps is some occult force, which, resisting all attempts to form a void, instantly presses water up the pipes when the air previously in them has been exhausted by the piston. When the whole circumstances of the difficulty at Florence were placed before Galileo, he could only reply that nature's abhorrence to a vacuum is limited, and ceases to operate above the height of thirty-three feet. This opinion, given without opportunity for due examination, was probably not quite satisfactory to Galileo at the time. Within two years Torricelli, who lived in his family, and assisted Galileo during the last three months of his life, was able to announce that this "occult force" was the pressure caused by the weight of the atmosphere.

This important fact he first established by an experiment as simple as it was ingenious and conclusive. He had made a model of the Grand Duke's pump, which had a suction tube sixty feet long placed perpendicularly, with its lower end in water; when the air at the top was exhausted, Torricelli found that he could by no means make the water rise more than 32 or 33 feet. The length of the pipe was next reduced to forty feet, but without better success. It then occurred to the experimenter that if it were indeed the weight of the atmosphere which sustained the water in the pipe, a substance other than water would rise to a height in the tube exactly in proportion to the relative specific gravity of water and of the other substance employed. But a short time elapsed before this thought was submitted to the test of an experiment. The medium employed was quicksilver, which is about fourteen times heavier than water; and when a vacuum was produced in the top of a tube, the lower part of which was filled with quicksilver open to the pressure of the atmosphere, it was at once seen that the column was supported at a height of only one-fourteenth that of the column of water.

The new doctrine put forward by Torricelli was attacked with a virulence almost equal to that which, a few years before, had been shown on the announcement of his master's discovery that the earth revolved round the sun. It is difficult enough now to see who or what was injured by Torricelli's discovery, but the Jesuits opposed it furiously, and perhaps, had a less liberal-minded prince than Pope Innocent X. been on the throne of the Papal States, the young philosopher might have been seriously impeded in his work, if not subjected to personal inconvenience. In the midst of the discussion to which his pronouncement gave rise, Torricelli died at the age of 39; this event took place in the year 1647.

The question was then taken up by Pascal, a French mathematician and divine. He verified the experiments which had been previously made, and varied them, using wine and other liquids, always arriving at the same result. Pascal also was the target for much sarcasm and small wit, and encountered hostility in various ways, but he persevered, and at length hit upon an experiment which he at once saw, if successful, must be universally accepted as conclusive. This was to repeat the experiment of Torricelli several

times on the same day with the same apparatus, but at different altitudes. If the mercury rose in the tube to a greater height at the bottom of a hill than it did at the top, it must clearly be owing to the greater weight of the longer atmospheric column at the lower level. "It is absurd to suppose," says Pascal, "that nature abhors a vacuum less at the summit of a mountain than it does at its base." On September 19th, 1648, at the time when English fanatics, who had intoxicated themselves with the blood of the Archbishop of Canterbury, were preparing to shed that of the King, M. Perrier, a brother-in-law of Pascal, ascended the Puy de Dome, near Clermont, the highest mountain in France, to ascertain by actual test whether the expected result followed or not. The mercury fell in his tube as M. Perrier ascended the mountain, and when he reached the top it stood three inches lower than it had done at the commencement of the upward journey. The experiment was repeated on different sides of the mountain and at different times, but always, of course, with a similar result. And thus it became satisfactorily established beyond question that the mysterious power which had for so long a time eluded the search of philosophers was merely the pressure due to the weight of the atmosphere.

Within a very few years from the date last named, some of the practical results of the discovery were already realized. In 1654 the air-pump was publicly exhibited before the Emperor of Germany. Perrier himself, after a little observation, saw how Torricelli's tube could be applied to the measurement of the varying pressures of the atmosphere, and the partial prognostication of the weather which is rendered possible; though if he could have seen the clock-faced instruments which now hang in her halls, stupidly marked "Change," "Rain," "Set Fair," etc., as if every different height of the barometer corresponded to its own unvarying weather, he would, perhaps, have paused before putting into the hands of foolish humanity his air measuring machine in the capacity of a weather glass. He also applied it to measuring the altitude of mountains, for which purpose its suitableness was at once apparent.

The establishment of the truth of Torricelli's supposition enabled mechanics, for the first time, to understand the cause of the action of a pump. They must, for centuries, have observed this action, and have noticed its powerlessness at a greater depth than thirty-three feet, and every pumpmaker must in time, as a part of his mechanical training, have become acquainted with the fact. Why, then, did the Florence engineers try to satisfy the requirements of the Grand Duke when they must have known their endeavors would be fruitless? Probably just because they received the order to do so; the risk was not theirs, and perhaps they did not dare to disobey. The cause as well as the fact itself was now understood; it explained also the different results obtained from the same machine at different places. A pumping engine which would raise water thirty-three feet in a city of the plains would be quite ineffective for a similar depth in a mountain town. The fire engine, which does as much in London, can only "draw" from a depth of twenty-two feet in the city of Mexico, and on some parts of the Himalayas, should it be required in that region of eternal snow, not more than eight or ten feet.

Suction Hose.—Suction hose is a flexible pipe attached to the inlet of a fire-engine or pump of any kind. Through it the supply of water is taken into the pump. For durability suction hoses are best made of leather; but with large suctions some difficulty is usually found in getting leather perfectly air tight, and consequently India rubber is more generally used. This is not nearly so durable, the nature of rubber, like that of all vegetable substances, being to perish, a tendency which vulcanizing only partly overcomes. Manual engine suctions are nearly always made of leather, copper rivetted; but steamer suctions of this material are usually bound outside with copper wire, the inside coats being formed in each case of canvas, treated with marine glue, tar, or pitch, and bound over an iron or copper spiral.

Some India-rubber suctions are made with imbedded spirals, by means of which a clear waterway is obtained. The objection to this class of suction is, that the inside coat sometimes strips away from the spiral. In the usual form the metal spiral is exposed inside, being sunk in the rubber just sufficiently to hold the coils of the spiral apart, and to prevent their slipping, at the same time presenting a fairly smooth waterway.

A length of suction hose is tested by fixing it to the inlet of an engine, and closing the strainer end by means of a cap having a vacuum gauge attached. The engine being then worked, the gauge should show and maintain a vacuum of about 14 lbs. per square inch after the pump has been stopped. If this cannot be done, there is a leak. The most likely place is at one of the couplings; the washers should be examined and adjusted if necessary. A defect in the body of the suction can often be located by passing a candle along outside whilst the engine is being worked; the flame will indicate where air is entering. If the defect cannot be found in this way, it will be necessary to apply a slight water pressure from the inside, which can easily be done by attaching the suction to the delivery outlet of the engine.

Water is propelled through the suction pipe of a pump by the act of removing or lessening the pressure of the atmosphere on the surface of the water in the suction pipe. Properly speaking, there is nothing in the operation resembling that of suction. One end of the pipe being placed in the water, and the other end connected with the pump inlet, which is closed by a valve, the stroke of the pump plunger has the effect of partially removing the air in the pipe. The surface of the water being then relieved of a portion of the atmospheric pressure, there is less resistance offered to the water rising in the pipe. The water outside the pipe, having still the pressure of the atmosphere upon its surface, is forced through the suction to supply the place of the excluded air. The water inside the suction rises above the level of that outside in proportion to the extent to which the pressure of air is removed. If, for instance, the pressure of air within the suction is reduced by the first stroke from 14½ lbs. to 13½ lbs., the water will be forced up the pipe about 2¼ feet, because a column of water an inch square and 2¼ feet high is about equal to one pound in weight.

Upon the reduction of the pressure of the air contained in the suction from 14½ lbs. to 13½ lbs. per square inch, it is evident that unless the water ascended the pipe there would be an unequal pressure upon its surface inside and its surface outside the pipe. In consequence of the water rising 2¼ feet in the pipe the

pressure upon the surface of the water, both inside and outside, is evenly balanced,. as the pressure upon the water exposed to the full atmosphere is 14½ lbs. upon each square inch of its surface, while that upon the same planes, but within the pipe, will sustain a column of water 2¼ feet high (weighing 1 lb.) and 13¼ lbs. pressure of air, making a total of 14½ lbs. If, in consequence of a second stroke of the pump, the air pressure in the pipe is reduced to 12½ lbs. per inch, the water will rise another 2¼ feet. This rule is uniform, and shows that the rise of a column of water within the pipe is equal in weight to the pressure of the air upon the surface of the water without.

The distance water can be lifted through a suction pipe varies with the height above sea level and also with the pressure of the atmosphere, which is constantly varying, the usual range of the barometer, at sea-level, being from 28½ in. to 30½ in. At this level the column of water which the atmosphere will support is about 33 feet in height, and a pump will "draw water," as it is called, this distance, but the force which sends the water into the pump at this height is so diminished as to be almost balanced by its own weight. For, although the atmosphere will support a column of water about 33 feet in height, it will only do so as long as the water in the pipe is stationary. If it is desired to keep the stream running, as in fire engine practice, the atmosphere has to perform two duties, one of them being to sustain the weight of the water, and the other to keep it moving.

Thus, taking the barometer at 28.5 inches, about the minimum ever reached in the ordinary way at sea level in this country, if the lift is only one foot, not more than 0.43 lbs. are required to counter-balance the weight of the water, and 13.57 lbs. are available to cause velocity. With a ten feet lift 4.34 lbs. are necessary to sustain the column of water, leaving 9.66 lbs. for velocity. With a 20 feet lift 8.67 lbs. are required to sustain the weight of water, and only 5.33 lbs. are left for velocity. At a little over 32 feet the atmosphere can only sustain the water stationary in the pipe, all its own weight being necessary to counterbalance that of the water.

The following table gives the velocity of flow through a suction pipe in feet per second with various heights. Barometer 30, thermometer 60 deg. Fahr.:—

Height of Pump in feet.	Velocity of Flow into Pump Chamber.	Height of Pump in feet.	Velocity of Flow into Pump Chamber.
	Feet per Second.		Feet per Second.
1	46 16	18	32.21
2	45.45	19	31.19
3	44 75	20	30.14
4	44 01	21	29 06
5	43.28	22	27.93
6	42 33	23	26.75
7	41 77	24	25.52
8	40.90	25	24 23
9	40 20	26	22.80
10	39 39	27	21.41
11	38.57	28	19.85
12	37.72	29	18 16
13	36.86	30	16.29
14	35 98	31	14.18
15	35.07	32	11.70
16	34.14	33	8.52
17	33.19	34	2 89

It will be seen that a pump will not raise water with a velocity which is of practical value at a greater depth than 24 to 25 feet, and this is about the extreme limit of a fire engine's or pump's efficiency. Such heavy duty as this cannot be done except under the most favorable conditions. There is, however, hardly any limit to the length of horizontal suction pipe through which a pump will draw, provided both the pump and the joints in the pipe are air-tight and the sizes are so proportioned as not to cause undue friction.

The following table is from practical tests. It shows the pressure on each square inch in pounds avoirdupois for each inch of the barometer, and the height of a column of water, stationary be it remembered, which the atmosphere at the pressures indicated will sustain:

Mercury in Inches	Pressure on each square inch in lbs. avoirdupois.	Corresponding columns of water in feet & decimals.	Mercury in inches.	Pressure on each square inch in lbs. avoirdupois.	Corresponding columns of water in feet & decimals.
1	.49	1.13	17	8 35	19.26
2	.98	2.27	18	8 84	20 39
3	1.47	3.40	19	9 33	21 53
4	1.96	4 53	20	9 82	22 66
5	2.46	5 67	21	10.31	23.79
6	2 95	6.80	22	10 81	24 93
7	3.44	7.93	23	11 30	26.06
8	3 93	9 06	24	11 79	27.19
9	4 42	10.20	25	11.28	28 33
10	4 91	11.33	26	12.77	29.46
11	5 40	12.46	27	13.26	30 59
12	5 81	13.60	28	13.75	31.72
13	6 39	14 73	29	14 24	32.86
14	6 38	15.86	30	14.74	33 99
15	7 37	17 00	31	15 23	35.13
16	7.86	18.13			

For use with deep lifts, a foot valve is usually provided. This is a valve to be fixed at the lower end of the suction, so hinged that the water can enter but cannot pass back. The effect, of course, is to keep the suction always full of water when it has been once filled.

I have pumps drawing water half a mile, 800 and 1,000 feet, with lifts of 23, 27 and 30 feet.

BERTRAM ENGINE WORKS CO.

The business formerly carried on under the name of "Doty Engine Works Co." and "The John Doty Engine Co., Ltd" will henceforth be known as "Bertram Engine Works Co." The new firm have made the following announcement in regard to their business:—

"Our Engine and Boiler Works are situated on Bathurst and Niagara streets, and the shipyard at the foot of Bathurst street, Toronto. Our facilities for work in our line are unsurpassed: the machine shop contains some of the heaviest machine tools to be found in the Dominion; the foundry is well equipped in every particular, and both are under charge of the same foremen who have for years past contributed to the established reputation which our machinery enjoys. The boiler shop is fitted up with tools thoroughly suited for the heaviest marine work, and with a reorganized force, is now under charge of J. J Fletcher, who, for the last ten years, has been with the Polson Iron Works Co.

"Owing to the extensive buildings and complete plant which we possess, we are in a position to turn out almost any kind of machinery; we will, however, devote special attention to the construction of Marine Engines, High Pressure, Compound and Triple Expansion, High-speed Engines for Electrical Work, Reynolds' Corliss Engines, all sizes; Hoisting and Vertical Engines; Gas Engines, 1 to 10 horse power; Marine, Stationary, and Portable Boilers, Roberts' Safety Water Tube Boilers, Mosher Water Tube Marine Boilers, Steel and Composite Yachts and Steamships, Mining Machinery, Ore Crushers, Stamp Mills, etc

"A Angstrom, who was chief engineer of the Cleveland Ship Building Co. for the last four years, and who came to us with the highest recommendations of the President of that company to accept the position of Manager of our works, will be able to give all our customers the benefit of his extended experience. It is our intention to leave nothing undone in the way of turning out first-class work at the lowest possible price, and giving satisfaction in every particular. We will be represented on the road by Mr. A. R. Milne, a practical engineer, having a thorough knowledge of general machinery."

Electrical Department.

GAS AND ELECTRIC WIRES.

Prof. John Trowbridge draws attention to the danger attending the carrying of electric wires along gas fixtures. He once noticed during a thunderstorm that some incandescent lamps "blinked" at every flash of lightning, though the interval which elapsed between the blinking and the peals of thunder showed that the storm was somewhat remote. The effect was doubtless due to induction, produced by the surging of the lightning discharges. On the occasion of a heavy discharge, the lamps became extinguished, although no fuse was burned. This provided an opportunity for an attendant to discover that a jet of gas from a pinhole leakage in the gas fixtures had become ignited (doubtless by a minute electric spark) and the flame was impinging upon some adjacent woodwork. The discovery averted what would have been, perhaps, a serious and mysterious conflagration. The moral of the story is, of course, to be found in the reflection that had the electric light wires not been carried along the gas fixtures, as they were in this case, ignition would probably not have occurred. This practice is fraught with danger, for if there is a leakage of gas (and what gas fixtures do not leak?) at the joints of the pipes or through a sandhole or other flaw in the casting, then tiny electric sparks arising through resonance effects or from the passage to earth of an electric charge brought into the building by the wires, may, if they happen to form in contiguity to the leak, readily ignite the escaping gas without being discovered in time to prevent disaster. If people will cling to their gas when they lay down an electric lighting system, then it behooves the electrical engineer who superintends the work to see that the wires and the pipes are never contiguous, for no lightning guard or protector yet invented can insure that minute sparks, due in some cases to resonance effects, may not arise.

THE process recently referred to in THE CANADIAN ENGINEER of lighting cars from the axles is described as follows: There is a passenger coach with seventy-five eight-candle power incandescent lamps. The dynamo by which the electricity is generated obtains its power from the axle by means of a series of sprocket wheels, chain belts and two shafts between the axle and the direct connecting shafts of the dynamo. One of the intermediate shafts is movable or swinging, and makes the chain belts conform to every movement of the car at whatever speed. The power taken from the car axle has, heretofore, gone to waste, and the process by which it is being used to make electricity is called equalizing of power, and by the mechanical contrivances the ill effects of oscillation and vibration have been overcome. While the train is in motion the lights are made directly from the electricity generated, up to a certain limit of speed, which is fixed. When higher speed is obtained the superfluous electricity generated is stored in batteries under the cars, so that at any given time there is sufficient electricity on hand to supply the lights four hours without the train moving. The machinery, complete, weighs about 900 pounds.

ELECTRICITY is a wonderful thing, but it has its limits. The *Electrical World*, in speaking of this subject, refers, as an instance, to the fact that to obtain more than 746 watts from a horse power is as much of an impossibility as perpetual motion. Some persons, however, who have a dangerously small knowledge of electricity, seem to have the idea that this figure is based on experiments in which only our present machinery is used, and therefore by inventing an entirely new system of conversion there is a way of obtaining an entirely new and much greater equivalent between electrical and mechanical power. A little study will show them that this is not the case, but that the figure 746 is obtained by simply converting one system of units by calculation into another; it is a calculation which is as purely mathematical as to find the number of cubic inches in a pint, if we know the weight of a pint of water, and that of a cubic inch; there may be a slight error in our knowledge of the weight of a cubic inch of water, but there is nothing radically wrong in the determination of this empirical constant. It is no more possible for anyone to obtain more than almost exactly 746 watts from a horse power than there is a possibility of obtaining more so-and-so many cubic inches from a pint. The sooner would-be inventors recognize this the better it will be for their capitalists and for the development of legitimate electrical industries in general.

Electric Flashes.

A TELEPHONE line now connects New Hamburg with Wellesley.

AN electric street railway is talked of for Charlottetown, P.E.I.

THE telephone line between Quebec and St Michel is now in working order.

THE Vankleek Hill, Ont., Electric Light Co. are increasing their capital to $10,000.

THE Peterborough Electric Street Railway Company have ordered an electric sweeper to guard against snow blockades

THE first sod of the Hamilton, Grimsby and Beamsville Electric Railway was turned on the 7th ult., and construction work is now proceeding.

THE Hamilton Electric Light and Power Company's buildings are being thoroughly overhauled, under the superintendence of architects Stewart & Son.

THE Bell Telephone Co. are constructing a telephone line between Danville and Dudsville, Que., taking in St. George, Wotton, St Camille, and South Ham.

THE Light and Power Company at Peterborough, says the *Review*, are putting in a steam engine of 150 horse-power to replace water-power, which has been irregular of late.

COL. BAKER, of Nanaimo, announces his intention of constructing an electric tramway from the Golden Eagle Mine to the head of China Creek, near which a smelter is shorly to be built.

THE Hamilton street railway, says the *Times*, will likely commence the building of their proposed extension to the Beach early next season. It is not yet decided whether the track will be single or double.

JAS ARMSTRONG, real estate agent, is applying for an injunction to restrain the Richmond Hill Street Railway Co., Toronto, from making use of Forest Hill road. He also asks leave to quash a township by-law granting the company a bonus of $20,000.

THE Ottawa Car Company are building some electric cars for the Hamilton Street Railway Company

AN electric lighting station at Bear River, N S., is in course of construction, and the town will soon be lit by electricity.

COL J M CLARK'S proposition to equip London, Ont., with an electric car system has been rejected by the council.

BRACEBRIDGE, Ont., has passed a by-law to raise $25,000, partly for the purpose of putting in an electric light plant

THE Aurora, Ont., electric light plant has been sold, the town considering the electric light too expensive for their means

THE new power house of the Wingham, Ont., Electric Light Company is being fitted with a large quantity of machinery, water-power will be employed

THE Stormont Electric Light and Power Company of Cornwall offer to put in an arc light plant there supplying 28 lights at a cost of $102 per lamp per year.

HENDRIE & Co., of Detroit, who are owners of the St. Thomas, Ont., Street Railway, contemplate turning it into an electric road and extending it to Port Stanley

THE Montreal Street Railway Co. are about to make an experiment for the removal of garbage by electric cars. Six cars fitted for the purpose are to be run a month on trial

THE Northey Man'fg Co., of Toronto, now make a portable pump operated by electricity One of these pumps is now in operation at Gooderham & Worts' distillery, Toronto.

THE plant of the Sherbrooke, Que., electric light station, which has lately been enlarged, now consists of twelve dynamos, the power for which is furnished by two very large turbine wheels.

THE Westinghouse Co., for whom Ahearn & Soper are Canadian agents, has perfected a dynamo which automatically produces just the amount of current needed for any number of lights within the capacity of the machine.

R. R DOBELL, Quebec, president of the Canadian Atlantic Cable Co., has received an offer for laying the company's cable from some point on the Straits of Belle Isle to a point on the west coast of Ireland. The capital required is $2,500,000, and the Dominion Government will probably be asked to grant a subsidy.

D W CLARK & SONS, of St. John, N B., have obtained incorporation to carry on electrical works in Carleton, Fairville, and adjacent suburbs Capital, $22,000. The incorporators are Daniel W Clark and Daniel C. Clark, contractors; Charles R. Clark, electrician; William Bruckhof, merchant, and George F. Calkin, agent

THE St. John's, Que., Electric Light Co., who have a lighting contract with the city, some time ago made an offer to increase the number of lights, if the city would pay the bare cost of the addition. Finding, however, that the city hesitated, and that misrepresentations were being made as to their motives, the company have now finally withdrawn their proposal

THE city council of Montreal last month adopted the report of a special committee in favor of a charter to the Montreal Belt Line Co., who propose building an elevated electric road connecting the city with suburbs east and west. It would enter the city by St. Catherine st ist, thence to Craig by Delorimier Ave., and on Craig west to Little Craig, and thence to the western suburbs by St. James st The company are to pay the city $2,000 a mile and be responsible for all damages arising from the construction of the road

THE annual general meeting of the Montreal Electric Street Railway Company took place last month. The chairman, President Forget, stated that the receipts showed a satisfactory increase over those of last year's, in spite of the heavy expenditure which had been incurred owing to the many changes and extensions in the road The month of October showed an increase of $9,686, or 15 per cent over October last year, and he expected that in a short time the full benefits of their change to the electric system would show themselves in a still more marked manner. The full length of the lines will be about 85 miles, including 20 yet to be built

THE ROAD TO ROAD REFORM.

A much-needed improvement in Canada is road reform; the growth and prosperity of every country depends on good roads. The extension of the railway systems may give greater facilities for the transport of produce in large quantities, but the common road or highway is the essential part of the prosperity of the railway. Without the common road how could freight reach the railway, or how could communication be kept up in the several parts of the country? The whole country, and the Province of Ontario in particular, has grown rapidly and increased in wealth, financial and agricultural; of late years, the products of cheese and butter factories alone are now an invaluable asset to the province; these institutions call for the daily and constant use of the public road every day of the year. The farmer has no choice now, he must take his milk to the factory every day; his duties are greater than they were 20 years ago, when he could lay off for a few weeks in fall and spring, waiting for good roads. The subject of road reform has not been neglected during this period, and of late years has received much attention by the press, by professional journals, and by universities, many of whom have given prizes for essays on the subject. This has been of advantage, and as far as it has been carried has done all the good which can be done by this means. The time has come when farmers' institutes, county councils, dairymen's associations, and such like must stop reading papers and take definite action.

The action of the Canadian Institute, in resolving to call a convention to discuss the question, and take steps to form a national association for road reform, is one which should commend itself heartily to all interested in road reform. Emanating from a purely scientific body, the proposal is based on principles which affect the weal of the commonwealth, the institute having no end to serve but the advancement of the country. We are particularly pleased to note this action, and we wish the institute complete success in the valuable work in which they have engaged The resolutions are given in full in another column.

NOTES ON WATER WHEELS.

BY A. C. M'CALLUM, M.E.

Take care of your water wheel; most men expect when they get a turbine that because it is made of iron that it is going to last for ever. It simply means that you place the wheel in the penstock, let the water in upon it, and after it is started let it continue to run, year in and year out, never taking the water off the wheel to look at it, until it suddenly breaks down; you are surprised that it should do so—you get out of patience with it and wish it far enough away.

A well-constructed turbine, if properly set in the penstock, and if looked after every spring and fall, would last a life time, and give as much power and as high a percentage of efficiency at the end of thirty years as it did at the end of the first thirty days. Every wheel should be examined within the first two months after it is put in, because most penstocking made of wood settle somewhat when the water is let in upon them for the first time, together with that of the weight of wheel and shaft with gears.

If the wheel is out of plumb, the shape will wear heavily upon one side, and cause the runner or wheel to rub against the casing, destroying the wheel, and reducing the efficiency considerably. I noticed the other day, in passing through a machine shop, in ——, a Leffel water wheel taken out of a large woolen factory, where the penstock was completely rotten, and the wheel had been grinding against the case, and cut away a large portion of the edge of the lower buckets, necessitating a patch upon them of about 4 inches by 5 inches. I don't think they had any idea that this

grinding had been going on. When the wheel is placed in the new penstock now being made, the truth of that old adage, "A stitch in time saves nine," will become apparent.

Any intelligent man can readily find out if the wheel is plumb or not. Look that the gate rods, bolts and other parts liable to become loose, are in their places; tighten all slack nuts. Repeat the investigation every spring and fall, note whether the running part of the wheel is wearing down the step; this can be ascertained by feeling in through the chutes, or looking at the step: if it has settled it should be raised.

One of the most important things in connection with your water-power is a good rack to the head of the flume or race-way.

The cross-section of the flume where the rack is placed should be amply large; it will aid the free and easy passage of the water, should the rack at any time become clogged. The racks should be kept clean; if the water is lower behind the rack than it is in front, that much head is lost.

Water wheel builders do not care to have the wheels fed with clubs, fence-posts, and railroad ties; they prefer to have your wheel driven with water.

MINING ENGINEERING.

BY WILLIAM HAMILTON MERRITT, TORONTO.

"What is a mining engineer?" Some people, I have no doubt, labor under the impression that he is a person who runs a steam engine under ground, others that he sustains life by breaking rocks in inaccessible places, and I once heard a gentleman occupying a prominent position as a geologist in this country state that you could get any number of mining engineers anywhere, but that a man who could sketch fossils was indeed a *rara avis* and worth many mining engineers. Of course, there are mining engineers and mining engineers, as there are geologists and geologists, and the former, if thoroughly competent and qualified (commonly called an "expert" by our American cousins), must of necessity have at least as extensive a scope of knowledge as any scientific profession, if, indeed, he does not require a more extensive scientific qualification.

If you will glance at the curriculum of any well-appointed school of mines you will see what studies a properly qualified "miner" is supposed to have mastered, all of which are, of course, supplemented by practical experience But as I suppose there are not many who indulge, from choice, in that sort of literature, I think it may be of interest to mention some of the subjects which a qualified mining engineer has studied, and which are mapped out for the course at the Kingston School of Mines.

First of all, he must master the principles of chemistry, in order that he may understand the composition of minerals and ores, and the reactions which take place during metallurgical operations. He also will be required to have made qualitative and quantitative analyses to be able to determine the composition of minerals, ores, and metallurgical products.

Next he must have studied physics and mechanics, in order that he may know the laws of light, heat, sound, magnetism and electricity, and appreciate the forces connected with the various classes of machinery which play so important a part in his subsequent operations; and, of course, to master this, a thorough foundation in mathematics, and a knowledge of mechanical drawing, will have been necessary.

Then the study of mineralogy is essential in order that the crystalline form, color, hardness and specific gravity of mineral substances may be mastered and that any of them can be recognized when seen.

Then every mining engineer must essentially be a geologist, and be familiar with the principles of petrology, geognosy, including paleontology, stratigraphical geology, and a certain amount of geological surveying, in order that he may recognize the structural form of the earth's surface, with which he will have so much to do.

After an acquaintance with the composition of the minerals going to make up rocks and ores (mineralogy) and some of the infinite variety of forms and conditions in which these rocks occur (geology), the next step is the science of mining, under which is studied the various kinds of deposits of economic minerals, the modes of prospecting for them, the usual plans of opening them up, and extracting them from their resting places in the surface of the earth, and the systems of mechanically separating that part which is of value from accompanying rock—matter which is of no value. In connection with this a full knowledge of the machinery in use, both above and below ground, for these purposes, is necessary, as well as the capability of making surveys, calculations and plottings to show the underground workings and their connection with the surface.

Then, lastly, every competent mining engineer must be acquainted with the methods in vogue for treating the various kinds of ores whereby the metals which they contain are extracted. This is the science of metallurgy, and naturally follows the science of mining.

The above are the subjects essential to a thoroughly competent and qualified mining engineer. When I say thoroughly competent, be it remembered that I mean one who has not merely acquired a smattering of the above-mentioned subjects, but one who has, to all practical purposes, thoroughly mastered them, and we keenly feel how difficult it is for us to keep up with the advance of science and appliances which in these days of electrical development is so rapidly changing. As an example of the work which falls to the lot of graduates of a mining school, I might mention the only two gentlemen whom I know of in Canada who, besides myself, took the mining associateship at the Royal School of Mines in London. The senior is Mr. Henry S. Poole, who manages the large Acadia colliery in Nova Scotia, and the other is Dr. G. M. Dawson, C. M.G., one of the assistant directors of the geological survey, and almost as well known in the scientific world as his learned father.

Before concluding I would like for a moment to draw your attention, in a very general way, to the great possibility which exists in Canada for mineral development, and also to say a good word for the legitimate character of mining development and of investment in *bona fide* mining operations.

From the fact that the prizes are very great, when rich mines are worked, there are many people taken in by the unscrupulous with undeveloped mining locations, called "mines" by the sellers; and this fact has, we regret to say, brought mining development into disrepute to a much greater extent than should be the case in this country.

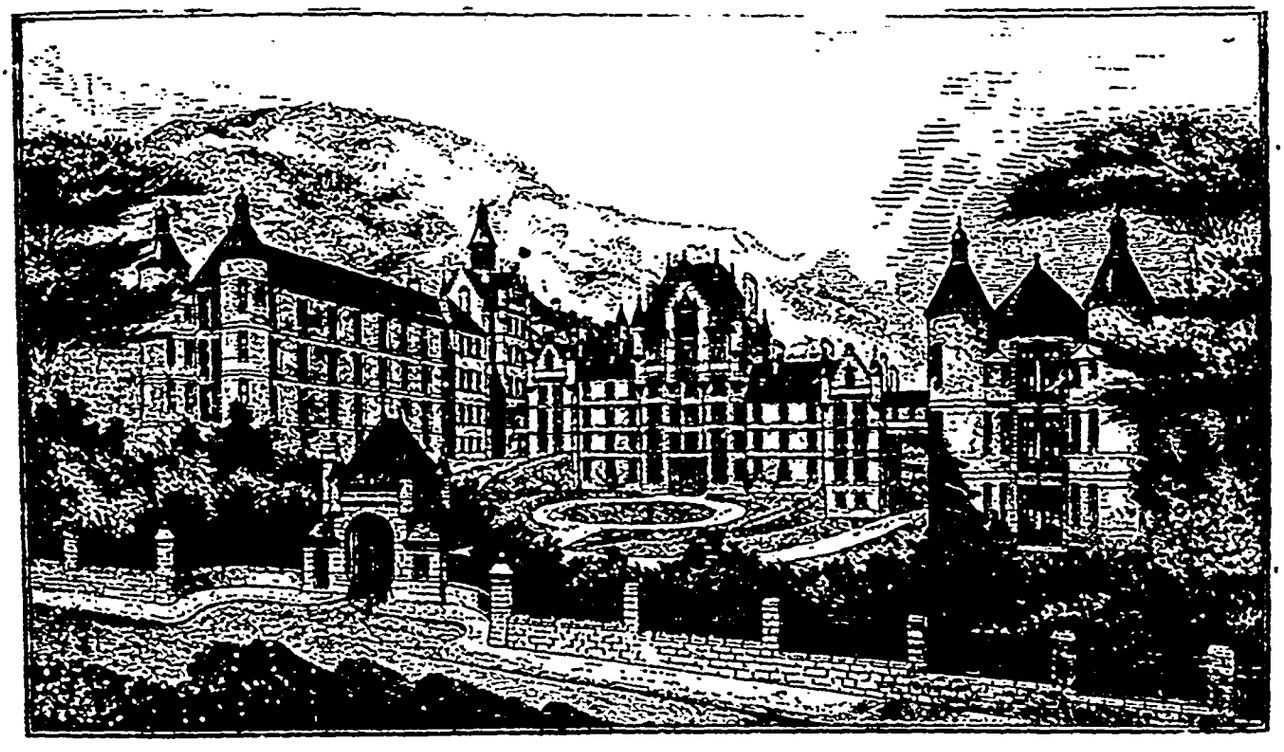
There is great room for legitimate mining development in this Canada of ours. Our neighbor to the

south extracted, in 1891, minerals and metals of the value of $666,105,837, and largely from similar geological formations to our own. Our production for the same year was but $18,500,000, or only 1-36th (one thirty-sixth) of the production of the United States, while our population is about one-twelfth; or, if we produced only proportionately to her, we should be extracting at least three times as much mineral and metal as we are doing to-day.

One important factor, and one in which this district has great interest, is the unsatisfactory position of the iron and steel question in our country. We ought surely to be utilizing our own iron ore, and making our own iron and steel, instead of importing $12,000,000 worth of iron and steel, as we did last year—which includes five times as much raw material as we manufactured. Until a helping hand is lent to create this giant industry in Ontario, and our country at large is awakened from the narcotic influences which engendered the suicidal policy of making us dependent on the rest of the world for our steel rails, I fear that our iron mines will not get fair play.

THE NEW VICTORIA HOSPITAL.

For the magnificent Victoria Hospital opened by the Governor-General on December 2nd, the City of Montreal is indebted to the generosity of Sir Donald A. Smith and Lord Mount Stephen, as their memorial of the Queen's jubilee and a benefaction to their fellow citizens. The buildings, which cover twenty-three acres, and are made of Montreal grey limestone, were designed by H. Saxon Snell, of London, Eng., although the work of construction was entirely under the supervision of J. R. Rhind, Montreal. The contractors employed were as follows: Peter Lyall, masonwork; J. Brunet & Son, brickwork; Simpson & Peel and Forde & Casey, woodwork; Dominion Bridge Company, steel beams; W. J. Cooke and J. Morrison & Son, plastering; F. W. Reed and Montreal Roofing Company, roofing; Clindinneng & Son and H. R. Ives & Co., ironwork; J. Murphy and A. Craig, painting; R. Forsyth, granolithic pavements and corridors; Garth & Co., plumbing and heating, and Royal Electric Company, electric wiring. Contracts were signed June 18th, 1890, and the main building, which is of the Scottish baronial style and is now a prominent landmark on the side of Mount Royal, was practically completed June, 1892, though some additions have been made since. The cost of building was $650,000, the heating, plumbing and electric wiring costing $50,000 more, and the furniture, fixtures and machinery about $70,000. Lord Mount Stephen and Sir Donald Smith gave each $500,000 to create this fine institution, their gift covering the cost of the grounds. The outer walls are lined with brick, faced with cement. The dividing walls are of brick and terra cotta, faced with cement. The spaces between the iron beams are filled with concrete, a surface of granolithic being laid over this in the corridors. The ceilings are also faced with cement, and the whole building is thus practically rendered fire-proof. For the purposes of ventilation, there are ducts passing at regular intervals along the side of the walls and leading to a vast trunk or tunnel running along the bottom of the wing, and opening into an octagonal shaft, which surrounds the smoke stack and which is carried up with it to the outer air. The heated air, passing up the smoke stack, causes an upward current in the shaft, and thus draws the air from the wards, through the ducts into the trunk or tunnel. Fresh air is supplied to the wards by ducts similar to those used for the removal of the foul air. All danger of cold draughts is obviated by the passage of the air over steam coils before it enters the wards, which it does at a temperature of 90 or 95 Fahrenheit. There is a medical theatre with accommodation for 250 students and a surgical theatre made to hold 300 students. There are 40 wards, accommodating 260 patients.



THE NEW VICTORIA HOSPITAL.

The hospital is heated by hot water supplied by boilers in the basement of each wing. Altogether there are fifteen boilers, six in the surgical wing and nine in the medical. It would require too much space to describe in detail all the different parts of this vast institution. It is only necessary to say that all the departments

from the patients' wards to the medical theatre, and from the nurses' quarters to the commodious kitchen, are arranged perfectly and in thorough keeping with the general magnificence of this institution, which will certainly do much to enhance Montreal's reputation for fine architecture.

The articles of incorporation define the objects of the institution to be for the benefit of "sick and injured persons of all races and creeds without distinction," a broad-gauge principle of philanthropy which we should naturally expect in the men who were generous enough to bestow such a magnificent gift upon their city. The act contemplates the establishment of convalescent cottages, as branches, at Banff, N.W.T., and at Caledonia Springs, Ont.

REVIEW OF THE METAL TRADES.

MONTREAL, Dec. 14th, 1893.

Since the close of the navigation the movement in the heavy metal trades has been small as usual, and the market altogether is in an unsatisfactory condition. Although the number of houses in this branch of the trade is smaller than a year or two ago, competition seems to be quite as keen, if not keener than before. Tin plates have sold very low during the past year, and during the disturbances caused by the McKinley tariff, some English firms dealing with Canada, and whose market was largely in the United States, have closed down indefinitely. The depressed condition of this trade may be inferred from the fact that plates which sold ten years ago at $8 or $10 now realize only $3 to $4, while the wages paid to miners and operatives are slightly higher than then. Last month we referred in this report to the fact that American producers of steel have endeavored to compete in Canada with English firms, and now we learn that American wire manufacturers are invading this market, chiefly in Ontario. The progress of this movement will be watched with interest, but some are of the opinion that it is only by the recent cutting of freight rates on the railways that Americans are able to do this. The German manufacturers of gas and water-pipe seem to be gaining a firmer hold on the Canadian market.

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 October, and for the previous ten months, compared with the same periods of last year:—

	October.		10 months ended Oct.	
	1892	1893.	1892.	1893.
Hardware and Cutlery	£ 9,647	£ 7,769	£ 81,384	£ 83,065
Pig iron	11,007	9,002	71,265	48,121
Bar, etc	3,919	2,037	31,018	23,918
Railroad	51,241	26,892	351,955	494,649
Hoops, sheets, etc	12,009	13,528	71,239	61,379
Galvanized sheets	9,613	13,032	50,898	64,326
Tin plates	25,119	44,792	173,646	183,013
Cast, wrought, etc., iron	8,520	11,520	88,817	105,991
Old (for re-manufacture)	5,502	8,034	70,518	97,895
Steel	17,023	13,902	114,602	114,930
Lead	3,773	2,061	28,328	14,782
Tin, unwrought	4,351	6,068	28,928	27,952

MAKING wrought iron pipe direct from the bars is the process recently started in a rolling-mill at Stubenville, O. If it works it means a complete change in pipe manufacture.

A PROFESSOR OF BLACKSMITHING.

The following item appears in a recent issue of the Liverpool, Nova Scotia, *Advance*, and the heading is as above:

"We have, it seems, furnished a professor to that ancient institution of learning, Harvard University, in the person of J. G. Telfer, son of the late Richard Telfer, of North Queens, a professor of whom we feel disposed to be just as proud as if he filled the chair of Greek, or Latin, or history, or medicine, or any of the "ologies," though he stands at his anvil, with apron on and brawny arm bared, while the sparks fly from the sturdy blows of his deft hammer, for Mr. Telfer is nothing more nor less than professor of blacksmithing, and the skill and application that secured him his position, with a salary of $1,200 per year and incidentals, was mainly acquired in an unpretentious smithy of his native province. J. G. Telfer began to learn the trade of blacksmithing with his brother-in-law, James Loveless, at Caledonia, Queen's Co., at the age of 14, and served an apprenticeship of five years."

To be sure, if he is a good blacksmith and a good man, as we must suppose he is from the choice made, the *Advance* does well to be proud of him. The man dignifies the office, not the office the man. But lest there be snobbish folk who despise a handicraftsman and think that only the learned professions are tony, let it be remembered that Peter the Great of Russia was a shipwright, and that certain German royalties of the present day have been taught trades, actually among prosaic shavings and iron-filings in a "vulgar" shop.

A professor of blacksmithing. And why not? If we had more professors of handicrafts teaching and demonstrating in our colleges, we should, as a people, be better off. The trades should have a chance. Have not the ologies and the istries been taught to our young men until there are more doctors than can get patients, more lawyers than can get clients, more parsons than can get charges. And yet the artisan is esteemed a comparative nobody, and the merchant of a lower social stratum than the "professional man." A different state of things prevailed in the middle ages. Then, a merchant was often such a swell that he owned not only farms galore, but whole villages and townships. Helen Zimmern relates that a worthy shoemaker became burgher of Lubeck, then visited Rome as a pilgrim, and afterwards was named shoemaker to the German Knights, a very honorable office. And a clever artificer in iron was regarded in the light of an artist. If the learned professions have social precedence to-day, the artisan can look back proudly to the days of the Hanseatic League, with its factories at Bergen and Bruges, its steel-yard wharf in London, to the time when Charles IV. addressed the Council of the Hansa as "lords," and declared that Lubeck, a trading town of the League, ranked with the cities of Rome, Venice, Pisa and Florence, imperial in importance. And indeed, as history tells us, the shoemakers and tailors of Lubeck thought no small beer of themselves in the old days. Nay, he may sing that old Tubal Cain was a man of might in the days when earth was young; and, if he choose to go back to the myths of the ancient Greeks, he may boast that the god Vulcan, son of the great Olympian Jupiter, in addition to being a blacksmith, was an architect, a house builder, an armourer, and shod the steeds of the gods with gold. Not only so, by his mythical power this divine artisan endowed with life the brazen or golden images that he framed in the

likeness of men or women. No slight indication, this, of the relative standing of a smith, a mechanical designer, in the theogony of so aristocratic and imaginative people as the Greeks.

However, in a Republic of Learning, such as Harvard, let us hope that Mr. Telfer will be happy in his title, as in his work, and quite undisturbed by any social nonsense of precedence. If he is disposed to scholarly habits, he may be stimulated by the bookish acquirements of "The Learned Blacksmith," Elihu Burritt, in the present century, or if ambitious he may recall the renowned achievements of Benvenuto Cellini, that inspired erratic brass-founder and goldsmith, in a former century. In any case this good maritime tradesman with a Scotch name can, if he will, teach to the gilded youth of Harvard the same lesson the poet has put into the life and example of Mr. Telfer's New England prototype, whose shop was under a spreading chestnut tree—that at the flaming forge of life our thoughts and for tunes must be wrought: the lesson, in short, of work, persistent effort, honest economy. Nor is it only a moral lesson that can be learned in such wise. The distinguished Dr. Bovey, of McGill, will tell us that no department of that great University is of more importance than his blacksmith shop and machine shop, marvels of equipment as they are to mould deft as well as book-learned metal-workers for the coming generation of Canadians.

PHOSPHORUS IN IRON.

N. Kjellberg has been making some investigations into the relations between phosphorus and pig iron. The following are some of the conclusions he draws:

1. When the phosphorus content of the ore is not above 1·25 per cent., the temperatures under which he worked do not influence the phosphorus-content of the pig iron, nor does the amount of silica in the slag. The greater part of the phosphorus of the ore is combined with the iron, only a small portion, 5 to 10 per cent., going into the slag.

2. When the phosphorus in the ore is above 1·25 per cent. it begins to enter the slag, and this slagging process increases in intensity with the increasing percentage of phosphorus. Both the temperature of the furnace and the acidity of the slag commence to influence the reduction of the phosphorus, and this action also increases with the amount of phosphorus up to 3·5 per cent. If the ore contains as much as 3·5 per cent. of phosphorus, the greater part of this element combines, under all circumstances, with the iron. If, however, the ore-charge be increased and the burden made basic, the phosphorus content of the ore may rise to 3·5 per cent., and still 40 to 50 per cent. of it be slagged off. With a higher temperature and an acid burden 95 per cent. of the phosphorus, already slagged, can be made to enter the iron.

3. No volatilization of phosphorus took place in the blast furnace even with ore containing 3·6 per cent.

4. The carbon-content of the pig iron diminishes with the increase of phosphorus, but is not manifest until the phosphorus rises about 3 per cent. The pig iron obtained from the ores richest in phosphorus contained only a small amount of graphite and was white, with mirror-like planes on the surface of fracture.

5. The content of silicon varies with that of phosphorus; a sample of charcoal iron with 4 per cent. of phosphorus contained no more silicon than steel does. Pig iron containing upward of 4 per cent. of phosphorus can be made to take up a few tenths of one per cent. of silicon only by urging the blast and using an acid slag. The pig iron of highest phosphorus was quite brittle, a slight blow of a hammer serving to break a bar into many pieces.

To make basic open-hearth stock with not over 0·6 per cent. phosphorus, it is advisable, Mr. Kjellberg thinks, to use 60 per cent. ore containing not over 0·4 per cent. phosphorus. For cast irons, with phosphorus up to one per cent., ore with 60 per cent. iron and not over 0.6 per cent. phosphorus should be used.

For Thomas iron, with at least 2 per cent. of phosphorus, the ore must contain at least 1·6 per cent. phosphorus, and 60 per cent. iron, as only ¾ of the phosphorus is reduced and enters the pig.

Do not delay in sending in your subscription for THE CANADIAN ENGINEER. You may not get another sample copy. If you order the paper now you will get it to the 1st January, 1895, for one dollar.

REFLECTION shows us that the statement, so often made, that steam at the moment of exhaust contains a large percentage of water, must be quite erroneous. The only water, says the *London Engineer*, that the steam can possibly contain is that due to the liquefaction brought about by the performance of work. All the rest must be deposited on the metallic surfaces, unless, indeed, water has originally entered the engine from the boiler; and the reason is obvious. If the steam has parted with its heat, and the resulting water escapes the moment the exhaust port opens, then heat must accumulate in the engine. The truth is, that the amount of condensation due to the action of the metal is invariably measured by the evaporation during the exhaust stroke, condensation and evaporation precisely balancing each other during each revolution. All this is old knowledge. It is far more to the purpose to consider whether there is or is not some obscure cause of condensation at work, which is collateral in its operation with the action of the cylinder walls. We hold that it is in this direction that inquiry should be pushed, and the accumulated data should be carefully examined to ascertain, first, whether there is or is not liquefaction going on which can not be accounted for by the action of the metal alone; and secondly, if there is, what the liquefying agency may be.

LITERARY NOTES.

CONTINUOUS CURRENT DYNAMOS AND MOTORS.—Their Theory, Design and Testing. With sections on Indicator Diagrams, Properties of Saturated Steam Belting Calculations, etc. An elementary treatise for students New York: the W. J. Johnston Company Limited, 41 Park Row (Times Building), 1893. 271 pages, 83 illustrations. Price, $2.

This work, intended for students, gives the theory and design of continuous current dynamos and motors as understood and practised in the designing room, and the methods of testing, as described, are those of the factory testing room. The practical side of various questions treated is always kept in view, discussions having little bearing in this direction being excluded, as well as the descriptions of different machines and systems which are so often used to pad out the pages of similar treatises.

The first four chapters consist of a brief review of the electrical units and the general principles of the machines, and may be considered as an introduction to the subsequent portions; the higher branches of mathematics have been avoided here, as elsewhere. Chapter V. is on calculations pertaining to the magnetic circuit. Chapter VI. treats of the theory of windings, losses, etc., and Chapter VII. of the special points to be observed in motor designing.

In Chapters VIII., IX. and X., the application to the design of armatures, field magnets and motors of the principles developed in the preceding chapters, is explained by reference to numerical problems selected so as to cover as broad a field as possible, and show in what manner to make the various compromises always necessary in practical designing.

In Chapters XI. and XII. the methods of testing a completed machine, and investigating its characteristics and the effect of various changes in design and operation, are very fully discussed and illustrated by numerous curves.

As the subject of the steam engine is only so closely allied to the testing and operation of dynamos and motors, the last two chapters are devoted to indicator diagrams and steam-power calculations, which are treated in the same eminently practical manner as the purely electrical subjects.

The four appendices are on tests of irons, ampere-turn tables, determinations of sizes of wire for armatures and field coils, and on the calculations of belting.

With one exception all of the engravings were specially prepared for this work, and all of the numerous curves are reproductions of those obtained in actual commercial tests.

J. A. Grenier, C.E., patent solicitor and expert, has sent us a very interesting little booklet containing hints to inventors. Besides giving in detail the fees which must be paid, either in Canada or United States, at each step of taking out a patent, full instructions are given regarding the proper procedure of one going about that task. Information is also given about trademarks, industrial designs, caveats, etc. The pamphlet may be obtained from Mr. Grenier at the Imperial buildings, Montreal.

The November and December numbers of the *Engineering Magazine* are more than usually instructive, and some articles are of special interest to Canadians. The November number has an article on "Canada and Our New Tariff," by Erastus Wiman, and another on the iron ore regions of Lake Superior, by R. A. Parker. The illustrations are excellent and numerous as usual.

We have received from the Clayton Air Compressor Works, New York, a pamphlet reprinted from the *Engineering Magazine*. It is by W. P. Pressinger and is entitled the "Ordinary Use of Compressed Air," into which subject it enters quite exhaustively. The employment of compressed air for power purposes has, as the title of this little book would indicate, increased very considerably during the past few years, and even a hasty glance is sufficient to afford surprise at the large number of engineering and other processes of which it forms the basis. The following list is a bare enumeration of the cases to which the principle of compressing air has been applied: in the pneumatic dynamite gun; pneumatic device for block-signalling process for raising water from deep wells by compressed air; in utilising crude petroleum as fuel; in sugar refineries, for cooling the syrup; in india-rubber factories, for removing hose from the iron mandrels; in pneumatic riveting-machines, &c.; in pneumatic carving-tools, in architectural stone works; pneumatic cranes and hoisting machinery; in tubes for transmitting mail matter and parcels; in refrigerating and ventilating pneumatic cars; pneumatic grain elevator; in disposing of sewage by air under pressure; in the method of raising sunken vessels by placing collapsible india-rubber bags in the hold and connecting them by hose to an air compressor; in purifying city water-supplies. The above, however, are only some of the processes depending upon compressed air; to those interested further in the subject we would recommend the reading of Mr. Pressinger's article.

THE McKinley tariff has given rise to many differences of opinions as to the exact nature of articles which are to be included in any particular schedule. "What is a billet?" is a question of this sort of some importance, as apart from the question of duty. We understand that the railroads make for billets a classification which gives some amount of advantage in freight charges. A discussion upon this particular subject has been going on in the *American Manufacturer*, and from this it would seem that a billet is always a bar of iron or steel, though all bars are not billets. It is not the size of the bar, but the use to which it is put, that determines the question. A billet is a bar of iron or steel further advanced in the process of manufacture than an ingot or a bloom (the result of the first hammering); it is a bar which is to be rolled or hammered into some smaller size. The standard size of a billet is 4 x 4 inches, and the railroads only accept under the billet classification a bar of that size. However, as we have said, the real point of distinction does not depend upon size, but upon the use to which the bar is to be put.

THE next annual convention of the chiefs of fire brigades of the United States and Canada will be held in Montreal. Canada is becoming a favored site for continental conventions.

SOME say that machinery increases the number of unemployed. Yet, compared with population, England has the most machinery and the greatest number employed, while Russia has the least amount of machinery and the greatest number of unemployed.

A GOOD BEGINNING.

FURTHER FAVORABLE NOTICES OF "THE CANADIAN ENGINEER"

We say it with some pride, though, we hope, with no undue vanity, that no paper started in recent years in Canada has received a more kindly welcome from the press of this country, as well as of England and the United States, or has had more encouraging comments from subscribers, than THE CANADIAN ENGINEER. If a good beginning is half the accomplishment of a good career, THE CANADIAN ENGINEER should have prosperous days.

In previous numbers we have quoted the friendly opinions of some of our contemporaries. Besides these we have to thank the "Pembroke Standard," "Meaford Monitor," "Brandon Sun," "Acton Free Press," "Guelph Herald," "Guelph Mercury," "Ingersoll Sun," "Bowmanville News," "Colchester (Truro) Sun," "Kincardine Reporter," "Petrolea Advertiser," "North Bay Times," "Picton, Ont, Times," "Bradford Witness," Compton "County Chronicle," "Manitoba Liberal," "Winnipeg Commercial," New Glasgow "Eastern Chronicle," "Halifax Chronicle," "Orillia Times," "Sarnia Canadian," "London Free Press," "Brockville Times," "Windsor (Ont) Review," "Milton Champion," "Petrolea Topic," "Amherstburg Leader," "Carleton Place Herald," "Whitby Chronicle," "Winchester Press," "Gananoque Journal," Simcoe "British Canadian," "Almonte Times," "British Columbia Commercial Journal," "Thorold Post," and many other papers. The following extracts from other contemporaries have been crowded out of the past two issues :—

The July number of THE CANADIAN ENGINEER is to hand. As a high class journal it is second to none in the Dominion. Its contents embrace the whole territory between the Atlantic and the Pacific, and full of interest for those outside the profession, while for engineers and all connected with that calling it is the journal par excellence —*Kootenay Star*

We are in receipt of the second number of THE CANADIAN ENGINEER, a bright monthly journal of about 30 pages, devoted to the mechanical, mining and other branches of the engineering trades. Its typographical appearance and make up are excellent, and it gives a large amount of news of interest to the trades concerned. Published by the Canadian Engineer Co., 62 Church st., Toronto, and the Fraser Building, Montreal, at $1 per year —*Meaford Mirror.*

THE CANADIAN ENGINEER, a new monthly magazine, has reached our table. It is published in Toronto and Montreal, and deals with the different branches of the engineering trade, chief among which might be mentioned mining, marine, mechanical, locomotive, sanitary and other departments of engineering. It is specially devoted to the mining and manufacturing interests of Canada. Its subscription price is $1 a year, and no magazine we know of contains a larger amount of valuable reading for such a price. In addition to the articles on trade which its pages contain, there is also a large amount of general news interesting to every one.—*Renfrew Journal.*

We welcome with outstretched arms and with hearty fellowship to the field of trade literature our esteemed contemporary, THE CANADIAN ENGINEER, METAL TRADES JOURNAL AND ELECTRICAL SCIENCE REVIEW, of Toronto In typographical appearance, quality of matter and general tone it is as bright as it is interesting, and, with all sincerity, we wish our contemporary prosperity and success.—*Sanitary Plumber.*

THE CANADIAN ENGINEER, METAL TRADES JOURNAL AND ELECTRICAL SCIENCE REVIEW, the third number of which we have received, is a first-class publication that deserves a very large circulation It contains twenty-seven pages of articles, paragraphs, and news of various kinds of special interest to engineers, machinists, iron workers, builders, etc. It contains an Electrical department, Industrial Notes, Railway and Marine News, etc We would heartily recommend this publication to our readers, particularly those in the mechanical and engineering line —*Eastern Chronicle. New Glasgow*

THE CANADIAN ENGINEER, published at Toronto and Montreal, is a gratifying example of journalistic enterprise in the Dominion. It is admirably produced and very well edited, and is full of information about the Canadian engineering and metal industries. These would seem in all branches to be making rapid progress.—*British and South African Export Gazette*

I have much pleasure in handing you my subscription to THE CANADIAN ENGINEER, which has regularly been received by me since its first issue I am pleased with its appearance and wish it every success. Devoted as it is to the interest of a class whose work and services tend largely to the prosperity and rank of any country, I think it should be looked upon as a national advantage and receive a corresponding support from all well wishers of this fair Dominion.—*Robt. W. King.*

Prof. Wm. L Goodwin, Professor of Chemistry in the School of Mining, Kingston, writes: "In the number of your paper which you recently sent us I noticed many paragraphs of general scientific interest, and have to congratulate you on your success in providing a Canadian engineering journal."

I received the sample copy of your paper a few days ago and like it very much. I enclose $1 for year's subscription, and wish you success.—*Emile Dube.*

A NEW DEPARTURE IN STEAM BOILERS.

The Finlayson Upright Water-Tube Boiler, of which we present illustrations herewith, has recently been placed upon the market, and according to the points set forth in a neat and clearly-worded catalogue issued by its manufacturers, Doty Bros. & Co., Toronto, Ont., possesses advantageous features which should commend it to the careful consideration of steam users We notice certain departures from other pipe boilers heretofore placed on the market as follows :

No fire-brick on the inside or brick masonry on outside is used in its construction. Instead of fire-brick walls the Finlayson Boiler has a water front and water back, connected at the top by steam-drum, and at the lower corners by side-flow pipes Through this feature a considerable amount of effective heating surface is gained over that afforded in boilers using fire-brick, and, consequently, greater efficiency is assured Through the absence of fire-brick much is saved in weight, and the danger resulting from tumbling down of the fire-brick walls, as in boats in a sea, is removed. No masonry is required for stationary plants.

All steam generating pipes and the superheating pipes are placed in a perpendicular position, the opposite from the returned continuous horizontal coils.

It is virtually a drop-tube boiler, the difference being only in that the tubes are arranged in sections, and that the ends are connected together, each section being in turn connected at the top with the steam-drum, and at the bottom with the side-flow pipes. All the sections are divided in the middle of the boiler so as to permit of expansion without injury to any of the joints

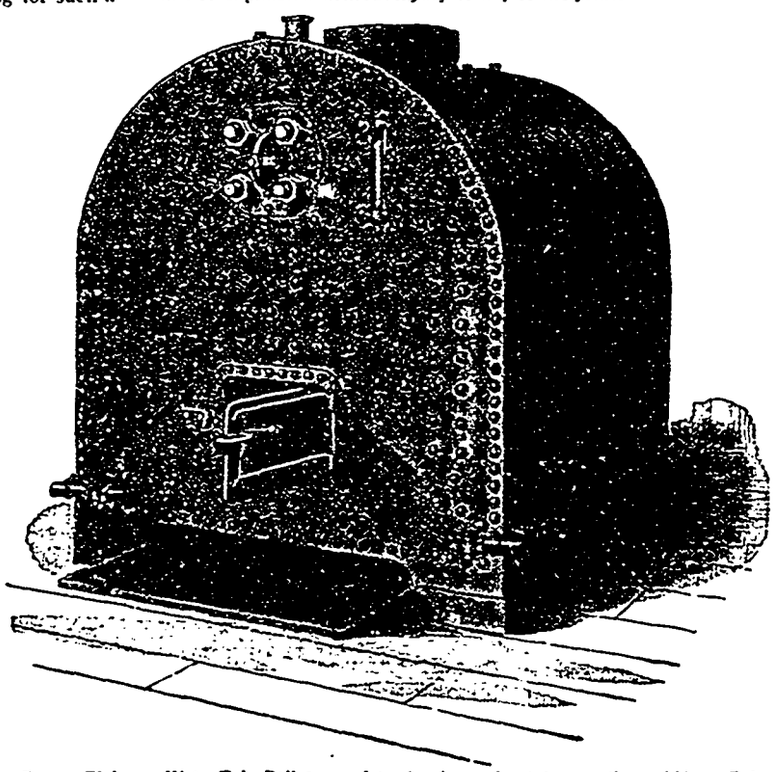


FIG. 1.—Finlayson Water-Tube Boiler, complete, showing feed-water connection and blow-off pipe on sides. Portable and ready for steam and water connections in condition as represented.

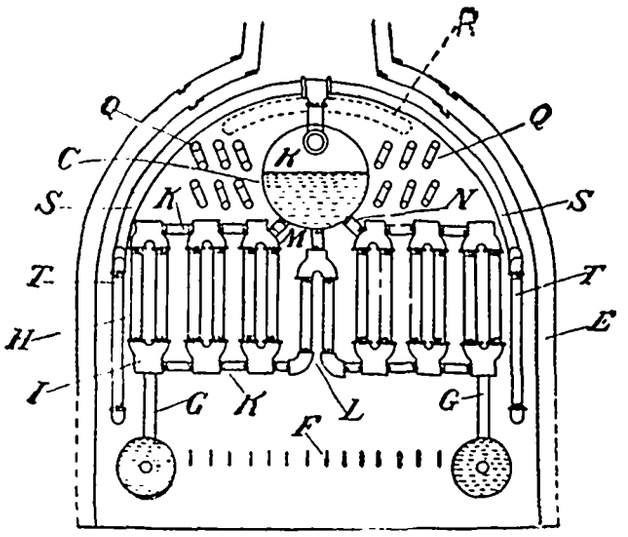


FIG 2.—Sectional front elevation, showing
E—Double jacket side-covering.
F—Grate bars.
G G—Upright connections between side-flow pipes and steam-generating sections.
H—Steam generating loops
I—Special malleable iron fittings.
K, K—Lateral pipe connections between fittings
L—Division line between the steam-generating sections, to permit of expansion
M—Connection between expansion Y and drum.
N—Connection between steam-generating sections and drum
Q, Q—Feed-water coils
R—Dry-pipe lying in steam portion of water-front and water-back
S,S—Connections between steam-drum and super-heating coils.
T—Upright super-heating pipes

Through the arrangement of the short upright pipes, the most rapid generation and liberation of steam is provided for. The steam is not required to make its way through 30 or 40 feet of pipe returned on itself several times, and filled with water. It is claimed that a steady water-level is maintained under all circumstances, and that it is impossible to boil the water out of the steam-generating sections, as these are re-supplied with water through the large quantities carried in the front and back as fast as converted into steam. This is an improvement over inadequate "downflow" pipes for supplying the steam-generating pipes There are no fluctuations present in the Finlayson Boiler in quantity or level of water, or in the steam pressure, due to the larger quantity of water carried.

The grate surface is very large, and this combined with the other features, insures the greatest possible efficiency.

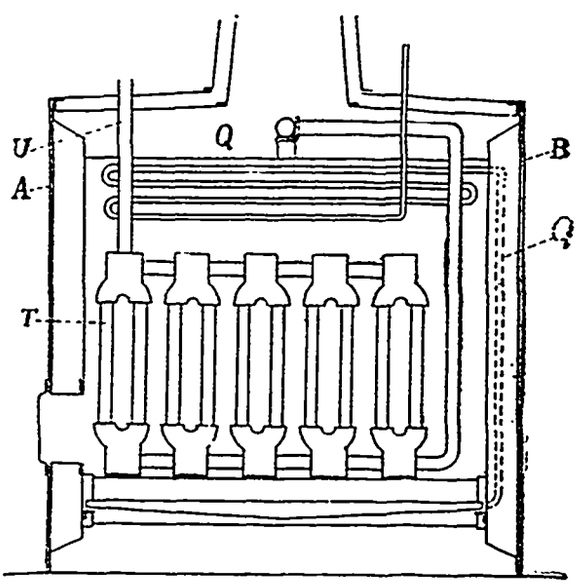


FIG. 3.—Side elevation Finlayson Boiler, showing particularly the arrangement of super-heating coil (*T*), its connection with steam-drum, and outflow through engine supply pipe *U*. A super-heating coil lies on either side of furnace.
A & B—Represent a water-front and water-back.
Q, Q—Feed-water coil.

The super-heaters are so arranged as to provide absolutely dry and highly expanded steam, and priming is avoided By providing free escape for the dry steam at the top of each perpendicular pipe in the super-heater, and all being connected with engine supply pipe, any water that might by any possibility be carried over into the super-heater, would not be drawn or forced into the engine, as must result in the horizontal continuous super-heating coils. The super-heating coils receiving all the heat passing through between the rises from the side-flow pipes, would rapidly convert any water that might react them into steam, and thus absolutely dry steam is guaranteed.

Another point in its favor is simplicity of construction The boiler is provided with a double heavy iron side and top casing lined with thick fire felt, and is complete for steam and motor connections as it leaves the shop. Scale and mud are easily removed by means of blow-off cocks inserted opposite side-flow pipes, and if necessary every section can be washed out by insertion of nozzle of water hose.

Those interested should send for illustrated catalogue to Doty Bros. & Co, Toronto, Ont.

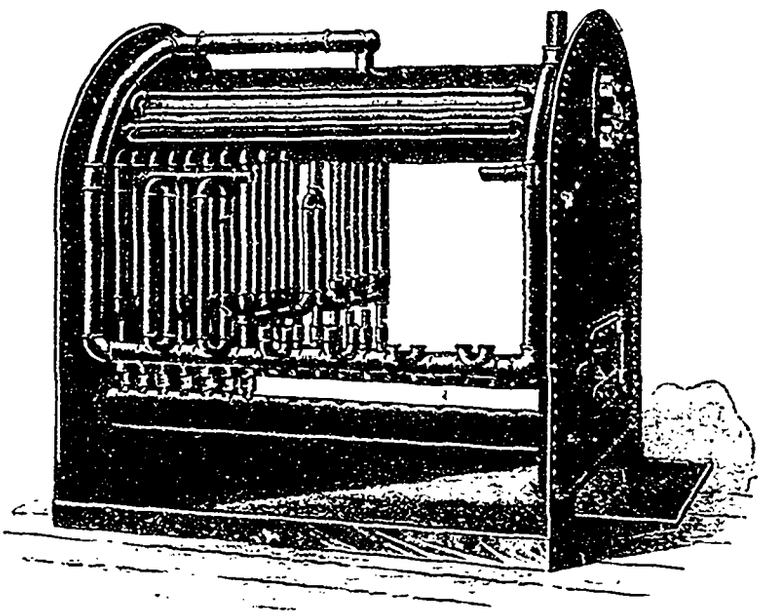


FIG. 4.—Finlayson Boiler in process of construction, with only part of the steam generating loops and superheating pipes in position, showing particularly the arrangement over the fire

THAT WATER-WHEEL PROBLEM.

The water-wheel problem propounded by Mr. Bell, of Welland, in the October number of THE CANADIAN ENGINEER, has elicited a good deal of correspondence, and Mr. Bell will at least have gained some new light on the subject. Two further letters received are given below. Mr. McCallum's long study of the operation of water-wheels will give his letter and rough sketch special interest:

Editor CANADIAN ENGINEER:

In THE CANADIAN ENGINEER of October, 1893, page 149, I notice an article headed "A Problem." In reply I would ask you, whether you do not think the cause of the difficulty in not getting as much power from the first wheel when the second is not running might be because when the second wheel is not running the water backs up on the first wheel and "floods it."

If you had a flume or box running across the penstocks and take the water as required to each wheel, it might be a benefit, or shut off the supply of water when the second is not running.

Yours, etc.,

A BURROWES.

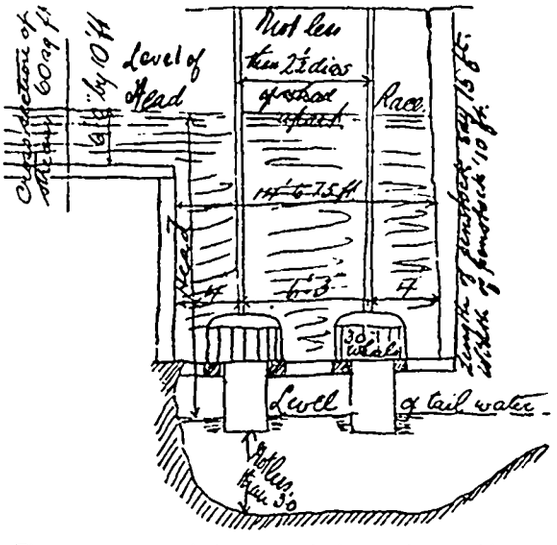
Deseronto, Ont

Editor CANADIAN ENGINEER:

I have looked into the problem, and I think it rather strange; I sometimes think that it cannot be properly put.

Less power will certainly be obtained from No. 1 wheel than when 1 and 2 are working together, but I can hardly think that No. 2 wheel will give as much power as 1 and 2 together; if so, as I

understand it from the problem, something must certainly be wrong. We must look, then, to the construction of the penstock and flume for the trouble. In looking at the sketch, I would judge that the head of No. 2 wheel is less than No 1, which at once shows that the supply is not sufficient for those two wheels, or else the head on No 2 wheel would be the same as No. 1. Two wheels of the diameter mentioned would require a flume whose cross sectional area should not be less than 60 sq. ft , if Mr. Bell's flume is less than this, it will certainly cause trouble.



The arrangement of the penstocks is one that would not com mend itself to me. I think that better results could be gotten if the two penstocks were in one. The conduct of the wheels would suggest to me that they are choked at the bottom, the wheel pit being too shallow, as the information is so meagre, I can only suggest those ideas I submit sketch of penstock that would be suitable

Yours truly,

A. C. McCALLUM

Peterboro, Ont

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

ANNUAL DINNER OF TORONTO NO 1

The seventh annual dinner of Toronto Branch No. 1 was held at the Avondale hotel, Toronto, on the evening of the 23rd November The attendance was large, and in fact was too large for the building in which the banquet was held. Had the committee known the affair was going to be so largely attended, they doubtless would have arranged to spend the evening in much larger premises, but they will profit by their experience, and in the future it is not likely there will be any inconvenience

A few we noticed present were Toronto—Prof Galbraith, Principal School of Practical Science, Jno Galt, C E., M.E.; J. Inglis, A. E Edkins, Prov Dep. for Ontario, A M. Wickens, Dist Dep, Wm Sutton, Vice-Pres Executive, W G. Blackgrove, Treas Executive, W. Philip, Pres Toronto No 1, W Butler, Vice-Pres Toronto No. 1; Ed Philip; Geo Gilchrist, John Fox; H. E. Terry Samuel Thompson, Geo. Fowler, Geo Mooring, Fin. Sec. Toronto No 1, C Mosley; W. L Oathwaites, J. Barber; Wm P Sutton, Huggett; Ed. Appleton, Alex Fraser, Sec-Treas. Boiler Inspection and Insurance Co., John Perkins, Geo Grant; A. S Wilson, J Sanrioll; James Wadge, F Tushingham; Mr. Crosby, Chief Engineer T. Street Ry. Plant; S. Mathews, Asst. Eng T St Ry Plant, F Forster, David McCulloch, Ed. Ash; R. Waterson F. Smith, Sec Marine Engineers' Association; Geo. Gore, Geo Haworth; Walter Lewis, J. Johnson, John Day; Fred. Day: George Thompson, and others, and from outside points we noticed Robert Mackie, Dist. Deputy; Duncan Robertson J. Langdon; R Chillman from Hamilton No. 1; Jas. Devlin, President, Kingston No 10; W. T. Brown, of Galt, and Arthur Ames, of Brantford, No. 4

Because of the smallness of the dining-room it was found necessary to have a first and second table. But, of course, this does not mean that those who ate first got the best of it, but that those who had to wait for the first table to get through had ample time to think over their speeches or gossip about fresh possibilities in the engineering line,

The chair was occupied by Wilson Phillips, president of Toronto No. 1, and in him the association has a good man. He expressed his appreciation of the members in helping to make the meeting a success and his pleasure at seeing so many in attendance.

The first toast of the "Queen" was duly honored, after which the toast of "Canada, Our Home," was drunk. J. J. Cassidey, of *The Canadian Manufacturer*, responded, and in the course of his remarks said that Canada was the fairest and finest land he knew. He remarked that one of the great necessities Canada stands in need of was in regard to the appointing of competent inspectors by the Government for the inspection of all the steam boilers used The Government, he said, had appointed inspectors for marine boilers, but not for the stationary ones, and he thought it was just as necessary in one case as in the other.

Ald Bell rose to his feet to respond to the toast "Toronto, the Queen City of the West," and said that the City Council was a much-abused body, but after all they were doing their best to encourage manufacturers and others who would do the city good. He intimated his intention of becoming a member of the C A.S.E, which announcement was received with cheers. Further, he said the City Council were doing all in their power to help the working classes. He, too, thought as did Mr. Cassidey about the appointing of competent inspectors and the licensing of engineers.

"Our Educational Interest," a toast which aroused a good deal of interest because of its application to this body, had the names of Prof. Galbraith, of the School of Practical Science, and Mr. John Galt, C.E., coupled with it

Prof Galbraith said the progress of the association had been beyond his greatest expectations, and that apparently the hard times did not affect the Engineers. Said he. A well organized business is better than a small one. This society had not been organized to encourage strikes, but rather to raise the standard of the work done by its members, and thus make them more valuable to their employers. The time had come when the wages of a man were not determined by the time he worked, but by the value of his work to his employer. The man who does not measure his services by his pay is the best man. He endorsed the way in which the association was educating its members, and closed with an invitation to the members to visit a test which would be made at the school on the 1st December.

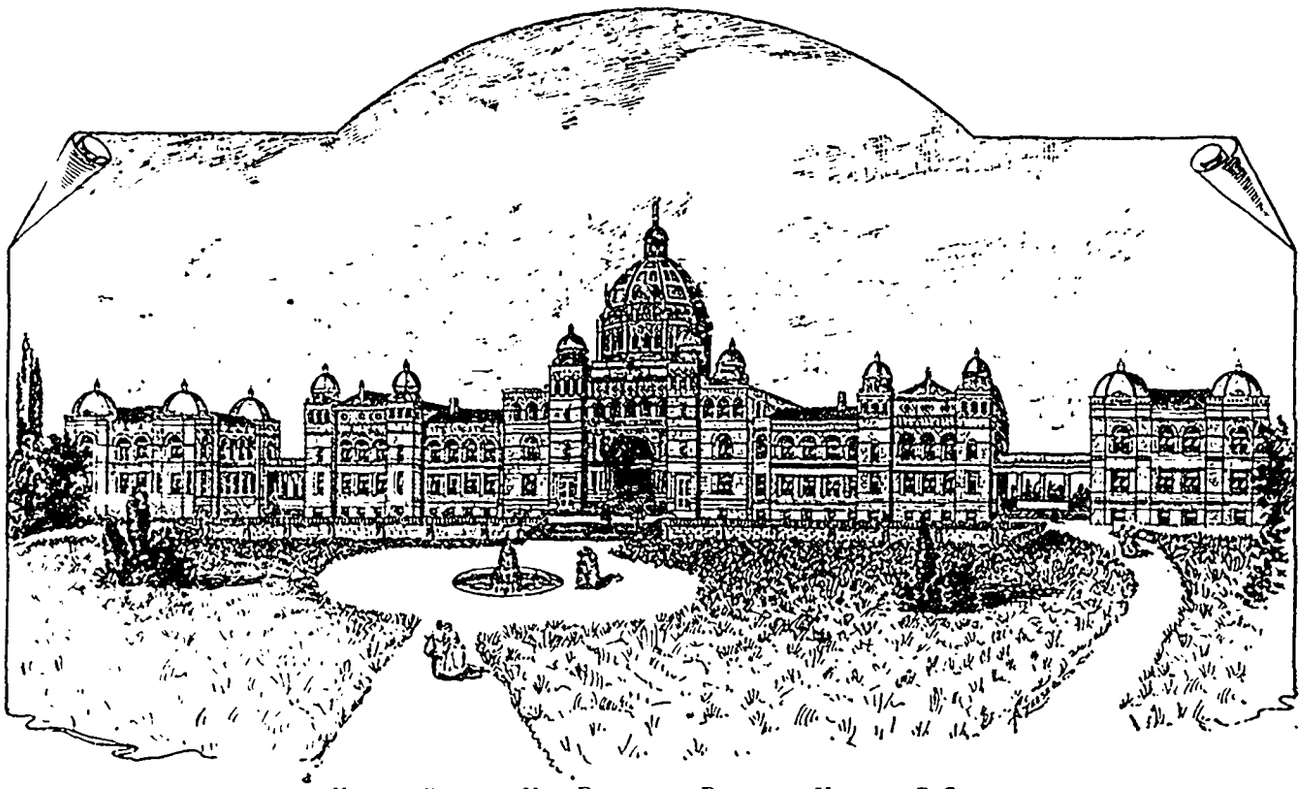
John Galt commenced his remarks by telling why and when the association had been organized. The start was made, he said, because of the educational benefits its members would derive from meeting together, and by reading all the different text-books on engineering, as furnished by the association. Its progress was rapid and had spread all over the Dominion. He did not think the members should be at all dismayed because they were not countenanced by the Government in the matter of a license law But he thought the time would come when this association would be recognized as the only body of mechanical engineers. He also, in an interesting way, told how there was a time when nothing but the slow speed engine existed; then they were made to go faster, and for a time everything was "high-speed" engines, but gradually they were being done away with, and now we were almost back to the slow-speed engines. This fact had to do with the multipolar dynamos being constructed.

W T. Brown was asked to respond to the toast "Our Manufacturing Interests." In his careful and well chosen words he said, among other things, that the members of the association received the best wages going, and this fact was due to the efforts made by the association to educate and make better workmen of its members It was also noticeable that these men took more interest in their work than did those who do not take advantage of the educational and other privileges as offered by the association. He hoped to see the association spread to the smaller towns, where there were always some engineers who would avail themselves of its advantages.

O. P. St. John, in his brief reply, told of the advancement engineers had made during his time. He could remember when all that was expected of an engineer was to be able to turn the valve and start the engine, as well as keep a sufficient head of steam on. To-day, however, things are different. The engineer must know his engine thoroughly and be able to keep it in the best possible condition. He also referred to the general good qualities of the slow speed engine, and thought that greater economy existed where the long stroke engine was used.

In the absence of his father, whose name had been coupled with this toast, Mr. Perkins, jr., made a few happy remarks.

The toast "Executive Council C. A. S. E." was heartily received, and in reply E A. Edkins gave a brief outline of the work. He thought the outlook for the coming year was exceedingly bright Since the convention held in Montreal a branch had been organized in Kingston with a membership of 30, and although



View of Proposed New Parliament Buildings, Victoria, B. C.

it was at present difficult to start new branches because of certain prejudices that had no being but merely existed in the minds of some, still he firmly believed that it would be but a short time before nearly every town had its branch During the past seven years the association had been doing splendid work in the way of educating its members up to a high standard of efficiency The demand for engineers who have some knowledge of electricity is growing, and he would advise all those who could to avail themselves of every opportunity to study along this line. He impressed on those present the importance of an interchange of views between men engaged in mechanical pursuits, for, when this is done, the benefits derived, not only for the men themselves, but for their employers, are very great, and tend to further their advancement and general welfare He ended his remarks by saying, "I hope and trust that I may never see the day when this association will work along any other lines than those laid down during the past few years."

Mr Grant was asked to respond to the toast "Amalgamated Engineers," and he did so in a methodical way He pointed out the difference between their society and that of the C. A. S. E. by saying that it was a trades organization, but they were not in the habit of rushing into strikes without a just cause He quoted some figures which showed the progress and amount of work done by the society since its commencement some forty years ago

Enthusiasm prevailed while the toast "Old Toronto No 1" was being honored, and it fell upon A M Wickens to respond. His remarks were of a reminiscent nature, and he entertainingly told how the association had been started with only eleven members, and this amidst much opposition. In referring to a license law, which had been so much sought after, he said that the Legislature had granted a permissive law, and under this a board of examiners had been appointed.

The toast, "The Marine and Locomotive Engineers," was drunk, but no one was present to respond

Then Messrs. R. Mackie and Jas Langdon replied to the toast "Hamilton Association"

It was early in the morning when Mr. Devlin rose to reply to "Kingston No. 10," but this fact was forgotten in the enthusiasm which prevailed. He was there to represent the branch which was the last to join the ranks of the C.A.S E. His remarks were brief, but pointed

Numerous other toasts then followed as a wind up to a very successful and pleasing event. "God Save the Queen" was sung with as much heartiness as though the night was not far spent and the company beginning to think of their beds.

The committee of management was composed of Samuel Thomson, chairman, H E Terry, sec-treas, A. E. Edkins, W. G. Blackgrove, J Harper, and George Fowler, and they all attended to their duties in the most praiseworthy manner.

The evening was not spent without a good supply of music furnished in good style by Messrs Grant, Anderson, Blackgrove, Harding Tupper, and McKendry.

CANADIAN SOCIETY OF CIVIL ENGINEERS.

A meeting was held in Montreal on the 7th inst., at which there was a fair attendance

Mr. Gower suggested the formation of a Board of Arbitration in connection with the Society, to which all disputes might be referred.

Chairman Hannaford thought that such a scheme would not act, people would not feel themselves bound by the board's decisions.

The attention of the Society was then drawn to the fact that land surveyors were in the habit of affixing to their names the title C E, but after a brief discussion it was conceded that no steps be taken in the matter

Mr. St George (for the Committee on the Society's Dinner and Reception) stated that the dinner had been arranged for satisfactorily at the Windsor Hotel The chief difficulty was in the matter of a reception. An offer of a private house had been made, but unfortunately it had fallen through. He then mentioned the cost for a reception at the Windsor.

A paper on "A Cubic Yard of Concrete," by Henry F. Perley, was then read by the secretary, after which a considerable discussion ensued

Chairman Hannaford remarked that Canadian cement was dearer than the English; he did not know, however, whether it was any better.

Mr Smith said most people had the idea that concrete was more expensive than timber. This was not always so, however In a case which had come under his own notice, concrete had been used at a cost of $5.50, the space concreted representing 1,000 feet of timber, the ordinary cost of which would have been $17. If natural cement were sufficient and cheaper for ordinary purposes, why should it not be used? He doubted whether the ordinary mode of mixing—by placing the sand and the cement in layers and then moving them about—was effective. It was better, he thought, to mix the particles of sand with those of the cement by letting the grains of one get round the grains of the other, and this could not be done properly by the "layer" method. He thought the writer of the paper had attached too much importance to slags With regard to the test of seven and twenty-eight days, that was of little use, for the increase of strength between the 7th and 28th day was very great. If the concrete gained its full strength in seven days, it would likely develop brittleness. The natural cements did not get their strength quickly.

Mr. St. George remarked that lime was the same

Mr. Smith (resuming) said there ought to be some standard for all to accept in the matter of cements. However, each kind of cement needed a different amount of water, and it was difficult to decide how much. Regarding the rate of speed, also, it was difficult to know what rate to use. Although a great deal was heard about the tensile strength of cements, yet there could be no doubt that on the whole the adhesive strength was the more important.

The secretary then read some communications from absent members, the first being Mr. M. J. Butler, who said that cement should be ground fine enough to leave not more than ten per cent. residue on the 10,000 on the mesh sieve (100x100 to the square inch). Any residne rejected by the sieve possessed no cementing properties, being merely the equivalent of so much sand. The specific gravity test should always be taken in preference to any weight per bushel test, the heavy weight per bushel hitherto demanded having been a direct encouragement to coarse grinding. Comparative neat cement tests would always show in favor of coarse grinding, hence the necessity for standard sand tests. The finest ground cement would, with the same proportion of sand, give the highest result. In other words, by using fine ground cement more sand might be used, and yet an equally strong mortar would be produced. The writer of the paper seemed to have overlooked the only reliable test yet known for free lime, viz., the hot water test. Twenty-four hours after immersion in hot water, it would be known whether the cement was safe, otherwise, in cold water, it might take three or four months before the effects of excess of free lime became apparent.

Prof Nicholson read some extracts from the report of a German committee on the testing of cements, especially bearing on the question of setting and consistency. The "consistency" was tested for by what is called a "normal needle," the needle sinking to a certain distance from the bottom of the vessel Another test was for the constancy of volume as time goes on. A cake of cement was placed on a glass plate and put to a temperature of 110° or 120° F.; its constancy was judged of by noticing the number of crevices prodnced. Only those tests should be used which relate to the purpose of the cement. Cement gave way sometimes by sheering. Therefore the compressing test was the natural one to be used for such cases as sheering was likely to occur in; and here the "personal equation" came in as a considerable factor.

Mr. Carry said that the standard tests gave no information as to the real value of a cement, they seemed to be given from the physicist's point of view, not from the practical engineer's They did not enter into the subject of how the cement was to be employed. In the case of mortar for masonry, the mortar had to convey pressure over bends, to convey the stress from the upper to the lower. Strength in the cement was not particularly called for; he knew of no case of a building failing owing to the cement crushing out from the joints. Another object to be aimed at was to protect the joints from frost and atmospheric influences. The standard tests did not give information on this point. In the case of mortar for walls, why neglect the greater and attend to the less (for the strength of the cement is often more than that of the building material) If adhesive strength was what was required, he did not see why the test should not be for that, it was just as easy as to test for the tensile strength. He thought in tenders for cement the point specified should be for strength, not for fineness merely

Mr. Smith spoke of the test for blowing, and said that Yale had adopted what might be called a boiling test, to see whether the concrete would disintegrate. He also noticed that the number of meshes per inch was different in the tests of each country.

Mr. E. F. Ball communicated that fully 19-20ths of the Portland cement used in the United States was artificial; but in some localities deposits of rock occurred which contained lime, clay, etc., in proper proportions, and from which *natural* cement might be made Such a cement was manufactured in Egypt, Pa., from a dark-colored rock resembling hard slate, which was quarried, broken up, burned at a moderate temperature, made into bricks and burned a second time—the last burning being at a high temperature and continuing for some time, after which the resulting clinker was finely ground into cement He would add fine grinding of the material before calcination to the requisites which Mr Perley had mentioned for a good Portland.

The secretary then read a few remarks in continuation of the discussion upon Alan Macdougall's paper on "Domestic Sanitation."

Dr Griffin, Medical Health Officer, of Brantford, Ont., drew attention to the plumbing by-law of Brantford No premises could be connected with the public sewers, unless plans of the plumbing and drainage had been made in duplicate, examined, approved and endorsed by the City Engineer and Medical Health Officer.

Dr. Bryce, Secretary to the Provincial Board of Health, Ontario, thought that the house connections with sewers would come in time.

Dr Bethune, Medical Health Officer, Seaforth, Ont., spoke highly of the usefulness of Mr. Macdougall's paper.

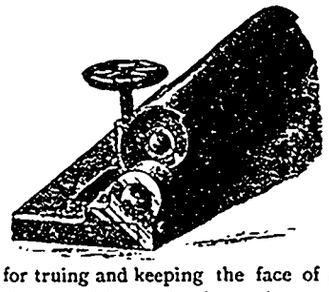
Dr. J. Ryall, Health Officer, of Hamilton, Ont., considered that all sanitary work regarding building, testing sewers, etc., should be under the inspection of a sanitary engineer, having full control over plumbers. He certainly approved of a Sanitary Association that could be worked in harmony with our health departments.

The Montreal stationary engineers have had another interesting addition to the nucleus of their museum, Peter H Cowper, mechanical superintendent of the Canadian Rubber Company, having presented this association with a model of a steam pumping engine, made by himself The model is a remarkably neat piece of workmanship, and its value as a means of instruction is greatly enhanced by the fact that the cylinder has a tiny glass window for the purpose of showing the action of the water The presentation was made the occasion of an interesting meeting of the association in their hall on Craig street a few evenings ago, when the generosity and mechanical skill of Mr Cowper came in for an equal tribute of admiration from members. Bros. Hunt, Nuttall, Ryan, York, and others made interesting speeches on the occasion, when the hope was expressed that that would not be the last gift of a similar kind from those who had the intellectual progress of the stationary engineers at heart It is worth while in this connection to recall the fact that Mr. Cowper presented the first model—that of a glide valve engine—ever given to the association At the same meeting Hugh Vallance, of Montreal, presented the association with a portfolio of views of the machinery of the steamer "Lucania"

William Meaden, of 533 Richmond street, London, Ont., has been chosen secretary of the London branch of the C A S. E., in succession to Geo Taylor, of the *Free Press* The meetings are in future to be held on the first Thursday and last Friday of each month.

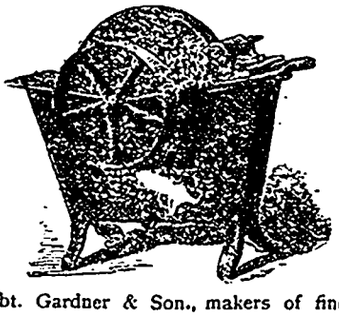
A meeting of the board of the Ontario Association of Stationary Engineers took place a short time ago, and it was decided to petition the Ontario Government for a much stronger license law than that at present existing.

IMPROVED GRINDSTONE TROUGH AND TRUING MACHINE.



One of the most disagreeable things to be done in a workshop is the Truing of Grindstones. It is, therefore, often the case that they are allowed to become quite out of shape and untrue, very much to the annoyance of the workman. The accompanying cut illustrates a device which is well adapted for truing and keeping the face of grindstones constantly in good shape. This can be instantly applied to the face of the stone, working automatically, without interfering with the constant use of the stone, and does the truing without raising any dust.

The main stand or bottom piece is securely clamped upon the trough close to the face of the stone, then, by turning the hand wheel, the threaded roll is brought into contact with the face of the stone, and is allowed to remain so long as is requisite to produce the desired result. The water is to be left as usual in the trough When by long use the thread on the hardened roll becomes worn it can be re-cut. The stone should revolve so as to have the device upon the face which moves upwards, and the device should be well oiled before it is used.



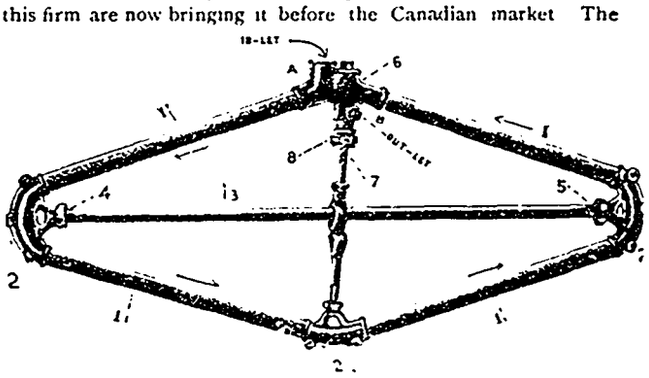
The second cut represents a Grindstone Trough combining a number of very desirable qualities In addition to the ordinary arrangement of trough, spindle and pulley, which is 20" diam. and 4½" face, it is provided with self-oiling boxes, and the adjustable truing device referred to. Further information may be had of Robt. Gardner & Son., makers of fine machine tools, Montreal, who represent the patentees in Canada.

WILLIAM PERRY

William Perry was born in Chudleigh, Devonshire, England, in 1837, and came to Canada at an early age. In the early part of his life he worked with his father, the late William Perry, at the Fire Engine Building, Montreal. In this line he is quite at home, having made a study of the business, and is to-day one of the first hydraulic engineers in Canada Twenty years ago he challenged a chemical fire engine company in New York for the championship of the world, and with the assistance of the late Chief Bertram, and the different men of the Montreal fire department, came out best. He organized the first fire department in Cote St. Paul twenty-four years ago. He was then in the employ of Frothingham & Workman, and built the improved shovel machinery put into the works at that time. He was the first employe of the late Charles W. Williams, sewing machine manufacturer, now called the Williams Manufacturing Co. He built the pin machinery in use in Montreal 26 years ago. But his hobby is steam pumping machinery, and he has completed some very important water works plants, among which are Stratford, Ont., Peterboro', Ont., Iroquois, Ont., St Hyacinthe, Que., water works stations for the Grand Trunk Railway, Canada Atlantic Railway, Montreal and Western Railway, Pontiac and Pacific Railway, Montreal and Sorel Railway, Intercolonial Railway, Canadian Pacific Railway, Lake St John Railway, and others. For the past 18 years he has been with the firm of R. H. Buchanan & Co., Montreal, in which connection he has put in a large number of Worthington pumps. He has laid submerged pipe in lengths from 40 to 400 feet long, varying in diameter from 6 inches to 2 feet He prides himself in never having a failure. Among some of his work is one plant put in for the Dominion Cotton Co., Hochelaga; it is a suction pipe 16 inches diameter, 500 feet long, and at low water in the St. Lawrence, 3 pumps supplied themselves at a lift of 22 feet Also another for the same company, with over 300 feet of suction pipe, 27 feet lift. As may be readily imagined from the portrait, Mr Perry is a man of genial temper, patience and courage. Mr Perry has written occasionally for the technical papers in the United States, and his first contribution of the kind, at home, appears in this issue of THE CANADIAN ENGINEER. No doubt many of our readers will be glad to hear from him again

A NEW STEAM TRAP.

Thos Down & Co., Dalhousie street, Toronto, have recently introduced a steam trap, which appears to have several noteworthy advantages, and they have received many strong testimonials in its favor It is widely known throughout the United States, and this firm are now bringing it before the Canadian market The



principle involved in this trap is the expansion of metals by heat, and their contraction by cold, the expansion or contraction of the outer frame governing its entire working When the outer pipe which constitutes the trap becomes heated, and expands, the expansion cannot find vent lengthwise or laterally, because of the adjusting rod. The trap, therefore, vents its expansion vertically or in a line across the centre The valve and valve stem are in this vertical line, and influenced by the slightest variation Expansion causes the valve to close and stop the flow of water, whilst contraction opens the valve for ready discharge of water The rod passes through an opening in the valve stem The trap must always be adjusted with steam on by turning the adjusting rod sufficiently to prevent all escape of steam Then when water enters contraction ensues, thus opening the valve, allowing the water to flow out of the outlet. The delicate adjustment admits of discharging water of any desired temperature The advantage of this trap is that no water accumulates to condense steam, thus giving the full benefit of it. It may be attached to steam engines, pumps, boiling kettles, railroad coaches, or any heating apparatus, or wherever steam is used for heating purposes, and is said to save 30 per cent., at least, of steam.

SCHOOL OF SCIENCE DINNER.

The annual dinner of the School of Practical Science, Toronto, was held on the 1st inst at Webb's, J. D. Shields in the chair. About eighty were present, consisting of members of the School, with the Faculty of the School as guests There were also present as guests Alan Macdougall, representing the Canadian Society of Civil Engineers, D B. Dick, president of the Ontario Society of Architects, and A. J. Van Nostrand, of the Ontario Land Surveyors' Association. The dinner was much enjoyed, and the menu card was embellished with clever and apposite quotations The speeches showed hearty goodwill between the Faculty and students, and the songs as well as the speeches were much enjoyed The dinner was such a success that there was a general feeling in favor of making it an annual fixture

ELECTRIC LIGHTING OF LONDON, ONT.

Seven well-known companies ask the honor and profit of supplying the city with a complete electric light outfit. Their tenders do not include the erection of a power house, which the city will do itself Then the corporation own a number of poles, for each of which the companies would allow $5 to $7 off the contract price The specifications call for 250 arc lights and 2,000 poles, with all things necessary to complete equipment Separate tenders were called for—first, for the electric light furnishings alone; second, for the electric equipment and the steam power together. Apart from this, leading firms were asked to tender for the boilers and engines by themselves.

Some of the companies tendered for both electricity and steam Where only the former was given the cost of the cheapest steam plant, as tendered for separately, could be added. The following figures are the lowest in each case ($14,700 being added for steam pumps—the cheapest separate tender)

Company.	Electric Equipment.	Including Steam Plant
Standard Electric Light, Chicago..	$43,130 00	$57,830 00
Canadian General Electric, Toronto	36,300 00	51,000 00
Fort Wayne Electric	42,224 00	56,924 00
Reliance, Waterford, Ont	32,990 00	47,690 00
Royal Electric Co., Montreal	42,650 00	57,350 00
Western Electric Co., Chicago....	42,274 59	56,974 59
Siemens & Halske, Chicago..	.....	65,690 00

In Siemens & Halske's tender, owing to the nature of the plant, the cost of steam power is necessarily included. Their tender, without poles, is $54,798. Their offer was for 258 lamps.

The Canadian General Electric Company offer their present electric plant for $32,670

The lowest tender for the steam plant was from Robb & Armstrong, Amherst, N.S., $14,700.—*Free Press.*

On May 1st last, Montreal No 1 Branch of the Canadian Association of Stationary Engineers possessed $103 and a ballot box To-day their balance on the right side is $400 in cash and $225 worth of furniture This is a very good showing for seven months' work on the part of the energetic and painstaking officials of the association.

William Wilson, who was killed in Montreal Rolling Mills on the 11th inst., was prominent owing to his having been financial secretary to the Montreal No. 1 Branch of the Canadian Association of Stationary Engineers, by which body his death is very much regretted They sent a wreath, with a handsome design emblematic of the Order.

Industrial Notes.

A TOWN HALL is proposed for Eganville, Ont.

ALLAN SILVER is establishing a pump factory in Avonmore, Ont.

GRIFFITH & CANBY have opened in Welland a coal oil barreling works.

A MR. PINKIE has built a new gristmill, with improved rollers, at Reaboro, Ont.

THE Hearle Soap Manufacturing Co., Montreal, have opened a branch office in Toronto

ROBERT ADAMSON, of Berwick, intends to erect a grist mill at Upper Millstream, N B

F. F. FERLAND & Co., contractors, Montreal, have assigned with liabilities of about $15,000

JACOB SWEENEY'S furniture factory at Yarmouth, N S., has been completely gutted by fire. Insurance, $10,000.

THE Record Foundry and Machine Co., Moncton, N B., sent a shipment of stoves to Newfoundland, not long ago

DUNN BROS. are building a saw-mill at Grand Bay, N.B., to replace the one burned down some twelve months ago.—*St. John Sun.*

W. H. & J. ROURKE, St John, N B., whose saw-mill was burned down some time ago, are erecting a new building on the old site.

THE Kingston Foundry and Machine Company have refitted with engines and shafting McRae & Co.'s steam saw-mill at Calabogie, Ont.

THE Ontario Bolt Works Company, Swansea, near Toronto, are negotiating for the purchase of the Ontario Rolling Mills of the same town.

THE building record of Regina, N.W T., for 1893 far exceeds that of 1892, and is only a little below the famous record of 1891, says the *Standard.*

THOMAS JOHNSON & Co., wholesale tinsmiths, Montreal, had their premises destroyed by fire last month. Loss estimated at $100,000; insured for $27,000

NELSON STABLEFORD, a shunter on the I C R at Moncton, slipped and fell under a moving car last month, losing both legs. He died from his injuries.

THE Wrought Iron Range Co., Toronto Junction, are removing their plant to Pearl street, in the city, the company believing a more central position desirable.

JAS. STEELE has bought the shingle machinery from McKenzie's factory at Kirkfield and will start a shingle factory at Munro's Corner, Ont.—*Lindsay Post.*

A WRITER in the Galt *Reporter* urges the town authorities to have another boiler for the water works to increase the motive power, in order to provide against accident

THE new water works at Buckingham, Que., were inaugurated on the 6th November. These works cost $50,000, and were built under the superintendence of J. E. Vanier, Montreal.

THE British Columbia Jute and Cooperage Company's factory at Vancouver, B C., has been totally destroyed by fire. Loss, $30,000, insured The building will be rebuilt at once

HUMPHREY & TRITES' sawmill at Petitcodiac, N.B., with large piles of lumber, have been completely destroyed by fire. Cause of fire supposed to be a hot box. Loss $15,000; insured.

HIRAM WALKER & SONS, Walkerville, will shortly erect a rack warehouse to contain 40,000 barrels of liquor. The *Woodstock Sentinel-Review* says this will be the largest building of its kind ever built.

AN engine and boiler are being put in Folkin's mill at Upper Millstream, N.B. This mill has hitherto been run by water-power, but owing to frequent droughts, has often had to be closed down for long periods.

DOUGLAS & Co., the iron founders, of Halifax, who lately removed to Dartmouth, are now thoroughly equipped for business. Their engine and pattern room is 25 by 65 feet, and the main building 90 feet by 30.

AT the sale of N.B. Crown Lands in Fredericton last month, the Muskoka Lumber Co., of Toronto, bought up about 250 square miles of timber limits The purchase has caused a little anxiety among provincial operators.

A SCHEME is on foot to supply Lunenburg, Ont., with water

JAMES SMITH will add a grist mill to his rotary mill, at Berwick Corner, N.B

A BY-LAW has been prepared authorizing two main sewers in the town of Welland, Ont.

A NEW glass factory has been started near Welland, Ont., its specialty being brown glassware.

A GRINDSTONE weighing over 3,000 pounds has been put in the Almonte, Ont., file factory.

THE Breithaupt Leather Company are putting new machinery into their works at Penetanguishene.

THE baby carriage factory at Burlington, Ont., recently burnt down, is being rebuilt on a smaller scale

THE walls of Winnipeg linseed oil mill gave way a few days ago, and the building was completely wrecked.

E. LECLERC'S door and window sash factory at L'Islet, Que., has been burned, Loss, $5,000. Not insured.

THE people of Arnprior, Ont., are thinking of adding a chemical engine to their fire station, at a cost of $2,500

THE Listowel, Ont., *Standard* says the new foundry buildings and machine shops in that town are well under way.

THE machine shops of C. Audet at St. Anselme, Que., have been destroyed by fire Loss, $25,000, very little insurance.

THE Water Commissioners at Amherstburg, Ont., are asking the Council for $30,000 for the extension of water mains.

A FIRE started at Ashburnham, Ont., by which Hunter's barrel factory and other buildings were destroyed. Loss, altogether, $20,000.

THE new saw-mill at Admiral Rock, N. S., is now completed, and seems likely to be running night and day for some time—*Truro Daily News.*

THE Smith's Falls council are taking steps to induce the Dominion Government to place a new bridge over the Rideau at Jones' Falls—*Kingston News*

A. EDWARDS & Co's furniture factory, at Portage la Prairie, has lately been enlarged, and now sends out an immense amount of goods to Manitoban towns.

THE new "Norwood" bridge across the Red River at Winnipeg is finished It consists of three spans of about 140 feet, and a draw span of about 250 feet.

REGINA, N.W.T., and Edmonton, Alta., have just increased their capacity for fighting the fire fiend by the addition of Ronald fire engines from the Brussels, Ont, Works

GEO. R. DAVIS is organizing a company for the manufacture of pianos in St. John, N B. The capital will be $25,000, and the company is to be styled the Davis Piano Manufacturing Co.

THE pumps at the Sherbrooke, Que., waterworks have lately been much improved. A new flume, also, of boiler plate iron has been put in from the dam to the wheels.—*Examiner.*

G E. TANGUAY, C.E., says that the water supply for Beauport, Que., Asylum, can only be put into a proper condition by the construction of an aqueduct, which would cost about $27,000

THE *Brandon Sun* says that new machinery of the most approved kinds has recently been added to the Rapid City Roller Mills, which are now doing a large and rapidly increasing business

THE office of the Hamilton Engine Packing Co., makers of Clappison's celebrated packings, and dealers in engineers' specialties, has been moved from King St West to 310 King St East, Hamilton.

THE Thomas McDonald Man'fg Tin and Stamping Company's premises, at Montreal, had a narrow escape from being completely destroyed by fire last month. Loss about $50,000, against an insurance of $27,000

JOHN WATSON is rebuilding his box factory recently destroyed at London, Ont. The works are now in the premises lately occupied by Thomas Green & Co., and the new engines will be of larger capacity than before.

A COMPANY is in course of formation to establish at Montreal a factory for making glue entirely out of bone, under a process patented by Dr Schweize. By this process, grease and bone meal are said to be also formed in paying quantities.

THE *Eastern Chronicle* says that the new seminary at New Glasgow will have a frontage on Temperance street of 94 feet, and a depth of 73 feet over all. The building will be of brick, with the underpinnings and trimmings of brown sandstone

THE Blakeney, Ont., roller mill is having extensions built.

TENDERS are called for a bridge over the Creek at Melfort, Sask.

THE Winnipeg Waterworks Co propose to borrow $150,000 by issuing bonds.

JUDD & COLEMAN'S starch factory, at Waterloo, Que., is now in working order

THE Cookshire, Que., Mill Co. have closed down their mill for the winter

ROBT ADAMSON will shortly erect a saw and grist mill at Upper Millstream, N.B

R H. COALFLEET & Co are erecting a flour and cornmeal mill at Windsor, N S.

COOKSHIRE, Que., offers a bonus of $2,000 to any one who will set up a fire-wood factory there.

THE Canada Paint Co., Montreal, have resolved to increase their capital from $450,000 to $750,000.

CONTRACTOR KILLAM says work on the Tantramar, N B., covered bridge is progressing rapidly, and will be finished within a few days.

DAVID GILMOUR, of lumber fame, is home from the new limits and says the cut this winter would reach 30,000,000 feet —*Trenton Advocate.*

ESTERBROOK'S saw-mill at Tweed, Ont., is now running fifteen hours per day, and in the winter will probably run without ceasing day or night

IT is said the boot and shoe factory of Stevens, Clarke & Stevens, in London, Ont., will be bought out by an American firm and enlarged.

AT D. Hibner & Co s furniture factory, Waterloo, Ont., a steam press, used for drying chair slats, exploded, injuring two workmen and doing considerable damage to the roof

THE new gas works owned by Coates Co., Montreal, now have a franchise from Cote St. Antoine, St. Henri, and St. Cunegonde, and the works are to be inaugurated this month at Cote St. Paul.

F ALDRED, of the Glencoe, Ont., foundry and machine works, has received a contract to supply McFarlane & Co., Glasgow, Scotland, with all the wooden goods required for their trade in bakers' supplies.

THE Christian Brothers' school at Ottawa was burnt on the night of the 16th ult., the loss on the building, which was a very large one, being estimated at $50,000 The fire was said to have started from one of the furnaces.

CARP, Ont., flour mills have been bought by a Mr. McElroy, who intends to give them a thorough overhauling and to refit them with high-class modern machinery. He will also add an elevator with a capacity of 50,000 bushels

THE new factory for making chair and other frames, dining room suites, etc., which X. Lippert, Schæfer & Co are building at Waterloo, Ont., is nearing completion, and will likely be ready for work at the beginning of the year.

THE Truro, N. S., Condensed Milk and Canning Co. have just put in a lot of new machinery for the purpose of manufacturing what is called "Evaporated Cream," a preparation similar to condensed milk, and without its sweetness

A SHORT time ago the Erie Glass Works at Port Colborne, Ont., were advertised to be sold in order to meet a judgment. The sale has now, however, been cancelled, as the required funds have been secured. Work will probably be resumed shortly

LIPPERT, SHAEFER & Co. are building in Waterloo, Ont., a new factory for the manufacture of parlor frames and similar articles The building is to be 48 feet by 80 feet, four stories in height, and is to be completed about the middle of December Exemption from taxation for ten years has been granted.

THE Welland (Ont.) Power and Supply Canal Company (Ltd.) are applying for incorporation. The objects of the company are to construct a canal from some point on the Welland River, near Stamford, to Thorold, or between Niagara and Grantham, and to supply water power and distribute electricity, light, heat, and power throughout Ontario

THE premises of Rolland & Brothers, upholstered furniture manufacturers, Montreal, were almost burnt out on Thanksgiving day. There were several severe accidents, one being fatal. The fire is supposed to have originated in some moss fibre and tow stored in the basement. Insurance on building $15,000, which fully covers the loss. Loss on stock about $40,000, insured for $34,000

THE "York" Bridge, at Mitford, Alta., is now open for traffic.

THE cheese box factory at Lyndhurst, Ont., has closed down for the season

R. R. DeWolfe is building a new carriage factory at St Stephen, N B.

THE bridge over Whiteman's Creek, near App's Mills, Ont., is being pushed towards completion.

THE new drill hall at Brantford, Ont., which cost $15,000, has been completed and opened.

R. SMITH & Co's new machine shop at Stanstead Junction, Que., is being fitted with machinery.

THE Universal Tire Lightning Machine Company, Vancouver, is opening a branch office at Hamilton.

PETERBOROUGH Council have been discussing the erection of a foot bridge across the Otonabee at Auburn

THE new gas company of Montreal are convinced that they will be able to supply the city with gas by May 1

THE Washburn roller mill started operations the other day and is doing a rushing business —*Kingston News.*

AMOS OXLEY, of River Phillip, is going to build a new saw-mill at the Sugar Loaf Mountain, N.S., this winter

THE old "Kirk" at Pictou, N.S., was burnt last month. Loss, $35,000; insurance, $12,000. It will be rebuilt.

THE Dominion Government are being petitioned to place a drawbridge over the Burlington Canal at Hamilton.

THE Edmonton *Bulletin* says that the N W.T Government are calling for tenders for a traffic bridge across the Red Deer River.

STANISLAS ROCHON, JR., and Simeon Rochon, Montreal, have formed a partnership as contractors under the name of Rochon Freres.

ALEX. RANKINE has taken over from S. S. McAvity and will now operate the St John Nut and Bolt Works. R. R. Rankine will be superintendent of the works

SHERBROOKE, QUE., Town Council have given instructions to the engineer to draw out plans for the proposed water works and sewerage without delay The estimate is $10,000.—*Gazette.*

J. B YOUNG has taken an action for $50 000 damages against A. O. Granger, manager of the Auer Light Co., to whose affairs we referred in our last issue Mr. Granger is now again at the head of the company.

THE McRae Trading Company (Ltd.) is the name of a new company, with headquarters at Ottawa, and with a capital of $100,000, formed to deal in coal, cement, iron, lumber, general contractors' supplies, etc.

JAS. HARRIS & Co., Strait Shore, N.B., who recently purchased Foster's foundry, St. John, N.B., will carry on the manufacture, on a large scale, of cut and wire nails, with the aid of Foster's plant for this purpose. The building will probably be sold.

JOHN BERTRAM & SONS, Dundas, Ont., have just made for the Nova Scotia Steel Co., New Glasgow, what is said to be the largest turning lathe ever built in Canada. It is to be used for turning heavy steamboat shafts and forgings, and is 68,000 pounds in weight.

E C MOORE, who is going to establish the new nail factory at St John, N.B., has chosen, as headquarters, the Kirk & Daniel mill on the Long Wharf, which is pronounced by the *Telegraph* to be a site admirably suited to this purpose. It will be fitted up at once with modern improved machinery.

THE Hamilton Iron and Steel Co have elected officers as follows: President, W Foster, jr., New York; vice-president, J. H. Tilden, Hamilton, treasurer and general manager, J. J. Morehouse, New York; and secretary, H N. Curtis, New York. Work on the foundations of the smelting works will be commenced this year.

THE proposal to start a piano factory in St John has taken definite shape, reports the *Sun*, and is being pushed by Geo Davis, the originator The capital stock will be $25,000, with one-half paid up. It is expected that one piano can be turned out in each day of the year, giving employment to quite a number of men.

AT a meeting of the electors of Moncton, on the 8th November, it was decided to instruct the city council to take a poll of electors for and against the expropriation of the waterworks system as provided in the act of the legislature passed last winter; also to approach the company with a view to an amicable purchase of the electric light and gas works in case a majority of electors vote to expropriate the waterworks.

Mining Matters.

THE Souris, Man., Coal Mining Company is seeking incorporation.

NATURAL gas, with a good flow, has been struck at Highgate, Elgin, Ont.

NATURAL gas has been discovered in the neighborhood of Moncton, N.B.

A SHAFT of about 100 feet has been sunk at Alma, N.B., in the expectation of finding coal.

AN extensive new gold belt near Fort Steel, B.C., is reported. The ore occurs in slate fissures.

A DEPOSIT of what is said to be very fine mica has been discovered a little way north of Gananoque

FINCH & CLARK have bonded the Reed & Robinson group, on Four Mile Creek, B C., for $40,000.

THE output of the Canmore coal mines is now 200 tons per day, all of which is taken by the C. P. R.

G. B WRIGHT and six men are at work on three feet of ore on the Mill Point mine —*Nelson Tribune.*

THE Canada Iron Furnace Co., Radnor Forges, Que., are now working the iron mine at East Sherbrooke.

A COMPANY has been formed to work thirteen old oil wells at Port Colborne, which have begun to reflow.

A SHIPMENT of 40 tons of ore has been made from the Le Roi mine in Trail Creek district to the Tacoma smelter.

A R. McPHEE and George Atchison are thinking of hydraulically operating the ground near Forty Mile Creek, B C.

AT the "Silver King," a prospecting diamond drill and a rock crusher have been ordered, and will be placed shortly.

Two claims of the Grady group, the "Alpha" and "Black Bear," have been bonded to Mr. McNaught, of Seattle, for $70,000.

COAL of fair quality has been discovered at Little Shemoque, N B., and natural gas has been found about two miles from Moncton.

THE Truro, N.S., *Daily News* reports the finding of a valuable gold deposit at Ragged Falls, Twelve Mile Stream, Harbor district

THE Kootenay Hydraulic Co. will put in monitors at Seven and Nine Mile bars, and commence operations in the early spring. —*Victoria Colonist.*

IN order to assist in the constant development of the Kootenay mines, the C. P. R. will make an effort to keep communication open with that region all winter.

SOME more nickel claims have been located in the Trout Lake district of the Kootenay, and one correspondent thinks the nickel mines of British Columbia will equal the galena.

A SHAFT will be sunk on the Kootenay Bonanza, a drift run both ways from the winze sunk in the main tunnel, and a drift run both ways from the old shaft on the "Silver King."

THE *Pembroke Observer* has seen some samples of gold ore from the William Coffee Mine, Sudbury district, and says they show distinct marks of the precious metal to the naked eye.

THE *Victoria Colonist* reports that a company is forming at Nanaimo, with a capital of $100,000, to operate the Sandy and Gem claims near China Creek. A smelter will be built close by.

THE prices of mica and phosphates are going up, says the *Arnprior Chronicle*, and greater activity in these mines in the neighborhood of Perth is expected.

T. H. & H. E. FLYNN say that the general outlook for mining in the Cariboo district is very bright. The hydraulic mines of the Barkerville division have paid well during the past season. At Ashcroft a large amount of machinery is now awaiting shipment to Slough Creek.

THE people of Humberstone, Ont., appear to have strong objections to the gas pump, and meetings have been held recently at which resolutions were passed vigorously protesting against allowing the Provincial Natural Gas Company from "stealing" the landowners' gas deposits.

ON November 25th a strong flow of gas was struck at Hamilton at a depth of 400 feet, with a pressure of about 100 pounds to the inch. The jet burned steadily until the following morning, when it suddenly ceased, the pocket of gas having given out. However, the company have not lost hope yet, and operations will be carried still deeper.

WORK has commenced at the Point de Bute, N.S, gold mine.

THE Erie Natural Gas Co., Welland, are preparing to sink some more wells.

THE East Kootenay placer claims have been laid over till next June, says the *Nelson Miner.*

THE "Golden Eagle" mine, near Quesnelle Forks, B.C., will be worked during the winter.

THE Bedrock Flume Co. are operating on Rock Creek, in the Okanagan country. They report good prospects.

A HUNDRED tons of "Silver King" ore have been shipped to Swansea, South Wales, *via* Revelstoke and the C. P. R.

A PUMPING station has been built in the centre of the Humberstone and Bertie gas field at a cost of between $30,000 or $40,000.

Two new engines and boilers have arrived for use at the oil wells, at Gaspe. One of these wells is over 3,340 feet in depth.

THE output of Nova Scotia coal mines, up to the end of October, exceeded that of the corresponding period last year by 229,000 tons.

THE "Morning Star" claim, near Kettle River, owned by Mangot, MacEachren & Lefevre, has now 10,000 tons of good ore in sight.

B. KELLY, J. Mode, and Dr. R. P. Pattee, of Vankleek Hill, have purchased a white marble quarry at Campbell's Bay, which they intend working.

J. T. SMITH is developing the Chignecto coal seam near Maccan. The seam is five or six feet in thickness, and the quality is said to look promising.

THE *Sudbury Journal* learns that the Drury Nickel Co. will probably commence operations again at the Inez Mine, which has been closed down for some time.

AT the Consolation Placer Mine, on French Creek, the men are taking up gold, mostly in the shape of small nuggets, at the rate of $25 per day each.—*Kootenay Star.*

THE Byron N White Company are preparing to ship ore continuously from the "Slocan Star" The lowest of the three tunnels on this mine is now down 350 feet.

THE contract for tunneling at the Golden Eagle claims, Elberne district, has been given to Mr McGillivray, a well known miner. There will be three tunnels of 200 feet each

JOHN FINCH and Patsy Clark have bonded the Reed and Thompson group on Four Mile Creek for $40,000, and the Jenny Lind (in the same district) for $10,000.

D MANN'S mine, the St. Mary's, has a ledge 63 feet wide between walls consisting of solid galena on the foot wall, and carbonates mixed with galena the remainder of the width.

GYPSUM of good quality has been found near Port au Port in Newfoundland, and a company is being formed to work the deposits. The new Government railroad will pass through the property.

THE Golden Eagle claims in the Alberni district have been bonded for $60,000 to the Duke of Montrose. The ore from this mine averages from $50 to $100 per ton, while some samples range very much higher.

THE development work at the World's Fair mine, one of the "Noble Five" group, Slocan district, consists of three tunnels, the upper tunnel being 240 feet. Some of the ore assays 1,684 oz. silver to the ton.

J. D. MCDONALD has located two fine ledges on the divide between the Duncan and Lardeau. He has found at the Glengarry claim samples assaying 400 ozs. of silver, 26 per cent. copper and about 1 oz. of gold.

E. V. WRIGHT'S galena mine at Temiscamingue has been sold to an American syndicate for a large sum, the amount of which has not transpired. The Ottawa *Free Press* says the plant at present on this mine is worth at least $75,000.

B. APPLEBY, St. John, N.B., has purchased the Dawson granite quarry at Bonny River. The possibility of a reciprocity treaty with the United States is causing the granite industry in this district to look up, says the St. Andrew's *Beacon.*

W. A. EMBURY, J. C. Huffman, and E. B. Hemstreet, of Napanee, have bought 600 acres in the neighborhood of Massanog Lake, on which there is a valuable deposit of mica. The vein crops out at the surface, varying in width up to five feet, and can be traced a quarter of a mile. Messrs. Smith & Lawson, who have been working a similar mine in the vicinity, are said to have recently refused an offer of $70,000 for their property.

Railway and Marine News.

THE new wharf at Young's Cove, N B., is complete.

A LIGHTHOUSE will be built on Nigger Island, Bay of Quinte.

THE steamboat pier at Digby, N S., will be completed about Christmas.

THE C.P R. are going to build another iron bridge over Kicking Horse River, B.C.

THE railroad between Harrowsmith and Sydenham, Ont., is ready for traffic.

THE G.T. R. are replacing the old bridge near Cambray station with a new one

THE C. P. R. are adding apparatus for heating all their passenger cars by steam.

A NEW survey of the proposed railroad from Kaslo to Three Forks is being made.

THE survey of the proposed line between St. Jean Chrysostom and Napierville is now finished

THE Marine Department are asking for tenders for a new lighthouse at Mullin Point, Cumberland county.

NORTH GOWER has voted in favor of a bonus of $20,000 to the Kingston, Smith's Falls and Ottawa Railway.

THE fisheries cruiser "Kingfisher" has been sold and will be taken to British Columbia to become a sealer

AN iceboat and lifeboat house at Cape Tormentine, thirty feet square and two stories high, is to be built at once

THE Drummond County Railway is being extended from St. Leonard to Levis, to connect with the Intercolonial.

THE London and Port Stanley Railway has been leased by the Lake Erie and Detroit River Railway Co for $10,000 per year

THE first bonus, amounting to $20,000, to the Kingston, Smith's Falls and Ottawa Railway was carried by the township of North Gower.

THE Walker Railway will probably be extended from Ridgetown, to connect with the London and Port Stanley road near St Thomas

THERE was a serious break in the new Welland Canal last month, which impeded navigation for some time before it could be repaired.

THE Dominion Bridge Company are just now completing the draw-bridge for the railway extension round the harbor front at St. John, N.B.

THE Ottawa and Parry Sound Railway Co. are pushing ahead vigorously They have tapped the Kingston and Pembroke Road near Renfrew.

THE *Victoria Colonist* states that a company will be formed to construct a railroad from Westminster to a point on the Gulf in the Delta municipality.

THE extension of the I. C R. from the deep water terminus to the Bay of Fundy steamship warehouse is nearing completion, says the St John *Telegraph*.

A PLAN is on foot, according to the *Charlottetown Patriot*, to provide suitable steamers for all-winter communication between West Cape and Richibucto

MCLEOD STEWART, ex-mayor of Ottawa, proposes the construction of a ship canal, in order to make Ottawa the western terminus of ocean navigation.

THE Restigouche Railway is now located about ten miles from Campbelltown, and the company expect, in a short time, to have the first fifteen miles ready for contractors.

A BY-LAW is being introduced at Ottawa to grant a bonus of $150,000 to the Pontiac Pacific Railway Company on completion of a bridge from Hull to Nepean Point.

IT is reported that the Yarmouth and Annapolis and the Windsor and Annapolis Railroads will become amalgamated as soon as the necessary Dominion legislation can be carried through.

THE Dominion Line steamer "Dominion" caught fire in mid ocean, owing to cattle-men smoking amongst straw. The fire was soon extinguished, not before considerable damage had been done, however.

THE Dominion Government is being petitioned to build a railway from George's River to Little Bras d'Or, thence to Sydney Mines and North Sydney This would render the Cape Breton railway a continuous trunk line.

THE St. Lawrence and Adirondack Railway Co. have applied to Privy Council for power to lease their road to the Central Vermont Railway Co.

THE harbor lighthouse at Yarmouth, N.S., is now finished. *It stands on an iron pier, filled with masonry and concrete. The* pier is 42 feet in diameter.

TENDERS will be called for repairs on the Wood Island P E.I., breakwater. The Dominion Government voted $6,000 towards this end some time ago

THE *Strathroy Age* says the charter for the Strathroy, Port Franks and Port Stanley Railway has been revived and measures are being taken to build the road forthwith

W. B. CLARK, of Sarnia, father of Mrs. Albert Bradley, who was killed with her husband in the Battle Creek disaster, has commenced an action against the G. T R for $85,000 damages

GEO. E TUCKETT has been elected president, M. Leggatt vice-president, and Seneca Jones secretary treasurer of the Hamilton Steamboat Company. The past season has been a successful one.

TRACK-LAYING on the Nakusp and Slocan. B.C., Railway has begun at Nakusp, and the contractors hope to have the road through to the head of the lake in time to receive winter shipments of ore.

THE Halifax Board of Trade are urging the Government to subsidize the railroad proposed between Sand Point and Windsor Junction, which will tap the trade of Halifax and its vicinity.—*Herald*.

IT having been rumored that the C P. R were at the back of the Montreal Elevated Railway scheme, Mr. Shaughnessy, vice-president of the C. P R., says that the company have no connection with it in any way.

IT will not be long now before the first train runs on the Nelson and Fort Sheppard (B.C.) Railway. Four bridges are still to be completed, says the *Nelson Miner*, but it is expected everything will be in order early in December

THE Canada Atlantic Railway have now an arrangement to operate their fast freight traffic over the G T.R in Ontario west of Coteau Junction, in connection with the New York, Boston, and New England traffic —*Renfrew Journal*.

THE last span of the Stoney Creek bridge, in the Selkirk Mountains, B.C., built by the Hamilton Bridge Co., has just been placed The structure is 483 ft long, and is composed of five spans, each 63 ft. long, and two spans, each 86 ft., supported in the centre by a 336 ft. arch span, 100 ft high.

THE Alberta Southern Railway are applying for incorporation, with power to build a line from Calgary to a point near Lethbridge, and thence to the International line; also with power to construct a telegraph line connected with the above.

THE Keewatin Power Co propose to build dams at the falls farthest from the Lake of the Woods, and to conduct the water from thence in different directions, making available an enormous number of sites for all sorts of manufactures.

THE work of extending the G.T.R. to Owen Sound is well under way, and about 200 men are engaged in grading and preparing the road for the laying of rails in the spring. It is expected the line will be ready for traffic early in August

THERE is a proposition to construct a tunnel from Craig street, Montreal, through the hill down to the wharves on the harbor. The cost is estimated at $200 000, which is said to be considerably less than would be required for any other scheme.

TROOP & SON, shipowners, St. John, N.B., have been losing ships and money for some time past, and now they are reported by the Halifax *Herald* to be passing their property over to Mont McDonald and Charles Troop, as trustees for their creditors.

THE Windsor and Annapolis Railway Co. are considering a proposal to purchase the Nova Scotia Central Railway and add it to their system. Some time ago, the N. S C refused an offer of $100,000, and since then the property has become more valuable.—*Halifax Herald*.

IN the shops of the Grand Trunk Railway, at Montreal, tests have recently been made of pig iron made by the New Glasgow Iron, Coal and Railway Co., of Ferrona, N.S This iron was found to be of such a high character that it is now being used as the chief ingredient in the mixture of iron used in the manufacture of locomotive driving wheels. Test bars made of this mixture show a greater breaking strain and higher deflection than the railroad people have ever been able to obtain with the use of Scotch irons

THE new pier at Neguac, N. B., has been completed at a cost of $7.450.

THE C. P R. have been exempted from taxation at Carleton Place, Ont., for one year

A POINT near Nanaimo, B. C., has been chosen for a fortified coaling station for the British navy.

ENGINEER HANNAFORD, of the G.T R., wants to begin building the John Street bridge, Toronto, at once

RHODES, CURRY & Co., Amherst, N.S., are building several flat cars for the Moncton and Buctouche Railway.

THE Galt & Lethbridge, N.W.T. Railroad is now open again, after a change from narrow to standard gauge

THE Department of Public Works are calling for tenders for the construction of a ferry wharf at Campbelltown, N.B.

T. A. MOSHER is building a railroad to connect his plaster quarries with the W. and A. R. at Newport Station, N.S.

A RAILROAD will be built from the Red Deer Forks Coal Mines to some point on the C. & E. R. between Calgary and Olds

IT is believed that the C. P. R. will secure a portion of Ashbridge's Bay, Toronto, when filled in, for a shunting ground.

A BY-LAW will shortly be introduced at Marlboro', Ont., to grant a bonus to the Kingston, Smith's Falls & Ottawa Railway.

THE contract for erecting protection works at Grand Etang, N S, has been let to Frederick Toms, Ottawa, at a price of $17,000.

A BILL has been passed authorizing the Lake St. John Railway to borrow money on security of its property at Quebec and Hedleyville.

THE Victoria and Sydney, B.C. Railway Co. have re-elected as officers: P. Dunboy, president; and Robert Irving, secretary-treasurer.

THE "Red Cross" Line has added to its fleet a new steamer, the "Sylvia," to ply between St. John's, Newfoundland, and Liverpool.

THE Intercolonial Railway is asking tenders for 285,000 sleepers, 50,000 fence posts and all lumber and timber required for use during 1894.

TENDERS are called by the Provincial Board of Works for the erection of wharves at Bayswater and Somerville, N.B., to be finished by April next.

THE Minister of Public Works has recently been visited by deputations with regard to the proposed railway from Montcalm to Ste. Julienne, Que.

THE British Columbia Southern Railway has now reached Elk River, says the *Golden Era*, and the engineers are re-locating the road at that point.

W. HEPBURN, of Picton, Ont., launched a new steam barge on the 2nd inst. It will be used in the grain-carrying trade, and has a capacity of 10,000 bushels.

THE Temiscouata Railway, with head offices at River du Loup, Que., is doing a large business this fall, shingles and lumber being the chief freight resources.

POINT EDWARD ratepayers, who are wanting to amalgamate with Sarnia, Ont., are considering the proposed grant of $100,000 to the G. T. R. to establish car shops there.

THE cost of the international pier, N.S., which the Dominion Coal Co. will shortly begin building, will approach $80,000. The company have been advertising for 200 workmen.

THERE is a talk of a petition to ask the Government not to give any subsidy to the proposed Hervey Railway from Land Point to New Germany, unless it is made a through line to Halifax.

THE steamer "Miowera," of the new Australian line, was successfully hauled off the reefs at Honolulu by means of anchors and cables after a long wait. The damage is fully covered by insurance.

MONTREAL city engineer expects that the guard pier will be finished in 1895. It has been decided to have it "rip rapped," that is, faced with broken stone on the outside, to guard it from the effects of ice, etc.

THE work of constructing the Kingston, Smith's Falls & Ottawa Railway will probably begin early next summer. Twenty miles, beginning from Rideau, have been already surveyed, and plans and profiles are now being prepared.

THE Mount Royal Park Incline Railway Company, Montreal, have paid a dividend of 6 per cent. on the receipts of last season. Mr. Withal has been elected president of the company: W. Mann, vice-president and managing director, and W. G. Turner, secretary-treasurer.

THE Winnipeg and Hudson Bay Railway Co. are going to ask for an extension of time in which to complete the main line.

THE steamer "Hero" is having new wheels put in at Picton, Ont., which will increase her speed a mile an hour, says the *Gazette*.

M. HENRY, Port Dalhousie, Ont., who has the contract for the iron work on the large lock gates for the Sault Ste. Marie Canal, expects to complete the work soon.

GEO ROBERTSON, the retiring president of the St. John, N.B., Board of Trade, strongly recommends the establishment of a steamship service between that city and Manchester.

THE Dominion Coal Company advertise for 200 men to work at International pier, at Sydney, N.S., during the winter. The company will spend $80,000 on the work.

THE number of inland vessels arrived during the past season at the port of Montreal, shows a slight increase upon last year, the figures being 5,244 and 5,190 respectively.

THE London and Port Stanley Railway Board of London Ont., city council have confirmed the lease of the road to the Lake Erie and Detroit River Railroad Company.

A CONTROLLING interest in the Richelieu and Ontario Steam Navigation Co. has been secured by an American syndicate who will act in conjunction with the Connolly's.

LOGAN & RANKIN, marine engineer designers, have designed a new engine to replace the ancient piece of machinery now in the steamer "Sadie," referred to in another column.

THE Dominion Coal Company are making extensive improvements on the International Pier, Sydney harbor, which will be its chief point for handling ocean freight.—*Halifax Herald*.

THE following have been elected officers of the Stanstead, Shefford & Chambly Railroad Company: President, J. J. Cowle; vice-president, D. D Ranlett; and secretary treasurer, J. P. Noyes.

THE steamship "Evangeline," of the Evangeline Navigation Co., plying between Kingsport and Parrsboro, N.S., is being thoroughly overhauled in readiness for the resumption of navigation next season.

TROOP & SON, the large New Brunswick shipping firm, to whom we have referred before, are applying for incorporation under the Joint Stock Companies' Act, under the name of Troop & Son (Limited). The capital stock will be $250,000.

A NEW contrivance to shelter the brakemen who run the ballast trains on the Parry Sound construction line has been arranged for, says the *Arnprior Chronicle*. Small canvas shelters are being constructed in the mechanical shops at Ottawa, to fasten to the flat cars.

AMONG the new large railway undertakings adopted in the report of the Special Railway Committee, Montreal, are a big C. P. R. hotel in conjunction with the new Craig street depot and a G. T. R. bridge over Mountain street, the probable cost of which will be $150,000.

L. G. DE BERTRAM, one of the purchasers of the Moncton & Buctouche Railway, is making arrangements for the establishment of an all-the-year ferry system between Richibucto Cape and Point Wolf, in connection with the railway. He proposes to build a boat for $250,000.

THE Sherbrooke (Que.) *Gazette* remarks that the C. P. R. are busy putting in sidings:—one at McLeod's Crossing to Stearns' Mills, one at Pattee & Winsboro's Mills, between Milan and Springhill, and another at the lake near Milan for shipping pulpwood to McLeod's Mill.

THE number of ocean-going vessels arrived in the port of Montreal during the past season was 737 steamships, against 658 last year, with a tonnage of 1,128,658 and 1,004,396 tons respectively. Sailing vessels this season were fewer in number, though the tonnage was much greater than in 1892.

THE work of double-tracking the Niagara Falls Park and River Railroad is progressing admirably, says Manager Grant. The company finds it necessary to provide the road with car shops and more storage room. The new machine-room will be 50 x 80 ft., and will have a capacity of handling six cars at one time.

IN view of statements made to the effect that the new United States man-o'-war "New York" is too large to be dry-docked in any dry-dock on the continent, Geo. Johnson, the Dominion Statistician, points out that the great graving dock at Halifax is amply sufficient to hold her. It has 30 ft. of water on the sills at ordinary spring tide, and its length is 585 ft., which can be increased to 601 ft.; and its width 89 ft. at the entrance, 102 ft. at the coping, and 72 ft. at the bottom.

Personal.

CHARLES R. COKER, Dominion inspector of hulls and equipments since 1882, has sent in his resignation

JOHN MCFARLANE has been elected president of the Canada Paper Co in place of the late Thos Logan, deceased.

J B. FUTVOYE, superintendent of the northern division of the C. V R , has been offered the general management of the Baie des Chaleurs Railway

JOS. LESSARD has been appointed inspector of factories for Montreal and chief inspector and president of the board of inspectors for the Province of Quebec.

H. H. POWELL, manager of the Woodstock, Ont , gas works, one of the victims of the Battle Creek disaster, has been removed to his home, and has now nearly recovered.

GRANVILLE C. CUNNINGHAM has been appointed managing director of the Montreal Electric Street Railway, in the place of H A Everett, who resigned Mr. Everett is still vice-president.

ARENDT ANGSTROM, naval architect and constructing engineer of the Cleveland Ship Building Company, recently resigned his position there to accept the general managership of the Bertram Engine Works Co (late Doty Engine Works), Toronto. The *Marine Review*, of Cleveland, referring to Mr Angstrom's departure, says he is a native of Sweden, and his early education in mechanics was secured with his father, Professor C. A. Angstrom of the Royal Technical High School of Stockholm Upon graduating from the Stockholm school, he spent some time at the ship yards in Sweden, and later took a course at the naval institute in Cherbourg, France. After visiting England he went to the States, and at Newport, R I , perfected the gun-cotton plant at the torpedo station He designed several coast steamers and also assisted in the designs of the Old Colony steamers "Puritan" and "Plymouth." Later, the opportunity with the Cleveland Ship Building Company presented itself, and his first production of importance with that company was the horizontal triple expansion engines of the paddle steamer "City of Toledo," which has been engaged during the present season in the World's Fair service He also designed for the Cleveland company the monitors "Choctaw" and "Andaste," owned by the Lake Superior Iron Company, the steel steam yacht "Wadena," the Wilson line steamer "Yuma" and the Bradley steamer "Alva."

The Patent Review.

RECENT CANADIAN PATENTS.

43,964 Wilhelm Aurel Polster, Bautzen, Saxony, process for the production of tough resistable cast iron bodies, etc.
43,966 Arthur Benjamin Browne, Cambridge, Mass., the process of manufacturing white leads
43,967 Frederick J Haworth Hazard, Toronto, bath tub.
43,970 Frank D. Moses, Chicago, Ill, process of manufacturing gas.
43,971 James F. McElroy, Albany, N.Y, system for heating cars by electricity.
43,972 Manson Campbell, Chatham, Ont., elevator cup attachment.
43,974 Julius Leed, Minneapolis, Minn., means for consuming petroleum, and process and apparatus for making a combustible gas therefrom.
43,975 Hammond U. Hayes, Cambridge, Mass., telephone transmitter circuit.
43,976 Robert Pugh, Casselton, Dakota, heating and ventilating drum
43,977 Frederick Giles, South Yarra, Victoria, Australia, the construction of umbrella frames.
43,978 Thomas J Carroll, Hamilton, Ont, sight feed lubricator.
43,979 Thomas Hoag, Alvinston, Ont., spool and article holder
43,980 Farnham Maxwell Lyte, London, Eng, electrodes for use in the electrolytical decomposition of metallic salts.
43,981 Same as last number, except process of electrolytically decomposing fused metallic chlorides.
43,982 Joshua Hurrocks, Brooklyn, N Y., wire structures.
43,983 Fred. Holderman, Bowling Green, Ohio, reversing mechanism for counter shafts.
43,984 Basil John Atterbury, Brixton, Surrey, Eng., ore pulverizers and gold savers, and mineral concentrators
43,986 Rudolph Geissler, New York, candle and gas lighter and extinguisher.
43,987 Derrick Summer West, Boston, Mass, breech-loading small arm.
43,991 Emil J. Franck, Philadelphia, Penn., knitting machine.
43,994 Wm. Cutler, Birmingham, Warwick, Eng., apparatus for propelling boats.
43,995 George H. Shacker, Albany, N.Y., oar propelled ice-boats.
43,997 Henry Arthur Wheat, Melbourne, Australia, lamp for burning liquid hydro carbon.
43,998 Wm. G. Adams, Philadelphia, valve
43,999 Axel Albin Strom, Austin, Ill., railway switch.
44,000 John J. Ryan, Worcester, Mass., telephone index.
44,001 Samuel Cameron McNeil, Montreal, cut-off valve for hydrant and water-pipe.
44,002 Hubert Root Ives, Montreal, caster.
44,005 John Henry Carson, Brooklyn, N.Y, car heater.
44,006 James F. McElroy, Albany, N.Y., temperature regulator for fruit car heating apparatus.
44,007 Joseph Moseley, Manchester, Eng, pneumatic tires.
44,009 Frank Hawthorne Clark, Springfield, Ohio, electric signals
44,010 Thomas Leopold Wilson, Leaksville, North Carolina, electrical reduction of aluminum and other metals and the like productions of alloys thereof.
44,011 Cæsar Hass, Leinhouse, Eng., method of and apparatus for reproducing carvings in wood and other material.
44,015 Thomas S. Evans, St. Louis, Missouri, stove pipe.
44,016 Carl Hering, Philadelphia, Penn, variable speed electric motor.
44,017 Albert Dean, Ottawa, Kansas, automatic car-coupling.
44,018 Zoel Chartrand, Waterloo, Que, cover for sap bucket.
44,019 Wm. Atkins, St John, N.B., nut lock for locking the nuts of railway tracks
44,020 John Adams Duggan, Quincey, Mass, railway switch.
44,022 Henry Chitty, Chisewick, Middlesex, England, electric motor and dynamo machine.
44,023 Charles Warren Brown, Montreal, telephone switch board system.
44,024 Milan W. Hall, Plainfield, N. J, electrical pumping apparatus.
44,032 David Folton, Guelph, Ont., pea harvester.
44,033 James S. Derrough, Walnut Hill, Louisiana, car coupling.
44,035 Frank Reardon, Halifax, Nova Scotia, veneered building.
44,038 Spencer Stewart Marsh, Atlanta, Georgia, hydraulic motor.
44,040 Archibald Filshie, Mount Forest, Ont, threshing machine.
44,041 Same as last number, except horse power
44,042 Lucretia Lester, Cuba, N.Y, fire escape.

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.

Eli Danner, Willoughby, Sask., churn, No. 507,788.

Charles Kelley, Toronto, commode, No. 507,820.

Frederick L. H. Sims, Toronto, rotary brick press, No. 507,638

Eugene W. Cleveland, Rounthwaite, Man., vehicle brake, No 508,283.

Wm Cox, Hamilton, safety apparatus for electric or other street railway cars, No. 508,089

Walter S. Shipe, Toronto, machine for forming rolled longi-tudinal joints in cylinders, No 508,350.

Walter S. Shipe. Toronto, uniting the heads to the bodies of boilers, etc., No. 508,351.

TRADE MARKS.

Arcand Brothers, Montreal, Canada, hygienic coffee, No 23,768.

GERMAN PATENTS.

The following list of German patents is supplied exclusively to THE CANADIAN ENGINEER by Brockhues & Co., patent solicitors, Cologne (Germany):—

Draught regulators for steam boilers, Wilhelm Schmitz.

Gas supply regulators for the firing of steam boilers; Lawrence Gardner.

Appliance for purifying the feed water, with return-valve and catch-funnel in the steamroom; David Hanna.

High-level railway with suspended passenger carriages; Eugen Langen.

Alarm signal for railway trains; Oswald Koschetnki.

Appliance for the automatic working of signal arms; Siemens & Halske

Flywheel brake with electric putting out of gear; E. Jacob.

Apparatus for regulating and disengaging the reversing shaft in boring machines; Bernhard Fischer & Winsch.

Apparatus for introducing the wire in wire tack rivet and shoe nail machines during a part only of the semi rotation of the fly-wheel; Robert Huffer.

Automatic skein tier, appliance for thread-winders; Edward Breslauer.

Scutching machine for bast fibres; George Edmund Donisthorpe.

Shuttle catch; Gebruc... Muller.

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