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For THE CANADIAN ENGINEER.

SUCCESS OR FAILURE IN MANUFACTURING.

BY G. P. CLAPP, SUPERINTENDENT, PILLOW & HERSEY MANUFACTURING CO., MONTREAL.

With an experience of thirty years as superintendent of various manufacturing concerns in the United States and Canada, I think I am entitled to consideration when I say a large percentage of manufacturers and superintendents are sadly deficient in the qualifications necessary for the successful prosecution of manufacturing enterprises. Lack of judgment and a practical knowledge of the business engaged in, is more prevalent than is generally understood. The manufacturer who is at the mercy of an incompetent superintendent, will not usually succeed. Neither can the manager expect to fill his position with any hope of success, if he depends upon his employés for the practical knowledge necessary for the various processes of manufacturing.

Many employers have an idea that the prosperity of the business depends upon screwing down the wages of the men to the last degree of starvation prices. Beyond a certain point this is a suicidal mistake, and the result is found in incompetent operatives, inferior goods, discontented help, and strikes and failure. In my long experience I have always found that it pays better to select steady, reliable men, and pay them wages that will insure long and faithful service. Some employers seem to think all they have to do is to pick up any kind of help, at prices below the market value, and the business must surely pay. A greater fallacy was never indulged in. When taking charge of various establishments, I have found men working at prices from ten to twenty-five per cent. below the established market rates; inferior, slovenly work, and an output much below the average requirements was the result. In many instances two and three men of this class have been discharged, and one good man put on to do the same amount of work, at a slight advance over the prevailing price of labor, and the consequence has been cheaper and better goods, satisfied help, and prosperity.

Good men are willing to work hard for good pay, and they will usually remain long enough to make themselves as useful as any two ordinary cheap men. Help that is constantly going and coming is the most ruinous of all, and the employer is greatly to blame for this evil, from the fact that men are selected, not for their intelligence, sobriety and knowledge of the work required of them, but because they can be got cheaply. This is a very unwise proceeding, as well as an injustice to deserving labor. Inferior, unworthy men are given the preference, and the manufacturer fails to see the disastrous effect it has upon his business. Men only fit for the most ordinary labor are required to operate complicated machinery, and put in positions where great care and natural ability are absolutely necessary. Then the employer wonders why his business seems to be going to the dogs. In these days of close competition and small profits, steady, intelligent, industrious labor that will turn out the largest quantity of good work on the least expenditure of capital, is necessary for any concern that expects to succeed. And I claim that well-paid competent labor is the most profitable help to employ. Some employers prefer cheap superintendents and foremen. There may be but a few dollars at stake between a capable and an inferior man, but the employer thinks the cheap man is good enough, and hires him with the idea of saving money, but somehow the business don't seem to prosper. Less money is being paid for superintendence, foremen and labor than his neighbors are paying; surely the business should pay, but it don't. What is the secret of the matter? Simply this. The employer hasn't the judgment nor the ability necessary to stand at the head of any manufacturing industry; he has simply mistaken his calling, and should be under the control of some one qualified to manage the business successfully. The percentage of employers of this character is much larger than is generally understood. The manufacturer is not generally in a position to judge the merits of his employés; he has no time to look into the details of the mechanical routine of the work, and trusts entirely to his manager. This is all right, providing the manager is a competent man; but the business must be run on a cheap scale, and the manager is a very cheap man, consequently a cheap quality of goods and a limited output is the result. Much depends upon the judgment and ability of the superintendent. He should be free from prejudice and undue personal pride. The interests of his employers should be his first consideration, and his own convenience should be the last. Some men will discharge the most competent and profitable men on the premises, through prejudice or some fancied slight to their dignity. New men are secured and the company suffers

through the indiscretion of the manager. The following incident, which came under my personal observation, will illustrate some of the necessary qualifications under consideration : A foreman, holding a responsible position, came to the works under the influence of liquor. The manager complained of work being done ; without provocation the man raised a hammer to strike the manager. After a struggle the man was disarmed and made to return to his work. The circumstances were reported to the owners, who gave pre-emptory orders for the man's discharge. The manager refused to do as requested, on the ground that the owners' interests would suffer, from the fact no other man could be secured for this special work ; but a good man was immediately put on to learn this special business, and three months after the hammer incident the man was discharged. By this judicious action on the part of the manager the company's interests were protected and the manager gained a victory over himself that was more valuable than gold. Superintendents and foremen should be men of ability, judgment and honor, to whom responsibility can be entrusted. Let them understand that they are to assume all the responsibility of their position, and then hold them accountable for the proper management of the business, and employers will not usually have cause to complain of poor work, or discouraging elements of success. The necessity of keeping machinery in good repair and in perfect running order, is very imperfectly understood by many, but it is a question of vital importance to the manufacturer, and the manager who fails to understand this simply lacks the judgment necessary to run any manufacturing establishment successfully. Such men usually have but little natural or acquired ability, and to make up for this deficiency they usually resort to the pettifogging method of cutting down the wages of men, and trying in this foolish way to make up in unjust oppression what they lack in experience and practical ability. By all means keep your machinery in good repair. The following incident came under my personal observation : A certain man erected a manufacturing plant and ran it successfully for two years ; he then took charge of a larger concern. At the end of six months his former employers wrote him, saying that everything seemed going wrong in the mill ; the quality and quantity had fallen off greatly, and asking him to come and visit the works and give them a written report, stating the causes which had brought about such a change in so short a time. The request was accepted and the following report made : " The causes leading to the condition of your business, as stated in your letter, are as follows : Under your former superintendent your machinery was kept in first-class repair. When the works were closed for a few days the machinery was thoroughly overhauled and all needed repairs were made. Your present manager says you have not given him facilities for continuing the practice formerly observed, and the result is what can always be expected under like conditions. Your machinery is badly in need of repairs, and in no condition to turn out good work in paying quantities. I advise you to close down your works at once, put on all the help you can conveniently employ, and put your machinery in thorough repair, and then keep it in repair. Give your manager all facilities required to turn out good work in paying quantities, and you will have no cause to complain." These suggestions were carried out, and the next letter received stated that the quality of the goods was fully up to the former standard, and the output exceeded any former record. Don't fail to keep your machinery in thorough running order. Neglect of this important item has closed the doors of many promising concerns. It is the cheapest, most profitable, and the only way that a manufacturing business can be run with any hope of holding its own, while men and machinery, up to the times, are brought in competition every day. The same principle should be applied to manufacturing interests that prevails in the handling of steamships and railway trains. The safety of the public, the prosperity of the owners, and every interest bearing upon the successful operation of the ship or train, demands that every detail should be observed and every appliance be in perfect working order before the ship leaves port, or the engine leaves the round house. And there is no more excuse for the manager to neglect keeping his machinery in the best possible condition than there is for the captain of the ship or the engine driver to neglect their duty. And a proper realization of this important matter will greatly reduce the danger that has wrecked many bright hopes and promising manufactories.

COMBUSTION.*

BY THOMAS WENSLEY, OTTAWA.

Combustion is the energetic chemical combination between the oxygen of the air and the constituents of the combustible, and the value of any fuel is measured by the number of heat units which its combustion will generate, a unit of heat being the amount required to heat one pound of water one degree Fahrenheit. The fuel chiefly used to generate the heat consumed by steam engines is coal and wood, the component parts of which are carbon, hydrogen and ash, with sometimes small quantities of other substances not materially affecting its value. The combustible is that portion which will burn, and, in the combustion of coal, carbon is the principal substance that unites with oxygen, and the air is the source from which oxygen is derived.

Coal has been divided into two primary divisions, viz., anthracite, or hard coal, and bituminous, or soft coal. Anthracite contains a very small portion of volatile matter, but is nearly pure carbon, ranging from 85 to 94 per cent., and burns almost without flame. The term anthracite is never applied to coal containing less than 82 per cent. of carbon. The usual components of soft coal are bituminous volatile matter, coke and ash, as a mechanical separation, but chemically the constituents of coal, though varying in quality as well as degree, are chiefly carbon and hydrogen gas, combined occasionally with a small proportion of sulphur and incombustible matter. The proportion of carbon in this coal varies ; in good coal it is seldom less than 75 per cent. of the whole, sometimes considerably more. Not only do the different kinds of coal differ in their constituents, but coal from the same seam will vary considerably from the normal standard of that coal.

From a scientific analysis, by Professor Liebeg and other eminent chemists, it has been shown that in soft or bituminous coal there is about 80 per cent. of carbon, 5 per cent. of hydrogen, 10 per cent. of azote and oxygen, and 5 per cent. of ash, varying with the different kinds. The principal constituents of all coal, carbon and hydrogen, are united and solid in its natural state, and are essentially different in their character and in their modes of entering into combustion.

* A paper read before the Canadian Association of Stationary Engineers.

The theory of combustion is well understood by scientists, but in practice the art of burning coal economically, and of converting all its natural elements into heat and power, is but little understood. It is also a well known fact that carbon and hydrogen require certain quantities of atmospheric air to effect their combustion, yet, in practice, the means necessary to find out what quantity is supplied, is generally neglected and treated as though it was of no importance.

The bituminous portion of coal is convertible into heat in the gaseous state alone, and then only in proportion to the right mixture and union effected between them and the oxygen of the air, while the carbonaceous portion is only combustible in its solid state, and neither can be consumed while they remain united. To obtain combustion they must be separated, and a new union formed with the oxygen of the air. In combustion there must be a combustible and a supporter of combustion, which means chemical union, and oxygen is this supporter. In fact oxygen is just as essential in combustion as it is in the maintenance of life in the animal kingdom.

You all know from experience that on putting a fresh supply of coals into the furnace, they do not immediately increase the general temperature, but, on the contrary, become the absorbent of heat, the source of the volatilization of the bituminous portion of the coal; and until these constituents are evolved from it, its solid or carbonaceous part remains black, and at a comparatively low temperature. Now volatilization is the most cooling process of nature by reason of the quantity of heat directly converted from the sensible to the latent state.

On the application of heat to bituminous coal the first result is its absorption by the coal, then follows the liberation of its gases from which flame is exclusively derived. These gases are composed of carbon and hydrogen, and the union is known as carburetted hydrogen and bi-carburetted hydrogen. Carburetted hydrogen by itself is not combustible, but must be united with oxygen, and notwithstanding the strong attraction which exists between them, they will not rush together or enter into chemical union, which we call combustion, until they have been raised to a certain temperature, and this temperature, according to Sir Humphrey Davy, should not be under 800 degrees Fahrenheit, since below that flame cannot be produced or maintained.

The first essential to effect the combustion of gas is to ascertain the quantity of oxygen with which it will chemically combine, and the next the quantity of air required to supply the necessary quantity of oxygen. Now while this may be well understood and correctly arrived at by an expert chemist in his laboratory, we know that in the management of combustion in the furnace the ordinary engineer can at best only approximately apply the exact laws of chemistry to the very imperfect conditions found at every furnace. It is important, however, that every engineer in charge of a steam plant should at least understand theoretically the analysis of the elements with which he has to deal in producing combustion, and the proportional part of each element entering into the same.

According to chemical analysis an atom of hydrogen is double the bulk of carbon vapor, but the latter is six times the weight of the former. (Atom in modern scientific usage is the smallest portion into which matter can be divided—the chemist's unit. In chemistry two atoms of hydrogen and one atom of oxygen make a molecule of water.) Again, an atom of hydrogen is double the bulk of an atom of oxygen, yet the oxygen is eight times the weight of hydrogen. So of the constituents of atmospheric air, which is a mechanical mixture of nitrogen and oxygen, not in chemical union, but simply shaken up together. These constituents, nitrogen and oxygen, are mixed in the proportion of 79 parts of nitrogen to 21 parts of oxygen out of every 100, and by weight 77 lbs. of nitrogen to 23 lbs. of oxygen, or one pound of oxygen to every 3.3478 pounds of nitrogen.

To accomplish the combustion of six pounds of carbon, sixteen pounds of oxygen are necessary, forming 22 lbs. of carbonic acid gas, which will have the same volume as the oxygen, and therefore a greater density, and to accomplish the combustion of one pound of hydrogen eight pounds of oxygen are required. When therefore we know the proportions of carbon and hydrogen existing in coal it is easy to tell the quantity of oxygen, and consequently the quantity of air necessary for combustion.

As a general rule it may be stated that for every pound of coal burned in a furnace about 12 lbs. of air, or 150 cubic feet, will be necessary to furnish the oxygen required, even if every particle of it entered into combustion. But from careful experiment it has been found that in ordinary furnaces about as much more air will in practice be necessary, or about 24 lbs. per pound of coal burned, since, besides the air required to furnish the oxygen necessary for the complete combustion of the fuel, it is also necessary to furnish an additional quantity for the dilution of the gaseous products of combustion. Now one cubic foot of air, at a temperature of 40 degrees, weighs ·08 of one pound, and it requires twelve and a-half cubic feet of atmospheric air to equal one pound in weight, and each pound of air contains 3·68 ounces of oxygen, and it will take 1,200 lbs. or 15,000 cubic feet of air for the perfect combustion of 100 pounds of coal. We thus perceive that each pound of coal requires 150 cubic feet of air for its perfect combustion, or in other words, for the conversion of its carbon into carbonic acid, and all its hydrogen into water, and it must be remembered that just in proportion as this proper quantity is deficient, combustion is imperfect and fuel wasted.

Air expands or contracts an equal amount with each degree of variation in temperature, and its weight and volume for any condition of temperature and pressure may be found by the following formulas, which are nearly exact:—

$$\text{Weight} = \frac{2{\cdot}71 \times \text{Pressure in lbs. on the barometer.}}{\text{Absolute temperature.}}$$

$$\text{Volume} = \frac{\text{Absolute temperature.}}{2{\cdot}71 \times \text{Pressure on barometer in lbs.}}$$

$$\text{Absolute temperature} = 460 + \text{temperature shown on thermometer.}$$

$$\textit{Pressure in lbs. on barometer} = \frac{\text{Height in inches.}}{2{\cdot}0408.}$$

It is erroneously supposed by some that when no smoke appears at the chimney top, combustion is perfect; smoke, however, may be absent, yet the carbon may have only united with one atom of oxygen forming carbonic oxide (a colorless gas), instead of with two atoms forming carbonic acid, and consequently have only performed half the duty as a fuel of which it was capable, and this loss is constantly going on in all furnaces where all the air has to pass through a body of incandescent carbonaceous matter.

The air on entering from the ash-pit gives up its oxygen to the glowing carbon on the bars, and generates great heat in the formation of carbonic acid, and this acid, necessarily at a very high temperature, passing upwards through the body of incandescent solid matter, takes up an additional portion of carbon and becomes carbonic oxide. By the conversion of one volume of carbonic acid into two volumes of carbonic oxide, heat is actually absorbed, while the carbon taken up during such conversion is also lost. The formation of this compound, carbonic oxide, is attended by circumstances of a curious and involved nature, and is probably the cause that, in actual practice, so little is known about it. The direct effect of the union of carbon and oxygen is the formation of carbonic acid. If, however, we abstract one of its portions of oxygen, the remaining portions would be carbonic oxide, and it is equally clear that if we added a second portion of carbon to carbonic acid the same result will be arrived at, namely, have carbon and oxygen in equal proportions, as we have in carbonic oxide. By the addition of still another portion of carbon, two volumes of carbonic oxide will be formed, and if these two volumes of oxide cannot find the oxygen necessary to complete their saturating equivalents, they pass away but half consumed.

Another important peculiarity of carbonic oxide is, that by reason of its already possessing one-half of its equivalent of oxygen, it inflames at a lower temperature than the ordinary coal gas, the consequence of which is that the latter, on passing into the flues, is often cooled down below the temperature of ignition, while the former is sufficiently heated, even after having reached the chimney top, and is there ignited on meeting the air. This is the cause of the flame often seen at the tops of chimneys or the funnels of steamships.

If we could gather and retain the carbonic acid gas which is daily discharged by tons from the chimneys of our factories, we should still have all the carbon of our coal, but we could not do it, because it would take as much power to separate the carbon from the oxygen as they gave out in the form of heat in coming together, and here comes in one of nature's most wonderful and mysterious processes.

It is a peculiar function of vegetation that under the influence of sunlight, it can overcome the attraction which exists between the atoms of carbon and oxygen, appropriating the carbon to its own use, building it into its structure and letting the oxygen go free into the atmosphere, not with a noisy demonstration or prodigious effort, but quietly in the delicate structure of a green leaf moving in the sunshine.

When all the conditions belonging to the introduction of air to the two distinct bodies to be consumed, carbon and hydrogen, have been complied with, there should be very little difficulty in securing perfect combustion in the furnace. But as a rule, these conditions are not complied with, hence the great waste in fuel. If we would economize fuel, we must give attention, not only to the mechanical appliances, but also to the nature of the bodies we have to deal with, their constituent parts and chemical relations respectively, and as the laws of nature are inexorable, mechanical details must yield to those of chemistry.

Great strides have been made in improvements in the boilers and engines now on the market, but until recently scarcely any attention has been given to the grates and furnace, practically overlooking the fact that the furnace, in which the operations of combustion are to be carried out, is of the first importance, as it is here we have the real source of economy and power.

In regard to the proportions of the furnace, we have to consider the area of the grate bars for the holding of the solid fuel, and the kind best adapted to our purpose (some people think that anything will do for a grate that will stand up under hot fires), the size of the air spaces, and the means of keeping these air spaces clear of obstruction to the draught; then the sectional area of the chamber over the fuel for the consuming of the gaseous portion of the coal and the introduction of oxygen to this chamber.

The rule in practice to-day with our best fire-tube boilers, the horizontal return tubular, is to allow 15 square feet of heating surface per horse power, and by dividing the horse power by three, we obtain our grate surface in square feet, allowing 68 square inches of air space per square foot of grate.

Strictly speaking, there is no such thing as "horse-power" to a steam boiler, as it is a measure only applicable to dynamic effect. But as boilers are necessary to drive steam engines, the same measure applied to steam engines has come to be universally applied to the boiler, and cannot well be discarded. In consequence of the different quantity of steam necessary to produce a horse-power, with different engines, there has been great need of an accepted standard by which the amount of boiler required to provide steam for a commercial horse-power may be determined. This standard, as fixed by Watt, was one cubic foot of water evaporated per hour from 212° for each horse-power. This was at that time the requirement of the best engine in use. At the present time Prof. Thurston estimates that the water required per hour, per horse-power, in good engines, is equal to the constant 200, divided by the square root of the pressure, and that in the best engines this constant is as low as 150. This would give for good engines working with 64 pounds pressure, 25 pounds water, and for the best engines working with 100 pounds, only 15 pounds water per hourly horse-power.

The extensive series of experiments made under the direction of C. E. Emery, M.E., at the Novelty Iron Works, and published by Professor Trowbridge, show that at ordinary pressure, and with good proportions, non-condensing engines of from 20 to 300 horse-power required only from 25 to 30 lbs. water per hourly horse-power in regular practice.

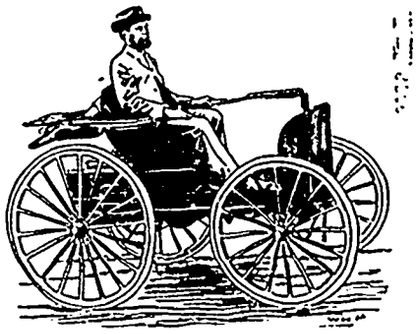
The standard, therefore, adopted by the judges at the Centennial Exhibition of 30 lbs. of water per hour, evaporated at 70 lbs. pressure from 100° for each horse-power, is a fair one for both boilers and engines, and has been favorably received by both engineers and steam users. But as the same boiler may be made to do more or less work, with less or greater economy, it should be also required that the rating of a boiler be based on the amount of water it will evaporate at a high economical rate. For the purposes of economy, the heating surface should never be less than one and generally not more than two square feet for each 5,000 British thermal units to be absorbed per hour, though this depends somewhat on the character and location of such surface. The range here given is believed to be sufficient for the different conditions in practice, though a far greater range is frequently employed. Square feet of heating surface is no criterion as between different styles of boilers—a square foot under some circumstances being many times as efficient as in others—but when an average rate of evaporation per square foot

has been fixed upon by experiment, there is no more convenient way of rating the power of others of the same style.

(Concluded in next issue.)

THE HORSELESS VEHICLE CONTEST IN CHICAGO

Thousands of pedestrians and vehicles were congregated on the Midway Plaisance at Chicago, on the morning of the 28th ult., to witness the start of the horseless vehicles for the $5,000 prizes to be awarded to the victors in the race. The interest was increased by the miserable condition of the roads along the line of route. Against tremendous odds, through deep snow and mud, and over "ruts" which would have tried horses to their utmost, six moto-cycles sped on their way. A number of those who came to Chicago, and were entered for the race, declined to run, as they were sure they would not succeed in getting through the route. After more than ten hours' struggle through the snow, the Duryea motor wagon was the winner of



DURYEA MACHINE, WINNER OF THE MOTO-CYCLE RACE.

the first prize of $2,000 and a gold medal. The wagon belonging to H. Mueller & Co. arrived second. The latter won the *Times-Herald* prize of $500 on November 2nd, and may get the second purse of $1,500. The third moto-cycle that seemed to be in the race belonged to R. G. Macey & Co., of New York city, but its steering gear was broken before it had run over one-half of the course, so that it failed to reach the winning post. The Mueller wagon arrived one hour and thirty minutes after the Duryea.

The further tests to be made will form a basis for improvements in moto-cycles for all purposes.

On the evening before the race twelve competitors declared their intention to start, and of these four were electric. At the start three gasoline machines and three electric machines were in the race. The longest distance traveled by the electrobats was 10 to 15 miles; while their power lasted they made a gallant struggle, but owing to the impossibility of renewing their power along the route, they gave up the contest. The actual time the winner of the race was under power was somewhat over 8 hours, or about 7½ miles per hour. Considering the very bad condition of the roads, and the numerous stoppages at railway crossings and from other causes, the machine did wonders, for it was the general opinion of those who saw the start made that not one of the vehicles would get back to the winning post. It is worthy of remark that three wagons which distanced all competitors were of German make. It is claimed, however, that some American improvements had been made on them. The De La Vergne, which won the first prize in the Paris-Bordeaux race, was also a German one. All of these named were propelled by Benz motors, but this failed to drive this vehicle through the deep snow, so it dropped out of the race also.

The influence of this contest cannot be estimated by a glance at the results. It is astounding to think that a self-propelled vehicle could be driven 54 miles through a sea of snow, slush and mud, at a speed that would kill more than one team of horses. It is also remarkable that vehicles could be guided over a course covered with pleasure carriages and electric tracks, without accident to the drivers or the users of the highways. While this does not settle the question of automobile propulsion, it has shown its adaptability to do rough work. There can be no doubt that many improvements will be made when the perfected American machine will be placed on the market. No less than 200 different types of American moto-cycle machines are now in process of construction, and 500 applications for patents for improvements on these machines have passed through the United States Patent Office.

There can be no doubt that the recent contest will be of untold advantage to the public, and to those now and to be engaged in the construction of vehicles. It will help to immediately inaugurate a new and immensely increasing business on this continent, and for which there is sure to be a large and growing demand. It will also lead to a great change in the character of the public highways, to adapt them to the motor vehicles; in fact, in every direction, it will lead to great changes in both passenger and freight transport, all to the public advantage.

Many persons who are inclined to doubt the future of the horseless carriage, notwithstanding what has been done, and is now being done in Europe and the United States, will be forced to recognize its admitted mechanical achievements and its adaptability to some of the most urgent needs of modern civilization. While it is not yet settled what kind of motor is best adapted to general use, yet enough has been demonstrated to show that it will work great changes in future methods of transport, not only on the public highways, but in its future adaptability to tramway, passenger and freight traffic. It will enable the farmer to have easier access to the large markets, and do away with the necessity of having small grain elevators in unimportant positions, as it will concentrate the business in larger centres of trade. It will also give the country districts a cheap source of power for general purposes on their farms, as well as for the propulsion of their wagons, while it will be of great advantage to city mercantile houses for receiving and delivery wagons, and for doctors, commercial travelers and others whose business requires numerous calls, as it has been sufficiently demonstrated that the cost of transport is far below that of any other method.

For THE CANADIAN ENGINEER.

CONCRETE CONSTRUCTION.

BY MAJOR HENRY A. GRAY, M. INST. C.E., M. CAN. SOC. C.E., ENGINEER IN CHARGE PUBLIC WORKS OF CANADA, DISTRICT OF WESTERN ONTARIO.

Concluded from last issue.

Much has been said in favor of using rubble blocks of concrete matrix between the blocks, such matrix being not less than 3 inches thick in the body of the structure, and between the blocks and the face of the walls not less than 6 inches. The portion of rubble blocks which can be introduced into the building naturally varies with their size. The larger the blocks, the greater must be the ratio which they bear to the surrounding matrix. The saving is, of course, effected

in the quantity of cement used and may be stated at 20 per cent. under ordinary conditions. It is also maintained that in addition to the saving in cost, rubble concrete possesses advantages in respect of rapidity of construction. In building a wall of considerable height in concrete, it is necessary to allow each course to acquire sufficient consistency to bear the weight of the succeeding courses. With rubble concrete this is not so to any considerable degree, as the work can be pushed on as fast as the materials can be supplied, This is due to the great solidity imparted by the presence of a large proportion of solid stone. In the construction of a pier at Skinningrove on the Yorkshire coast, about eight miles south of the Tees, the sand which covered the sea bottom, consisting of shale 6 feet below low-water spring tide, was first removed by an 8-inch centrifugal pump, the suction nozzle being guided by a diver cleaning the sand from off the shale, 25 feet long by 40 broad. Then the soft unset concrete was deposited immediately. The concrete was placed in position from hopper boxes holding 20 cubic feet, lowered by a crane and directed by a diver so as to make a "reef" over the entire excavated space, without any protection, and formed natural slopes of about 1 to 1. It was levelled and trodden down by the diver and carried up to 1 foot above L. W. O. S. T., or 7 feet from foundation. This concrete was composed of 2½ broken slag, ½ rough gravel, 1 of sand and 1 of cement. It was important to ascertain in what state of the sea the unprotected concrete could be deposited. The "reef" extends to only six feet below L. W. O. S. T., and is within the region of greatest scour during storms; nevertheless the sub-aqueous concrete was frequently deposited and was but little disturbed when the waves were from three to four feet high, but with higher waves the concrete was more or less washed away. A "groundswell" was much more destructive. Frequently waves ten to fifteen feet high washed over the reef of concrete twenty-four hours after deposit, without damaging it materially.

In cases where speed of construction is necessary heavy bags have been used to form a strong, though rough, base, under conditions which would render the deposit of soft, unprotected concrete impossible.

An important objection to the deposit of soft concrete below water is that part of the fine cement which is in suspension during the disturbance of the concrete while being manipulated, settles in the form of a creamy deposit called "*laitance*," forming layers or pockets in the mass which never set. It is found, however, that as the concrete was uninclosed, the motion of the water at once carried away the suspended cement, and prevented its settlement on work. On careful inspection the whole of the subaqueous concrete in the "reef" was found to be sound and hard throughout.

The purity of the water used in mixing the concrete is important. On the New Haven harbor works the water used was taken direct from the river, and it was found essential to do the pumping on the flood tide, as on the ebb tide the river silt partially killed the cement. The percentage of earthy matter in some springs is so great as to render their waters in an unpurified state unfit for use in concrete.

In concrete making on public works, in which an excess of water is generally used, the effect of frost is to disintegrate the concrete by the expansion of the water in freezing · and measures to neutralize this effect have been investigated, and it was found that the addition of common salt to the water enables work to be carried on during hard frosts, the proportion of salt so employed even reaching 8 per cent.

Mr. Sanderman, M. Inst. C.E., in a valuable paper to the institution, strongly recommends that where gravel is used for concrete, it should in every case be screened to remove any loam. He also says that the "strength of concrete depends upon the strength of the mortar, and the strength of the mortar upon the ratio of cement to sand, so that it is of vital importance that the cement and sand should first be thoroughly mixed together dry, in order that each grain may have its due share of cement. After this has been done, they should be cast on the aggregates, and it is then only necessary to turn over the whole once, dry, instead of two or three times, as is the general practice, and as the aggregates average more than twice the bulk and weight of the cement and sand, the saving of time and labor is considerable.

"Concrete mixing should not be allowed to proceed during very windy or wet weather unless performed under efficient shelter, as a considerable percentage of the finest and most valuable part of the cement will be blown away, and during rain the cement and sand cannot be efficiently mixed. To prevent the separation of aggregates, concrete should never be passed down in shoots, and if tipped from a height, a layer of from two to three feet in depth should first be deposited by lowering it in tubs."

I have left a very important matter for the close of my article, viz.: *Cement.*—What kind and what standard should be required to be used for concrete? There can be no doubt that the best Portland cement is made in England, and that next to it we have the French and German cements, but we have here in Canada a product that with a little more care and attention would equal, if not excel any of the former. Unfortunately, in the past a higher grade made in Canada was not procurable, and engineers have fought shy of the native product. This state of affairs is now vastly improved, and makers are doing their best to produce a brand that is reliable and uniform.

It has always seemed to me that the testing process was at the wrong end of the producing or manufacturing of cement, and by manufacture I wish it to be understood that natural cement is made from a natural stone, which, on being roasted and pulverized, produces a natural lime containing a certain amount of hydraulic properties, whereas Portland cement is an artificial compound obtained by a product of defined quantities of carbonate of lime, etc., which possess hydraulic qualities in a high degree, and enable it to set under water. The manufacture of both Portland and natural cements is of modern origin, and the present system of testing these cements *after* they are manufactured, in order to obtain their crushing and tensile strength, has only been developed during the last quarter of a century. and these tests merely give the result of a manufactured article. Now, the proper way to insure a good cement being manufactured would be to have the raw material of stone, chemically and properly analyzed *before* being roasted and ground. It is considered indispensable to do this with the raw material of iron and steel. The value of the manufacture depends more on the obtaining and selecting of the raw material which contains the least amount of deleterious elements, than in the elimination of such elements. It is easy to understand how iron and other manufactures would suffer

if their make depended upon the very scant knowledge applied to the manufacture of cement. The result is that the contractor or engineer receives a cement, a substance of undetermined composition, varying in quality with every circumstance of its manufacture, and every condition of its storage and preservation, and from this, by the addition of sand, water, etc., he must combine a material the strength of which he is to determine, although every variation in the materials of and in the method of combining the ingredients will affect the result. I would further recommend that every barrel of cement should be tested up to a Government standard before being placed on the market for sale, and its strength, with date of inspection, stamped upon the barrel.

Wooden structures must of necessity soon become obsolete, and the cost of timber is every year greater, and the renewals and repairs are too frequent. Concrete for all structures is very desirable, and for repairs would be cheaper in every way, as well as stronger and more lasting. Now is the time to start and gain experience in this mode of construction. We have at nearly every harbor the stone, gravel and sand for the taking, and only the cost of cement, labor and plant required to do the work need be considered.

For THE CANADIAN ENGINEER.

BREAKWATER CONSTRUCTION.

COMPILED BY W. G. WARNER, TORONTO, FROM THE U. S. ENGINEERS' REPORTS.

(*Concluded from September number.*)

METHODS OF CONSTRUCTION.

The superstructure of breakwaters at Colombo, Madras, Mormugao, Manora and Kustendjie consisted of super-imposed blocks of concrete arranged in a series of sections, each free to settle in planes transverse to the axis of the breakwater, independently of the other sections, and without disrupting any bond between these sections, each section being massive enough to sustain the shock of seas.

Superstructure of Odessa and Ymuiden consists of concrete blocks in horizontal courses as ordinary bonded masonry. That of Fume breakwater, in part of concrete in mass, deposited in frames in the water, so as to make a monolith of entire superstructure.

DIMENSIONS OF BLOCKS IN FIRST FIVE BREAKWATERS.

LOCALITY.	Height. feet.	Depth. feet.	Length. feet.	Weight. tons.
Colombo.....	6	5½	8, 9 and 14	17 to 30
Madras	8	4½	12	27
Mormugao	8	4½	13 and 17	28 to 37
Manora	8	4½	12	27
Kustendjie	6	5	12 to 18	20 to 30

At Colombo each sloping section of blocks, constrained from transverse movement by five joggles, consisting of oblong grooves in the blocks, filled subsequently with concrete in bags. These grooves were eighteen inches at right angles to axis of breakwater, and gave for each set of sloping blocks a united cross-section of 225 square feet. The general arrangement of joggle-bond not only connects several sections, but also individual blocks of each section, and seems to be an evolution from preceding methods. Mr. Kyle, the resident engineer, stated that while the system worked well, it was still open to improvement.

At Madras blocks of each sloping section are connected by a mortise and tenon, 4½ inches wide and 2½ inches deep, formed on top and bottom respectively of each block, but no attempt was made to connect sea and harbor rows of each section or several sections together. In revised plans for extending breakwater, provision is made for clamping together the upper pair of blocks. This lack of transverse bond was the cause of part of the injury to the breakwater in 1881.

Mormugao—Similar mortises and tenons used as described for Madras, and in addition a rectangular vertical joggle 15 inches square connected each pair of blocks of the upper two courses. Upper pair of blocks were further secured together by 2-inch square iron clamps and a dowel of iron 7 feet long penetrating 3½ feet into the upper pair of blocks. (See first article).

Manora—No attempt was made in any way at first o connect sections of blocks. Subsequently, when it was found that the action of the sea displaced upper blocks, an attempt was made to add to their stability by inserting stone dowels between top blocks and block immediately below. The breakwater still remained as two independent walls placed side by side without even a connection at top between them.

Kustendjie—Blocks extended entirely through wall in single pieces, and no attempt was made to connect blocks of each section or the sections together.

In Colombo, Madras (revised), Mormugao and Kustendjie breakwaters, top of blocks, after settlement had ceased, were tied together by a monolithic mass of concrete for entire width of superstructure and from 4 feet to 6 feet in depth. This secured upper blocks, protected top of work from pounding action of waves, and largely removed danger of injury to the upper joints of blocks from compression of air and water.

Kustendjie—Where sections of blocks were laid at angle of 48 degrees with horizontal, toe of lower block had a tendency to slip ahead, finally producing a concave slope to transverse sections of superstructure. From plate 2 it will be seen that plane of foot of lower row of blocks was at right angles to face, and in setting ower blocks, supporting rubble stone had to be placed under base of block. This naturally gave block a tendency to settle outward, and finally produce concave slope described.

Mormugao—There was a slight tendency for the angle of the slope to flatten and become concave at 2nd or 3rd courses above base. By reference to plate 2, that the lower face of lower blocks was a compromise between forms used at Kustendjie and later works.

At Colombo, Madras and Manora no such tendency towards slipping of lower blocks, and, consequently, flattening of the slope, is alluded to.

At Colombo ultimate settlement of tops of blocks was from 8 to 18 inches. This was allowed for by keeping outer end of work slightly higher when first laid.

Madras—Settlement 6 inches to 4 feet, latter over bottom of yielding sand and mud.

Manora—Settlement excessive, 3 feet to 4 feet. Here the deposition of rubble mound only slightly preceded construction of superstructure, and its settlement was not complete before superstructure was added. Sand bottom also yielded in an unexpected degree.

Mormugao—Settlement of superstructure was from 1½ to 2 feet, and quite even in extent. The principle of using sloping blocks arranged in more or less vertical sections independent of each other, was devised to overcome the difficulty appertaining to settlement and result-

ing dislocation of blocks bonded and arranged in horizontal planes. Again, in system of ordinary horizontal bond the outer end of the work required to be left in an unfinished condition, from necessity of stepping back the successive courses of masonry on each other. With system of sloping blocks the outer end of work is at all times in a closer and more secure condition. Sloping block system first adopted at Manora in 1870, and directly afterwards at Kustendjie; then at Madras and Colombo, and lastly at Mormugao in 1880.

Vernon Harcourt says: "Mixed system, *i.e.*, an upright wall founded upon a rubble mound, will probably have most extended application, and of all varieties best appears to be a superstructure founded some 20 feet below low water upon a simple rubble base formed of large concrete blocks laid with overhanging cranes upon sloping block principle, securely connected vertically and horizontally, and capped with concrete in mass after settlement had ceased."

Advantages of using concrete in mass or in bags mainly confined to small works, which would not justify expenditure for plant, or to localities where stone is scarce and foundations firm.

Disadvantages are: Not suitable for irregular settlement; that locality should be sufficiently protected to use piling and sea-staging; requires larger proportions of cement; introduces an uncertainty as to character of concrete below surface of water; only permits labor during times of comparatively calm weather.

In setting concrete blocks two methods used—from staging and from cranes.

Great advantage of cranes over staging upon exposed sites is, while latter must be left exposed to storms, former can always run to shelter, and though the first cost of suitable cranes for handling heavy blocks is quite large, their use dispenses with great labor, ultimate cost and delay incident to use of staging. Advantages are entirely in favor of cranes; they have practically taken place of staging in modern works.

At Kustendjie alone staging was used, but total length of breakwater was only 253 lineal feet, and work would not have economically carried any large expenditure for plant.

COMPOSITION OF CONCRETE BLOCKS.

LOCALITY.	Cement.	Sand.	Gravel.	Stone.	Proportions.
Aberdeen	1	4	5	.....	1 9
Kustendjie	1	2½	.....	5½	1 8
Manora	1	4	5¼	3¼	1 13
Ymuiden	1	3	5	.....	1 8
Colombo	1	2	.....	6	1 8
Mormugao	1	2	1	6	1 9
Alderney	1	1	4	40%	.....
Wick	1	1	2	4	1 7
Dublin	1	2	5	.....	1 7
Madras	1	2	.....	7¼	1 9¼

Parts above used are by volume.

Authority of best practice in work of this kind seems to be the use of Portland cement for manufacture of concrete blocks in proportion of 1:8, of which sand equals 2 parts, gravel and broken stone (2½ inches) for remaining 6. If gravel or clean shingle cannot be economically obtained, the 6 parts of broken stone are divided into 4 parts broken to 2½ to 3½ inches ring, and 2 parts clean screened stone broken to ¾ inch to 1½ inch cubes.

Under Mr. Kyle at Colombo, concrete blocks of the latter composition gave after 3 months average tensile strength of 41 pounds per square inch of section, and crushing strength of 4,231 pounds per square inch of section. To such a mixture of concrete hard rubble stone was afterwards added to extent of about 40 per cent. of entire volume while material was being placed in molds. Care was taken that none of this rubble came within 4 inches from surface of blocks.

At Colombo molds were removed after three days, and three weeks after blocks could be set. Manora blocks were three to four weeks old; at Mormugao when about three weeks old; at Kustendjie when two weeks old.

LOCALITY.	Length Breakwater.	Total Cost.	RUBBLE IN BASE. Gross Tons.	Average Cost per Gross Ton.	Cost of Levelling per Square Yard.	CONCRETE BLOCKS. Quantity of C. Yards.	Cost of Making.	Cost of Setting.	Total Cost in Position.
	Ft.	$		$ c.	$ c.		$ c.	$ c.	$ c.
Colombo	4,212	2,430,000	320 400	1 63	1 86	124,984	9 57*	.....	9 57
Madras	7,836	2,402,000	438,100	86	...	202,313	3 77	82	4 59
Manora	1,503	529,000	96,700	86½	3 00	29,180	4 23	1 04	5 27
Marmugao	1,176	420,000	79,500	59	75	56,900	4 10	52	4 62
Aberdeen	1,050	373,500	.....	.....	..	22,851	3 15	97	4 12

* This price includes cost of setting.

In connection with cost of concrete in blocks, the cost of concrete in bags and frames follows. Prices given as in case of blocks, exclusive of cost of plant and superintendence:—

LOCALITY.	Proportion of Concrete.	Cost in Bags.	Cost in Frames.
Fraserburgh	1:5 to 1:7	$6 34	$5 06
New Haven	1 8	5 82	5 00
Sand Haven	1 6	....	4 32
Aberdeen, N. Pier	1 7	5 05	4 97
" S. Pier	1:8	6 12	3 90
Wicklow	1 7	....	4 56

No comparison can fairly be made between cost of bags, frame, and block system. In former cases work was done in India, largely with native labor and employment of women, and heavy freight charges had to be added for cement, tools and machinery. In latter cases, though prices of labor may have been higher, it was more efficient, and cost of concrete was in several cases materially reduced by use of shingle dredged from site of work.

Entire cost of works at Colombo was $3,274,000, including dredging of harbor, foreshore reclamation, shore works, and all expenses of administration. Amount in table, $2,430,000, was cost of breakwater proper increased by its proportion of general and administrative expenses. Ordinary labor was furnished by prisoners paid at rate of 37½ cents per day of 8 hours. Cement, tools, machinery, etc., and skilled labor, were brought from England. Stone was brought 12 miles by rail.

Madras—$2,402,000 includes $395,000 for preliminary expenses of surveys, railways, buildings and plant, and $150,000 for superintendence.

Manora—$529,000, contains about $75,000 for plant.

Mormugao—$420,000, contains about $20,000 for superintendence, and $133,000 for plant and maintenance.

Progress in placing concrete superstructure, Colombo—166 prisoners, 8 hours per day, made 6 blocks per day, and 309 prisoners, 12 hours per day, made 12 blocks. Season possible to work lasted six months, during which

an average of 125 working days was obtained. Average progress of superstructure was 900 lineal feet, or 150 lineal feet per month of superstructure 34 feet wide and from 24 feet to 28 feet high. Progress would have been better had blocks always been on hand. On one occasion 720 tons were set in 12 hours, which was at rate of one 30-ton block each half hour. Average rate = 8,000 tons per working month.

Manora—In a season of 4 months, containing 92 working days, 910 blocks, each 27 tons weight, were set to 710 lineal feet breakwater; average rate per working day = 10 blocks, or 270 tons, or about 6,000 tons per month.

Highest rate, 18 blocks per day; but at one time, under very favorable conditions, 6 blocks, or 162 tons, were set in 1 hour and 40 minutes. Rate of progress was usually controlled by the rate at which top of rubble mound could be prepared by divers.

Madras—Superstructure 24 feet wide and 30 feet high, advanced on south breakwater 990 lineal feet per season of 6 months, and on north breakwater 770 lineal feet per season, or 7,000 tons per month.

Mormugao—Superstructures 30 feet wide and 30 feet high. Average rate of progress was 109 lineal feet superstructure per month. Progress could easily have been 200 feet per month (10,000 tons), had blocks been on hand ready to lay.

From foregoing, it seems fair to assume that with blocks on hand, and with suitable appliances for handling them, 8,000 to 10,000 tons of concrete blocks could be placed in a superstructure each working month.

For THE CANADIAN ENGINEER.

WHY CIVIL ENGINEERS SHOULD TEST CEMENTS; AND HOW THE TEST SHOULD BE MADE.

BY PROF. CECIL B. SMITH, A.M., CAN. SOC. C. E.

There is by no means as much systematic testing of cements as one would suppose. Often, the testing, if any, consists in making a few neat briquettes, giving the tensile strength at one week and four weeks, while systematic and intelligent testing is confined to a few city departments and some of the larger Government contracts; this arises sometimes from ignorance, but not ordinarily so; usually, it is partly from indifference and partly from an idea that the appliances and time necessary are out of proportion to the benefit to be derived.

There are two things that the writer would like to urge on his fellow civil engineers.

(1) Whenever feasible, prescribe the tests advised by the Canadian Society of Civil Engineers, and let us get down to some basis by which dealers and manufacturers can tell where they are. At present, with stringent requirements, as in the Barrie specifications lately, and no tests at all, in a large Ontario city, with everyone going a different road, those dealing in the product hardly know what course of action to pursue. This is neither fair nor rational, and does not give our own manufacturers a fair chance or encouragement to excel.

(2) To reconsider their ideas of testing, and by using less cumbersome tests, to enable themselves to do it more persistently and for smaller orders and pieces of work. I take it that a large percentage of civil engineers, and almost all contractors and dealers, will insist on the idea that the criterion of a good cement is a high, *neat* tensile test at one week and four weeks.

It is probable that no more fallacious idea ever got into the brains of intelligent men on a strictly determinable fact than this. *It is absolutely no criterion of the value of a cement whatever*, because it can be found in *coarse, underburnt, unsound* cements, and all authorities on cement testing, and all who have had any amount of testing to do, assert it, and yet, because it is so easy to say that a cement will "stand so and so at 1 week and 4 weeks," and it is, seemingly, so plausible an index to the value of the cement, the error has become very widespread.

There are three qualities of a cement which are determined much more easily, and which are of infinitely more importance, and the writer would invite attention to the facility with which these can be arrived at. These are *soundness, fineness*, and *specific gravity*. Of these the first is paramount, and is the subject of much controversy. Undoubtedly, if any one of the tests ordinarily used is fully satisfied, the cement is reasonably safe. These tests are in order of their severity:

(*a*) Immersion in boiling water for 24 hours.
(*b*) " " water at 125° F. for 24 hours.
(*c*) Hot air bath at 150° F. to 175° F. for 24 hours.
(*d*) Immersion in cold water for one month.

The Germans have fallen back on the last one, but the writer's experience is that although it will detect bad cases of unsoundness, yet it will not detect those that are slightly so. The second test of immersion in water at 120° F. to 125° F. for 24 hours, after having been allowed to harden for three or four hours in the vapor of the same, is a sti[illegible]ent determination of the slightest tendency to "blow." This test evidently, therefore, requires very little time, a thermometer, a spirit lamp and tin receptacle of some kind, with cleats to hold a piece of glass on for the first three or four hours, and then to immerse the hardened pat in the water. If the cement is sound it will come out, after 24 hours, hard, smooth and stuck tight to the glass. Its badness may vary all the way from fine cracks to a complete disintegration.

The 2nd test for fineness is purely a matter of dollars. Cement not passing a No. 100 sieve is not a cement, but a sand, and if we have one cement with 25 per cent. residue on 100 sieve, and another with only 5 per cent. on 100 sieve, then in any 3 to 1 sand mixture the proportions are $\left\{\begin{matrix}75 \text{ to } 325\\ \text{and}\\ 95 \text{ to } 305,\end{matrix}\right\}$ and even this is not a full discrimination. It will be found that of the two cements referred to, if equally well burnt and of same constituents, the 1st will actually be barely half as strong as the 2nd *in a 3 to 1 sand mixture*. It is easy to see from this whether fine grinding is worth paying for, where *strength* is required. The outfit for this test is worth $3 or $4, and the test takes 10 minutes to 15 minutes to make, with the use of a good balance.

The 3rd test of specific gravity to determine the thoroughness of burning is easily made with a graduated tube, and is a check on the tendency to underburn, in order to be able to meet fineness requirements easily. Other things equal, a cement burnt well has much more cementing value when mixed with sand than an underburnt one. This test requires half an hour's time, some coal oil and a graduated test tube, with fittings worth $3 or $4.

If these three tests are made and found satisfactory, the neat tensile tests are merely *confirmatory*, and sand tests a vindication of fineness. Thus it will be seen that $15 to $25 in outfit, and a few hours' time for each sample, will give such a knowledge of its characteristics as will enable an engineer to classify the product and determine its relative value—leaving ten-

sile tests for those whose outfit, in addition to that already enumerated, contains machines and appliances for such work.

It may seem superfluous to go all over this well-trodden ground, but experience teaches that simple truths need frequent reiteration as well as abstruse facts, in order to keep them in the minds of those interested.

UNITED STATES WAR SHIPS.

We have heard a great deal lately of the success of recent efforts of the ship-builders of the United States. It seems, however, that there are still some few points in which British builders might instruct them. It has been found impossible to dock the new United States battle-ship "Texas," as she began to go to pieces as soon as the water got low in the dry-dock. Just how far the smash-up would have gone it is impossible to say, for at the first appearance of rending plates and cracking cement the water was returned toth edock There is a good deal of discussion as to whom to blame for the break-up. The plans of the ship were the result of a competition for a prize of $15,000, and were prepared by a British draughtsman. They were amended by the United States naval authorities before construction was begun, however, so that no blame for the failure can attach to the original draughtsman. It has been more than hinted in American papers that faulty work was purposely put in to throw discredit on the author of the plans, but of course no evidence of this has yet been brought forward. The chief thing that the United States naval authorities have to learn is to build ships, and the first chapter in the lesson is that when they have accepted a plan it should be carried out to the most minute details; the second is that when they are carrying out a plan they should do it honestly and put good work into every inch of it.

AMERICAN VS. ENGLISH HEATING APPARATUS.

The merits of American methods of house heating, and the opportunities for Americans to extend their business in England by making a careful study of British requirements, are ably discussed by W. M. Watson, Dundas street, Toronto, in a letter which appears in a recent number of the *Leeds* (Eng.) *Mercury*. The great point to be observed is that soft coal is the general fuel, and an apparatus which is constructed for consuming anthracite is soon clogged with tar and soot when soft coal is burnt. For this reason the ranges sent to England have in many cases failed to give satisfaction. One point which should appeal strongly to our trans-Atlantic neighbors is the economy of following our methods. An ordinary grate fire, which will heat a good-sized room, will consume enough coal to heat a nine-roomed house if burnt in a modern furnace. The most suitable heater for the English trade is the hot-water heater, as the cold there is never very great, and what is desired is a mild and equable temperature, which is easily regulated. Hot water is also more suited for use with soft coal, as the fire may be let down, and the radiators remain warm for a long time, which is not the case with either steam or hot air. The English heaters are much more cumbrous than the American, and 3 or 4 inch pipes are often employed as radiators. Much more heat could be obtained from the same fuel if smaller pipes were employed, as is customary here. Mr. Watson thinks that if the English dealers do not pay more attention to developments on this side of the water, they will have cause to regret it.

MERRY CHRISTMAS AND A HAPPY NEW YEAR.

Into all the different homes where THE ENGINEER comes this Christmas, we wish that all good cheer and happiness may enter too; that all bearings may be true and the wheels of business life run without heating. We hope that all our readers may build many more successful years into the arch of Time before the key-stone is set and the workmen are laid off.

THE MOTO-CYCLE RACE IN CANADA.

The suggestion made in THE CANADIAN ENGINEER last month to organize a public exhibition of horseless vehicles in Canada next summer has been approved of by the Toronto *World*, Hamilton *Spectator*, and other papers, and private offers of assistance have already been made by enterprising individuals to the publishers. Subscribers writing from Hamilton advocate holding the exhibition in that city, instead of Toronto, as steps are now being taken to organize a company to make the moto-cycle there. It matters nothing to THE ENGINEER whether the exhibition be held in Toronto or Hamilton, so long as it is taken up with spirit, and we are sure there will be no jealousy on this score between the two cities. If a good strong committee is formed in either city, it will be a great success. In view of the attention given to horse-racing on the Queen's Birthday, a moto-cycle race would probably draw a larger crowd if held on Dominion Day. THE CANADIAN ENGINEER will be glad to hear from anyone in Hamilton, Toronto and elsewhere who is willing to serve on an organizing committee.

OUR readers will be interested in knowing that the Mr. Pennington whose remarkable new motor is described by Mr. Killey in this issue, is the same gentleman who has been experimenting on machinery for navigating the air. Though the application of the Kane-Pennington motor has been on machines traveling on land, the extraordinary power developed by the invention may actually lead to the accomplishment of what Mr. Pennington and so many other inventors have been vainly striving at—aerial navigation. The achievement will probably be as great a surprise to Mr. Pennington as to the rest of the world, but from tests reported in the *American Machinist* it really seems that this highest accomplishment of mechanical genius will soon be the gift of mankind. The principle of this new motor is so far a secret, and mechanical men, of all others with whom the writer has discussed the matter, have been most skeptical. Yet the tests made and the details given upon so good an authority, leave little doubt that the new motor is all that is claimed for it.

THE Dominion Government has to be complimented on the selection it has made of commissioners to sit with the American commissioners on the subject of the Deep Waterways of Canada and the United States. Mr. Howland is not only a clever, painstaking and industrious man, but he brings great enthusiasm into his work. As to Messrs. Keefer and Monro, the engineering experts of the commission, no two men could be selected having a wider grasp of the subject or capable of making clearer deductions from the mass of facts and statistics with which they will be called upon to deal. A biographical sketch and portrait of Mr. Monro appeared in our April number, and a sketch of Messrs. Keefer and Howland appears in this issue.

For THE CANADIAN ENGINEER.

A WONDERFUL POWER DEVELOPMENT.

BY J. H. KILLEY, HAMILTON.

The construction of the Kane-Pennington oil motor, considering the power developed when in action, has a remarkably small quantity of material in it, and is lacking in all the complicated parts and appliances that have been in the past attached to most oil and gas engines. Its simplicity of construction is such that no ordinary engineer or mechanic would expect to develop power from it without seeing it in actual operation. When in motion it is capable of driving loads far above its apparent capacity. This motor runs without the usual cooling water jet, and the cylinders do not get hot. Theoretically there is a great loss of power brought about by the cooling water; this all authorities agree upon. The heat that in other motors is lost is thus turned into power. The electric current from the primary battery on the vehicles and elsewhere is in this motor continued through the stroke. It is claimed that the effect of this mixture of electricity and vapor is to practically double the power of the motor. When the spark is simply introduced at the commencement of the stroke the power is found to be weak and develops heating of the cylinders and pistons. On the contrary, when the sparks are continued to the end of the stroke or nearly so, the cylinders can be felt by the hands, so little heat is evolved. All the engineers that have examined this motor have been entirely surprised by its performance. The continuous spark referred to has been applied to another motor by a different inventor. It was clearly demonstrated that it doubled its former power. This machine, regarded as a motor whose source of power is heat—and all power engines are classed as thermo-dynamic machines—gives, it is believed, at least four times the power that can be developed by the best modern steam engine from the same quantity of heat produced from fuel burned under the boiler. This discovery is rich in future possibilities, as it may be utilized advantageously in many other directions.

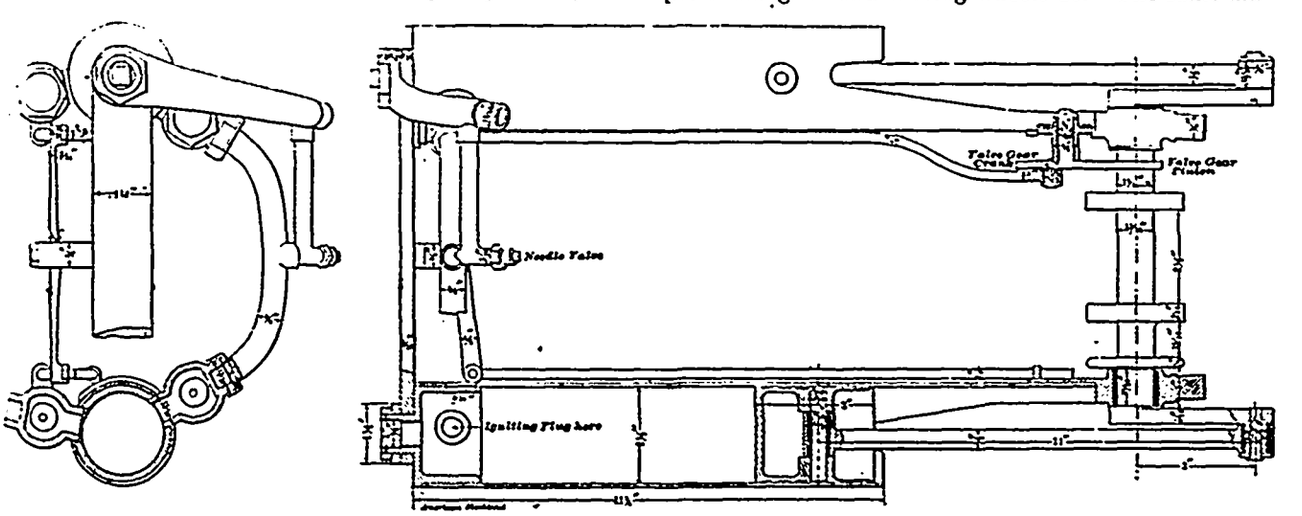
One of these motors actually developed four and three-quarters horse power at 700 revolutions per minute, and weighs only 17½ pounds all told. A bicycle has been constructed, the propelling power being a motor of this kind, the whole weight of which, including oil for a long trip, is only 58 pounds. This machine, with a 200-lb. man on it, has recently run in Milwaukee a mile in 58 seconds, or 3 miles in 3 minutes. To do this the 22-inch wheels on which the bicycle runs had to make 900 revolutions per minute. This bicycle is constructed to carry two persons when desired.

Road carriages on four wheels with more powerful motors, on the same principle, are constructed that weigh no more than 400 lbs. This machine on fair roads can easily travel 25 miles per hour, the consumption of common kerosene oil being one-tenth of a gallon per mile run. This carriage is called a Victoria. The weight of an ordinary road wagon or buggy is the same.

Nothing like this weight and power has been ever shown by any motor in existence, and, therefore, at the present time it stands unique in weight, power, construction and action.

The average weight of the common 1 horse-power gas engine is at least ten times the weight of the 4¾ horse-power engines described here. The ordinary speed of the 1 h.-p. gas engine is from 200 to 250 turns per minute, while this engine will maintain a speed of 2,000 revolutions per minute without danger or difficulty, and will develop over 10 h. p.

One of the bicycles run by this motor has no power connection with the road wheels. It is propelled with a two-bladed, cloth-covered screw acting on the atmosphere, and will run with a 200-lb. man on it on the common road at 35 miles per hour. Another runs a 4-wheeled wagon with two propeller blades, 42 in. in diameter. This will run this wagon just as quick as the chain gear and driving wheels do. The same machine was fastened in a boat 21 ft. long, 3½ ft. beam, with three men in it and 600 lbs. of ballast. It drove the boat through the water in the Racine River at the rate of from eight to nine miles per hour. The construction of this motor will be more fully described in another article.



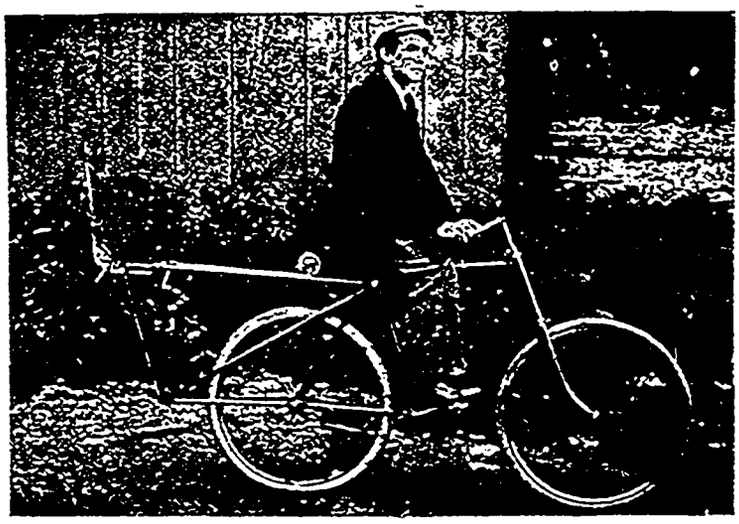
The results of the action of this extraordinary motor have been in no way exaggerated. In fact less has been given here than has been claimed for it deduced from actual practice and indicator diagrams. It seems astonishing that a motor could make 34 revolutions per second, receive and expand the charge in that space of time and develop power. The makers, however, claim that they can run much quicker than this without any difficulty. It appears to be an almost miraculous machine. The question may be asked, what will its future be?

A working drawing of this motor, for which the writer is indebted to the *American Machinist*, is given herewith. The oil admission is simply a screw-controlled needle valve. The igniter—the construction of

which is so far kept a secret—is simple to look at, but gives no hint of its two-current refrigerator powers. The cylinders are made of steel tubes ground inside, "and not a very close approximation to a cylindrical form." The pistons and open cylinders appear to be wholly free from any deposit. The trunk pistons are a slack fit in the cylinders. After the representative of the *American Machinist* had made a trial trip on one of

KANE-PENNINGTON MOTOR.

these motors, he felt the water jacket of the cylinder and found it barely blood warm, which seemed strange considering the absurdly small size of the cooling water tank. When asked how this could be, Mr. Pennington replied that all fluids took up vast amounts of heat in the change to vapor, and that as his engine used no carburetter, but vaporized the charge directly in the



FAN-DRIVEN BICYCLE—KANE-PENNINGTON.

cylinder, the fluid in vaporizing absorbed the heat which the cylinder walls had derived from the last explosion. The charge, he went on to say, was exploded only when the effective stroke crank-angle was 45 degrees, and that previous to the delivery of the igniting spark to the charge, there was a "mingling" current of electricity put through the air and gas in the cylinder, and that by virtue of this non-igniting current delivered to the mixture, the heat absorption capacity of the gas in the cylinder was so incredibly augmented that the cylinder temperature could be and was so greatly lowered that the walls of the cylinder were kept cool within working limits.

As will be understood, the motors themselves are of the four-piston stroke cycle variety. There is no visible discharge of vapor and no perceptible odor, except when there is an over admission of oil, and in this case there is an immediate loss of efficiency, and then the odor ceases. The one great mechanical mystery is the coolness of the naked cylinders, which should be red hot before fifty strokes are made.

CASE'S IMPROVED PROPELLER WHEEL.

Since the old-fashioned paddle-wheels on steamers began to be superseded by propellers, marine inventors have been continually experimenting for the purpose of discovering a shape of propeller that will exert a greater power of propulsion than is possessed by the ordinary rearward thrust wheel. The results of these years of experiment have been a number of highly ingenious devices, most of which have been characterized more by their ingenuity than their utility.

A. Wells Case, the well-known Highland Park, Conn., inventor, some years ago became possessed of an idea that propellers on steamboats were not exercising their full possible amount of power, and he immediately set to and worked until he matured a distinctively new style of propeller. This new wheel permits of an outward and non-rotating thrust, and the results over the old style rearward thrust wheel have been proved to be 18 per cent. greater pressure. Mr. Case says that the object sought in the construction of this form of screw is to obtain, as far as possible, a solid backing or resistance to the blade of the screw while in motion, and by experimental tests it has been demonstrated that the outward thrust principle, as applied to the Case propeller wheel, is theoretically, mathematically and practically correct, whether working in a liquid or under atmospheric conditions. It is an indisputable fact that the direct astern or concentrated thrust wheels do not have solid water resistance while in motion. Water thrust against by any one blade of these wheels is backed by water already put in motion by the preceding blade, consequently the wheels are working in a current of water moving in a line directly from the wheel. In the Case outward thrust wheel the blades are backed by solid water, or water outside of the course of the wheel and undisturbed by it. The superior effectiveness of the Case wheel has been frequently demonstrated. One of the severest competitions into which an invention of this kind could take part was held at the Gas Engine & Power Company's at Morris' Heights, New York. A great number of tests were made, records of four of which were given., the Case wheel, in every test made, beating the others. Of those recorded in the first test the Case wheel beat that of the Gas Engine & Power Company, by 20¼ seconds per mile, the second time by 14½ seconds per mile, the third by 27½ seconds per mile, and the fourth by 8¼ seconds against a new specially designed wheel by Mr. West. On November 20, and long after the experiments had been completed, Mr. West wrote Mr. Case a letter in which he said: "I frankly admit you have produced a wheel that has proved itself, on trial, superior to anything that has come to my notice. It is not pleasant to admit defeat, but facts are stubborn things, and after repeated trials of wheels from two to six feet in diameter, of many kinds, I find the results show a gain in speed very flattering to you, and very discouraging to competitors. Few men would have had the courage to place a propeller on a boat, with a guarantee that it would increase the speed of the boat, or it would be removed at no expense to the owner, as in the case of the yacht 'Orienta.' This yacht was built in 1882, and has tried eight wheels during that time, some of them good, and some of them far from good Yet the first trial of a Case wheel showed a gain in speed of 15 seconds per mile over any wheel that was ever on the yacht, and I am confident that the racing speed will be greatly in excess of this gain per mile when a chance is offered to make time. In calling the attention of steamboat owners to your improvement over the old type, you have the advantage of many who estimate the result of their inventions in a statement of *facts* that should convince them that your wheel is not a result of guess work, but has come to stay, and has made better speed in every trial than its competitors, and can do it again."

The next vessel on which the Case wheel was applied was the steam launch "Nora," owned by C. W. Shields, of Philadelphia

The launch had been fitted with a 30-inch Cramp wheel, this was changed for one of Mr. Case's patent, with the following result: "The course run over was on the Delaware River, and exceeded one mile by only a few feet. Nineteen runs in all were made on different days with the Cramp wheel, with and against the tide, at an average of 8 minutes and 55 seconds to the mile. Thirteen runs were similarly made with the Case wheel, with and against the tide, as on previous trials The average time per mile with the Case wheel was 8 minutes and 6 seconds, a gain for the Case wheel of 49 seconds per minute. In addition to this there was less vibration

Later tests of the Case wheel were made in Chicago with the steam launch "Abyssinia," the engineer of which writes: "I took the steam launch 'Abyssinia' to the shop last Friday, October 27th, and left her there. Before doing so I made several trials with her. One from the North Pond pier to Van Buren street pier was made with the Case wheel in forty-five minutes. It had always taken an hour with the other wheel to make the distance The run around the outer crib was made with the other wheel under the following conditions: steam at start 150 pounds; at finish 80 pounds, time, twenty-four minutes. The same run was made with the Case wheel, with steam at 150 pounds at start and 83 pounds at finish, in twenty-two minutes and forty-five seconds. I had to let the steam run down with the Case wheel to keep the conditions the same, or the time would have been less My opinion of the Case wheel is that it is a better wheel under all conditions than the one I had before."

The steam launch "Glad Tidings," owned by Beall Bros., of Alton, Ill., said to be the fastest steam launch between St. Paul and New Orleans, was, while having this reputation, fitted with the Case propeller. The adventure was a somewhat bold one on the part of Mr. Case, but the result fully sustained his opinion of the invention. Beall Bros. wrote and told Mr. Case that they thought they could secure greater speed with 160 pounds of steam with the Case wheel than from 250 pounds pressure with another wheel.

The yacht "Orienta," owned by E. R. Ladew, of New York, is fitted with the largest wheel yet made on Mr. Case's patent. It is of bronze, six feet wide, and was made at Mr. Case's expense, with a guarantee of better speed than that of any of the eight wheels previously tried on this yacht. From the data obtained, the wheel is 15 seconds per mile faster than any previously tried. Mr. Case has fitted numbers of his propellers in all parts of the country, and the fact that he has been prepared to place his wheels on boats entirely at his own risk, shows that he is certain of the superiority of his invention. The May number of THE CANADIAN ENGINEER contained an interesting account of experiments made by Mr. Case to prove the excellence of his alterations in propeller wheels.

The Case propeller wheel having found so much favor among marine men in the States, has now been introduced into Canada, and arrangements have been made whereby those who wish to procure wheels of this style may do so by application to the Bertram Engine Works Co (Limited), Toronto.

With regard to the more recent performances of the wheel, Mr Case writes us: "Before the S. F. Hodge Co., of Detroit, would decide to make my wheels, I had to demonstrate the superiority of them in their presence. Arrangements were made with Mark Hopkins, of Detroit, to put a wheel on his steam yacht "Bonita" 125 ft. in length. The yacht had previously had a large number of wheels tested on her, and I was required to make 1½ per cent. gain over the best time made by any of the other wheels in order to have the wheel accepted. If I did not make that gain, I was to take the wheel back and pay for two dockings of the boat. I had no hesitancy in accepting the proposition, for I knew what my wheel would do. The trial was made, and the parties write me that the wheel is satisfactory, since it will be paid for. The report shows the gain to be four per cent."

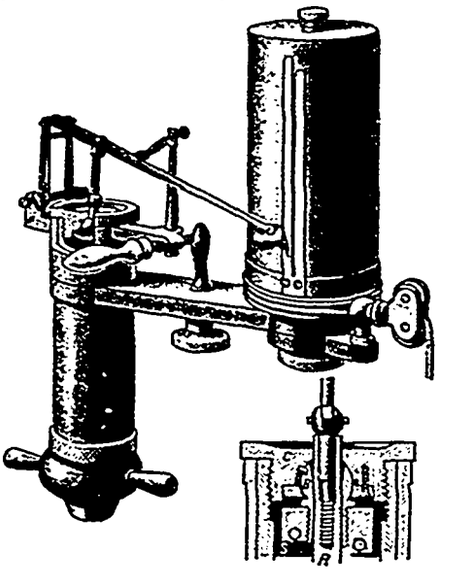
Mr. Case is receiving offers for the introduction of his wheels in Europe—a proof of the interest their work has elicited from marine men abroad.

THE inaugural meeting of "Hamilton Association," a literary and scientific society of Hamilton, Ont., was held last month. Geo. Black, local manager of the G N W Tel. Co., read a paper on acetylene gas, which, as is now generally known, was discovered by T. L Willson, a young Canadian. A number of burners were lighted and a photograph taken successfully by means of the new illuminant, and much interest was displayed by the members in Mr. Black's very instructive lecture A full account of the new gas will be given in the January number of THE CANADIAN ENGINEER.

A NEW INDICATOR DEVICE.

Probably in no branch of steam engineering has more ingenuity been expended, than in the attainment of the nearest approach to absolute accuracy in the use of the steam engine indicator. The fraternity will not be content with an approximation—perfect accuracy is demanded. For years every detail of this instrument has been under the closest scrutiny, in order that its accuracy would remain unimpaired under the severest conditions of use. The worst enemy to correct practice is friction in the moving parts, and no instrument is considered worthy of confidence unless the piston and parallel motion will drop freely throughout the limits of their movement, without the slightest suspicion of a "catch;" as this must be accomplished without appreciable lost motion in any joint, its attainment is only possible by the most perfect design, and workmanship of the very highest order.

To be assured that a slight friction will not be contributed by the final adjustment of the spring, it has been usual to provide some form of a "universal" or "ball and socket" joint for its attachment to the piston. Owing to the fact that this, as well as every other part subject to movement, must be constructed as light as possible, this ball joint has been made much smaller than considerations and lubrication, and freedom from wear under the excessive pressure, would indicate. To overcome this difficulty, the arrangement shown in the accompanying engraving has been devised by Hine & Robertson, 46 Cortlandt Street, New York.



Briefly speaking, it consists in transferring the ball and socket joint from the piston to the cylinder head, where it has no movement, so that it can be made with a wearing surface probably fifty times greater than has been usual. As it requires no attention in changing springs, there are no adjusting screws which, sooner or later, will work loose while in operation, and vitiate the diagram. The fact that it can be lubricated at frequent intervals, while in use, is also worthy of consideration. It can be applied to any standard indicator at present on the market.

FACTS ABOUT BOILERS.

ARTICLE NO. IV.

(Concluded.)

The three preceding units will soon belong to the back numbers of boiler practice, and, like an old Patent Office report, be only a graveyard of buried hopes. A few developments from them may survive for a while, where some special fitness for special work condones their frequent break-downs, repair bills and total replacement.

There is one other class, however, that deserves careful watching. It is the last ditch of the boiler crank who trades on public ignorance. It starts out all right with straight tubes, but ignores the one essential point—facilities for cleaning.

This defect is inherent in the other units; in the straight-tube unit it exists but for one reason—cheapness! Make it cheap! Yes, cheap! so it can be kept dirty, inefficient and short-lived.

Does this kind of cheapness pay?

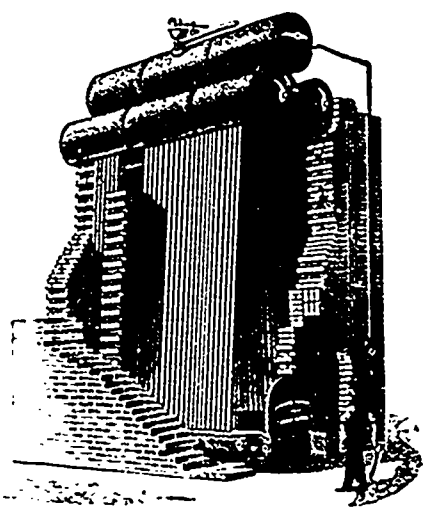
There was some excuse for the inventor of a new angle for a closed-ended tube—for the one who succeeded in putting so many kinks in a bent pipe that the circulation got lost before it got around—for the inventor who gloried in his "aggregation" and its labyrinth of right-angled bends; there was some excuse for these inventors adding to their laurels by also inventing a theory that

wormed around inside their particular boilers and kept them clean.

But, unfortunately, theories don't make much of a fist at this kind of work, and the fact remains that there are only two ways by which boilers can be kept efficient and economical, and a check placed on their suicidal tendencies. The first is to feed them with absolutely pure water—practically a physical impossibility. The second is to arrange them so that the scale due to evaporation can be removed, which means to provide free access for the mechanical cleaning of every square inch of internal surface.

A brawny-armed workman, at the end of a straight-handled scraper, is the only successful "boiler compound."

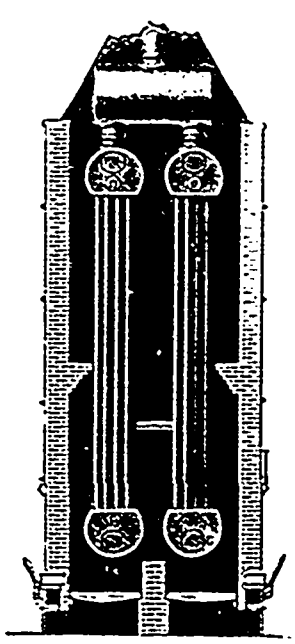
The FIRMENICH boiler consisted of flat-sided horizontal drums at top and bottom of a bank of straight tubes. Two such units were placed "A" fashion, with the grates between them at the bottom, and surmounted with a steam drum on top. These tubes were inaccessible for cleaning, but the boilers frequently cleaned out everything around them, including the firemen.



NO. 44. 1875—TRADE CIRCULAR ISSUED AT CHICAGO.

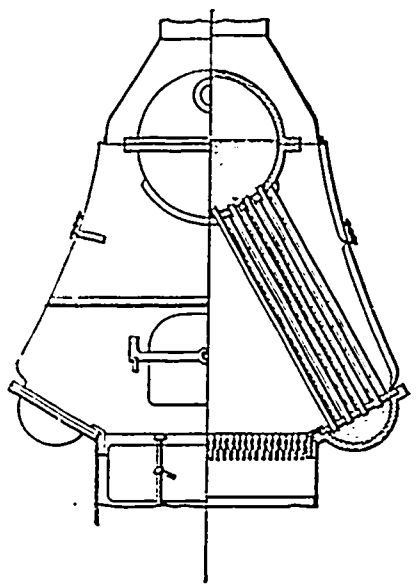
Make the drums round and bend the ends of the tubes, and the units would strongly suggest several more modern boilers previously described. (Stirling, Pierpont, etc.).

Stand the Firmenich units plumb instead of at an angle, and we have the WHEELER boiler, which comes down to us as brand new about the time the last of the Firmenichs went up.

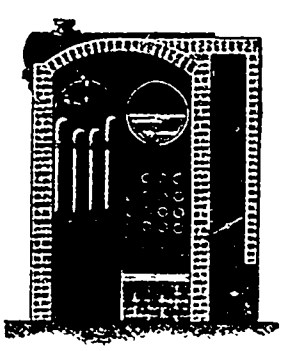


NO 45. 1892—NEWSPAPER CLIPPING

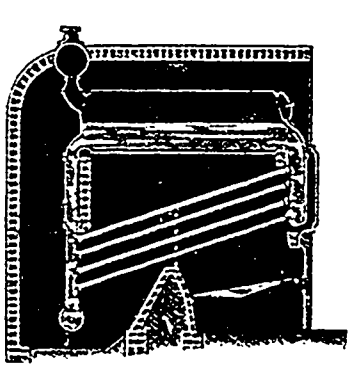
The YARROW boiler, a slightly modified Firmenich (1875), is in some instances made with small diameter drums bolted together in the centre, in larger sizes, with the upper drums of sufficient diameter to draw the tubes into As in all this class, the drums are greatly weakened by the large number and close proximity of the tube holes, and the sheet is liable to be strained or ruptured by expanding the tubes When a tube leaks it is difficult to locate, and hidden leaks are liable to cut out the metal. They are accessible for cleaning by taking apart on smaller sizes, or by working in the dark and trusting to luck in the larger ones.



NO. 46. 1894—NOTES OF NAVAL PROGRESS, U. S. NAVY, 1894.

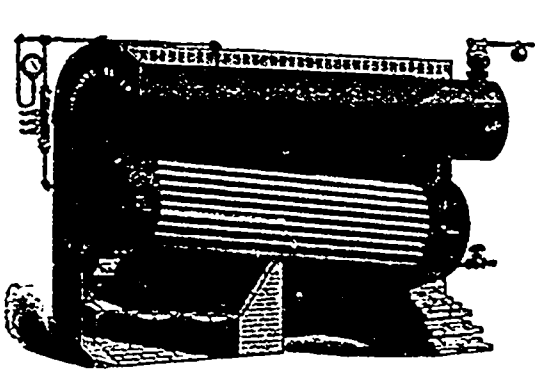


BABCOCK & WILCOX built a sectional boiler with straight vertical headers The tubes were brightened, laid in the mould, and the headers cast on. No handholes opposite the tubes were provided. It died very young.



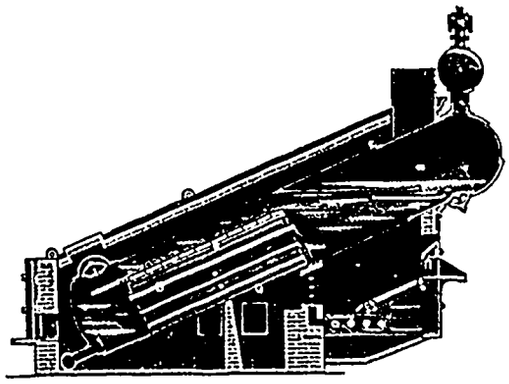
NO. 47. 1868—ORIGINAL DRAWINGS.

MAYNARD used a horizontal steam and water cylinder above a bank of tubes placed at a slight inclination from the horizontal; the ends of the tubes expanded into round boxes having stayed heads connected to the horizontal drum. The course of the gases was back and forth lengthwise of the tubes—in fact, a Heine boiler of earlier date without any hand-hole openings opposite the tubes.



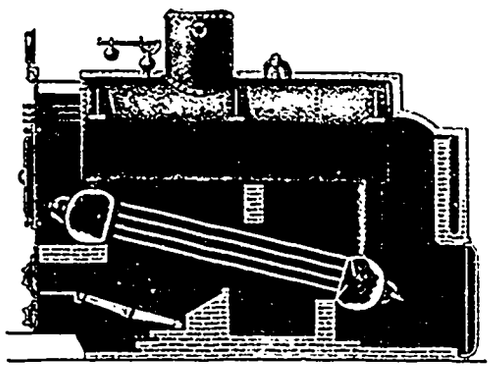
NO. 48. 1870—TRADE CIRCULAR.

Cut off Maynard's top drum, place one large tube at the top of the bank for a return circulation, lengthen the front water box, and we have MEISSNER'S boiler.



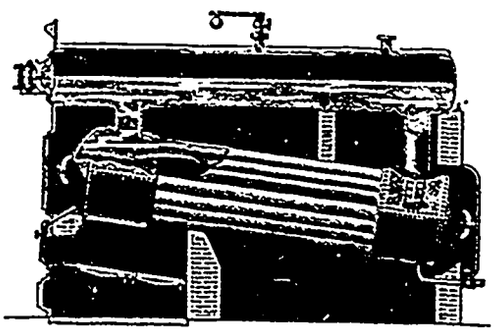
NO. 49. 1882—TRADE CIRCULAR ISSUED AT PHILADELPHIA.

THOMPSON took one of Firmenich's sections, placed it in an inclined position, *à la* Maynard, beneath a return tubular boiler, and connected them at front and rear by a supply and delivery pipe.



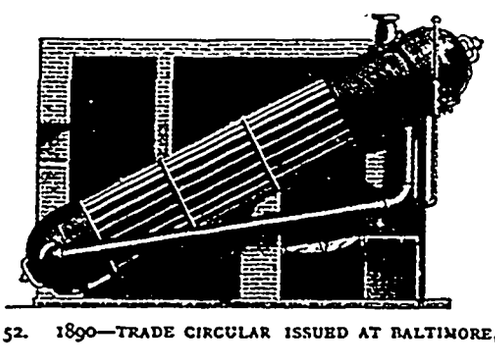
NO. 50. 1884—TRADE CIRCULAR.

Substitute a round neck for the flanged neck at the front of Maynard's design, and we have the Woon boiler.



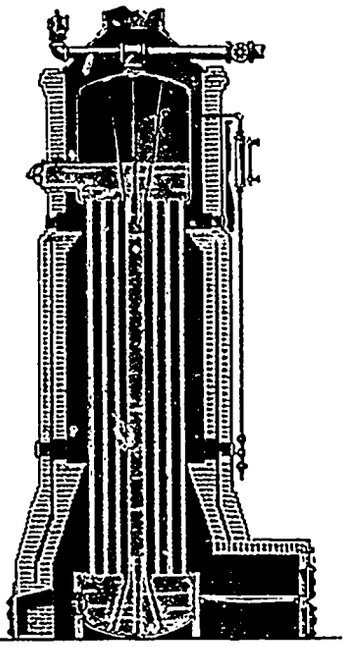
NO. 51. 1889—TRADE CIRCULAR ISSUED AT CONSHOHOCKEN, PA.

Put Meissner's return pipe outside, re-christen it, and we have BLACK'S boiler.



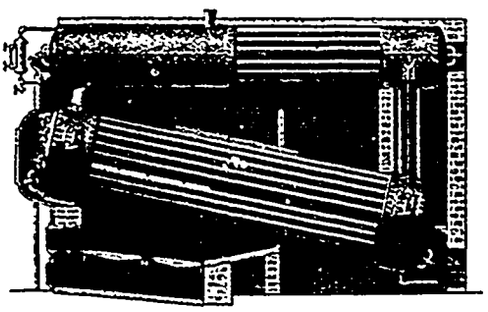
NO. 52. 1890—TRADE CIRCULAR ISSUED AT BALTIMORE, MD.

Stand Meissner's boiler vertically, put the return pipe in the middle instead of at the side, and we have COOK'S boiler.

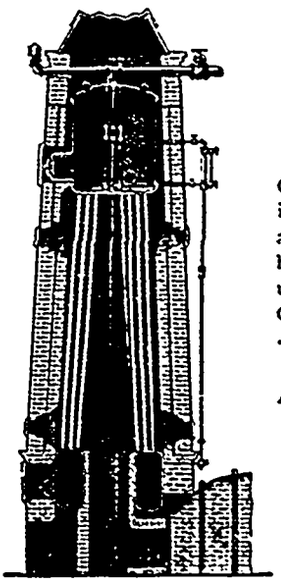


NO. 53. 1891.—TRADE CIRCULAR ISSUED AT MANSFIELD, O.

HENSHALL took Meissner's boiler for a top drum, and Cook's boiler for a lower drum, placed them in the same relative position as Maynard's two principal units, and connected them at the ends by circulation pipes.

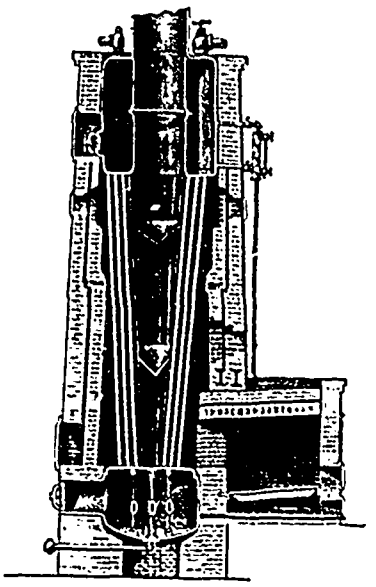


NO. 54. 1892.—TRADE CIRCULAR ISSUED AT TREMONT, PA.



Take the large central pipe out of Cook's boiler, cut off a piece and use it for a flue through one of the drums, and we have the CAHALL double-header boiler, built to run either end up, reminding one of Zekle in "The Courting":

"He stood a spell on one foot fust,
Then stood a spell on t'other;
And on which one he felt the wust
He couldn't told ye nuther."

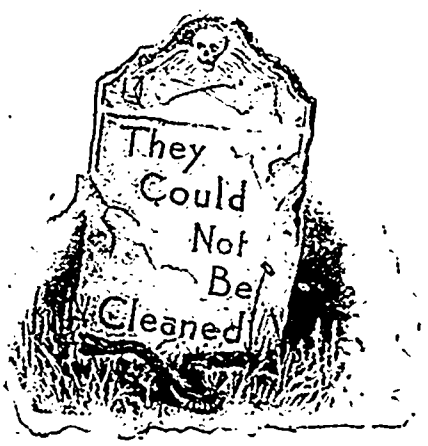


No 55. 1892—TRADE CIRCULAR ISSUED AT MANSFIELD, O.

MORAL.

When one considers that the boilers described are only a small fraction of the different kinds offered to the public as "self-cleaning," is it any wonder that for many years patent boilers were classed with patent medicines and lubricating oils by the people who were bitten?

As the "re-inventor" is a perennial bloomer, it will be well to check his future designs by all available information, and avoid investing money in boilers that fail because



ANSWERS TO CORRESPONDENTS.

DELMOTTE FRERES, Tournai, Belgium.—We have forwarded you by post the additional information about the inventor of the electrical organ, which was omitted from the translation of our article that you saw in a German paper.

W I., Parry Sound.—(1) The secretary of the Board of Examiners of the Ontario Association of Stationary Engineers is A E. Edkins, 139 Borden street, Toronto. (2) We are sending you the address of a firm which can supply your wants.

E. P I., New York.—Have sent you privately address of a gentleman who will fill your requirements to the letter

G A LITTLE, Lindsay, Ont.—The terms upon which THE CANADIAN ENGINEER is supplied to newsdealers have been sent you by post

THE WINNIPEG RIVER DAM.

Editor CANADIAN ENGINEER

SIR,—In your November number, page 193, is an article on the Keewatin Power Company's dam on the Winnipeg River, which is very misleading and should be corrected No lands have been damaged in Minnesota or elsewhere The big dam has been built, but the stop-logs have never been put in, and as the dam is below a fall about 15 feet below the level of the Lake of the Woods, the water of the lake has never been affected by the building of the dam a single inch Even when the dam is closed up the lake will not be above high water mark. At present the Lake of the Woods is unusually low.

Yours truly,

Rat Portage, Nov. 27th, 1895 RESIDENT.

KEROSENE MOTORS.

Editor CANADIAN ENGINEER

SIR,—Having read your very able and useful article on kerosene motors in the issue of September last you were good enough to send me, I wish to point out one or two slight inaccuracies in that article

1 All the French petroleum carriages use gasoline, specific gravity about .63. The word kerosene throughout the article should read gasoline The only road carriage in Europe, and I believe in the world, using kerosene for motive power, is the Roots Petrocar, made by Roots & Venables, 100 Westminster Bridge Road, London. This Petrocar carries two persons, and will travel 13 miles an hour on a fairly level road, and ascend steep gradients at 3½ to 4 miles an hour Its weight, without the two passengers, is 5½ cwt The motor alone weighs 2 cwt. 5 lbs. It costs only one penny for each six miles run oil at 6d per gallon, as in England, its motor of 2 h.p consumes 1.21 pint per brake h.p. per hour It will be remembered that benzoline, a less dangerous liquid than gasoline, has a spec. gr of 7 and kerosene sp. gr. 825.

Only the least successful of the French petroleum or gasoline motors employ the method described, *i.e.*, that of a friction disc, and pulley for changing the speed of the motor. All the successful ones use gear wheels for changing the speed, and chains for transmitting the power to the carriage axle, further particulars of which I shall be glad to give if desired.

3 The Roots kerosene motor is from 50 p.c. to 75 p c. lighter for power than any other in Europe, the nearest approach being the French gasoline motors.

4. Your article says, "In England large firms are *preparing* to engage in their manufacture" The Roots oil engine in its horizontal form for stationary engines, for all power purposes, and in its vertical form for yacht and launches, has been on the market in Great Britain for nearly three years. It has had a large sale in Great Britain, India, Australia, New Zealand, China, Japan and S. Africa. The yacht and launch engines, indeed, have practically a monopoly in Europe owing to their great power for small size and weight, their simplicity, safety, and comparative freedom from attention while running. The Roots is the only oil engine, as far as I am aware, in the world driving a locomotive crane.

Yours, faithfully,

13 Cedar Gardens, Putney, England J. D. ROOTS.

STEAM BOILERS AND FEED-WATER.

Editor CANADIAN ENGINEER:

SIR, The proper method of furnishing feed-water to steam boilers is a subject of much discussion, and a diversity of opinions exists among engineers as how to obtain the best result.

There are several ways to connect the feed-pipe, all of which have their advocates and good qualities, but according to the writer's experience, none are entirely without fault. The method almost universally adopted for supplying water to a battery of boilers is by connecting feed-pipe to the mud-drum In some respects this is a very good way; it is reliable and furnishes water of practically the same temperature to every boiler in the battery. At the same time, however, it does away with the fundamental principle of the mud-drum As the drum is, or should be, arched over with fire-brick, the water contained therein is affected but very little by the action of the heat, and seldom reaches the boiling point, it therefore (when not disturbed by an inflowing current from the feed-pipe) becomes practically a dead body of water into which all the sediment and impurities of the water above may settle But it is simply impossible for the sediment to find its way into the mud-drum against a strong and constantly rising current, as in the case when boilers are fed through the mud-drum It is a matter of experience that the mud-drums of boilers fed in this way are generally very free from deposits of any kind. Another method is to pass the feed-pipe through the top of boiler and let it extend about midway between the shell and water-line. Underneath the feed-pipe a cone is placed, upon which the water falls and is thrown out into the surrounding steam in the form of spray, before it reaches the water below. Boilers fed in this way may be severely criticised on account of furnishing wet steam to the engines, when in reality their construction is such that they are capable of generating practically dry steam, and the whole trouble lies in the fact that minute particles of water from the cone are caught up by the rising current of steam, and it thus becomes wet or saturated steam.

If, however, we continue the pipe from the top of boilers to several inches below the water-line, we shall do away with the possibility of wet steam from that source, and at the same time approach very near to the best possible method of furnishing feed water to our boilers. YOUNGSTER.

GRAND TRUNK RAILWAY.

THE HALF-YEARLY MEETING.

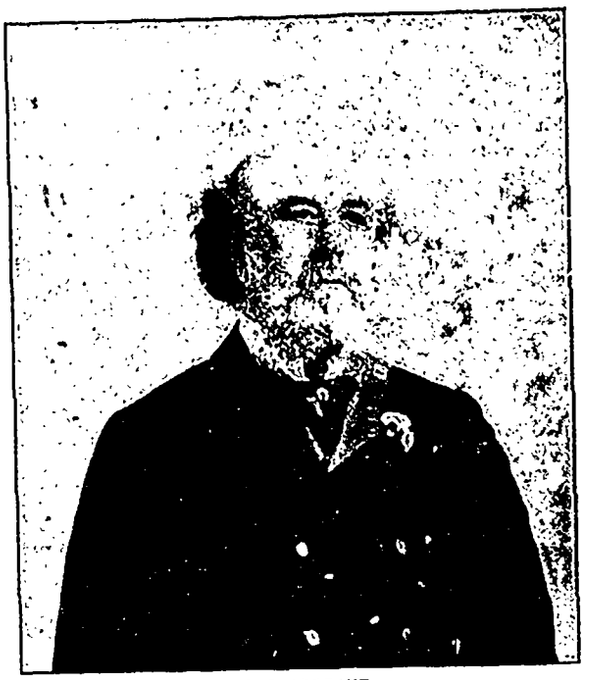
At the half yearly general meeting of the Grand Trunk Railway Company, held on the 30th of October, in London, England, the new board presented the report of the operations of the past six months The capital account during that time, Sir Charles Rivers Wilson, the new president, reported, had been increased by the issue of $1,000,000 4 per cent. debenture stock. On July 1st, $2,100,000 4 per cents. had been issued at 80. These transactions had improved the credit of the company, both in Canada and England When the present board assumed office, they found themselves in charge of a railway 4,000 miles long, with gross earnings of $22,500,000, a capital of $325,000,000, of which $220,000,000 received no dividend, and net earnings which were $485,000 less than sufficient to pay the interest on the bonded and debenture debt.

Sir Charles said that the board had no hesitation in arriving at the conclusion that the general lines of their policy must be—first, a firm determination to resist the temptation of being led into the acquisition of other lines, or the extension of those now in the possession or under the control of the company, unless in such exceptional cases or under such special conditions as would ensure a profitable result to the transaction, second, a system of the strictest economy in all branches of the administration compatible with the maintenance of the roads in a state of efficiency; and, third, constant supervision over the staff of the company, and special care in the selection of the principal officers, upon whose intelligence, zeal and integrity the prosperity of the company so largely depended.

Upon observing how badly some of the lines in Michigan were equipped, 1,000 new freight cars of the largest capacity had been purchased by the board, and there was already a moderate increase in the earnings of the Chicago and Grand Trunk. While not wishing to reflect on the policy pursued by his predecessors, the president pointed out the error which had been made in grafting on certain lines which had not yielded expected profits. Since no plan could at present be devised for disencumbering the Grand Trunk of these subsidiary lines, the board would do their utmost to work them to the best advantage.

A still greater cause of loss than that of unprofitable branch lines was the fluctuation and depression of rates. Agreements had been entered into and tariffs had been framed for common observance, but the rivalry and competition among the companies had been such that in no instance had any one of the many agreements been permanently observed. The board had willingly co-operated in the last effort of the trunk lines to come to an agreement of a binding character. The object sought was the erection of some quasi-independent machinery, not only with authority to make rates for joint observance, but to enforce them—a point where all former agreements had broken down. He hoped and believed that this important result had been achieved. An agreement had, after prolonged discussions by the experts of the different lines, been adopted by the presidents of the following nine great trunk systems: Grand Trunk, Vanderbilt, Lackawanna, Lehigh Valley, Erie, Pennsylvania, Baltimore and Ohio, Chesapeake and Ohio, and Wabash. The importance of this agreement to the Grand Trunk could hardly be exaggerated, and taken in connection with the revival of business, which now seemed assured, held out to the shareholders the best-founded expectations that had been offered to them for many a day. At the close of the meeting a resolution was carried unanimously electing Mr. Seargeant a director upon his retirement as general manager on January 1st, 1896.

Lewis James Seargeant, who is about to retire from the management of the Grand Trunk Railway, is a man of strong character and determination. Born in Trowbridge, Wiltshire, England, he was early identified with the railway business, and has been a prominent figure in the railway world, both in England and America, for many years. He occupied various offices in connection with the English railway service, which gave him a wide grasp of the details necessary to the successful management of a railway. Prior to his acceptance of the position of traffic manager of the Grand Trunk in 1874, he was chief executive officer of the Cornwall and West Cornwall Railways, and of the Bristol and Exeter, and South Devon and Cornwall Joint Committee, an organization intended to harmonize the working of competitive lines. In this he was successful, framing agreements for the division of traffic, which led to the establishment of relations satisfactory to all the interests concerned. In 1874, he was offered and accepted the position of traffic manager of the Grand Trunk Railway of Canada, then a new office. In this, Mr. Seargeant again showed his capacity for management, organizing the staff with great foresight and judgment. During his career as traffic manager, Mr. Seargeant worked hard to assimilate the interests of the railways of this continent with a view to the avoidance of "rate wars," and it was largely owing to his exertions that the Trunk Line and Central Traffic Associations were formed. As a literary man, Mr. Sergeant has contributed articles of considerable value on various subjects in connection with railway matters, many of which are to-day quoted as authorities. In 1890, upon the resignation of Sir Joseph Hickson, Mr. Seargeant was appointed general manager of the Grand Trunk and President of the Chicago and Grand Trunk, and Detroit, Grand Haven and Milwaukee Railways In this office, as in the others, the impress of his ability is shown:. no better evidence could be afforded of his capability than the manner in which he brought the company through the recent severe commercial depression. When railways by the score were going into the hands of receivers, the Grand Trunk's credit was not at any time impaired, although, of course, it suffered from depletion of traffic in common with other lines.



L. J. SEARGEANT.

Mr. Seargeant has had a long and honorable career in this country, and it is a fitting compliment that at the termination of it he should be elevated to the board of directors. It will be of great benefit not only to the company, but to Canada. No one is more capable of expressing an opinion on the multitudinous questions likely to arise in connection with the management of the property than the subject of our sketch. At a meeting of the board of presidents of the trunk lines recently held in New York, Mr. Seargeant announced his resignation of the general managership and acceptance of a seat on the London board. Chauncey Depew, president of the New York Central, and Mr. Ingalls, president of the Chesapeake & Ohio Ry, both paid eloquent tributes to the sterling character and straightforward manner in which he had dealt with the various questions coming before that body. In a resolution of regret at his leaving, the following high compliment was paid to Mr. Seargeant: "He has brought to the discussion and decision of the important questions which are constantly before us such ability and fairness that he has materially assisted in our deliberations. He carries with him to his new position our cordial regard and best wishes for his health, happiness and success."

A genial, open-hearted Englishman, Canadians will be sorry to lose his familiar face, but it is a source of gratification to know that he will still be in a position to help forward matters in which the Grand Trunk is concerned in Canada. Mr. Seargeant will leave for England to assume his new duties on the board of directors about the beginning of the year, but before leaving a banquet will be tendered to him by the Board of Trade and leading citizens of Montreal.

THE NEW GENERAL MANAGER.

Charles M. Hays, the new general manager of the Grand Trunk Railway, is a man whose first appearance accounts for and justifies the glowing things that have been said of him since his appointment was first announced. A correspondent of the Toronto *Globe* thus describes him. "Of medium height, well set up, in

the prime of life, with a keen eye and an open countenance, Mr. Hays, by the ease and repose of his manner, suggests the man of power, who could not be easily moved from a position in whose tenability he believed He has had a large experience of men and things in the course of a busy life There is not a prominent politician or railway man in the United States with whom he is not on terms of intimacy."

It is in his familiarity with public men and affairs across the lines that the G.T.R looks to find one of the new manager's strongest points One of the high officials of the road is reported to have said that a Canadian might have been as able a manager as the man Sir Charles Rivers Wilson had just appointed, but there must always be questions, many of them complicated, arising between the Canadian railways and those of the United States, and a man who had experience of the railway system of the United States, and is familiar with all the phases of the questions which might come up for discussion, is naturally the man to remove acerbities, to deal with conflicting interests and to promote a better feeling between all the great railway interests.

A charming story connected with the way in which the appointment came to be made has been given to one of the Chicago papers by a railway man in that city At one of the president's meetings in New York, Mr. Hays took part in the discussion of an important matter He did it in that terse, outspoken way which wins him friends wherever he goes As he went directly and convincingly into his subject the new president of the Grand Trunk leaned over to the vice-president and said, "That's the man we want, Mr Price," and a few days later Mr. Hays was offered the general management of the company

Mr. Hays was born at Rock Island, Ill., May 16th, 1856. He entered the railway business November 10th, 1873, when he went to work as a clerk in the office of the Passenger Department of the Atlantic & Pacific at St. Louis. From January to March of the next year he held a more lucrative position in the auditors' office, and from then until January 1st, 1877, he was a clerk in the office of the General Superintendent of the same company. He then entered the service of the Missouri Pacific, and was secretary to the general manager until April 1st, 1884, when he accepted the position of secretary to the general manager of the Wabash, St. Louis & Pacific On October 1st, 1886, he was promoted to be assistant general manager of same road, and on July 1st, 1887, he was made general manager of the Wabash Western Railroad, which position he held until July 1st, 1889, when he was made general manager of the reorganized Wabash Railroad system. On February 1st, 1894, he was also elected to the office of vice-president, filling the dual position of vice-president and general manager.

The Grand Trunk Railway has recently had constructed a freight locomotive of somewhat novel type. It is a compound Mogul, 19 and 29 x 26 x 5 feet 2 inches, of the ordinary broad gauge, and burns bituminous coal Total weight of the engine and tender, 199,388 pounds, total length over all 56 feet 7¼ inches. The boiler is a straight back, steel barrel, 11 feet 2½ inches long, of half-inch plate, inside diameter of smallest ring 4 feet 2¾ inches; the tubes are charcoal iron, outside diameter 1¾ inches. The maximum working pressure per square inch is 180 pounds. This is the first compound engine in Canadian railway history

THE NEW SMELTING WORKS AT HAMILTON.

The new iron smelting works at Hamilton are approaching completion, and are expected to be in full blast early in the incoming year They have been in course of construction for the past three years The plant will be in every respect up to date, with modern furnaces, machinery and appliances, and both railway and shipping connections direct to the works, and will be capable of producing 3,000 tons of cast iron pig per month. The blast furnace, hot air ovens, gas fired steam boilers, forced blast engine, steam hoists and handling tackle are built and erected from the most recent designs, so as to economise as far as possible the labor of the employés, and improve the quality of the output. About 300 tons of iron ore, 120 tons of coal or coke, and about 30 tons of limestone and other materials, will be required daily, including Sundays, to keep the works in operation. A very large proportion of the ore will be mined in Canada; still there will be a considerable quantity imported to get the grades of iron required by the trade. The company will have their own locomotives to handle the materials at the works, having provided every facility to receive the ore, etc., from vessels or from their railway connections, either incoming or outgoing. These works stand nearly in the centre of the iron-consuming district, and the company claim that they will be in a position to supply iron with greater advantage to the consumer than any of its Canadian competitors. It will be the means of centering and distributing a large amount of money in Ontario that would leave it for imported iron, and as Hamilton is a manufacturing centre using a large quantity of iron, it will have a tendency by reason of the cheapness and proximity of these works to bring other iron-using industries to this city.

Those capable of judging of the financial prospects of this venture are confident that if the present Canadian fiscal laws dealing with the importation and the manufacture of iron in Canada remain as they are at present, there can be no doubt of the work being fairly profitable It is expected that $60,000 worth of iron will be produced monthly when the works are in operation. The gentlemen at the head of this organization are all capitalists who have made a success of their own business and are far-seeing business men, it is to be hoped that their sanguine anticipations will be fully realized, not only for their own advantage, but that others may be encouraged to extend the iron manufacture in this country also.

DEEP WATERWAYS COMMISSION.

The action of the President of the United States in appointing commissioners to inquire into the whole question of deep water navigation of the region of the great lakes, has called for similar action on the part of the Dominion Government, and T. C Keefer, C.M.G., Thos. Monro, C.E., and O A. Howland, M.L.A, have been appointed as the Canadian members of the Joint Commission. The duties of the Commission are outlined in the Act of Congress as follows: "The President of the United States is authorized to appoint three persons, who shall have power to confer with any similar committee which may be appointed by the Government of Great Britain or of the Dominion of Canada, and who shall make inquiry and report whether it is feasible to build such canals as shall enable vessels engaged in ocean commerce to pass to and fro between the great lakes and the Atlantic Ocean, with an adequate and controllable supply of water for continual use; where such canals can be most conveniently located; probable cost of the same, with estimates in detail; and if any part of the same should be built in the territory of Canada, what regulations or treaty

arrangements will be necessary between the United States and Great Britain to preserve the free use of such canal to the people of this country at all times, and all necessary facts and considerations relating to the construction and future use of deep water channels between the great lakes and the Atlantic Ocean."

T. C. KEEFER, C E.

Thomas Coltrin Keefer, C M G, is a son of the late George Keefer He was born in 1821, and educated at Upper Canada College, Toronto; is an eminent canal and railway engineer; was employed on the Erie and Welland Canals in 1838-45, and as chief engineer of Ottawa River works in 1845-8; in 1849 gained Lord Elgin's prize for the best essay on "The Influence of the Canals of Canada on her Agriculture," and published "Philosophy of Railways", in 1850 was employed with the surveys for the navigation of the rapids of the St Lawrence, etc., and was sent by the Canadian Government to assist U S Consul to report on Canadian trade with the United States; in 1852 went to New York to assist in a second report on the same subject; these reports led to the Reciprocity Treaty of 1854; in 1851 made preliminary surveys for the Grand Trunk Railway, and for the railway bridge over the St. Lawrence at Montreal, and was appointed Canadian Commissioner for International Exhibition at London; was nominated Engineer to Montreal Harbor Commissioners, 1853; has constructed water works for cities of Montreal, Hamilton, and Ottawa, and been largely engaged in harbor and bridge engineering; was some time Chief Engineer to Railways in Upper and Lower Canada: Commissioner to International Exhibition, London, 1862, and Executive Commissioner for Paris Exhibition, 1878, and a member of International Jury for Architecture and Engineering (Officer of Legion of Honor), in 1869-70 published a series of letters advocating the Canadian Pacific Railway; in 1886 was Vice-President of American Society of Civil Engineers of New York, and Chairman of Royal Commission at Montreal on ice floods, in 1887 was President of Canadian Society of Civil Engineers, and in 1888 President of American Society of Civil Engineers; elected a member of Royal Society of Canada, 1891, is a M.I C E., London; created C.M.G. in 1878.

THE CANADIAN ENGINEER gave a biographical sketch of Thos. Monro, with a portrait, in the issue of April, 1895, to which the reader is referred.

Oliver Aiken Howland is a son of Hon. Sir W. P. Howland, K.C.M.G., C.B., P.C., the first Lieutenant-Governor of Ontario, after it became a Province of the Dominion. He was born at Lambton Mills, in 1847. Educated at the Upper Canada College, Toronto Model Grammar School and Toronto University. He entered upon the study of law in 1870; was admitted to the Ontario bar in 1875, and is now a member of the legal firm of Howland, Arnoldi & Bristol, Toronto. Mr. Howland has devoted considerable attention to literature and art. He is a contributor to the *Week*, the *Canadian Magazine* and other current magazines, and is the author of "The New Empire," a valuable work published in 1891. He was elected president of the International Deep Waterways Association (at the Toronto Convention), and re elected to the position at the Cleveland Convention this year In June, 1894, he was elected member of the Provincial Parliament for South Toronto. In his legal capacity Mr Howland has been engaged in celebrated cases before the Privy Council and other high tribunals

THE CHICAGO HORSELESS VEHICLE RACE PRELIMINARY TESTS.

(From a correspondent of THE CANADIAN ENGINEER.)

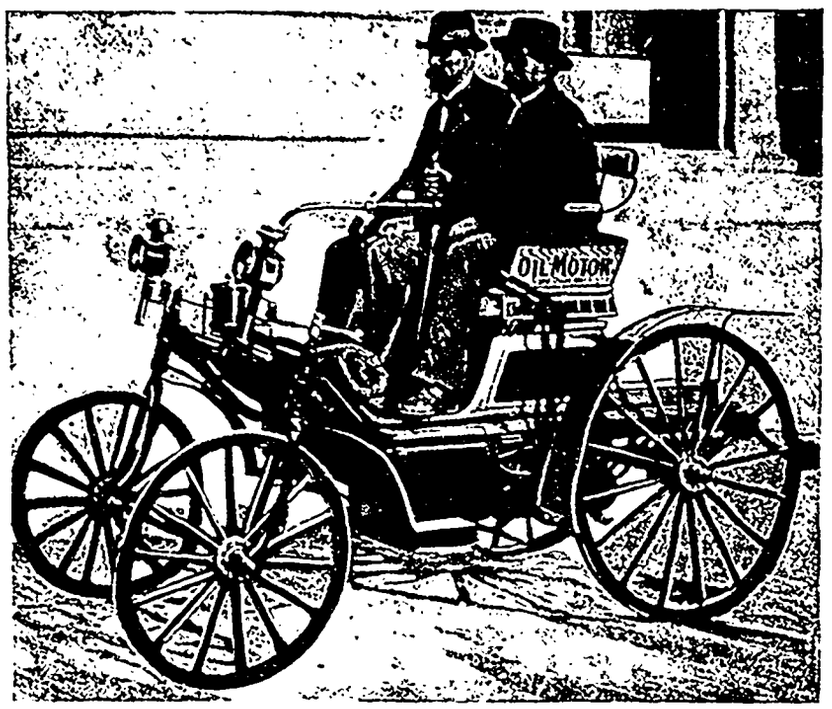
Notwithstanding the very unfavorable condition of the weather, it was demonstrated on the 26th Nov., that a carriage without horses can be driven through ten or twelve inches of snow, slush and mud, at a good rate of speed. The carriage of H Mueller & Sons (the same that ran about 100 miles on the 2nd inst., and won the $500 prize), traveled over ten miles of roads in the most wretched condition, taking its chances with every class of road vehicles, also cable and trolley and horse cars, stopping 20 times at street car crossings, yet, despite these delays, and others along the route, it made this trip of over ten miles in less than one hour and a half. This trip settled the question of winter travel by kerosene motor cars, as the same could not have been done in the same time by a conveyance run by horses. When this moto-cycle arrived at Wabash avenue, where the crowd of moto-cycle owners and experts were assembled to witness the testing of the machines, they one and all acknowledged that the question of winter traveling by these carriages was settled in their favor. Many parties had advanced the argument that they were only fit for good roads and favorable weather, but this settles it" was the general remark of those best able to judge of the result achieved, while it was stated that if a moto-cycle can go over the ground in such snow, slush and mud, there is not one now in the building preparing for the contest on the 28th that cannot go over the course on Thursday. One of Morris & Salums' electrobats also made a passage through the snow and slush, it also got through successfully. The French Roger machine imported from Paris was introduced by H. H. Macey & Co., of New York. This is a mate to the machine that left New York city for Chicago last week. It proved its ability to navigate over snow-covered roads on its journey towards Chicago It made a brave fight against snow and rains. It climbed the Peekskill mountains, and went up and down hills nearly as steep as the roof of a house. Lundre and Sumners, the engineering experts, made thorough and exhaustive tests on Monday, the 25th inst., of the moto-cycles. The tests on a Break machine were witnessed by a large number of people. Among those tested were electric vehicles and moto-cycles run by gasoline and kerosene. The results of these tests have not been made public at the time of writing. People from all parts of the United States, and many from Canada and Europe, have gathered to witness the tests.

THE PROPOSED HORSELESS CARRIAGE CONTEST IN CANADA.

(Correspondence of THE CANADIAN ENGINEER.)

It has become evident that the horseless carriage test in Chicago was fixed at too early a date. Even the extension of time, the 28th November, left some of the most prominent builders too brief a space in which to complete their new machines. Further, the lateness of the season is now against a satisfactory trial of the carriages, therefore the proposition made in the ENGINEER to have a time appointed for tests in Canada next summer bids fair to be more successful, provided the work is taken in hand immediately. The competition should be open to all those wishing to participate in it. Parties building kerosene, gasoline and other motors that would be a unit in themselves, not deriving power from any outside source, should exhibit also. Probably by that time the new motors suggested to run by liquid acetylene gas may be to the fore also. If these proposed motors will be as economical of power as they are said to be of light, one cubic foot of this gas giving as much as twelve cubic feet of common gas, a great advance would be made. Further, the material from which acetylene is made can be had in unlimited quantity at little expense for all time, while that of kerosene or gasoline is of uncertain quantity, and will no doubt be increased in price in the near future. It may also be possible on the occasion of the test to interest some of the English firms sufficiently to exhibit their remarkably economical gas engines with gas apparatus attached. These engines are guaranteed to run with less than 1 lb. of coal per brake horse-power per hour, and can be made of any desired power. There are now a number of makers of these engines in England, France and Germany

It has been proposed also that an exhibition should be held in Hamilton during next summer This would no doubt be a greater success if held both in Toronto and Hamilton, as the cost of transportation between these centres would be very moderate, the railway companies gaining an advantage on their increased passenger service The expense of this need not be great, the vehicles can enter the fair ground direct from the railway, or they could be run by their own power through the city to the grounds, an entrance fee for the public to the grounds of 25 cents being charged, as also a reasonable charge on each of the moto-cycles to be in the contest It will be important that the judges and managers of the competition will be men in which the public have confidence both as regards mechanical ability and knowledge of what a vehicle for this purpose should be. The conditions of the test, together with all particulars of who the judges, etc, proposed will be, ought to be published at the earliest opportunity



OIL MOTOR HORSELESS CARRIAGE.

CANADIAN ASSOCIATION STATIONARY ENGINEERS.

The Association de Societe Mutuelle des Ingenieurs Mecaniciens had their first annual supper at their hall on Bonsecours street, on the 28th of October. President R Droum occupied the chair, and on his right sat Joseph Lessard, honorary president, while on his left was Louis Guiyon, manufacturers' inspector, and Mr. Langlois, past president, Mr. Mann, architect, J Guilmette, and Eph Valiquet, vice-president, and Damase Morin, boiler inspector The hall was gaily decorated and an orchestra provided music for the guests. After a good supper the toast list was taken up and a very happy evening was spent. The president read letters of regret from John J. York, Wm Laurie, Louis Lucien Huot, and M. Bonin.

A L.

At the regular meeting of Hamilton No. 2, C A.S.E., held Oct 10th, 1895, the following resolutions were adopted —Whereas it has pleased the Almighty in His Allwise Providence to remove from our midst, our beloved Brother Duncan Robertson, be it therefore *Resolved*, that while we submit to the will of the Divine Providence, we sincerely mourn with his family, the loss of one so dear to them. *Resolved*, that we tender our sincere sympathy to them in their sad bereavement, that a copy of these resolutions be transmitted to the family of our late brother, and that a copy be spread upon the minutes of the association, and another forwarded to the press for publication.

E. C Johnson, President.
Wm. Norris, Cor. Sec.

I am glad to report that Hamilton No 2 is getting along very nicely. Our meetings are being very well attended, and everything looks toward a very lively winter. We are starting our regular "instruction meetings," each second meeting in the month, and I will do my best to give you full reports of the proceedings thereof. This association has purchased an indicator for the use of its members, which we expect will be of no small value. We are much pleased with the choice of the executive president in appointing Bro. Pettigrew of this city as successor to the late Bro. D Robertson, as executive treasurer This association wishes to express its thankfulness to the brothers of Ottawa No 7 for the kindness shown towards our delegates, and all join heartily in wishing them every prosperity W. Norris, Rec.-Sec

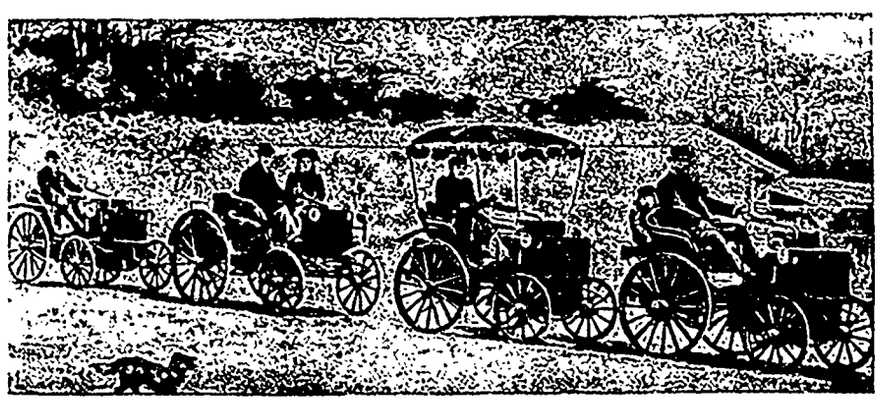
Hamilton, Nov. 22nd, 1895.

The annual dinner of the Toronto Branch, C.A S.E., which was held at the Richardson House, on the 20th Nov., was a decided success The attendance was so large that the capacious dining hall of the Richardson was twice filled, and so heartily was the dinner enjoyed that it was nearly eleven o'clock when the toast list was taken up. Wm. Lewis, president, occupied the chair, and on his right and left sat Mayor Kennedy, John Galt, C.E., and Prof. Galbraith. Letters of regret were read from Robt Mansergh and his son, the English engineers, E. H Keating, city engineer; G. C. Robb, of the Boiler Inspection and Insurance Co.; and O. B. St. John, of the Marine Engineers' Association, who were prevented by various circumstances from attending. After the toasts of the "Queen" and "Canada, Our Home," that of "Toronto" was proposed, and replied to by Mayor Kennedy, who referred to the fact that Toronto was becoming a favorite city for American conventions. He complimented the association on the policy they had adopted of mutual help and education, and the avoidance of meddling in labor disputes. "The Manufacturers" was replied to by John Mayne, who spoke of the great advance he had noticed among the members in the theoretical knowledge of boilers—with which business he was connected—compared to what was known by the average engineer years ago. Speaking of confidence in the state of trade, he enjoined a hopeful view of matters. The very faith in good times tended to make times good, and if we got up and did something, we would find something to do. Chas Smith, of the Ontario Engine and Pump Co., also replied, expressing his pleasure in being present and in noting the increase in the membership of the association Frank H Wright, of Augustus Newell & Co., was called on, and spoke of the responsibilities of the engineer, who had the lives of thousands in his care. He regarded the work of the engineer as next in importance to the manufacturer, and took pleasure in sitting beside his own engineer at this table. (Cheers.) Dr Orr, of the Toronto Technical School, replied to the "Educational Interests," and spoke of the wide reputation of the educational institutions of Toronto, where opportunities for advancement were open to the poor man's son as well as the rich He alluded to the noble pioneer work done by Messrs Wickens and Wills in founding the Toronto Technical School, which was becoming such a great success, and he would like to see a trade school now established in connection therewith. Prof Galbraith, of the School of Practical Science, was called on, and said that when he compared the small attendance at the first dinner of the association with the large gathering here, it showed that the stationary engineers were by no means stationary. When the Technical School was first started, he advocated a fee of $1 per head, as he was afraid people would not value a thing they got for nothing; but he was delightfully disappointed with the results of the free system, and the school was going to be a great success. The city council had done well for it, but he reminded the mayor that they would be expected to do more. "The Executive Council" was replied to by E J. Philip, executive secretary, who, alluding to Mr. Mayne's remarks on the association's progress, said that a few years ago there were members who could not add up a column of figures, and now they could figure out the strength of the "double butt strap triple rivetted" boiler humorously alluded to in the bill of fare. This progress was due to the educating influence of the C.A.S.E. One noteworthy fact was that they had made more headway in membership during the recent hard times than before, and the rooms were full during the summer sessions, while those of other associations were more or less empty The members always found such men as Prof. Galbraith and Mr. Galt always ready to help them, and they appreciated this valuable assistance. The "Sister Societies" was responded to by A. B Smith, president of the Canadian Electrical Association, who extended the fraternal greetings of that association, and trusted that though this was the first time, it would not be the last when these

greetings would be exchanged. Mr Bliss, of the Amalgamated Society of Engineers, was also called on, and said the organization to which he belonged had a membership of 80,000, with annual receipts of $1 420,000 from all sources. The "Press" was replied to by E. B Biggar, of THE CANADIAN ENGINEER, and C. H. Mortimer, of the *Canadian Electrical News*, who expressed their wish to do all in their power to forward the interests of the association. In reply to the former, who suggested the formation of a library of engineering works of reference, Mr. Philip said the association had engaged new rooms of their own for that purpose, and hoped to have a beginning made during December. The gathering broke up at 2 a.m. The entertainment committee consisted of E. J. Philip, G. C Mooring, Samuel Thompson, Jas. Huggett, Thomas Eversfield and A. E. Edkins, who did their work well. The menu card contained several humorisms such as "steam-boiled cod-clinker sauce—scales removed by Sutton's compound," etc. The musical part of the programme was supplied by Messrs. George Grant, Thomas Seaton, William McLean, Charles Watson and Albert Flint.

MONTREAL NO. 1 MARCHING ON

I beg to enclose you a short account of what Montreal No 1 has been doing during the month. In the first place, President York read a paper on "What must I do to Succeed as an Engineer?" It was one of the most instructive papers, or perhaps it should be called a lecture, ever presented to the members. It was full of good advice, and pointed out many of the stumbling blocks in the way to success; not only did it point them out, but it showed the manner in which they must be overcome. At the conclusion it was very evident that the paper had made a deep impression on many of those present, judging from their remarks. The following week Bro. Harry Nuttal read a paper on "The Purchase of a Steam Boiler." He took for illustration an actual transaction where a steam user called for tenders for a 100-h.p. boiler, the makers to furnish their own specifications. These were tabulated and spread on the blackboard, and the vast difference, not only in the actual price, but in the dimensions and detail of this supposed 100-h.p. boiler, was a surprise to many of those present. Bro Nuttal then proceeded to recount the arguments that each



PROCESSION OF MOTO-CYCLES IN PARIS.

maker advanced in favor of his boiler, after he had been shown the prices and specifications of the others, some of which were really amusing. Bro. Nuttal then stated which boiler was actually purchased, that is, without the advice of an engineer, and then the members were asked to discuss the matter and say whether this man made a wise choice. Several members spoke on the subject, and it was decided that he had not got the right boiler. At the last meeting Bro. P. McNaughton gave a very able paper on "Evaporation in Practice and in Nature," during which he pointed out that the action of steam and water in a boiler was analogous to rain, dew, mist, etc, that was evaporated by the heat of the sun only to condense and return to the earth again, when night came and there was no heat. At the conclusion of his paper Bro. McNaughton was the recipient of many compliments and a hearty vote of thanks was tendered him. I must also tell you that Montreal No. 1 is still making many new friends, on the evening of the 22nd the president, on behalf of W. T. Bonner, Canadian agent of the Babcock & Wilcox Co., presented the association with several handsome photographs of their offices in the Board of Trade Building and of their high pressure boilers; and also a full size Stratton Steam Separator, with one side skilfully cut out to show the interior arrangements, it is also equipped with all the necessary valves and gauges, and mounted on an ebony frame bearing an engraved brass plate showing when it was presented. The members naturally felt very proud of this valuable addition to our collection, and several members spoke in the warmest terms of Mr. Bonner, as this is not the first time he has thought of Montreal No. 1. After the enthusiasm had somewhat subsided, the association unanimously passed a hearty vote of thanks to Mr. Bonner. During the coming month there are no less than five applications to be considered, some of them from very prominent engineers, so you will notice that we are still marching on to success.

B. A. YORK, Secretary.

LITERARY NOTES.

The "Architects' Directory" for 1895-96 has just been issued by W T Comstock, 23 Warren street, New York. The directory is carefully prepared, and contains a complete list of Canadian and United States architects. The effect of the recent depression is seen in the number of names which have disappeared during the last two years.

The first edition of the "Stationary Engineers' Gazetteer of Illinois, 1895," is to hand. It contains an alphabetical list, with addresses, of chief engineers of all steam plants throughout the State. It also gives the make and capacity of the engines, boilers, pumps, dynamos, electric lights, elevators, etc. For the convenience of shippers, a table gives the most direct route to any part of the State Stationary Engineers' Gazetteer Association, 159 La Salle street, Chicago

"Alternating Electric Currents," by Edwin J. Houston, Ph.D., and A. E. Kennelly, Sc D., is the first of ten volumes of an "Elementary Electro Technical Series" for popular use. The subjects to be treated are alternating currents, electric heating, electromagnetism, electricity in electro-therapeutics, arc lighting, incandescent lighting, electric motors, electric street railways, telephony and telegraphy Though the several volumes form a series, each is, nevertheless, so prepared as to be complete in itself, and can be understood independently of the others The authors develop the fundamental principles underlying the difficult branch of electrical engineering of which the work treats, in the simplest language and without the use of mathematics any further advanced than ordinary arithmetic, while the various applications are described in terms as free as possible of technicalities. The book is profusely illustrated, printed on paper of a fine quality, and substantially bound in covers of a special design New York The W. J. Johnston Company, 225 pages, 77 illustrations. Price, $1.

The annual report of the Association of Ontario Land Surveyors for the past year has been issued. It makes a volume of 184 pages, and contains, besides the reports of committees, the full text of the papers mentioned in the report in THE CANADIAN ENGINEER of April last. The frontispiece is a very good reproduction of the portrait of Joseph Bouchette, the well-known author and surveyor whose works are so much prized by Canadian literary men. A. J. Van Nostrand, Yonge street arcade, Toronto, is secretary of this active association.

The tenth annual report of the "Illinois Society of Engineers and Surveyors" is to hand. The report, which extends to 176 pages of closely-printed matter, gives a number of valuable papers, and much that is instructive relating to the progress of engineering matters in this progressive State. The papers embrace "Sewer Construction," "Preservation of Sources of Water-supply," "Rockford Water Works," "the "Ottawa (Ill.) Water Works," "Western Springs Water System," "Pumping Water from Well to Reservoir," "Brick Pavement Construction," "Photography for Engineers," "Location and Alignment of Drainage Districts," "Laying Out Race Tracks," "Substructure for Small Bridges," "Effects of Frost on Materials," etc. Jacob A. Harman, Peoria, Ill., is secretary.

The "Supplement to the Year Book of the Imperial Institute, 1895," gives a statistical record of the resources and trade of the British colonies and India. A map of India is given showing the recent railways and steamship routes, and there is also a map of Tasmania. Published by the Imperial Institute, South Kensington, London, England.

Chas. Baillairge, city engineer, of Quebec, is as prolific as ever in literary work. Among the contributions from his pen received by THE CANADIAN ENGINEER within the past two months are the following pamphlets.—"An Address of Welcome to the Montreal Section of Canadian Architects," "On the Bearing and

Resisting Strength of Structures, and that of their Component Parts and Materials," and "Bribery and Boodling, Fraud, Hypocrisy and Humbug" The last-named is a pamphlet of 74 pages, and in it Mr. Baillairge scathingly denounces the dishonesty that is rampant in municipal and other contract work, citing cases that have come under his own knowledge

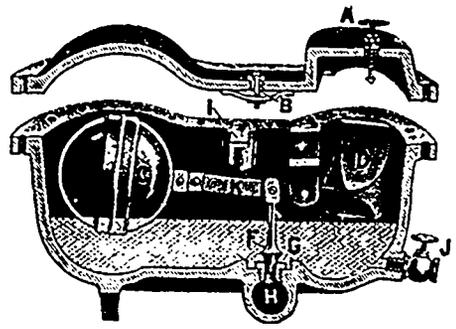
"The Kootenay Mines . a Sketch of their Progress and Condition To-day," by Chas. St. Barbe, Nelson, B.C., is an instructive account of what has been accomplished in this wonderfully rich mining region, whose value seems to be only now becoming really known to the outside world.

The Orillia *Packet* is to be complimented on its fine souvenir number, which, besides views of Orillia as it stood a mere hamlet in 1854, contains portraits of 70 of its prominent citizens. No paper in Ontario stands higher in moral tone than the *Packet*.

A complete and immediate revolution of transportation methods, involving a reduction of freight charges on grain from the West to New York, of from 50 to 60 per cent, is what is predicted in the November *Cosmopolitan* The plan proposes using light and inexpensive corrugated iron cylinders, hung on a slight rail supported on poles from a cross arm —the whole system involving an expense of not more than fifteen hundred dollars a mile for construction The rolling stock is equally simple and comparatively inexpensive. Continuous lines of cylinders, moving with no interval to speak of, would carry more grain in a day than a quadruple track railway. This would constitute a sort of grain-pipe line. *The Cosmopolitan* also points out the probable abolition of street-cars before the coming horseless carriage, which can be operated by a boy on asphalt pavements at a total expense for labor, oil and interest, of not more than one dollar a day.

THE McDANIEL STEAM TRAP.

A new steam trap, adapted for use in sugar refineries, breweries, distilleries, paper mills, canneries, etc., is now being offered to the trade Many advantages are claimed for the new trap, and a number of them are guaranteed It is a continuous drainer, does not discharge at intervals, or throw out any steam with the condensation, and it is said to give more drainage for the amount it is sold at than any other trap on the market



The chief points to which attention is called are the large water outlet and the special make of copper float, which is neither braised nor soldered, and will neither sweat nor leak, and so requires no outside air communication Garth & Co., Montreal, and the Jas. Morrison Brass Manufacturing Co, Toronto., are agents for Watson & McDaniel, Philadelphia, the manufacturers.

CABLE MAKING AND WIRE COVEKING MACHINERY.

We have received from Johnson & Phillips, the well known engineers and electricians of Old Charlton, Kent, Eng., and 14 Union Court, Old Broad Street, London, a new catalogue of "Cable Making and Wire Covering Machinery," which is unique in being the only publication in the world dealing so fully with this class of machinery. The illustrations are all taken from photographs of the actual machines, and the designs are of strikingly elegant form, the whole of the metal being disposed to the very best advantage, this ideal quality having been reached by long experience with and great care in the production of each separate machine. It seldom falls to the lot of one firm to be both manufacturers and users of the same machines, but when it does, as in the present case, it cannot fail that the experience gained by actual touch with the working of the machines will result in the best design to fulfil the requirements of the work to be performed. In this connection it is worthy of notice that they have been enabled to give particulars of the output of the various machines, a departure which is unusual in trade catalogues. The tabular particulars of the sizes, capacity, ground space required, etc., for the different machines, are given in English and also in metrical measures. The large "shore end" machine, shown on page 2, calls for particular notice, as it is probably the largest of its kind in the world. The function is to armor the heaviest types of submarine cables, and at the same operation sheath with tapes and compound. Variations of this machine can be made to sheath with steel tapes or hemp yarns. The particular machine shown in the engraving has been in successful work for several years in the factory of a large continental cable manufacturer, and is giving every satisfaction.

As showing the capacity of this establishment for rapidly turning out large volumes of work in cases of emergency, it may be mentioned that on a recent occasion they successfully manufactured no less than 25 of the large vertical multiple taping and compounding machines, shown on page 16, in seven weeks. An idea of the magnitude of this order can be gained when it is stated that the combined capacity of these 25 machines is 750 miles of covered wires per day. This book, which is copyrighted, will be sent to any person requiring it in good faith.

ONTARIO ASSOCIATION STATIONARY ENGINEERS.

Editor CANADIAN ENGINEER :

During the month of November twenty-three engineers have been examined, and nineteen succeeded in passing their examinations. Names of successful candidates in third-class are as follows:—I Crozier, Cobourg, C Stillwell, Brockville, Jas. Walker, Trenton, J Kemsley, Picton, W Irvin, Belleville, J. Coughlin, Hintonburg; H C. Sutton, Cumming's Bridge, Geo. Cameron, Ottawa; R J. Stewart, Lucknow; F. G Hall, Kincardine; W. J. Hackett, Geo. Nelson, Toronto; R. J. Levey, Wingham; R. A. Root, J. T. Nicholls, R A. Ballantyne, Strathroy; S. Barber, Lucknow. Those who passed in second-class were:—O. Monger, Strathroy, F. H. Walker, Kincardine.

Four applicants for certificates either failed in examination, or had not had the required experience. The following engineers who held second-class have passed the first-class, and received certificates, viz :—Jas. Queen, Toronto Junction, John Fox, Toronto. The following who held third class have passed for second-class, viz.:—E Carr, Brockville, A. Cunningham, Toronto; A. R. Barwick, Strathroy. Enquiries *re* examinations are coming in from all over the Province.

A. E. EDKINS, Registrar,
139 Borden street, Toronto.

P. S.—Any engineer desiring information *re* examinations, etc., who will send me a post-card to that effect, will receive a copy of by-laws and Act respecting stationary engineers, giving all information. The association has decided to introduce a bill for examination of engineers during the next session of the Local Legislature, and want the assistance of all practical engineers.

A. E. E.

METAL IMPORTS FROM GREAT BRITAIN.

The following are the values in sterling money of the imports in the undermentioned metals for the month of October, 1894 and 1895, and for the ten months ending October, 1894 and 1895:—

	Month of October,		Ten mos. end'g October,	
	1894	1895.	1894	1895.
Hardware and cutlery	£5,894	£5,152	£58,119	£46,379
Pig iron.....	5,597	8,219	23,386	29,845
Bar, etc.....	797	3,850	16,993	13,670
Railroad	25,545	12,943	217,626	120,658
Hoops, sheets, etc.....	6,742	11,763	75,752	53,844
Galvanized sheets	5,962	6,871	45,631	55,006
Tin plates.....	35,505	37,697	172,655	133,189
Cast, wrought, etc., iron ..	6,572	7,959	59,167	49,049
Old (for re-manufacture)..	3,626	9,238	18,295	20,781
Steel	8,011	10,075	80,651	62,717
Lead	2,789	5,184	11,180	22,403
Tin, unwrought	3,473	4,490	20,574	21,527
Cement	1,905	3,226	33,028	24,292

Under the head of exports to Great Britain we notice that copper ore was exported in October, 1895, to the value of £12,540, as against £2,985 for the same month of 1894, and £29,566 for the ten months ending in October, 1895, as against £24,563 for the period ending October, 1894.

EVERYBODY interested in boilers will appreciate a very interesting article in the last issue of THE CANADIAN ENGINEER, entitled "The Bent Tube." This article is very interesting as showing the evolution of the modern boiler.—*American Artizan.*

Industrial Notes.

A SAWMILL is being put up at Alma, N.B., by Mr. Richardson.

WORK is being rushed on the new town hall at Carleton Place, Ont.

THE new Purves mill, in Carleton, N B., is now under construction.

PERTH Ont., wants a new bridge over the Tay River, at Drummond street.

A $1,300 extension to the market building at Guelph, Ont., is under discussion.

THE *Lindsay Post* says that Jno. Dovey will not rebuild his saw-mill till spring.

TENDERS are asked for to build a new bridge over the Assiniboine at Brandon, Man.

WHETHER or not Arnprior, Ont., is to have waterworks, will be decided by the electors in January.

MOUNT FOREST, Ont., is still talking waterworks, but things have not yet reached the contract stage.

JOHN MCKENZIE, Petrolia, Ont., has purchased the Kincardine planing mill, and sash and door factory.

THE plans for a new fire hall at Dundas, Ont., are being prepared by W. A. Edwards, architect, Hamilton, Ont.

THE farmers of Delta, B.C., recently held a public meeting at Ladner to discuss the establishment of an oatmeal mill.

W. THOMPSON, of Mitchell, Ont., "the oatmeal king," has purchased the Great Western Mills at Woodstock, for $11,500.

THE new building of the Metallic Roofing Co., corner of King and Dufferin streets, Toronto, is rapidly nearing completion.

THE frame of the new nail factory at St. John, N.B., is up, and the proprietors expect to be turning out nails by January.

THE new warehouse which is being built for James Pender & Co., near their factory at St. John, N.B., is nearly completed.

BERTRAM & SONS, machine tool builders, Dundas, Ont., have engaged a number of additional men and are working a night gang.

A WHEEL weighing 20,000 pounds has been shipped from the Copp foundry to Guelph, Ont., to be used in the new rolling mills there.

POLSON & MILLER, owners of the Polson shipyard, Owen Sound, Ont., have been refused exemption from taxation by the town council.

THE main drainage scheme, which has been so much discussed in Ottawa, Ont., recently, has been left over for next year's consideration.

BRANTFORD, Ont., is to have a cold storage warehouse. Dr. Lowry and Geo. Foster have taken fifty shares ($5,000) each in the proposed company.

IT is reported that a new organization to be incorporated as the Alberni Mill Co. will succeed the B.C. Paper Manufacturing Co. now in liquidation.

WORK is progressing well at the new crushing mill at Union Point, St. John, N.B., and it will now take its old place as one of St. John's busiest centres.

GLASS manufacture is proposed for Chatham, Ont. The necessary sand is said to be found in the neighborhood. Mr. McDougall, of John McDougall & Co., Montreal, thinks the enterprise would be a success.

DAVIS & CROTHERS, a new lumber firm at Upper Gagetown, N B., are replacing the water mill there with steam power and a new rotary saw mill, the machinery being supplied by E. Leonard & Sons, London, Ont.

THE Verity Plow Works, Brantford, Ont., are working overtime, and recently one hundred of the employés worked a stretch of thirty hours with only two hours off.

THE village of Grand Falls, N.B., will become an incorporated town, in order to give assistance to the Grand Falls Water Power and Boom Co. by leasing to it certain property.

DR. BORDEN, of Canning, N.S., is making extensive improvements in his steam sawmill in the shape of a new engine and large steel boiler, made by E. Leonard & Sons, of London, Ont.

A SANITARY ASSOCIATION has been formed in Hamilton, Ont., to afford people a cheap means of testing the sanitary condition of their houses. M. W. Hopkins, C.E., is consulting engineer.

CARRIER, LAINE & Co., Levis, Que., have the contract for eight locomotive boi[illegible] or the I.C.R.

THE Rubber Tire Wheel Company, of Springfield, Ohio, is talking of establishing a branch in Hamilton, Ont.

THE peat moss works of W. F. Todd, St. Stephen, N.B., recently destroyed by fire, are to be rebuilt at once.

THE Raymond Sewing Machine Company, of Guelph, Ont., began operations on Nov. 18th under the new management.

DURING the last month or two Robert Gardner & Son, engineers, Montreal, have received several cable orders from England for their biscuit machines.

THE town of Palmerston, Ont., has refused the Cone Coupler Carriage Co. a loan of $5 000, for which they wished to mortgage their property to the town.

THE Facer Car Wheel Co., Perth, Ont., have bought an [illegible] and a half of land on Wilson Point for their workshops, and the C. P. R. are running a siding into the yard.

JOHN GOODISON, of Sarnia, Ont., has purchased and shipped to Sarnia the stock and patterns of J. Elliott & Son, London, Ont., formerly manufacturers of agricultural implements.

THE old mills at Doran's Mills, in Bathurst township, county of Lanark, Ont., built and long owned by Judge Doran, of North Bay, are to be repaired and again put in operation.

THE City Council of Fredericton, N B., has ordered estimates to be made for extending the water service on the new streets. American firms are to be asked for tenders for pipes.

WE learn from the W. R. Gardner Tool Co., of Brockville, that the reports published as to their leaving that town are unauthorized and that nothing has yet been decided in the matter.

THE Montague Paper Co., of Turner's Falls, Mass., are said to have bought the Dudley Mills. This will give the Montague Paper Co a monopoly of the lumber business at Lake Megantic, Que.

THE Record Foundry and Machine Co., Moncton, during the past six weeks, have converted over one hundred tons of steel and iron into a roof for the Intercolonial Railway freight shed, at Halifax, N.S.

THE large boiler and fixtures for the Guelph Norway Iron and Forge Company, Guelph, Ont., have arrived from the works of the Aultman-Taylor Machinery Company, of Mansfield, Ohio, and been placed in position.

THE directors of the Stevens-Campbell Milling Company have finally decided to constitute St Thomas, Ont., their headquarters. The amalgamation consists of the mills in Chatham, Blenheim, St. Thomas and Aylmer.

THE Dominion Ministry has promised to favorably consider the request of the people of Ottawa, Ont., for an asphalt roadway on the Sappers' Bridge, and new bridges over the canal at Maria and Somerset streets.

A TRIAL of a new paving material is now in progress at the corner of York and Wellington streets, Toronto. It is claimed for Asphaltina, the new compound, that it is impervious to water and unaffected by heat or cold.

THE Ontario Government has purchased a pumping engine from the Northey Company, and placed it in the basement of the Parliament buildings, Toronto, because the city water pressure is insufficient for fire protection.

THE Maritime Chemical Pulp Co.'s mill at Chatham, N.B., is shut down for repairs. A lot of new machinery is being put in, and an additional water supply is to be obtained by laying down five miles of pipe to the Nappan River.

JAS. WILKES, of Montreal, is putting the furnaces of the Londonderry Iron Co., Halifax, N.S., into shape for the production of puddled bar iron About 150 men will be employed. Operations will begin in about three months.

MESSRS. CAWTHROP, of the Diamond Mills, Ridgetown, Ont., are making extensive repairs to their engine house. The mill is running sixteen hours per day—and would run twenty-four hours were it not for the scarcity of water.

WM. KENNEDY & SONS, of Owen Sound, Ont., have just sent the last of twenty-four 51-inch new American wheels to the Sault Ste. Marie Pulp and Paper Mills, and are reported to find an increasing demand for their electric water governors.

WM. MCLAREN, engineer at D. Kippen's sash and door factory, Perth, Ont., had a narrow escape from drowning one morning lately, as he accidentally fell down a well in Dietrich's workshop, but was able to climb out by means of the feed-pipe to the boiler.

A NEW flour mill is to be erected at Armstrong, B.C.

A PAPER MILL is to be built at St. Croix, N.S., by H. McHart.

G. F. EMERSON proposes to start a bicycle factory at Clinton, Ont.

A PULP MILL will be built at Calais, Me., opposite St Stephen, N.B, in the spring.

THE new building for the deaf and dumb at Halifax, N.S., is nearly completed.

A WATERWORKS system to cost about $12,000, will be installed at Port Colborne, Ont.

G L. ORME and A. J. Stevens intend to build a row of handsome stores on Sparks street, Ottawa.

A TACOMA lumber firm intend building a large mill on the mainland near the north end of Vancouver Island.

ALAN MACDOUGALL, C.E, is at present engaged on plans for the extension of the sewage system of Stratford, Ont

THE city council of Kingston, Ont., has let the contract for a new pumping engine to Inglis & Son, Toronto, at $12,000.

THE Montreal Hydraulic Wheel Company, Montreal, are applying for incorporation, with a capital stock of $100,000, to manufacture hydraulic wheels, etc.

LISTOWEL is to have a new furniture factory. Chas. Runge and Wm Becker are putting in machinery for the manufacture of a number of lines of furniture.

I. MATHESON & Co., New Glasgow, N.S., are applying for incorporation, with a capital stock of $60,000, to carry on the business of iron founders, machinists and engineers.

SAWDUST fuel is now being manufactured at a factory at Chaudiere, Ottawa. The manager of the company states that the fuel will shortly be tested by the C P R. locomotives.

THE hardware firm of John Stairs & Co., Halifax, has assigned. The habilities are not stated, but there are preferences for $50,000, of which $40,000 is to the John Stairs estate.

J. C. WILSON, at the Board of Arts and Manufacturers' meeting at Quebec, offered to contribute $5,000 towards the construction of a technical school in Montreal for the instruction of young men in mechanics, etc.

THE Ingersoll Screw Co., of Ingersoll, Ont., who are the largest manufacturers of set screws in the Dominion, are now engaged extensively in the manufacture of brass-threaded nuts for bicycle work.

E. G. REID, contractor of Montreal, shipped a cargo of pulp wood from Newfoundland to Scotland, and the pulp manufacturers there having reported favorably upon it, a pulp mill is to be established in Newfoundland at once

THE B Greening Wire Company, Hamilton, Ont., has introduced a new patent cattle chain, which has many points to recommend it This company manufactures cables, wire goods and ropes for all mechanical and manufacturing purposes

THE Sault Ste. Marie Pulp Paper Company, which has a mill on the Canadian side, will erect the largest paper mill in the world on the United States side of the Sault. They have just paid $265,000 for the water power rights, and will begin work at once.

THE scheme proposed for the disposal of Hamilton, Ont., sewerage, by Engineer Knichling, of Rochester, N.Y., would cost $270,000 to put into effect, made up as follows: Interception of sewers, $130,000, pumping station, $75,000; discharge pipe, $65,000.

L K. MCLAURIN, of East Templeton, Ottawa county, Que., and A. E Schyer, W. B. Hitchcock, M. J. Hitchcock and H. T. Sayers, Ottawa, are applying for incorporation as the Ottawa Novelty Co., Limited, with a total capital stock of $10,000, to manufacture and deal in lamps, lamp brackets, electroliers, general fancy goods, etc.

THE Ottawa Land Association recently purchased the old Sparks' mill property at the "Little Chaudiere," up the Ottawa River, from the mill-owners at the Chaudiere and the Philip Thompson estate, for about $30,000. The property comprises 40 acres and valuable water power, which it is proposed to utilize in the near future.

W. R BROCK and J. J. Foy, Q.C., of Toronto, and George H. MacDonell, M.P., have asked the Dominion Government to grant a subsidy to the Ontario & Rainy River Railway Company, which was chartered some years ago to build a railway from Port Arthur through the famous mining and lumbering regions contiguous to Rainy River The Ontario Legislature has already subsidized 130 miles at the rate of $3,000 per mile.

LT.-COL. SEITZ, of the British Empire Exhibition proposed for Montreal next summer, says a large number from California have promised to send exhibits, and the State will be officially represented. Col. Seitz is now in Washington arranging for exhibits.

A MEETING of the St Stephen, N.B, Edge Tool Company was held recently, at which the following board of directors was elected: C. W Young, C. O. Barker, A. I. Teed, J. Edwin Ganong and F. M Murchie. Last year's work was encouraging, the company says

THE plans prepared by Mr Wilson, of Chatham, Ont., for the town hall, at Blenheim, Ont., have been accepted by the Blenheim Council, on his guaranteeing to let the contract for its erection, including furnaces, seats, and all requisites mentioned in plan, for $7,000.

THE town of Carleton, N.B., will probably spend $30,000 on its waterworks immediately. It is proposed to lay a 12-inch pipe along Watson street to Queen street. All the cement pipes between Watson street and the harbor which have given any trouble are to be done away with.

THE residents of Sussex street, Ottawa, Ont., have petitioned the city council for a street pavement of Telford syenite. They request that there shall be a foundation of nine inches of broken limestone, and that there shall also be nine inches of syenite concreted and well rolled.

APPLICATION is made for incorporation of the Cottingham Varnish Co., Ltd., Montreal, with capital of $20,000. Chas Lyman, druggist of Montreal, is one of the provisional directors of the company. Incorporation is also applied for for the W H. Cottingham Co., Ltd., to manufacture paints, with capital of $105,000.

WHILE manufacturing generally has suffered from the low water in the lakes, it reminds one of the old proverb about the "ill wind," as a number of concerns have added steam plants to their establishments since the water has become so low. There has also been quite a run on propeller wheels to replace those broken on the steamers navigating the now dangerous waters of the St. Lawrence.

THE applicants for incorporation as the Bedford Mfg. Co., to manufacture edge tools and operate a grist mill at Upper Bedford, Que., are: E. Coslett, merchant; G. Coslett, mechanic; G. S. Walsh, manufacturer; F C. Saunders, druggist; M. Smith, farmer; P McGarry, farmer; H. Horskins, founder; J. Mullin, merchant, of Bedford, and O. S Rixford, manufacturer, of East Highgate, Vermont, U.S.A.

THE Hamilton Engine Packing Co., Hamilton, Ont., report trade as being unusually brisk in their improved ring packing and other goods The Smith Adjustable Rainbow manhole and handhole gaskets for boilers, for which they control the exclusive right for the Dominion, is meeting with great success They are also exclusive agents for the Economic Oil Filterer, by which contrivance all waste engine and machine oil can be clarified, and all sediment and impurities removed.

THE works of the Guelph Norway Iron and Steel Company at Guelph were opened on the 2nd inst., when part of the plant was put in operation. A few blooms were made from the knobbling fires under the large steam hammer. Thos. D. Beddoe, of London, who was formerly manager and secretary of the Iron and Forging Company of Hamilton, and later superintendent of the Calumet Iron and Steel Company of Chicago, is to represent the company on the road.

THE town of Trenton is in a peculiar position as regards water supply. Some time ago A. W. Hawley and the Rev. Armstrong secured leave from the council to lay water pipes They dug a reservoir on the mountain and laid pipes, and in the meantime R. Weddell also secured leave from the council to supply water, and dug a well somewhat lower on the mountain than the first reservoir. This took away the water from the first parties, and now they have pipes and Mr. Weddell has water, and the townspeople have neither.

THE city council of London, Ont., has passed a by-law, which has the approval of the Grand Trunk Railway Company. By this the company agree, in exchange for a bonus of $100,000, to erect shops in London, and employ not less than three hundred men for a period of forty years. The terms are to be fulfilled within twelve months after the signing of the agreement by both parties. The Grand Trunk are pledged to do in London all their car repairing west of, but not including, Toronto.

DARLING BROS., of Reliance Works, Montreal, have issued an illustrated catalogue giving definitions and illustrations of their various articles of manufacture. The book is handsomely bound, well illustrated, and contains information of much interest to any

one engaged in manufacturing. Among the principal articles treated of are elevators worked by hydraulic, belt power, hand power, and electric power, wire wheels, tube scrapers, feed drillers, the Webster vacuum feed water heater and purifier, Webster oil extractor and steam separators, and a number of other machines, etc.

JOHN BERTRAM & SONS, of the Canada Tool Works, Dundas, have been busy this season principally on tools for bicycle manufacturing companies. The new company starting at Toronto Junction, H. A. Lozier & Co., have placed the largest order ever given in Canada with them to equip their factory with lathes, planers, drills, shapers, and special milling machines. Seven car loads have been shipped to this firm, and they still have a large consignment to ship.

WE understand that W. G. Walton, of Hamilton, who went to Chicago to witness the test of horseless vehicles, is so convinced of the success of the machines that he is going to organize a company for their manufacture in Canada. Mr. Walton is a good mechanical engineer, and a successful business man, and under his auspices such a company will be certain to pay good dividends. A subscriber to THE CANADIAN ENGINEER writes that he is ready to place an order with any company as soon as they produce a working machine.

THE Clappison Pipe and Boiler Covering Co., Hamilton, Ont., have recently erected a new brick boiler-house, storeroom and chimney to their factory. This is the second addition they have made since commencing to manufacture the asbestos-magnesia covering less than two years ago, and report business as being very brisk, having recently shipped large consignments to Montreal and Maritime Provinces, and orders still on hand unfilled. They also beg to say that the test recently published in THE CANADIAN ENGINEER between mica and magnesia coverings was not their make, but a foreign production and not as good a non-conductor, as it did not contain the same ingredients or layer of porous felt paper, which they apply between the material and outside canvas jacket, which adds more than the difference shown to the non-conducting properties of the asbestos-magnesia covering.

THE attention of our readers is called to the advertisement of the sale of the new and extensive foundry establishment of Wm. Clendinneng & Son at Montreal. This is a most favorable opportunity for a firm or company to engage in the manufacture of gas and water pipes, an enormous quantity of which is yearly required for the needs of the cities and towns of the Dominion. The Clendinneng stoves are known from Halifax to Vancouver. The firm had recently moved to its new and extensive premises in the St. Henri suburb, where the suspension of its bankers necessitated a stoppage of its business. It is one of the most modern and best equipped foundry establishments in the Dominion, and no such favorable opportunity for acquiring so desirable a property of this kind has been before offered in Canada. The plant has only been idle a few weeks and is ready to start in perfect working order. Kent & Turcotte, Montreal, are the curators of the estate, from whom all particulars can be obtained.

Railway and Marine News.

IT is reported that the St. Thomas, Ont., Car Wheel Company is to establish a branch in Austria.

THE expenditure of $9,000,000 on the improvement of the Erie Canal, U.S., is to be begun at once.

THE Central Railway between Hampton and St. Martin's, N.B., has been closed for the winter.

DURING the coming winter the Rideau Canal near Newboro', Ont., is to be deepened by blasting.

A COMPANY is being formed to place a new steamer on the route between Washadamook Lake and St. John, N.B.

WM. THOMPSON & Co. have ordered a large ocean steamer from an English firm, to run between London and St. John, N.B.

REID & TAIT, who operate a fishing plant on Lake Winnipeg, will build a steamer at Selkirk, Man., for use in their business.

FORT COVINGTON, N.S., sued the G.T.R. for damages caused by a bridge built over the Salmon River, and was awarded $3,636.50.

D McGILLIVRAY, of Vancouver, B.C., has a contract from the C.P.R. for the construction of a branch line along Arrow Lake, B.C.

THE new Canada Atlantic Railway depot in Ottawa on the canal bank facing the post office, will be opened on Dec. 15th, it is expected.

A NUMBER of new lights and buoys have been recommended to be placed in the upper part of the St. Lawrence by the United States authorities.

W. STEWART & SON, architects, have taken out a permit for the building of the T., H. & B. Railway station at Hamilton, Ont. The cost will be $20,000.

Two hundred miles of the Ottawa, Arnprior and Parry Sound Railway are now completed, and the remaining fifty will be finished before October next year.

ANOTHER coal ferry, somewhat larger than the one running now between Conneaut, Ohio, and Port Dover is now ready for service, on the same line.

THE Grand Trunk Railway has now a considerable force of men and trains at work between Port Dover and Jarvis, putting the track in thorough repair for the new coal route.

THE superintendent and surveyors of the Canada Southern have been over the line from Courtright to St Thomas, Ont., with a view to extending their line from St Clair to Port Huron.

THE people of Lindsay, Ont., want the canal basin at that town enlarged, and R P. Fairburn, of the Public Works' Department, Toronto, has been on the spot taking measurements, etc.

APPLICATION has been made to Parliament by the Winnipeg Great Northern Railway Co. for permission to build a branch line from Portage la Prairie to connect with their proposed main line.

DR. L. G. DEBERTRAM has contracted to build fifteen miles of railroad from Chipman to Newcastle, N.B. The work will be commenced early in December. Sub-contracts are now being let.

THE Chicago & Grand Trunk Railway Co. and its leased lines in the United States are to be consolidated with the Grand Trunk proper. The line will then be under one management from Portland to Chicago.

THE Ottawa Valley Canal is attracting a good deal of attention. The Ottawa Board of Trade has endorsed the scheme, and it has been formally brought before the Ontario Government by an influential deputation.

THE Montreal Transportation Company has laid the keel of a three-masted vessel to be completed this fall at Kingston, Ont., with a capacity of 60,000 to 75,000 bushels. As soon as this vessel is launched, the keel of another will be laid.

IT is understood that Adams & Co., of New York and Bathurst, who have bought the St Lawrence Lumber Co.'s mill and lands in Gloucester, N.B., will build a railway from the Caraquet line to Tracadie. Subsidies to a considerable amount are available for this branch.

THERE are various reports in circulation about the removal of G.T.R. shops from Brockville and Belleville to Kingston. If they should be moved, Belleville will claim a refund of the $25,000 bonus which it gave the G.T.R. some years ago to secure the location of the shops at that point.

OWEN MCKAY, assistant engineer L.E. & D.R.R., has completed the survey for the line to connect the C.P.R. and the L.E. & D.R.R. The line taps the C.P.R. at the Miller farm, Yarmouth Ont., and runs almost direct west, connecting with the L. & P.S., near the bridge across Kettle Creek. It is said that the connecting link may be built this fall.

THE contract for the stone work on the new London and Port Stanley Railway bridge over Zavitz' pond has been awarded to William Gibson, M.P., of Beamsville. The iron superstructure will be erected by the Hamilton Bridge Company, and the whole work will cost about $2,000. A great deal of difficulty was experienced in finding a suitable foundation for the masonry work.

AT the next session of Parliament a request will be made for an Act to incorporate the Hamilton, Brantford and Pacific Junction Railway, with power to construct a branch line from a point on the Hamilton and Buffalo Railway to the C.P.R. in East Flamboro. The road would be twelve miles in length and would cost $25,000 a mile. Brantford and Hamilton will both be petitioned for bonuses.

JAMES FINNEY, who has the contract for building some of the bridges on the Erie & Pacific Railway, says he will complete the bridge over the Little Otter shortly, and then commence the construction of the Teal bridge. He will also build a number of small over-head bridges. About 1,000 men are employed on the road, and 400 teams. Six miles of track has already been laid, and the whole work will be completed by the first of the new year.

STEAMER "Alexandria" has been raised by Donnelly Bros. and taken to Montreal for repairs

THE Act incorporating the Sherbrooke Street Railway Co. has been passed by the Quebec Legislature.

AN addition 100 x 40 feet is being built on the already immense erecting shop at the Amherst, N.S., car works.

THE city council of St. John, N B., will spend $12,000 to give the C.P.R. a track from Sand Point to the city wharf.

COLLINGWOOD, Ont., has passed a by-law authorizing the expenditure of $25,000 in deepening the harbor to twenty feet. A further $75,000 will be expended by the Dominion Government.

C. H. GILDERSLEEVE, interviewed in respect to the proposed Kingston, Smith's Falls and Ottawa Railway, said that one of the promoters was in England endeavoring to float the bonds of the road.

THE Dominion Government is giving the people of St. John, N.B., their hearts' desire by granting a bonus of $25,000 a year to the Beaver Line to run their steamers from St. John during the winter.

THE Madawaska Improvement Co. and McLachlin Bros have made arrangements so that the water on the Madawaska river, above the Palmer rapids, will be kept at a sufficient height to enable the steamboat to ply between Carlow, Combermere and Barry's Bay.

THE Pembroke Southern Ry. Co are making some surveys in the township of Wilberforce, and the *Pembroke Standard* says the work is to be gone on with. It is thought that capital enough can be secured in the town to build the road, if outside capitalists refuse to take hold.

THE steam dredge, "Sir Hector," belonging to Poupore & Fraser, which was excavating in the Morrisburg canal, was burnt on Nov 28th. The dredge, which was built by Carriere, Laine & Co., of Levis, Que., was valued at $45,000, and insured for $10,000.

RAOUL RINFRET, C.E., Montreal, has returned from locating a railway from St. Gabriel de Brandon, county of Berthier, to St. Emelie, county of Joliette. The road will be fifteen miles long through a mountainous country; the construction will not be difficult, however Work will begin in the spring.

THE Ottawa Street Railway Company has purchased 24 acres of land opposite the Experimental Farm, and will make an excursion park of it next summer. The company expects that their new park will not take any of the patronage away from the Rockliffe Park, their line to which has proved so profitable.

THE Chicago and Lake Superior Railway Co., behind which the C.P.R. is said to be working, is building a road to connect Chicago with the Soo line at Lake Superior. This will give the C.P.R. a line competing directly for the Chicago Pacific business with the Great Northern, Northern Pacific and other United States roads.

APPLICATION will be made at the next session of Parliament for incorporation of the Montreal South Shore Highway, Bridge and Electric Company, to bridge the St. Lawrence as near the Victoria Bridge as possible, and to build electric railways in the counties of Chambly, St. John, Iberville, Laprairie, Verchères and Richelieu.

AT a meeting of prominent citizens of St. Johns, Que., held recently to discuss canal connection between that town and Montreal, it was stated that if 18 miles of canal were constructed through a flat clay country presenting no engineering difficulties, it would reduce the distance between the two points from 90 miles to 25 miles. A committee was appointed to urge the scheme on the Government

THE Imperial Government has decided to support the project of a fast mail service between Great Britain and Canada to the extent of $375,000 annually for a class of vessels similar to the "Teutonic," that is, with a speed capacity of 20 knots an hour. The $375,000 is to implement the $750,000 voted by the Dominion Parliament two or three sessions ago. Contracts will be called for before long and every effort made to establish the service at an early date.

THE C.P.R. is making strong representations to the Ontario Government to secure an extension of the time in which they were to earn the subsidy of $100,000 which was granted to the Vaudreuil and Ottawa Ry., now known as the Montreal and Ottawa. As the default of the Montreal and Ottawa Ry. would allow the Central Counties Ry. to secure the subsidy, the latter are energetically opposing any extension.

IT is announced that a lease has been signed by the Michigan Central and the Canadian Pacific Railways, the terms of which are that the Canadian road secures the privilege for fifty years of running into Niagara Falls, N.Y., over the cantilever bridge. The Canadian Pacific Railway will use the Toronto, Hamilton and Buffalo as far as Welland, and from there will use the tracks of the Michigan Central. The first train will be run as soon as the T., H & B. is completed, so that trains will be running from Hamilton to Welland by the 20th of December.

THE Canadian Marine Association have been to Ottawa to urge on the Dominion Government the early completion of the Morrisburg lock, and the lower lock sills at Port Colborne, Port Dalhousie, Derochelle, and Iroquois The Hon. Mr. Haggart said that he would like them to strengthen their representations and promised to give the matter his consideration, and assured the deputation that the Sheik's Island dam would be completed for the opening of navigation.

RUSSELL SAGE, banker, and E. E. Gould, capitalist, of New York city; Hugh H. McLean, of St. John, N.B., barrister, Frank J. Menzie, of New York, clerk; and William E. Banks, of New York, broker, give notice of application for the incorporation of the Gold Car Heating Co., ltd., with head office in St John, N.B., and a capital stock of $250,000. The company will purchase the patent rights of the Gold Heating Company of New York, for Canada, and propose to manufacture these and other car heaters in Canada

Two steel steamers are being built this winter by a Toronto firm for the Upper Ottawa Improvement Company. One, to be used in towing on Lac des Chats, which is an expansion of the Ottawa River, will have compound engines, 20 and 38, with independent condenser (by Northey & Co.), and is in length 130 feet over all, and beam 40 feet; the boilers are two square fire-box boilers The other, which will be used in towing on Lake Deschênes, also an expansion of the Ottawa River, will have a single low pressure condensing engine, and is in length 141 feet over all and 44 feet beam, and has two locomotive boilers. The decks are steel plated, so as to avoid danger of fire, since the company have lost a number of boats from that cause.

W. OWENS, Rev. J. P. Belanger, priest, of Montebello; Rev. Ephrem Rochon, priest, of Papineauville; N. Chene, of Saint Andre Avelin; H. N. Raby, warden of Ottawa county, of Saint Andre Avelin; M. Joubert, mayor of Ripon; Joseph Bourque, of the city of Hull, contractor; S. R. Poulin, of Montebello, civil engineer, will apply to the legislature of Quebec for incorporation as the "North Nation Valley Colonization Railway Company, to construct a railway from Montebello or Papineauville, or other point on the C.P.R., northerly through the seigniory Papineau and the township of Ripon, Hartwell, etc., until it forms a junction with the prolongation of the St. Jerome branch of the C.P.R. Power will also be asked to use electricity for light, heat and power, to sell it and to operate electric railways in the county of Labelle.

THE low water in the St. Lawrence and the lakes has caused great loss by retarding navigation, but much of the alarm expressed as to the possibility of the lowering of the levels being permanent may prove to be unfounded. Dr. Dawson, director of the Geological Survey, attributes it to the lack of rain, the fall having been light during the past two years. Dr. Dawson said that the great lakes were subject to periodic lowerings which occurred every ten years, nearly. An old resident of Sarnia, Ont., says the St. Clair was as low as it is now in 1839 The lower water has added thirteen tons a day to the coal consumption of the Montreal waterworks, as only two of the four turbines can be kept going, and their place has to be taken by the steam pumping plant. The Canadian canal at the Sault has proved to be ahead of its rival in the United States, as it has been 18 feet deep, while the American one was only 13 feet 10 inches. The low water has made it necessary for the ferry company to deepen the harbor at Port Dover, which is the Canadian terminus of the Conneaut coal ferry. Kingston & Wood, Buffalo, are doing the blasting.

THE CANADIAN ENGINEER for October is to hand. It is an interesting journal. This month's contains, among other articles, a second article on the Montreal, Ottawa and Georgian Bay Canal, by Arthur J. Forward, of Ottawa, and a paper on the telegraph by Charles Dwight. This paper was read before the Canadian Electrical Association at Ottawa. A. E. Edkins, of Toronto, discusses boiler explosions in an able article, and J. H. Killey, C.E., of Hamilton, contributes a paper on kerosene yachts. The pages are full of interesting matter.—*Collingwood Bulletin.*

Mining Matters.

WORK has begun on the Trail, B.C., smelter.

MITCHELL & POWELL have opened a graphite mine in Marmora township, Ont.

THE Alamo Mining Co., B.C., has declared a dividend of 7½ per cent., amounting to $35,000.

IT is said that a gold nugget worth over $200 was picked up in Kamloops, B C., a few days ago.

THE artesian well at Galt keeps up its flow. A recent measurement gives a flow of 180,000 gallons a day.

THE Beaver Dam gold mine near Ship Harbor, N.S., was sold recently to Mrs. H. B. Highley for $10,000.

THE Kamloops Mining and Development Company have transferred their assaying plant to Rossland, B.C.

LARGE bodies of ore have recently been struck in the Reco and Ivanhoe properties on the New Denver, B.C., ledge.

THE Ruby silver mine at New Denver, B.C., has been bonded to the Omaha and Grant Smelting Company for $7,500.

T. J WATTERS has bought for $45,000 a newly-discovered deposit of graphite on the Madawaska, near Renfrew, Ont.

THE owners of the Washington gold mine at Slocan, B.C., will put in a 60-ton concentrator and construct a 1,500-foot tramway.

THE concentrator now being erected at Washington, New Denver, B.C, will be finished by January 1st. T. Mitchell has the contract.

A LARGE ledge of grey copper ore, which assays very high in silver, has been discovered on Hooker Creek, four miles from Pilot Bay, B.C.

THE Essex Standard Oil and Gas Co. has struck a fine gas well at Union, South Essex, Ont Its estimated capacity is 5,000,000 feet a day

A NUMBER of oil wells will be sunk immediately at Shetland, six miles from Bothwell, Ont., and people expect to see another Petrolia there in the spring.

THE J B. Miller nickel mine in the township of Drury, Ont., has been sold for $60,000 This is the highest price ever paid for a nickel property in that district.

AN English company has purchased mineral rights in Frontenac county to the extent of $50,000, through the legal firm of Walkem & Walkem, Kingston, Ont.

THE General Mining Association of the Province of Quebec is issuing a 300-page volume of its proceedings The next meeting will take place at Montreal in January.

FINE flake gold has been accidentally struck in the bed of an old river at Eburn, B.C. Some of the gold runs 50 cents to the pan, and much excitement is the result.

THE Conneaut-Port Dover ferry is to bring over large quantities of Escanaba and other United States ores for the smelting works in Hamilton, where they will be mixed with the Canadian ores.

THE hematite iron ore which the Nova Scotia Steel Co. is bringing in from Newfoundland, is proving very satisfactory. The first smelting of the new ore yielded 62 per cent. instead of about fifty, as had been expected.

DR. WATSON, of Detroit, owns a farm near Bothwell, Ont., which has a rich bed of slate upon it, about three feet below the surface. A company is being organized to develop the bed, and great things are expected therefrom.

THE War Eagle Gold Mining Company at Trail Creek, B.C., has up to the present time shipped 7,015 tons of ore The last 27 shipments, in all 2,300 tons, yielded $48.30 per ton The mine will shortly add two new 100 horse-power boilers to its equipment.

J KIRKUP, mining recorder, Trail Creek, B.C., says that, previous to March this year, 500 gold claims were recorded. Since that time 1,561 claims have been recorded, and there have been 650 to 750 transfers and bonds, 150 certificates of work and 25 applications for a crown grant.

THE Pelee Gas and Oil Company, in the second trial, have found the long-looked-for fluid petroleum The well was struck on the Dr Scudder estate of 3,500 acres, held by this company The whole island contains 13,000 acres, of which the Pelee Company have 7,000 The Standard Oil have lately secured a foothold of several thousand The oil is very lively, and tested at Windsor 35 specific gravity. Petrolia and Oil Springs go only 30 to 32.

THE output of the Nova Scotia coal mines to date is 100,000 tons less than last year.

THE mine of labrodorite, situated near Nain, Labrador, has been bought by capitalists from the United States.

THE Hall mine, near St. John, N.B., is again before the public. The company which is prospecting will operate the mine, it is said, if it assays two per cent. of nickel.

THE North American Graphite Mining and Manufacturing Company, Ltd., of Buckingham, Que., has built a new mill, and is rapidly installing new machinery.

AN English syndicate will cut a $40,000 ditch to bring water from Cayoos Creek to the McDonald and Hurley placer claims on the east bank of the Fraser River, B.C.

HAMILTON capitalists have been looking into the Glendower mine on the Kingston & Pembroke Railway, with a view to using the output at the Hamilton steel works.

THE Ontario Government find that the Bonanza Nickel Mining Company's gold property in McLellan township, Algoma, is not worth developing, and operations have ceased.

Two English companies, one of half a million and another of one million pounds sterling capital, have just been organized in London to develop the British Columbia mines.

THE Michigan Mining School, Houghton, Mich., has issued a handsome two-hundred page catalogue, which sets out plainly the claims and equipment of this popular institution.

THE Coxheath copper mines, Cape Breton, are to be reopened and operated on a larger scale. A railway is to be built from the mine to the shipping pier. C. O'Dell, C.E., is now locating the line.

IT has been reported to the Bureau of Mines that gold-bearing quartz had been discovered on two islands west of Quarry Island, Lake of the Woods. The find was made by J. Burley Smith, an English mining engineer of some prominence.

A REMARKABLE discovery of silver is reported from the north of Lake Superior, near the mouth of the Paysplat River. It is said that Messrs. Allen, of Ottawa, Donnelly, of Port Arthur, and King, of Fort William, are interested in the new find.

THE Cariboo, Lillooet and Fraser River Gold Fields Co., Ltd., has, it is reported, acquired the Lanark mine, at Illecillewaet, bonded the Maple Leaf of the same place and the Noble Five at Kaslo. This is one of the companies in which European capital is largely interested.

SEVERAL former Glengarrians, who have been for some time in Montana, were home recently on their way to Johannesburg, South Africa, where they will build a large gold crushing and stamp mill. Among the party were Allan J Cameron, W McLeod, and George Robertson, formerly of Lancaster, Ont.

I H HARRIS, of Winnipeg, writes the Bureau of Mines stating that he has floated a mining company in London, England, to be known as the Pipestone Gold Mining Co. (Ltd.), with a capital stock of £100,000, £35,000 of which is owned by Canadians. The mine is situated on Pipestone Point, Lake of the Woods, about twenty miles south of Rat Portage.

THE School of Mining, Kingston, Ont., will offer mine foremen, assayers, prospectors, and mining men generally, special courses of instruction in all departments of interest to them Lectures begin on January 8th, and continue for eight weeks. Chemistry, mineralogy, geology, lithology, discovery and mining of ores, milling, blowpiping, assaying and drawing are to be taken up, and the fees, the faculty states, are very reasonable.

THE British Columbia Mining and Manufacturing Co., Ltd., have acquired extensive mineral rights in British Columbia. The black sand lying off the Pacific coast, and containing flour gold similar to deposits which have been worked successfully in New Zealand, will be pumped up by a floating centrifugal hydraulic dredge and cradled. As the sand is said to be much richer than that of New Zealand, large profits are anticipated.

IT is reported that rich, gold-bearing ore had been discovered in a ledge at Agassiz, B.C., two or three hours ride from Vancouver, where gravel in a stream running through a poor settler's farm was found to be heavily gold-bearing. Excitement over the Agassiz strike almost equals the nervous unrest occasioned by the Lulu Island affair, which is still turning men's heads. In fact, in a radius of one hundred miles around the cities of Victoria, Nanaimo, Vancouver and Westminster, promising finds are becoming so frequent that some credulous citizens are looking for big gold nuggets in their back yards and in vacant lots in the commercial centres of the Province.

SIR JOHN SCHULTZ has returned from Edmonton, bringing a specimen gold ore found near the head waters of the Saskatchewan by a prospector named Noyes. It is believed now that the source of gold found in sand bars in the Saskatchewan River has been at last located.

A MEETING of capitalists interested in mica mining in Canada was held in the Russell House, Ottawa, Ont., recently, when the question of fixing a standard and a standard price for Canadian mica was discussed, and the advisability of such a move was unanimously decided upon.

B. W. FOLGER, of Kingston, Ont, says that Barney Barnato, who has become so famous in connection with the boom of South African mining stocks, was born at Eagle Creek, near Parham, on the line of the Kingston and Pembroke Railway, where he has a brother now residing.

LETTERS patent have been issued incorporating the Patterson Dry Mineral Magnetic Separator and Gold Extraction Company of Ontario, limited, with a capital of $125,000. The company consists of Thomas McCraken and Dr. W T. Stuart, Toronto; H H. Powell and R N Ball of Woodstock, and G. H Patterson of Denver, Col., and its object is to deal in mining and milling machinery, minerals, ores and metals.

AN important deal, in which American capitalists are interested, is taking place in connection with the gold and copper claims of Texada Island, off the coast of B C L. M. Turner, of Seattle, and Wm Woodruffe, of Chicago, who represent the syndicate concerned, are now visiting the island and inspecting the claims which they have bonded. They are accompanied by the present owners and also by the Government agent, who proposes, if the result of the inspection proves as favorable as is expected, to make a number of necessary road connections with a view to mine development.

STATISTICS of surprising importance have come to hand in connection with the newly-discovered coal deposits in Newfoundland They cover an area of twelve by six miles, and consist of three troughs, one of which is ten miles long and a mile wide. The deposits are within 40 miles of the water, and are quite adjacent to shipping passing through the St Lawrence River It is estimated that the quantity of coal in one trough is nearly 12,000,000 tons, and the others are supposed to be equally rich. The new railway from St. John's to the west coast runs close to these coal deposits at the head of Grand Lake E G. Reid, of Montreal, who has the contract for building the road, has leased a considerable area from the Government and will develop it at once The coal is said to be a fair quality of anthracite.

THE Toronto *World* has, like ourselves, an abiding faith in the future of British Columbian mining, and deals with the subject editorially in a very interesting way recently. The Hon Mr Turner, Premier of British Columbia, is authority for the statement that a number of the best known financiers of the Old World, including Baron de Rothschild, Baron de Hirsch, Baron de Machiels and Henri Rosenheim, are interested in some of the mining companies in British Columbia The *Board of Trade Journal*, of London, England, says that the output of the Kootenay mines was $770,000 in 1894 This was the output of about half-a-dozen mines and represents simply initial work, rendered possible by the completion, very recently, of several lines of communication, by which ore is now being shipped regularly In view of the number of mines being opened up, the rich character of the ores, and the extraordinary extent of the mineral formations, Kootenay district alone expects to vie with South Africa in mineral products within the next five years. A safe estimate for the output in 1895 is $5,000,000.

Electric Flashes.

ST JACOB'S, Ont, is to be lighted by electricity

THE electric company, at St. Stephen, N B, is thinking of putting in new water wheels.

A NUMBER of capitalists propose to build an electric road from Schomberg, Ont., to Newmarket

THE Bell Telephone Company will erect a building in Winnipeg, Man., to cost between $15,000 and $20,000

THE Board of Trade of Waterloo, Ont., has recommended a bonus of $30,000 to the International Radial Railway.

AHEARN & SOPER, Ottawa, have begun work on their contract of installing an electric lighting plant in Alexandria, Ont.

THE Michigan Central Railway will illuminate the Falls of Niagara with an electric searchlight.

THE Montreal Street Railway Co. has built five new snow sweepers, and now has fourteen ready for service.

BOYD, CALDWELL & Co. are putting in an electric lighting plant, and will light the village of Lanark, Ont.

J. H. FRANCIS, Pakenham, Ont., will probably light the village from the plant he has installed in his flour mills.

W H. COMSTOCK, the Brockville, Ont., millionaire, is interested in the project to give Brockville an electric railroad.

A LONG distance telephone line is to be constructed next spring between Calais and other places in New Brunswick, connecting with Boston.

THE Royal Electric Company, Montreal, has secured the lighting contracts for Logan's Park, Brock street tunnel, and Lachine Canal.

A BOILER and engine are being put in at the Tay Electric Power House, Perth, Ont., for auxiliary power when the water is low.

THE Almonte Electric Light Co. has reduced the price of lighting and are puting in a large number of new lights in consequence.

THE Hamilton Radial Company now gives notice that it will apply to parliament for power to extend the Guelph branch to Lake Huron.

THE new electrical plant at Chicoutimi is now in operation. The cathedral, seminary and archbishop's palace will be lighted with electricity.

THE employés of the electric railway at St. Stephen, N.B., have had a two dollar cut in their wages, and now receive $8 per week of seven working days.

A. E. PAYNE, a well-known electrican of Boston, Mass., has decided to make his home in Canada and has joined the Royal Electric Company, commencing his new duties in Toronto.

THE township of East Flamboro has offered to submit a bonus by-law for $30,000, and the village of Waterdown one for $6,000 in favor of the proposed International Radial Electric Railway Company.

THE Toronto, Hamilton and Niagara Falls electric railway is a new enterprise which is seeking incorporation. It proposes to connect by means of electricity the points named. Clark, Bowes, Hilton & Swabey, Toronto, are solicitors for the applicants.

J H. MEIKLE, JR., of Morrisburg, Ont., a graduate of Cornell University, who has been employed by the Brooklyn Electric Railway for some time, has gone to Johannesburg, South Africa, to manage an electric railway.

HAMPTON, N.B., will in all probability soon have the electric light. Cecil March has already secured a large number of signatures to contracts for the use of the future illuminant. Electric cars are talked of, too, between Hampton and St John, N.B.

THE Street Railway Company of Kingston, Ont., will extend its track into the eastern end of the city, and run cars to the lower depot, provided the corporation will make the streets on which the rails are to be laid. It is likely the corporation will accede to the company's terms.

AMONG the announcements of applications for railway legislation is one to incorporate the Huron and Ontario Railway Company, to build an electric railway from Port Perry to Kincardine, passing through the counties of York, Simcoe, Cardwell, Grey and Bruce

THE promoters of the Barrie and Allandale Electric Railway have almost completed arrangements with the G.T.R. by which they will get the land just west of the Minett's Point property, which is suitably wooded and better adapted for park purposes than Minett's Point.

E. A. C. PEW, the promoter of the Huron and Ontario Railway, is endeavoring to arrange matters so that an electrical manufacturing company from the United States would locate a new factory in Hamilton, the city giving them a factory, a bonus, etc As yet, the affair is in a purely conversational stage.

IN the matter of Blackley against the Toronto Street Railway, the jury brought in a verdict of $1,105 15 and costs. Leave to appeal was refused. The plaintiff's son Ralph was killed on a Church street car on which there was no guard; at the time, the system in Toronto was being changed from horse to electrical traction.

THE Ottawa Electric Co. are considering the building of an electric ambulance car for city service.

THE Metropolitan Electric Railway Co. has been given a year's extension of the time in which the road is to be completed to Richmond Hill.

AT Osgoode Hall, the other day, an order was made declaring the Brantford Electric and Power Co. insolvent and appointing Robert Henry provisional liquidator.

THE work of building the flume for the electric light power-house at Valleyfield, Que., is proceeding slowly, and it will be some time yet before the streets of Valleyfield are lighted up.

THE water-power at Trenton, Ont., is to be utilized to supply electric power to both Trenton and Belleville, Ont, and the work is now going on under the superintendence of George White Fraser, of Toronto.

A SCHEME is under consideration with the purpose of extending the Bear River electric light to Digby, N.S. The power would be generated by the Bear River waterfalls, and would be sent over ten miles of wire.

THE electric railway from Arkon to Cleveland, Ohio, has recently had some novel features added to it. Compressed air brakes and telephones are among them. A piston connected with an eccentric on the axle pumps air into a tank, and it has been found possible to stop a car going at 30 miles an hour within 100 feet Each conductor will carry a telephone, and half-mile stations where he can "connect" himself with the train dispatcher, which is also a new idea, will be provided.

LONDON, Eng., brokers, acting for an English syndicate, have purchased at an enormous cost the Vancouver Electric Tram Company, Vancouver Electric Light Company, the New Westminster and Vancouver Inter-Urban Electric Tram and Light Company, running a distance of twelve miles, and the New Westminster City Electric Tram Company. Half a million dollars will be spent in utilizing the water power of the Seymour River to run the entire immense system. An English syndicate has also bought the Victoria Tramway, it is said.

SOME people want the earth and some are content with a little less. It is somewhat difficult to say where the promoters of the proposed electric railway in St. Thomas, Ont., come in. They will not allow the city to participate in the earnings of the road. The company won't allow the city to fix the price to be charged for light, heat or power. The company will not undertake to provide any material, or to go to any expense to make any asphalt, brick or other pavement on track allowance which requires concrete foundation The company insist on using T rails The company ask the city to state what annual sum per track mile they will accept and maintain the track allowance Naturally matters have come to a stand still at this point.

THE Lachine Rapids Hydraulic and Land Company is not going to have any difficulty in disposing of their electric power, the works for whose development are now being constructed under the supervision of Thos. Pringle. A syndicate of the stockholders of the Lachine company has been formed, which will control the Citizens' Light and Power Company and the Standard Light and Power Company These two corporations own valuable franchises for the use of electricity in all its forms in Ste. Henri and Ste. Cunegonde, and for street lighting in Westmount and St. Louis de Mile End, as well as the lighting of the Montreal Harbor. They have also the right of erecting poles in the streets of Montreal. Leading members of the syndicate are R. Wilson Smith, J. H. Burland, W. McLean Walbank, M. P. Davis, Peter Lyall, O. L. Henault and F. Dagenais.

THE Napierville Junction Railway, a new electric line between St. Remi and Stottsville, Que., is preparing for active work. The whole distance is, about twenty-two miles, running through the parishes of St. Michel, St. Edward, Douglasburg and St. Phillipe, a district now without railway service. The Dominion Government has subsidized the road with $3,500 per mile, and the towns of Napierville and St. Edward have given bonuses of $10,000 and $2,500 respectively. The town council of St. Remi will grant a subsidy of $3,000. The whole work is to be completed by July 5th next, or the subsidy is lost. Hon. Mr. Laviolette is president of the road, and Mr. Lafontaine, secretary. This will be the first electric road in the province outside of Montreal and vicinity. It will connect with the Grand Trunk at Stottsville.

Personal

N. S. HUNSTON, of the Dartmouth Iron Foundry, Dartmouth, N.S., is dead.

W. F VAN BUSKIRK, C E, is superintending the system of main sewers being built in Stratford, Ont.

CITY ENGINEER KEATING, of Toronto, has left for Brussels, Belgium, where he expects to spend Christmas with his family

JOHN E NOLAN, one of the best-known engineers on the M.C.R., died at St. Thomas, Ont., November 2nd, after a long illness.

WM. ANDERSON, of Mount Forest, Ont., was caught in a belt and instantly killed in the Howland Mill, at Waterdown, Ont., November 12th.

R. A. BUSH, chief engineer at Brockville Asylum, accidentally shot himself in the thigh a few days ago. We are glad to learn that he will recover.

THE seventeen year old son of Kinnear Wilbur, sawmill owner of Midway, Albert county, N.B., was drowned in his father's mill-pond on Nov. 11th.

DONALD SUTHERLAND, the railway contractor, died at Shubenacadie, N.S., a few days ago. Deceased built a section of the Grand Trunk Railway.

J. Y LLOYD, London, Ont., for many years engineer on the G T R., committed suicide a few days ago by shooting himself. He was 73 years of age.

T. C ATHERTON, who had been engineer at the Normal School, Fredericton, N B, for a great many years, died very suddenly this month, at the age of eighty.

ROBT MCCALLUM, C.E, of the Ontario Public Works Department, has recently returned from inspecting the completed portion of the Ottawa and Parry Sound Railway.

BRIDGE INSPECTOR SEFTON, of the Intercolonial Railway, had one of his feet badly injured by the fall of a jack with which a heavy girder was being moved at Red Pine Brook recently.

AT the Pedlar Metal Roofing Co's Works, at Oshawa, F. Riggs, an employé, while fixing the machinery a few days ago, had his right arm completely wrenched from the socket. He will recover.

J B MORFORD, superintendent of the Canada Southern Railway, was married at St. Thomas, Ont, on October 30th. He was presented by the citizens with a handsome diamond ring, and the bride elect with a handsome diamond brooch.

THE members of the Institution of Civil Engineers residing in Toronto entertained the visiting English engineer, Mr. Mansergh, to dinner at the Toronto Club the night before he left the city. Mr. Mansergh is a vice-president of the institution.

A P. KILGANAN, Little Current, Manitoulin Island, Government engineer, died in Toronto recently. Mr. Kilganan establisehd telephone communication all over Manitoulin Island, and secured a charter and cleared 70 miles of road for an electric road.

ON the evening of November 15th the employés of the Canada Iron Furnace Co., Radnor Forges, Que., gave a complimentary supper and presented an address to the superintendent, J. J. Drummond, previous to his departure to Europe on a business trip.

PROF. CARLYLE, of McGill University, Montreal, has been offered the position of mining superintendent for British Columbia, a most important position under the Provincial Government. Mr. Carlyle has accepted the position, and will complete his work at McGill with the close of the present term.

JOHN RONALD MACDONELL, C.E., died in Montreal recently at the age of seventy-five. Mr. Macdonell was engaged in the construction of the I.C.R. along the North Shore, and afterwards came with his family to St. John, N.B., where he lived for several years. A few years ago he removed to Montreal.

GEORGE OLDS, who for 10 years past has been general traffic manager of the Canadian Pacific Railway, and has been in receipt of a salary of $12,000 a year, will retire from active service at the end of the present year. This information will be received with general regret, as Mr. Olds has been popular with the business men of Canada and faithful to the interests of the Canadian Pacific. Ill health is the cause. He will probably be succeeded in a portion of his duties by G. M. Bosworth, the freight traffic manager, whose office has been transferred from Toronto to Montreal.

William Collins, the inventor of what is known as the Lappin Brake-shoe, which is used on the elevated railroads of New York, died suddenly in Bloomfield, N J., November 3rd Collins was born in Toronto, Ont., forty years ago He was superintendent of the Lappin Brake-shoe Company, and resigned the place recently to become superintendent of the Corning Brake-shoe Company

A E Patton, of Stratford, Ont., who has had charge of the supply branch of the G T R. engineering department in the west, has been promoted to the position of inspector of plumbing and sanitary arrangements of the company Under his new position Mr. Patton's headquarters will be in Montreal, and his territory will be from Portland, Maine, to Sarnia

THE OTTAWA, ARNPRIOR AND PARRY SOUND RAILWAY.

This season's work commenced at the one hundred and forty-second mile and went to the one hundred and sixty-second mile from Ottawa, a distance of twenty miles of excessively heavy work, this total length of one hundred and sixty-two miles now being open for traffic. The Parry Sound Colonization Railway, which is the western section of the O., A & P. S Railway, starts from Scotia on the Northern Pacific Junction of the Grand Trunk Railway, and runs westerly a distance of forty-eight miles to Parry Sound Forty miles of this has been built during the past three years and the balance of eight miles will be open for traffic by the new year

Between the 162nd mile of the O., A. & P. S. Railway and the point known as Scotia on the Pacific Junction, which is also the commencing of the Parry Sound Colonization Railway, is a gap of 47 miles yet to be completed. The present intention is that this section (which is very heavy work) shall be built next season, thus completing the whole line from Ottawa to Parry Sound. They have also completed what is known as the Central Counties Railway (Rockland Division) from South Indian, on the line of the Canada Atlantic Railway to Rockland on the Ottawa River, a distance of 17 miles At Rockland is situated the W. C Edwards Company's large saw mills, and the company anticipate hauling a large amount of the lumber over this line The president of all the above roads is J R Booth Ottawa, E. J Chamberlain, Ottawa, general manager, Geo. A. Mountain, chief engineer.

The Patent Review.

48 333 W C Mapledoram and F Brown, Port William, and S. W Ray, Port Arthur, Ont., cover for cooking utensils.

48 335 N H Smith J Bunting, jr., L Bunting and others, vacuum fire kindler.

48,337 D Lalonde, Montreal, device for thawing pit ice in service pipes

48 339 Standard Valve Co., Chicago, Ill., apparatus for controlling valves, etc

48,341 J. H. Eastwood, Belleville, N.J., valve

48,342 W M. Chalk and F. G. Aldrich, Spivey, Kas., steering apparatus for wheat headers

48,346 J. R Jones, Philadelphia, J. W. Jones, Harrisburg, and T A. Jones, Philadelphia, Pa., railroad signal

48 347 M A Shipman, Central City, Neb., hand fence machine.

48,349 C F Goddard, Chicago, Ill., steering mechanism for threshing machines.

48,350 C. L Lightfoot, Toronto, Ont., hot air furnace

48,351 A. H Chilton, Baltimore, Md., horse detacher and vehicle brake

48 353 H Nielsen, Edgerton, Wisconsin, steam engine.

48,355 R T. Woldrep, Lifton, Ga., railway switch frog.

48,356 E. D. Mayo, Three Rivers, Que., gate opening and closing device

48,357 H S Herrington and W. S. Head, jr., Latrobe, Pa., car brake

48,358 The Cockshutt Plow Co., Brantford, Ont., nose for gang plow shares.

48,360 The Lombard Water-wheel Governor Co., Boston, Mass., speed regulator.

48,361 Hermenegilde, Roy and Tenon, St. Aubin, Montreal, Que., hot water heating system.

48,362 H O. Thomas, Chicago, Ill., hand truck.

48,363 D. Servis, Toledo, O., tie plate.

48,364 J E Webb, Hockley, Eng., method of extracting and destroying sewer gas.

48,365 J D. Ansley, Cambridge, F. W. Gregory, Boston, Mass., trolley wheel

48,373 J Howard, New York, brake adjuster.

48,375 Bell Telephone Co., Montreal, telephone circuits

48,376 Bell Telephone Co, Montreal, telephone exchange call boxes.

48,385 A. H. Brintnell, Toronto, electric motor.

48,389 W. H. Garven, Portland, Ore., telegraph call

48,395 J E. Dolber, Manchester, N.H., thill support.

48,397 C A. McCulloch and F. Welliver, Minneapolis, Minn., draft regulator for locomotives.

48,398 A. Piedfort, Calais, France, multiple telegraphic apparatus

48,407 J. E. Meek, New York, electric heater.

48,409 W J. Powers and H. E. Blake, Bedford, Que., thill coupling.

48,411 B F Perkins, Holyoke, Mass., dynamo meter.

48,412 C. B. Schoeumehl and C. M. Plate, Waterbury, Conn., galvanic battery.

48,413 H L. Boyle, Grand Rapids, F. B Gates, Owosso, Mich., gas engine.

AMERICAN PATENTS.

The following is a list of patents recently granted in the United States to Canadians This list is furnished to The Canadian Engineer by Hanbury A. Budden, patent solicitor, Montreal.

547,218 James D Lamb and J. E Chapman, assignors of one-twentieth to J J Durack, Montreal, street-car fender.

547,083 Manley Thomas, Prince Albert, sawdust feeder for furnaces.

547,277 Lemuel H Morgan, assignor of one-half to M. C. Todd, Galt, fastening device

547,043 William J. Still, assignor to W B. Close, Toronto, rectifier for electrical currents

547,752 John and E P. Forbes, Halifax, tire for bicycles.

547,726 Martin Leist, Maitland, assignor of one-half to N. Gentle, North Sydney, automatic centreing or pivoting drill

547 498 Ruben A Oakley, Montreal, cheese box trimmer.

547,747 Thomas H Walsh assignor of one-half to E A. Cowley, Montreal, car coupling