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

Toronto, September 1, 1893.

IMPROVEMENTS IN THE GAS ENGINE.

Prof. A. B. W. Kennedy, in a lecture delivered some weeks since at the Royal Institution, said that, in regard to the gas engine, its theoretical efficiency is already so high that there is but little need for attempting to raise it. The possibility of improvement lies in bringing the actual efficiency up to the theoretical, which is about 80 per cent. The greatest cause of loss is represented by the heat taken from the water surrounding the cylinder. The fact is we are trying to obtain incompatible results. To reach the high efficiency we make the initial temperature very high. But, then, any such temperature would melt up our machines altogether, and we have, therefore, to adopt the somewhat barbarous expedient of continually keeping the metal cool by a current of water passing through a jacket. This water must, of necessity, pick up all the heat which can get through the metal and carry it away to waste. The result is obvious in the figures. Although, therefore, the theoretical maximum efficiency is so much greater than that of a steam engine, the actual efficiency is not nearly so great. Notwithstanding this, the actual energy utilized per thermal unit of combustion of heat in a gas engine is very considerably greater than in a steam engine. Undoubtedly, great possibilities for increased economy exist here. A great help would be the discovery of some non-conducting material suitable for use in the construction of engines. What is wanted is something as strong and as easily machined as iron, with the conductivity of sawdust, a material which will remain unaffected by excessive temperatures and which will bear any amount of rubbing. In the case of the steam engine, the case is different; we want to raise the theoretical limit of efficiency. But here we are dealing with a material which is liquid at ordinary temperatures and pressures, so that in its working condition it is a vapor and not a gas, and its temperature cannot be raised without at the same time raising its pressure. Considerations of safety and strength of our materials become here very important, but even if left out of account altogether, and the value of the maximum working pressure of steam engines raised from its present limit of 10 atmospheres to 20 atmospheres—that is 100 per cent.—the theoretical maximum efficiency only would be increased about 10 per cent., a quantity hardly worth considering in such a case. Clearly, this is not a very promising direction in which to work.

No doubt the direction in which to seek for improvement is in that of what is called superheating the steam, or raising its temperature after it has been formed—converting the vapor into gas without increasing its pressure. Theoretically, this can be done to any extent, though it is only recently, through the introduction of mineral oils for lubrication, that it has been thoroughly practicable. At one time, when high pressures were looked at askance, and high temperatures were thought almost as impossible, great hopes were entertained of increasing efficiency rather at the bottom than at the top end of the temperature scale. It was proposed to use an auxiliary engine working with ether or anhydrous ammonia, or any other substance whose boiling point might be made as low as the temperature in the condenser of the steam engine. But there are such great practical objections to this plan that it has at present disappeared from the range of practical engineering. Undoubtedly, the most promising direction for improvement is to go up, and not down the temperature scale, and he will be a great benefactor who will devise a good and not too bulky superheater applicable readily to existing work. All this is rather in the direction of potential than of actual improvement. In the latter, however, there are still large possibilities. The losses here are due to many causes, but chiefly to two. The first of these is that the steam is thrown away at too high a pressure, *i. e.*, that it is not expanded sufficiently far in the cylinder. Mechanically this is remediable at once, but only at the cost of making the engine unduly large and costly for its work. This cause of loss is, therefore, likely to remain. The second is, that as the fresh hot steam is always admitted to a cylinder which has just been emptied of steam having a much lower temperature, a cylinder, moreover, which is made of excellently conducting material, a very large proportion of that steam is at once converted into water on entrance, so that for every cubic foot of steam which leaves the boiler and passes along the pipes, perhaps only two-thirds, or even half or less, does work in the cylin-

der as steam; the rest passes through the engine as water, or is sometimes partially re-evaporated, but never in such fashion or at such time as to be of much real service in doing work. There are thousands of engines at work to-day, in which for every ton of water which has been evaporated in the boiler half a ton does no good whatever, except to warm up (by being condensed itself) the engine sufficiently to allow the other half ton to do work. Here, truly, is a field for economy, and one with very great possibilities. Aside from steam jacketing and other methods in partial mitigation of the waste, Prof. Kennedy states that there is no doubt that the great benefits which have been derived from superheating, and the still greater possibilities of economy which exist in it, and will probably soon be more heard of, are not at all connected only with the rise of maximum theoretical efficiency. The drying of the steam very largely influences its behavior under the conditions mentioned, and unquestionably helps enormously to diminish the waste. In the case of the incandescent electric lamp, to quote another instance of waste of energy, about 95 per cent. is expended in heat and only 5 per cent. in the actual production of light. The great desideratum here is to obtain light without heat, or at any rate, with a minimum of heat; but the Professor acknowledges that he does not see from what direction the necessary improvements are to come.

A NEW MARINE BOILER.

It is well known that the construction of the marine boiler is not favorable to satisfactory circulation of the water in it, by means of which it can be maintained in all parts at the same temperature, says the *Engineering Review*. The lower parts get several degrees colder than the parts which are over the furnaces, and the colder and heavier water remains there without being stirred up to mix with the lighter and hotter water from which the steam is escaping at the higher level. The consequence of this inequality of temperature is a series of strains upon the shell, which are particularly trying and create a liability to leak at the seams. This leakage is the first step towards that corrosion which is always an element of danger, and which it is desirable to prevent if it is in any way possible. This difficulty gives especial interest to a form of water-heater which is being experimented with at Liverpool, the principal feature of which is that the suction of the feed-pump is taken partly from the hot well of the engine, where it has a temperature of 110° to 130°, and partly from the lower part of the boiler under the furnaces. Of course the latter water will be at a temperature higher than 212°, and by suitably adjusting the proportions the water which passes out through the delivery-pipe can be brought up to that temperature. By this means the water in the boiler is compelled to a circulation to supply the place of that withdrawn.

LIGHTHOUSES.

One of the most serious problems to be considered in lighting a coast is the question of differentiating one lighthouse from another in order that no mistake may be made either by day or by night. This is especially difficult when there are several lights within a few miles of each other. Various means have been devised to mark them by daylight, such as painting the lighthouses of different colors, with red or black and white bands or stripes, or pure white or red, or by having two lighthouses adjoining and the like. At night the lights are either fixed or revolve, or flash at certain intervals, or show different colors. But all these devices, especially those for the night, are becoming insufficient as steam navigation increases, and vessels going twenty miles an hour cannot or will not stop to study out the character of a distant light. The greatly increased number of other lights, and particularly electric lights, as the coast becomes more densely settled, is also found to add to the difficulty of distinguishing lighthouses at night. For these reasons experiments are now in progress, says an American paper, for introducing some system of numbered sequence in throwing out the light from the lantern similar to the method in use with steam foghorns, by which a given lighthouse or lightship is indicated by the sequence of the blast from the foghorn. Three numbers, sufficient for several hundred combinations, might be the basis for the method. Undoubtedly there are great difficulties to be overcome in maturing some good system, but something will have to be done to keep lighthouses up to the needs of the present day.

THICKNESS OF BOILER PLATES.

A. Blechynden, in a paper contributed to the Institution of Naval Architects, London, Eng., gives the results of some experiments upon the transmission of heat, with special reference to the efficiency of boilers. The experiments were in two directions, viz.: those in which there were varying differences of temperature at the two sides of the plate, and secondly, those in which the thickness of the plate varied. The general conclusion arrived at was, that heat transmitted is proportional to the square of the difference between the temperatures at the two sides of the plate. There was a general rise in the value of the moduli for temperature with decrease of thickness, but the progress was by no means constant and regular. This the author attributed to the difference in surface, and more especially the difficulty of maintaining it uniformly clean. It was found that the very slightest trace of grease caused a very large fall in the rate of transmission; even wiping the outer surface with a piece of rag was sufficient to influence the result. The smoothness of the surface was also shown to be an important factor. The author also noticed that the carbon content appeared to affect the conductivity, the plate lowest in carbon being also the lowest in conductivity. The results of these experiments certainly point to conclusion that the thinner the plates forming part of the heating surface of a boiler, the higher should be the boiler's efficiency, always provided that the plates are clean; but it will be evident that if the plates are coated with a covering of scale or some bad conductor, then the less must be the influence of the thickness on the efficiency, while with a thick coat of oil the influence might become practically unimportant. The fact that the heat transmitted is proportional to the square of the difference of the temperatures of the two sides of the plate, shows the importance of high furnace temperatures if efficiency is aimed at, and emphasizes the importance of rapid combustion, either by means of air supplied by fans or by height of funnel.

THE resistance offered to the flow of any liquid by bends in pipes is well known, says the *Stationary Engineer*, but is too seldom considered in the installation of machinery. The capacity of pumps is often decreased greatly by too great a number of short bends in feed and suction pipes. Similar effects are noticed in steam pipes, but in the case of either liquid or steam the resistance offered by the bends is usually overcome by an increase of pressure at a loss of fuel and greater wear and tear on the machinery. An expert pipe fitter can nearly always overcome the greater part of such loss by making long bends in the pipe where there is sufficient room for them, which should always be provided, and although the job may not appear as neat to the eye of those accustomed to the use of square ells, yet the beauty of the longer curves is apparent to those who are not prejudiced in favor of the old style fittings. Cast iron fittings should be avoided wherever possible, and, instead, the pipes should be bent to conform with the requirements. Bending pipe is not a very difficult matter if a person goes at it in a proper manner, for they can make long bends that will serve the purpose exceedingly well and not decrease the area of the pipe appreciably, as would be the case if shorter bends were employed. In the use of ammonia and some other substances the ordinary style of fittings are not suitable on account of the leakage which would be produced; consequently bends are preferable, and as they are easily made they should be employed wherever possible, for even in ordinary feed pump work considerable will be gained by such arrangement. In bending pipes the bends should not all be made at one heat, as it is almost impossible to do so to good advantage unless a special device is employed for the purpose; but by laying off that part of the pipe where the bend is to occur, several heats should be taken and short bends made at different places along the length, giving a fine contour, retaining the area of the pipe and making the angle of the pipe just what is required. More long bends and less ells should be used in pipe fitting for steam and water.

THE London *Engineer* describes a new form of shallow-draught steamer lately built by Yarrow & Co. It is propelled by a single screw 45 feet in length by 7 feet beam, yet not drawing more than 12 inches of water. The bottom of the hull is perfectly flat, and the bow spoon-shaped. Steam is generated in a horizontal boiler, and the engine is of the simple high-pressure inverted type, driving a screw about 2 feet in diameter. To immerse this size of screw in a boat of the usual form would necessitate a draught aft of at least 2 feet, but in the class of vessel we have before us the water is sucked up, as it were, into a raised tunnel built into the bottom of the boat, and the propeller revolves in it, and is consequently not only entirely immersed, but also well protected from injury. As before stated, the extreme draught is only 12 inches, owing to this method of drawing up the water to feed the propeller, which is a system not sufficiently well known, but nevertheless which has been adopted in a few instances for many years past. When building the first steamers on this principle, special arrangements were made for keeping the tunnel full of water by exhausting the air out of the upper, or above-water, part of it. Experience, however, has shown that the action of the propeller itself is quite sufficient to draw up the water and drive the air out at the after end of the tunnel. On trial in the Thames, a speed of seven to eight miles an hour was easily maintained, and the towing power of the boat was excellent. This little vessel is capable of seating comfortably about thirty-five passengers, but it is mainly intended for towing small native barges. There is a wooden awning extending the whole length to serve as a protection against sun and rain. The steering wheel is forward as usual in vessels for tortuous rivers where a good lookout for snags, etc., is of the utmost importance. The hull is constructed of galvanized steel, which is the most durable material for the river steamers of hot climates.

TWISTED IRON FOR FLOORS.

Fire-proof floors are being constructed of twisted iron incorporated in concrete. In a test recently made in which the floor occupied 10,000 square feet, it was estimated that it would safely carry a load of 250 pounds per square foot, and one section measuring 15 ft. by 22 ft. bore a uniform load of 415 pounds per square foot for a month without deflecting at the centre more than one-eighth of an inch. With spans constructed of this material, measuring about 15 or 20 feet, the saving in weight is about 20 per cent. over iron girders and hollow tiles. The twisting of the iron before it is imbedded in the concrete diffuses the strain equally throughout the bar's whole length, and it is firmly held at all points by the mass enveloping it. It may be mentioned also that any imperfect lamination of the iron is detected at once, and this ensures the employment of a good quality. Cold twisting is said to add to the strength of the bar very materially. In some recent tests it was shown that ordinary iron, $\frac{3}{4}$ inch square, gains 17 per cent. in tensile strength upon being given $1\frac{1}{2}$ twists per lineal foot; six twists per foot give a 24 per cent. increase. The results with superior qualities of metal give a still more marked effect, especially when there is a fairly long interval between the twisting and the testing.

HOUSE DRAINS.

E. R. Boulter, surveyor, says the cleansing of house drains is a matter requiring the serious attention of sanitary authorities, and by this is meant not only the removal of solid obstructions, but also the prevention of gaseous accumulations. Surely the drains of a house need at least as much attention as its chimneys. No sensible person objects to have the latter cleaned periodically; yet many people seem to think that when a drain is once laid no further attention is required in connection with it. Cases are known in which drains that have been in use only a few months are found to have the disconnecting traps completely clogged with matter and the parts above the traps quite blocked. This state of affairs generally arises from mere want of attention, and not from any defect in construction. Owners of property are frequently called upon to pay for work done in removing stoppages which might easily have been prevented by a little care earlier in the day. It should be remembered that a drain once removed is seldom made perfect again. Mr. Boulter suggests that the sanitary authorities of each district should undertake the work of flushing, which is at present so often neglected by house occupiers, and that the cost should be a charge upon the rates. The plan could be carried out in the following way: Workmen, furnished with the necessary implements and deodo-

rants, might visit all occupied dwellings, etc., on each line of sewer. That being done, a flushing van might be employed to discharge into the manholes such a quantity of water, mixed with the deodorant, as would effectually cleanse and flush the sewer in question. The deodorant recommended is manganate of soda, and Mr. Boulter thinks that if this proposed system were properly carried out there would be far fewer complaints regarding smells from ventilators.

WASTED HEAT.

BY A. M. WICKENS.

Our subject is very far-reaching and cannot be fully gone over in a paper as short as this one must necessarily be.

As heat is the source of all life, and also of all motion, its influence permeates everything in the whole universe. The great heat given to the countless worlds that travel their orbits, in a boundless and immeasurable space, is the sun. Sir William Herschel tells us that if a cube of ice 45 miles in diameter and 200,000 miles long were plunged endwise into the sun, it would be melted in one second of time. What the effect of this vast heat is on other worlds we cannot tell; what the condition of life, what manner of souls, what kind of an atmosphere, nor in fact any of the particulars we know not. Had we a full knowledge of all these things we undoubtedly would be able to utilize the great sun heat to create our motive power direct from its rays; but while our knowledge of other worlds is extremely limited, we have been able to learn something concerning our own surroundings and the wonderful combinations of nature provided by an all-wise Providence for the use and benefit of the inhabitants of this earth. If we could imagine anything perfectly cold, it would be without motion, perfectly still, and absolutely dead. The earth, the rocks, the trees, the air, are all moved continuously and subject to vibration, the direct cause of which is the heat and light of the sun's rays.

The human eye and ear, two of the most wonderful parts of our organism, would be useless to us as they are now constructed, were it not for the vibrations of the light and heat of the sun coming to us through the atmosphere surrounding the globe.

It is by utilizing the principles of these vibrations that we have telephones, telegraphs, electric lights, music, and many of the conveniences and pleasures of life. And as we become more enlightened on this line, it will be safe to say that much of the complication of construction and cost of operating and maintenance, in all these different branches, will be greatly reduced, and we should also expect as we gain knowledge to be able to show better results in the evaporation of water for power purposes. In following the theory of heat for this purpose, I do not expect to be able to give you anything new, as I can only follow old and well known tracks. Still, if I can so state some of the facts, and so put some of the deductions to be had from such facts that I can start the body of progressive and representative engineers to think long and deeply on the subject, I will feel that my effort has not been in vain.

The efforts of the eminent engineers of the world during the last 50 years have been, in a great measure, directed toward the improvement of the steam engine; their strides have been rapid, their achievements great, and their success almost phenomenal, resulting in a reduction of the amount of water consumed per horse-power, per hour, from about 60 to 12½ lbs. This must be very gratifying, and of great benefit to the manufacturers of the world; but, strange to say, while all this improvement in steam engines has been going on, the steam boiler has not kept pace with the other improvements, excepting in the matter of strength. The efficiency and evaporative capacity of our boilers of to-day is very nearly the same as they were 40 years ago, and very often a new high-class engine is attached to and takes steam from the same old generating device. Now, it seems to me, that a further economy must come from a better application of the heat derived from the coal or other fuel used, and who is or should be better able to do this than the engineer? The man who daily utilizes the heat should, if he will study up the requirements, be able to devise means to convert into mechanical work a greater portion of the heat of the fuel than is now generally utilized. It is evident that in order to do this, he must first acquaint himself with the component parts of the fuel, and the chemical combinations that occur during its combustion. The advancement of all science during the century has been exceedingly rapid; galvanism, magnetism, electricity and chemistry have been factors for our general use, and are being greatly improved by the master minds of our scientific men. The greatest discovery in chemistry was oxygen, made by Dr. Priestly, in 1774; its discovery was really an accident, but was soon turned to account by the learned doctor. In the study of chemistry several things should be kept in mind: 1st. Where is the element under study to be found? 2nd. How can it be obtained in a separate state? 3rd. What are its properties? 4th. What other elements will it combine with, and what will be the compounds?

Oxygen is the most widely connected with the other elements of all our gases; it composes about one-fifth of the atmosphere and fully eight-ninths of all the waters of the globe are pure oxygen. Its most remarkable propensity is its energy in supporting combustion, and anything that will burn in atmospheric air will burn with the splendor of a meteor in oxygen. Nitrogen, another of our gaseous elements, is part of our atmosphere, and composes about four-fifths of the atmosphere. It combines with the oxygen—but not chemically—(as we will see later on.) It will not support either life or fire, and in its combination with oxygen it serves to dilute it in order that we may not live too fast—that our fires, and lamps, and any other materials may not burn too fast, and that our iron utensils may not rust too fast. The atmosphere being composed of oxygen and nitrogen, we have these elements to combine with our coals in order to get the heat. Taking an average quantity of American bituminous coal, we find its component parts are carbon, oxygen, hydrogen, ash and sulphur; we have then air composed of oxygen 21 parts, nitrogen 79 parts, and coal composed of carbon 80 parts, of which 20 are very volatile. Oxygen 16½ parts, hydrogen 6½, ash and sulphur 3 parts. Now what occurs when these elements are combined? The oxygen combines with the combustible matter and forms a chemical gas; while the nitrogen remains neutral and is still nitrogen, showing that its combination with the oxygen is mechanical, and the proportion of the mixture is by weight oxygen 1° to nitrogen 3.35°.

Now, to make perfect combustion, we supply 1° of carbon with 2.66 lbs. of oxygen, carrying with it 8.94

lbs. of nitrogen, and the products will be a chemical combination of 3·66 of carbonic acid—the nitrogen, 8·94 lbs., passing off in an unaltered state, excepting that it is heated and expanded to about double its volume. The total weight of the product of the combustion is 12·60 lbs., but we have left out the sulphur contained in the coal. We will now supply 1 lb. of sulphur with 4·35 lbs. of atmospheric air, making 5·35 lbs. in all. Of this 1 lb. of sulphur and 1 lb. of oxygen unite and make 2 lbs. of sulphurous acid, leaving 5·35 lbs. of nitrogen aga n unchanged after passing through our fire. It then follows for the perfect combustion of 1 lb. of carbon, 1 lb. of hydrogen, and 1 lb. of sulphur, the quantities of air, chemically consumed, are for the hydrogen 34·8 lbs., or 475 cubic feet, and the product is water. For one pound of carbon, 11·6 pounds, or 152 cubic feet, product carbonic acid; the sulphur uses 4·35 lbs. or 57 feet, product sulphurous acid. If we should cut off our supply of air to one-half for the 1 lb. of carbon, using 5·7 lbs. or 76 cubic feet, the product would be carbonic oxide, sometimes called marsh gas, which is inflammable and a great detriment to the heat, in fact, a perfect waste of the coal and heat. It is then evident the chief governing element for the perfect combustion of the coal is that the amount of air passing through the coal be sufficient, and in order to be sure that we may have enough, we must construct our furnaces and openings therein to carry an excess of air, the amount of which can only be determined by experiment at each furnace. In tests conducted in Germany, and also at the Centennial in 1876, it was found that passing 24% more air through the fire than was theoretically required, had no effect on the evaporative efficiency of boilers. The heat of the fire is received by the boiler, first by radiation, then by convection. Experiments conducted by Williams and other English experts, show that the water evaporated by radiation is very much more than that by convection. Take for instance one of our ordinary return tubular boilers, and the evaporation per square foot of tube surface will be less than one-fifth of that at the fire sheets, thus showing the absolute necessity of designing our boilers to secure perfect circulation, and of carefully proportioning the amount of grate surface to the heating surface. In the great test of boilers at the Centennial Exhibition at Philadelphia in 1876, where fifteen boilers were tested as to their capacity to make steam and as to their economy, it was found that by reducing the rate of combustion thirty per cent. the quantity of water evaporated was only reduced 23 per cent., and at the same time the evaporative efficiency was increased 8½ per cent. The difference in the temperature of the escaping gases was 56° F., being only 409° at the most economical point, and 465° when steaming to their greatest capacity. This does to prove that forcing a boiler is a great detriment, in fact that it is one of our great wastes of heat. The average of a continuous test conducted in Germany is reported in D. K. Clarke's "Steam and the Steam Engine." The test was conducted for nearly four years on two tubular boilers steaming night and day, when it was shown that about sixty per cent. of the heat was utilized for the formation of steam, and that more than half of the remaining forty per cent. was lost by conduction and radiation through the brick walls. The average heat of the escaping gases was 360° F., and carried off 5½ per cent., while the losses due to ungenerated heat and escaping carbon particles did not exceed one-half of one per cent. The proportion of grate area to heating surface was changed during this test three times the most economical point being 1 sq. ft. grate surface to 34 sq. ft. The duty of boilers is generally expressed by the number of pounds of water they will evaporate by the combustion of 1 pound of coal, and that all may be treated alike, we say from a temperature of 212°, and under atmospheric pressure. In this case the temperature is not raised, the water is merely passed from a liquid to a gaseous state and the heat to be imparted is that of vaporisation only. The number of thermal units necessary to produce this change diminishes considerably as the temperature increases, being at 32°, 1091.7, and at 212°, 965.7, while at a pressure of 210 lbs. and a temperature of 385.67, it is only 440.4 under atmospheric pressure. The total heat units contained in the steam is 1178.6, of which 965.7 is to be imparted. In coal of a good average quantity the percentage of hydrogen, whose heat of combustion is 4½ times that of carbon, will nearly compensate for the incombustible ingredients, so that for our purposes we may consider that a pound of good coal is about equal to one pound of carbon, and as one pound of carbon will give as the heat of its combustion 14,500 thermal units of heat, which if divided by 965.7, the amount of heat to be imparted, we have a result of 15 lbs. of water evaporated by one pound of coal. Now, in practice, if we could show an evaporation of 12 lbs. we should do fairly well, but in many cases we do not show more than 6 lbs. in ordinary practice. Evaporation from different temperatures and under different pressures, the equivalent of this theoretical duty is ascertained by the following rule: The weight of water evaporated by the combustion of a pound of coal varies inversely as the quantity of heat necessary to be imparted, thus—to take an extreme case, let water at 32° be evaporated under a pressure of 120 lbs. per square inch, counting from perfect vacuum. The number of thermal units contained in the steam is 1217.94, the number in the water 32. Now, then, as 1158·94:965·7 :: 12:9·77, which is therefore the equivalent number of pounds of water evaporated by the combustion of a pound of coal under these conditions. The evaporation duty performed in evaporating from feed waters of a given temperature into steam of any pressure having been ascertained, the equivalent evaporation from 212° and under atmospheric pressure is found by reversing the proportion just illustrated. As an example, let 9 lbs. of water be evaporated from a feed water temperature of 130° into steam of 100 lbs. pressure, by the combustion of one pound of coal, then the total heat units contained in steam at that pressure is 1213·850, of which the water contained 130·192, leaving to be imparted 1083.658 and as 965·7:1083·658 :: 9 : 10.1, which is therefore the equivalent evaporation from 212° under atmospheric pressure. In connection with heating of feed water, it should be heated up nearly to the full heat of the exhaust steam by waste heat from the engine, each 9·50 of heat added to the feed water, results in a saving of one per cent. of the fuel used. It is reasonable to suppose that many of our wastes can be remedied. Let every member start at once to study up his furnace, his coal, his feed water, and the amount of air he is using; see that you are not distilling marsh gas in your furnace; see that the brick work is tight and in good order, so that all air admitted must pass through the fire; see that the surface of the boiler and flues are clean, that they may readily take up and conduct the heat to the water. Experiment a little in your own

boiler, and find out how much water you are evaporating per pound of coal, and keep at it until you have improved your work to such an extent that the difference in the coal bills will be a source of pleasure and profit to yourselves and your employer.

ZINC PROCESSES.

Three different processes, each believed to possess its peculiar advantages, says an exchange, are in vogue among the manufacturers of zinc in Europe. In Belgium, to get pure zinc from the oxide, the latter is mixed with coal and heated in a retort, the zinc volatilizing and coming out of the mouth of the retort as a vapor; cadmium is always mixed with the zinc, and cadmium vapor comes out first, and, when lighted, burns with a brown flame, the latter changing to green as soon as the zinc vapor begins to come off; an iron cap is then placed over the mouth of the retort, through which the vapor passes and is condensed into a fine dust, and gradually the cap becomes hot and melts the dust into liquid zinc, which runs into molds and is cast into blocks. The Silesian process differs from the foregoing only in the retort, the mixture of ore and coal being put in and heated, and the vapor passing out through a tube bent at right angles to the retort; the tube is kept cool, but not cool enough to condense the vapor into solid zinc, as, if this should happen, the pipe would become clogged and the retort would burst. In the English process the retort consists of a tightly covered crucible, through the bottom of which passes a pipe; the pipe is stopped with a wooden plug, and the mixture of ore and coal is put into the crucible and heated, and, as the mixture grows hotter, the plug is converted into charcoal, allowing only the zinc vapor to pass through it.

CRACKS IN BRASS PIPES.

Brass pipes may crack from several causes, such as over-pressure, bending strains due to lack of proper support, or to shocks caused by water-hammer. But in several cases breaks have been known to occur, says T. H. Bullock in the *American Machinist*, under quite moderate pressure, and where the pipes were entirely free from any external strain or water-hammer. He mentions an instance where a piece of 2-inch brass pipe about 4 feet long burst under a cold water pressure of 22 pounds. The pipe had three level supports in sixteen feet, and was supplied from a tank. The crack opened about a quarter of an inch wide and extended six feet. A piece 5 feet long cut from the other end, bore simultaneously a pressure of 200 pounds and a sharp blow from a hammer without fracture. That the part which cracked was under considerable internal metallic strain there can be no doubt, for a piece 12 inches in length required a weight of 1,781 pounds to bring the edges of the crack together again. Probably what has a good deal to do with the question of why do brass pipes crack, is the hardness of the metal, though why in the case under consideration there should be such different degrees of it within such a short space, is puzzling. Mr. Bullock, to satisfy his curiosity, made some experiments in the matter, in which he compared the various tones given out by different pieces of brass tubing when struck with the notes of a piano. These experiments seem to indicate that the inner portion of the metal of the pipe that burst was under a severe compression strain at the point where the break occurred, but that the other end of the same pipe was substantially free from such strain. It also seemed that in some specimens the outside portion was under strain, as the pipe closed slightly when planed open. It also seems that hardness can be ascertained by tone, and we may yet use standard tuning forks for examining pipe before its acceptance, for the tones given by the several pipes when knocked seemed exactly like those given out by the piano.

A speed regulator for steam engine governors has been patented, the object of which is to balance the centrifugal force at the different planes in which the fly-balls revolve. The idea was explained at the recent convention of stationary engineers at Montreal. This invention is mentioned in the list of patents given in last number.

THE attention of the Customs Department having been called to want of uniformity in the assessing of duty upon brass pumps imported, collectors of customs are instructed that such pumps, whether hand pumps or stationary, are dutiable at the rate of 35 per cent. under the terms of Item No. 407 of the tariff. A recent circular conflicting with this is repealed.

THE air thermometer is the name given to a recent English device for giving warning of a fire. In this apparatus the expansion of air by heat in an air box fitted to the ceiling of the room is made to inflate a thin, hollow India rubber diaphragm. This raises a small terminal rod, bringing it into contact with another terminal, an electric circuit being thus completed, the current ringing an alarm bell and releasing a semaphore, which serves to indicate the location of the outbreak.

AN electric pump has been invented in behalf of which the following claims are made: As the motion is purely rotary, there is no need for a special foundation, and that owing to the absence of valves, grit and thick water will pass through without trouble. It is a rotary screw pump, having four screws mounted in pairs on parallel shafts. The pump and motor have one of these shafts and the other is driven by means of gears. The suction is at the bottom, the water going to both ends of the pump; the discharge is in the middle on the top, and the back pressure due to the head is thus divided equally between the two pairs of screws, and as they are in opposite directions on the same shafts, the thrust is perfectly balanced. One advantage of this form of pump is that the flow from it is quite regular, thus doing away with the pulsations of the reciprocating pump The pump being rotary, and running at the same time as the water, there is no need for any intermediate gearing, and there is consequently a great saving in wear and tear

WHEN putting up a steam pipe between boiler and engine, it should be made to slope slightly toward the engine, so that all the water and condensed steam will be carried forward, as it cannot be made to run back against the flow of the steam; for water once in the pipe must move forward, and if no outlet is provided it must travel through the cylinder of the engine. The water can be kept from the engine by putting a separator or water catcher in the horizontal pipe near the last end before it reaches the engine. A small pipe will lead from the back to the boiler, trapping the water before it reaches the cylinder. By the use of this simple arrangement, the steam supplied to the cylinder will be much dryer and give better results in doing the work; it will also remove the danger of injury to the engine on account of entrained water. The pipe leading back to the boiler need not be larger than ¼ or 1 inch in diameter for engines of 100 horse power or less. If a water glass forms a portion to the return pipe, it will show that a surprising amount of water is returned from the steam pipe to the boiler. This water would otherwise have gone through the cylinder, requiring a greater amount of lubrication, assisting or causing leaks and presenting a possibility of great danger to the engine. In boiler tests, the steam which is condensed in the pipe and the water carried off by priming, is often credited to the coal, when a large portion of it is due to priming effects. The condensation of steam in the steam pipe is much greater than is generally supposed, and is always so much that greater economy in fuel would be obtained if the pipes were covered with some good non-conducting substance, such, for instance, as those advertised in THE CANADIAN ENGINEER. The different forms of separators employed in steam pipes serve an excellent purpose in providing dry steam only to the engine, but if steam pipes were well covered the work required of the separator would be reduced, in many cases, much more than one-half.

Brief, but Interesting.

An instrument is being perfected for fighting against fires by means of gases.

The "penny-in-the-slot" gas meter is coming into very considerable use in large towns in England.

A good cement for iron and stone is a mixture of sulphur, iron, silicic acid and aluminum. It should be applied in a molten condition.

A sheet of iron is in existence, measuring 8 inches by 5½ inches, which weighs 16 grains, and the thickness of which is $\frac{1}{1000}$ of an inch.

The roofing of the dome of the new observatory at Greenwich, England, will be a new departure; it is to be composed of papier mache.

A process has been invented for keeping iron free from rust by means of a coating of permanent magnetic oxide produced by volatilisation.

A new glass for thermometers is being manufactured, which is said to be unaffected by heat up to 1000°. Ordinary glass tends to become soft at 750°.

An Italian genius claims to use the electric battery with success in cases of chronic lead poisoning, basing this result upon the fact that electricity promotes assimilation.

Machines are now in use which can "bottom" four hundred pairs of shoes in one day. Formerly, three pairs of bottoms for each workman was considered a fair speed.

Some locomotive drivers' ears are said to be so acute from long training that they can instantly detect when a bolt becomes loose, even though the engine may be moving at full speed.

Factories are being started in the United States for the manufacture of mortar by machinery. It is found to be more thoroughly mixed, to be easier to work and not so liable to blister as the hand-made article.

A substitute for leather has been discovered, which is said to be similar to leather in everything except that it is much more supple. This material, which is called "flexus fibra," is composed largely of flax.

A Frenchman has invented a new method of coating metal sheets with paint for roofing purposes. It consists in cementing cloth to the sheets, washing the latter with spirits of turpentine and then applying the paint.

A silver-bronze alloy is being manufactured as a substitute for German silver. It is composed of about two-thirds copper, with zinc, silicon, aluminum and manganese in proportion. It is useful chiefly for sheet, rod, and wire purposes.

The duration of wooden sleepers varies according to the number of trains; it increases with the number of sleepers per mile, it is more in cold than hot countries; it is less on inclines; it may be reduced by one-third or more on curves of small radius; finally, it varies with the species of wood.

The following rule will determine the number of tons of rail required to lay a mile of track: Multiply the weight per yard by 11 and divide by 7. For example: Take a 70-pound rail; 70 multiplied by 11 equals 770, which, divided by 7, gives 110, the number of tons (of 2,240 pounds each) required to the mile.

In London, Eng., there was recently discovered the apparatus by means of which Franklin produced an electric light sufficient for reading purposes. The current was generated from a large cylinder of glass, which was rubbed by brushes with silk covers, and the light made its appearance between a ball and a metallic point.

It has been found that a square foot of iron plate one-eighth of an inch thick weighs almost five pounds; a square foot of ¼-inch iron, then, will weigh 10 pounds; and going upon this as a basis, we can say that the area of any sheet iron (or plate iron) in square feet multiplied by the thickness in one-eighths and multiplied by five, will give the weight of the piece.

Carriages are now being built for moving by steam along ordinary roads without rails. One is a wagon about 16 feet long, weighing 6,000 pounds and holding twenty persons, it will have a speed of between 10 and 20 miles per hour, and is estimated to cost for running one cent per hour for engine power, and ten cents per gallon for gasolene, ten gallons being the estimated allowance required for one day.

An improved form of boiler tube has been patented, from which, owing to its specially adapted shape, greater efficiency is said to be obtained. According to one arrangement, says the *Industrial World*, the parts of the tubes which are adjacent to the tube plates are made less in diameter along the horizontal centre line than along the vertical centre line, the body of the tubes being circular, as well as the ends which are inserted into the tube plates. The parts of the tubes which are not round can be made of any convenient form, such as that of the figure 8 with a flame passage on either side. Indentations may be made, according to a modification, at any convenient distance apart, arranged alternately on either side of the tube. These improvements, it is stated, are intended to remedy the tendency of the tubes to leak, and the greater space obtained between those parts of the tubes where the steam is most rapidly generated facilitates the ascent of the globules of steam.

The Pepper Axle Works, Guelph, Ont., have just turned out two axles, weighing 500 lbs. each, for McArthur Bros., Chesley, Ont. They are to be used in a truck for removing houses.

The merits of the Eno Steam Generator are gradually becoming known among engineers and steam users. The company, whose offices are at 35 Richmond street west, Toronto, have received many testimonials of high value from skilled engineers. Among many others, George Yorke, engineer of the Osgoode Hall, after testing the generator put in that institution, wrote the company:—"I have great pleasure in announcing that the two steam generators, placed on our boilers at Osgoode Hall on February 16th, 1891, worked well and gave every satisfaction until May 23rd, when we closed down for the season. They not only more than fulfilled all you claimed for them, but we are able to do with the two boilers the same work we required three to do previous to their attachment. They are also extremely useful in cleansing boilers of scale and dirt." Later on, Mr. Yorke reported:—"They are giving perfect satisfaction, and we confirm the statement made July 10th, 1891. They have had no attention, nor have they given us any trouble in the least since they were put in."

Personal.

John Shaver, foreman of the Waterous engine works, Brantford, Ont., died suddenly of heart disease.

F. G. Mitchell, of London, Ont. has been appointed an inspector for the Boiler Insurance and Inspection Company, Toronto.

Engineer Thorne, of the Government steamer "Curlew," has resigned, having obtained a good position with a St. John, N. B., firm.

Bert C. Lee has been appointed electrical engineer for the Ottawa Street Railway Company. Mr. Lee was born in China, but has been for some years in the United States.

Provincial Engineer Murphy has gone to Chicago, where he will read a paper before the engineering congress assembled there, on "The Use of Concrete in Foundations."—*Halifax Herald.*

D. Pottinger, chief superintendent of the I.C.R., Mechanical Supt. Brown, Chief Engineer Archibald and wife, and General Storekeeper Cooke, of Moncton, visited the World's Fair last month.

Mr. J. O'C Mignault, civil engineer, arrived in Montreal on August 31st, from Lake Simcoe, en route for River du Lievre, where he is engaged on hydrographic surveys of different places above Buckingham.

J. B. Morford has been reappointed superintendent of the Canadian division of the Michigan Central Railway, with offices at St. Thomas. O. F. Jordan, late superintendent, has been transferred to the Jackson division.

Adolphe Davis, superintendent of waterworks, Montreal, met with an accident the other day, his buggy having come into collision with an unmanagable horse. Mr. Davis was knocked out, his foot trampled upon, and he himself dragged along about thirty yards, receiving several bad contusions.

William Porteous, the well-known architect, died at Montreal on August 28th, at the age of 82. Besides superintending the construction and placing of the lock gates of the Williamsburg and Cornwall canals, he designed many churches, woolen and cotton mills, and was the inventor of an improved system of hanging lock gates.

Electrical Department.

THE ELECTRICAL ASSOCIATION.

Owing to the amount of space taken up by our reports of the Stationary Engineers' Convention, a detailed report of the annual meeting of the Canadian Electrical Association, just concluded, is crowded out, but will appear in next issue. The programme of papers was carried out as given elsewhere, and the meetings were attended by an average of about 40 members. The total membership of the association has increased during the year from 109 to 133, and the financial statement shows a balance of $103.48. The election of officers for the ensuing year resulted as follows:—President, J. J. Wright, manager Toronto Electric Light Company; first vice-president, K. J. Dunstan, local manager Bell Telephone Company, Toronto; second vice-president, John Carroll, secretary-treasurer Eugene Phillips Electrical Works, Montreal; secretary-treasurer, C. H. Mortimer, publisher *Electrical News*, Toronto; executive committee, A. B. Smith, superintendent construction, G. N. W. Telegraph Company; J. Yule, manager Guelph Light and Power Company; D. Thomson, Hamilton; T. R. Roseborough, School of Practical Science; Geo. Black, Toronto; H. O. Fisk, Peterborough Light and Power Company; L. B. McFarlane, Bell Telephone Company, Montreal; E. C. Breithaupt, Berlin; and T. Ahearn, of Ahearn & Soper, Ottawa. It was decided by an almost unanimous vote to hold the next convention in Montreal.

THE LAYING OF ELECTRIC WIRES.

The *Electrical Engineer* describes the English method of laying underground electric wires. There are two methods followed—one, the laying of iron pipes in trenches, and subsequently drawing the mains through these pipes, or, instead of iron pipes, using bitumen pipes or casings. Whether iron or bitumen be adopted, each main should have a separate tube for its own use. If you have two or more mains in one pipe you cannot draw them in and out without injury to the insulating material, and it is imperative that this should be injured as little as possible. Drawing-in boxes are built at intervals as required. Usually the course of the main is first laid out and the trench dug to the required depth. The trench is made in as straight a line as possible, and is carefully levelled, a good foundation being obtained by ramming, or sometimes by a layer of concrete. As long lengths of trench are operated at a time as are allowed. If bitumen casing is used, these are in 6 ft. lengths, and have to be jointed *in situ* so as to obtain one continuous casing. One of the most important operations connected with mains is the jointing, and the jointing of the casing is not less important. The great objection is to moisture, and if the casing is not properly jointed moisture will get to the insulated wire. Mice and rats are also pests to be avoided. They are no respecters of insulation, and no doubt many a one has met his death from nibbling where not wanted. To resume, two lengths of bitumen are laid close to each other with, say, 2 inches space between them. Mandrels are pushed through each hole in the casing joining the two sets of holes together. Hot bitumen concrete is then run round and shaped to the shape of the original casing. The mandrel is furnished with a hook to which a cord is attached, so that when withdrawn the cord is run through the casing; this, of course, being required for the drawing in of the main. Where mandrels cannot be used, the ends are butted together and a saddle of the material placed round, the joint being made sound by a little bitumen seared with a hot iron. When iron tubes are used, similar care is taken to get waterproof joints. The drawing-in boxes are of various sizes, generally constructed of brickwork, and well drained. The casings, whether iron or bitumen, project a few inches into the pit. The cover plates are of iron, filled in with cement to match the pavement.

An apparatus called the telephote has been invented for signalling at sea at night. It has an aluminum mast upon which are arranged over 100 incandescent lamps, which can be manipulated to form the signs of the Morse alphabet.

The arc light is invaluable when colors require matching, says the *Electrical Engineer*, because, with the exception of a very few shades, all the colors and shades known to us can be seen just as they would be in the light of the sun or daylight. A silk firm made a thorough trial of the value of the electric arc in their mills, and they found that out of about 650 different colors and shades, there were only seven that could not be matched in the light of the electric arc.

While the United States is ahead of all other countries in most departments of electricity, it is behind most countries in the utilization of the storage battery. The prolonged litigation over storage battery patents is explained by *Electrical Industries* to be the reason of this, but it is now hoped that the recent decision of Judge Coxe will end the litigation, and that the owners of the active patents will be able to make use of them. The storage battery is undoubtedly capable of greater improvement, and is suited in many ways for a more general use in certain kinds of work. When these patents have expired, which will be in a few years, we shall see a large increase in the use of the storage battery.

Arrangements have been made between the Post Office Department of Canada and the Ottawa Electric Street Railway Company whereby the mails which were formerly conveyed by horses and wagons between the post office and the railway stations, will, in future, be carried by electric cars. A branch track has been placed in the post office yard, connecting with the main line of the Electric Street Railway, and three special mail cars are being constructed for the service. These cars will be in appearance somewhat similar to the regulation mail car on steam railways, and will be devoted exclusively to the mail service. Ottawa is the first city in Canada to adopt this means of rapid transit, by which it is estimated that from fifteen to twenty minutes will be saved on each delivery of mails, and the Post Office Department and the Ottawa Electric Railway Co. are receiving the congratulations of the Canadian press on their enterprise in formulating the progressive scheme.

AN ELECTRIC LIGHT BATTERY.

E. Freund, speaking recently at a meeting of the Tramways Institute of Great Britain and Ireland, gave an interesting description of an apparatus for lighting omnibuses by electricity. It consists of a battery weighing about 8 lbs., and a lamp of shallow design which can be fixed by screws to the roof of the bus. The battery consists of six cells made of ebonite, that being the only material which permanently resists sulphuric acid, and at the same time it is the best insulating substance known. Each cell contains a positive and a negative electrode, well distanced from each other, and submerged in diluted sulphuric acid. The positive plates consist mainly of peroxide of lead, the negative plates of spongy metallic lead, and both contain a thin strip of lead which projects out of the plate, and which serve to make the connection. These plates have no frames, and thus a very considerable saving of weight is effected. Indeed, throughout this kind of battery, the distinguishing features are lightness and compactness, and there is consequently a great gain from the economical point of view, compared with the forms in common use. The ebonite cells are closed with a splash and acid proof cover, which contains a small hole in the middle through which the harmless gases which develop principally during the charging may escape. The metal terminals of the plates pass through these covers, and are joined above in the proper way and connected to the battery terminals. These consist of flat strips of brass fixed to the front of a wooden box, into which the ebonite cells are cemented. They are about 1½ inches apart from each other, and correspond with a pair of strong metal springs, which are fixed to the inside of a case provided under the seat of the omnibus. Two well insulated wires connect the contact springs of the case with the electric lamp. They are carried up behind the upholstering, along the pillars and principals of the roof, and are hardly noticeable and quite out of the way. The lamp consists of a wooden base 5 inches in diameter, carrying a metal frame and a screwed bezel for the hollow crystal lens. Or the lamps may be of the "fairy" type, supported by elastic hooks of hard drawn wire to cushion the vibrations and cause the light to be steady. No electrical work is required except the replenishing of the cells with dilute acid every few days, and there is very little expense incurred for wear and tear.

THE STATIONARY ENGINEERS' CONVENTION.

As will be seen by our report, the stationary engineers, who have just completed their convention in Montreal, were by no means idle during their stay in that city. The arrangements for the reception and entertainment of the delegates were excellent, and many were the praises which they heaped upon the committee appointed for that purpose. Besides their trip to Lachine and home by the rapids, they had the opportunity given them of inspecting the engines of one of the highest class of Atlantic liners and of visiting the fine "Applied Science" collections at McGill. *Apropos* of the latter, more than one delegate was heard to say, "I wouldn't have missed this for the world." Another feature of the convention which has just taken place was the good quality of the chief items on the programme, from the important papers on technical subjects to the various addresses delivered by officers of the association. The discussion on some of the papers read was very interesting and showed that, though the delegates were stationary engineers, yet they did not allow that fact to prevent them from thinking about other branches of the engineering profession as well.

Officers of the association to whom proofs of our report have been shown pronounce them to be the fullest and best of any paper in Canada. Subscribers who wish for extra copies to mail to friends should order early to secure them.

We have had so many requests for back numbers of The Canadian Engineer from the beginning that the supply has been exhausted. These are wanted for the purpose of binding, and we shall be glad if any of our readers who have perfect copies of No. 1 (May last) will forward them to us. Allowance for the month will be made on the subscription of anyone who does not intend to bind the paper and who will send us the first number.

JOHN J. YORK
Executive Secretary, Association of Stationary Engineers.

An electric railway from Brantford via Oshweekin (Indian Reserve), Hagersville, Nelles Corners, Balmoral to Selkirk and the lake port, and the dredging out of the bar across the mouth of the creek, is under consideration by several interested residents, says the *Selkirk Item*. The project is an ambitious one.

At a special meeting of the board of directors of the Merchants' Telephone Company of Montreal, held last month, the tender of C. F. Beauchemin & Co. was accepted. The work of putting in the plant will be commenced at once, and will be under the superintendence of the engineers of the company, Mignault & Belanger, civil engineers, of Montreal.

The Cataract Construction Co., which was organized to convey electric power and light from Niagara Falls to Buffalo, are proceeding with their work, but it will be some time before the power will reach Buffalo. The distance is about twenty miles to the centre of the city, which will be the greatest distance electricity has yet been conveyed on a commercial scale.

An organ with several electrical devices is being set up in St. Joseph's Roman Catholic Church, Ottawa, at a cost of $6,000. One of these electrical novelties diminishes the strain on the wrists and fingers in playing, and there is also a device for saving the labor of pulling out a series of stops in the middle of a selection. With the aid of the latter, various combinations of stops may be made before starting playing, and the only thing necessary in order to bring them out with their full effect is to touch a button.

The Ball Electric Light Company have installed at Grimsby, Ontario, a 500 light alternator with transformer and incandescent lamps. There are also being operated a number of arc lights for street lighting from the same wires, which are a perfect success, and are the first Canadian made arcs that have been installed for public street lighting working from the same dynamo as the incandescent lights for houses and stores. This class of light has made considerable headway in the States, but has just been taken hold of by Canadian purchasers. The company are also placing the same system and capacity in Port Dover, Ont.; also an arc plant for the estate of the late James MacLaren, Buckingham, Que.

Electric Flashes.

THE town of Blair, Ont., has just had added an electric light plant.

THE Louise Embankment, at Quebec, is now lighted by electricity.

THE Standard Electric Co. of Ottawa have put in a 5,000-light alternator.

WELLAND and North Pelham, Ont., are being connected by telephone.

THE people of Brantford are agitating for an electric railway to Paris, Ont.

THE Bell Telephone Company are putting up forty-foot poles in Breslau, Ont.

THE St. Thomas, Ont., Gas Co. have added an electric plant to their establishment.

THE Edmonton, Alta., Electric Light Co. have decided to make additions to their plant.

ALL the poles for the new electric street car service in Kingston, Ont, are now in position.

THE city council has decided that all telephone wires in Ottawa must be laid underground.

ST. MARY'S, Ont., electric light station has been destroyed by fire. Loss, $3,500; not insured.

GOLDIE & MCCULLOCH, Galt, are building a large compound engine for the Ottawa electric light works.

WORK has begun upon the extension of the Toronto and Humber Street Railway as far as New Toronto.

WORK has begun upon the telephone extension from Welland to Ridgeville, Fonthill and Pelham Centre

EUGENE BALDWIN is erecting a large wind mill to furnish power for electric lighting at Dixville, Que.

COMPLETE telephonic communication has now been established between Quebec and Ste. Anne de Beaupre.

F. W. STORER has been appointed agent for the Swan Incandescent Lamp Co., with offices in Montreal.

THE St. James' Club, Montreal, are negotiating for new electric appliances in the extension of their building.

TELEPHONE connection has been established between Arnprior and Reid & Ferguson's mills, at Fergusiea, Ont.

AUGUST WEISS, a German laborer, was struck by an electric car in Winnipeg the other day and died in a few hours.

THE Sandwich, Windsor and Amherstburg Electric Railroad Company want to extend their line as far as to the C.P.R.

THE Toronto Street Railway Co. are going to erect a foundry so as to be able to manufacture all the appliances required

COL. CLARK, representing American capitalists, has been granted an electric railway franchise by London West, Ont.

WORK will shortly begin upon the new electric railway between Tecumseh and Walkerville. It is to be completed within one year.

J. B. GRIFFITH, manager of the Hamilton electric railway, is on a six weeks trip to California. Mrs. Griffith accompanies him.

THE contract for lighting the streets of Calgary by electricity has been granted to the Calgary Electric Lighting and Heating Co.

THE Tilbury Centre, Ont., council wants an electric light plant of its own, in addition to the system patronized by the tradesmen.

GUELPH (Ont.) consumers want an all-night electric service, and the Guelph Light and Power Company are acceeding to their request.

THE Royal Electric Company will establish works and employ 300 men at Cote St. Louis, provided they are granted a bonus of $30,000.

THE Ottawa Board of Trade recommends the placing before Parliament of a bill for the inspection and measurement of electricity.

THE Royal Electric Company, Montreal, have received an order from the Montreal Street Railway Company for 500 additional horse-power.

D. THOMPSON, late manager of the Hamilton Electric Light and Power Co., has been presented by the employees with a silver service of twenty-six pieces, a carving set in mahogany cases, with some handsome articles for Mrs. Thompson.

THE extension of the motor system on the Toronto and Brockton route, replacing the old horse-cars, came into operation the other day.

THE dynamo at the Yarmouth, N S., electric street car station was burnt out in a thunder-storm recently, causing the stoppage of the car service.

JOHN KAY'S action to quash the Etobicoke by-law, granting a bonus of $10,000 to the Toronto and Mimico Electric Railway, has been dismissed.

THE town of Calgary, Alta., has granted a franchise for a street railroad to Leeson & Lineham, who propose to equip two miles of line by next June.

THE fourth annual picnic and sports of the Royal Electric Company's (Montreal) employees took place on the 19th ult., and were much enjoyed by all

THE C. P. R. has purchased the telephone line from Kaslo to Nelson, and will operate it in connection with the telegraph line from there to New Denver.

THE Ottawa Fire and Light Committee recommend the establishment of a civic electric plant when the present contract with the Ottawa Electric Company expires.

THE Montreal Street Railway Co. have made a new contract with the Royal Electric Company for 500 additional horse-power, equivalent to an increase of twenty-four motor cars

THE students at the Canadian General Electric Works, Peterboro, gave a farewell supper the other day to R. A. Ross, electrical engineer, and A C. Legrand, tester, who are leaving.

THE electric light system of Amherstburg is being thoroughly overhauled. The joints are being re soldered, a new cable is being put to each light, and the circuits are being re-arranged.

THE generator of the Vancouver, B. C., Tramway Co was burnt out during a thunderstorm recently. This was the first thunderstorm that has visited Vancouver for three years.

THE Montreal employees of the Bell Telephone Company had a pic-nic, with games, etc., in Otterburn Park on the 2nd inst. It was most successful and will probably become an annual event.

THE People's Electric Light Co., Windsor, Ont., have been notified that unless the poles are placed on Glengarry Avenue within twenty days, their right to do the work will become forfeited

EDOUARD VALLEE, Montreal, a painter, was trying to change from a trailer to the front electric car, when he missed his footing and fell beneath the wheels of the former. He died within a few hours.

THE jury empannelled for the inquest on John Sullivan, who was killed recently by a trolley car at Hamilton, made a recommendation that the alarm be sounded a short distance before every street crossing.

THE Niagara Falls Park Electric Railway has had a splendid season so far, and the prospects for profitable traffic are so good that the company have begun the construction of a second track alongside the first.

THOMAS BEATTY, who was knocked down by a trolley car in Toronto, a few days ago, has succumbed to his injuries. An elderly woman was also struck on the 12th, and had her legs cut off. She died from her injuries.

THE company who have in hand the extension of the electric railway from St. Catharines to Port Dalhousie have not begun work and will probably defer construction till spring, as the road is to be used only in the summer in connection with the steamboat travel.

THE proposal for Toronto street cars to run on Sunday has been defeated by a majority of 1,003. The quiet, orderly Sunday of Toronto forms one of the attractions of the city, to the minds of strangers, and the Queen City has lost nothing by maintaining its character.

AN attempt is being made to make an improved railway motor by putting in slow-speed armatures, which will reduce the liability to over-heating. An increase also in the diameter of the armature is proposed, which, it is believed, will result in a higher conductor velocity and an increase in efficiency.

IN stating last month the personnel of the new firm of T. W. Ness & Co., Montreal and Toronto, the names of P. H. Davidson and J. E. Adams were omitted. These gentlemen have received deserved recognition for the efficiency of their services to Mr. Ness in the past, Mr. Davidson having been office manager for several years and Mr. Adams book-keeper.

1. W. SWEET (Pres. Hamilton No. 2).
2. P. STOTT (Hamilton No. 2).
3. R. DROUIN (Pres. Montreal No. 2).
4. G. C. MOORING (Fin. Sec. Toronto No. 1).
5. H. GILDHART (London).
6. T PILGRIM (Pres. Brantford No. 4).
7. A LATOUR (Sec. Montreal No. 2).
8. J. A. HARTENSTEIN (Montreal No. 2).
9. DUNCAN ROBERTSON (Hamilton).
10. SAMUEL FISHER (Montreal).
11. W. E. GOWER (Montreal).
12. O. E. GRANBERG (Montreal).
13. J. G. ROBERTSON (Pres. Montreal No. 1).
14. JAMES DEVLIN (Kingston).
15. H. NUTTALL (Vice-Pres. Montreal No. 1).
16. J. THOMPSON (Pres. Ottawa No. 7).
17. J. KIRWIN (Montreal No. 1).
18. W. NICHOL (Hamilton No. 2).
19. W. SUTTON (Toronto No. 1).
20. C. KINSKY (Cor Sec. Toronto No. 1).
21. G. GILCHRIST (Toronto No. 1).
22. F. ROBERT (Fin. Sec. Ottawa No. 7).
23. R. W. GREEN (Guelph No. 6).
24. "Montreal Gazette" Representative.
25. F. PAGE WILSON, of the "Can. Engineer."
26. T. KING (Sec. Dresden No. 8).
27. Dist. Dep THOS. RYAN (Montreal).
28. Exec. Conductor C. HEAL (Toronto).
29. Exec. Sec. W. G. BLACKGROVE (Toronto).
30. Exec. Vice-Pres. GEO. HUNT (Montreal).
31. Exec. Pres. A. E. EDKINS (Toronto).
32. F. G. MITCHELL (Pres. London No. 5).
33. Past. Ex. Pres. A. M. WICKENS (Toronto).
34. Exec. Treas. R. MACKEY (Hamilton).
35. Dist. Dep. J. A. ANGELL (Guelph).

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.—Convention of 1893 at Montreal.

(From a Photograph by SUMMERHAYES, Photographic Artist, Montreal.)

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

FOURTH ANNUAL CONVENTION.

The fourth annual convention of the Canadian Association of Stationary Engineers took place at Montreal, on Thursday, Friday and Saturday, the 7th, 8th and 9th of September. Delegates were present from all the chief associations, and were as follows:—

Montreal, No 1.—Bros. J. J. York, H. Nuttall and J. G. Robertson.

Montreal, No. 2.—Bros. A. Latour, R. Drouin and J. A. Hartenstein.

Toronto, No. 1.—Bros. G. C. Mooring, G. Gilchrist and W. Sutton.

Hamilton, No. 2.—Bros. P. Stott and D. Robertson.

Brantford, No. 4.—Bro. T Pilgrim.

London, No. 5.—Bro. H. Gildhart.

Guelph, No. 6.—Bro. R. W. Green.

Ottawa, No. 7.—Bros. J H. Thompson and F. Robert.

Dresden, No. 8.—Bro. T. King.

Berlin, No. 9.—Bro. Angell.

President.—Bro. A. E. Edkins.

Vice-President.—Bro. Geo. Hunt.

Secretary.—Bro. W. G. Blackgrove.

Treasurer.—Bro. R. Mackey.

Conductor.—Bro. C. Heal.

District Deputy (Montreal).—Bro. Thos. Ryan.

" " (London).—Bro. F. Mitchell.

" " (Guelph).—Bro. J. A. Angell.

Doorkeeper.—Bro. F. Brisbois.

Also Bros. A. M. Wickens and Chas. Kinsey.

The proceedings opened with an address of welcome by District Deputy Bro. Thos. Ryan:

"*Brethren of the Convention of Stationary Engineers.*—As District Deputy of this city, I am called upon by the brethren of Montreal No. 1 and St. Laurent No. 2 to address a few words to you previous to the opening of this convention.

"At last year's meeting in Hamilton it was decided that the convention of '93 should be held in Montreal, and the brethren here were very much pleased at this decision and thank you for it. I know it is a long distance for many of you to come, but I sincerely hope that when you return you will not regret the labor and inconvenience it has caused you.

"As the humble representative of Montreal No. 1 and St. Laurent No. 2, I now bid you all a cordial and hearty welcome to our city and our hall. I am pleased to see so many of you present and would be still better pleased to see a larger number. I trust your stay here will be a pleasant one. A committee has been appointed to look after your comfort and entertainment, and I hope they will do their duty. This committee has also published a Souvenir Number of this convention, which we trust will meet with your approval and acceptance. A copy will be placed in the hands of each member of the association. The programme of the three days' proceedings is in your hands, and will be carried out as far as circumstances will permit.

"I hope that the deliberations of this convention will be the means of improving the working of our subordinate lodges, and tend to strengthen and combine the whole body in the bonds of brotherly love and friendship. As a district deputy I have not much to say. Unfortunately this district of Quebec is so far composed of but Montreal No. 1 and St. Laurent No. 2. I hope in another year it may be different. With regard to the two associations of this city, the utmost peace and harmony have prevailed between them. They are slowly but surely progressing, not so much perhaps in the way of number as in the quality of the material.

"I will not detain you further, but simply close by wishing that you may all have a good time and enjoy yourselves thoroughly, and that the convention of 1893 may always be looked back upon with pleasure and profit to all."

A committee was appointed to draft a reply to the address of welcome.

Bro. Wickens then read the report of the Committee on Credentials, who recommended that the Press be admitted at all the sessions.

A motion to this effect was carried, and the committee's report adopted.

President Edkins then read his address to the convention, which was heard with the greatest attention and interest by all present.

* Bro. F. Brisbois being absent, Bro. F. Robert was appointed door-keeper in his stead.

PRESIDENT EDKINS' ADDRESS.

Another year has been added to the life of this organization, since we met last in convention to advise with each other and to legislate for the different associations which we are again here to represent.

It is then, brethren, with no small degree of pleasure that I take this opportunity of addressing a few remarks to you, at the commencement of what has every prospect of being the most successful convention that this association has yet held.

When I look around in this hall, and see the well-known faces of such old friends of, and indefatigable workers for, our association, as are here assembled to-day, I am at once convinced of the fact that the subordinate associations have used good judgment in their selection of delegates to represent them on this occasion. I am pleased to be able to report that during the past year the work of organizing new associations has progressed favorably, owing chiefly to the able assistance which has been rendered me by the District Deputies. New associations have been organized at Guelph, Ottawa, Berlin and Dresden; all of which are now good, strong associations, and are pushing the good work in their several localities.

A large amount of work has been done toward organization, in Deseronto, Galt, Seaforth, Goderich, Halifax, N.S., and several other places, which we trust may be productive of good results in future.

There has been for some time past an Association of Stationary Engineers working in Kingston, Ont., and I have tried to induce them to take out a charter from the Executive Council, and thus become one of us, but unfortunately (I consider both for you and us) I have not yet been successful in doing so I am given to understand that the Kingston Association is working on precisely the same lines as the C. A. S. E., and will, I trust, be working under one of our charters in the coming term.

I took on myself the responsibility of inviting our brother engineers in Kingston to send a representative to this convention, and I have every reason to believe that in the event of their doing so he will be heartily welcome among us. I trust that during this meeting the members and delegates will be on hand promptly, at such times as may be arranged for the transaction of business, in order that the work of the convention may not be delayed.

I notice in looking over the programme that ample time has been set apart for pleasure and recreation by the Entertainment Committee, so that there will be no need to allow that to interfere with business. There will, I have no doubt, be several matters of importance to the association brought up during this meeting for your consideration, and I would ask you to give the same your most careful attention, keeping in view at all times the fact that you are here as the choice of your respective associations to legislate for and in their best interests, and in doing this you will keep in view the best interests of the C. A. S. E. as a body.

I would respectfully ask this convention to take some steps for the payment to Toronto No. 1 Association of the amount due it for the supplies and stock which were handed over to the Executive when that body was formed. This is a matter which should have been attended to long ago, as it now appears to have assumed the shape of a grievance between some of the members of Toronto No. 1 and the Executive, and is always brought up in the event of an account being rendered by the Executive against Toronto No. 1. I would therefore suggest that this convention take steps toward the payment of said claim. I have noticed during the past year that we are gaining ground with the manufacturers, many of whom have, when requiring an engineer, sent to the association in place of advertising in the daily press. This should be very gratifying to us; and I trust that during the coming term each member will make it his business to bring the association and its work to the notice of his fellows in some way or other. It appears to be a hard matter to gain the confidence and good-will of the Canadian steam user (with of course some exceptions).

We are building up an organization of which we can be proud. Our motto is Safety, Reliability, Economy and Intelligence. Each of these characteristics is indispensable to a competent engineer. The objects of our association are the elevation of the stationary engineer, helping each other in time of sickness, and the education of each other in the most approved and economical methods of steam engineering. We leave the matter of wages to be settled between each individual member and his employer, as we recognize the identity of interest between them, and we do not, neither will we countenance any project or enterprise that may interfere with perfect harmony between them.

One would suppose that any organization working on these lines would at once receive the hearty co-operation of all steam users. Yet such is not the case, and why I am at a loss to appre-

hend. We invite our employers to become honorary members of the association and attend any or all of the meetings, and see for themselves as to the work we are trying to do. Yet in the face of all this, many of them appear to look on us with a certain amount of distrust. I know for a fact that in the Province of Ontario a great deal of harm has been done by some of the members of the Local House, who after wasting their own time in filling an arm-chair during the session, have gone back to their constituents and told them how the stationary engineers' "Labor League" had tried to pass a law to compel all steam users to employ only engineers holding certificates, whose services would be worth so many dollars per day. This has been done to my own knowledge, and has been the means of raising much opposition against us in some places.

But this association can afford to ignore such things. We are, as I said before, gaining ground, and a good cause must triumph eventually. We can now count as our friends many steam users and engineers also, who, at the organization of the association, were very much opposed to us, and I firmly believe there is a great future for this association.

I trust to see the day when there shall be an association in every town in Canada wherein fifteen engineers are employed. The great difficulty in organizing new associations appears to be owing to the fact that in many towns the engineers themselves seem very indifferent toward their own education and advancement in their chosen calling; and in such cases we can only wait till their eyes are opened, so that they can see things in their proper light In some towns associations might be formed but for the fact that some of the engineers will not join, and try all in their power to throw cold water, as it were, on the scheme, in order to discourage the rest. And some complain of the cost of maintaining an association, and give as their excuse that they can't afford it This, as you all know, is a mistake, as the associations wherever formed have eventually been the means of doing an amount of good largely in excess of the cost of maintenance. In localities where engineers themselves have no ambition in the way of self-improvement, it would in my estimation be a mistake to start an association, as it would soon be suspended. But in places where even ten good members can be enrolled, who will meet together for mutual instruction in their calling, I believe that such associations would be productive of much good to all concerned.

Now a few words in reference to the future prospects for engineers. It has been said frequently during the last few years that no engineers would soon be required, owing to the electric motor coming into use for driving machinery. That many small steam engines have been replaced by electric motors I am well aware; but as a rule no engineer was employed in charge of these small engines, and therefore (with few exceptions) few engineers have been thrown out of employment. It amounts to this: For every h p. of work performed by an electric motor there might be an amount of power generated somewhere, somewhat in excess of that h.p., owing to loss in transmission, and with very few exceptions, where water power is available, we find the prime mover is a steam engine of the most approved type, and often of from 500 to 1,000 h.p. and upwards. In a central station, now, from the very fact that these small power steam engines are being supplanted by motors, and large central power stations are being built and being fitted up with engines and machinery of the latest, most approved type, there must naturally be a demand for engineers capable of taking charge of such machinery: and those engineers who have made a study of their work and can handle the indicator and demonstrate in a practical way their ability to secure the best results from a given quantity of fuel, will have no difficulty in securing positions at a good salary. I must also, in considering this question, draw your attention to the thousands of engines and plants which are being erected in all parts of the civilized world to supersede that most faithful friend of man, the horse, in operating street and suburban railway cars.

These things and many others point to the fact that the old reliable machine known as the steam engine is still rising, and even though it has done so much for the human race in the past, the day has not yet come when the inventive genius of man has produced anything to take its place.

Every little while some genius will startle the world with the announcement that he has invented a machine that will work wonders, produce something from nothing, or produce a revolution in steam engineering, but it generally commences in wind and ends in smoke, and the usual result is that after the end, there are some people in the world who have more sense for the future, but sometimes much less money to their credit in the bank.

The Secretary and Treasurer will in due time present their reports, when you will have an opportunity of seeing the financial and numerical standing of the Association.

In conclusion, I must congratulate you on your choice for a place for the meeting of this convention Montreal is a city of which we all as Canadian citizens feel proud, and we accord her the honor of being the commercial capital of this, the best and most prosperous country on the face of the earth. There is much to be seen in this city to interest engineers, and this, together with the arrangements which our worthy brothers of the Montreal Association have made for our enjoyment during our stay here, will I am sure prove no small factor in making our visit enjoyable. And when we shall again return to our homes we shall bear with us fond and tender recollections of our Montreal brethren, her citizens, and friendships formed and renewed, during the C. A. S. E. convention of 1893.

At the conclusion of the president's address the minutes of last meeting were read by the secretary, together with his annual report, which gave great satisfaction.

The following is Secretary Blackgrove's report:—In presenting to you my annual report, I regret that I am unable, owing to the neglect of the secretaries of two or three associations, to give you as good a report as I would like. The negligence of secretaries in this respect was referred to at our last convention, in Hamilton. It is both tiresome and annoying having to write frequently for reports from the various associations, and to receive them half filled out. Bro. F. Robert, of Ottawa No. 7, deserves great credit for the manner in which he has written up his report. I wish I could say the same of all secretaries. It must be understood in future that when the Ex. Secretary writes for a report of an association he should receive it, and not be delayed till the last moment and in some cases till the convention has opened. I would recommend that the Ex. Secretary have power to order blank forms, and each association be supplied with the same for making out their semi-annual reports, and to be forwarded to the Ex. Secretary within thirty days.

The past year has been one of success as regards the formation of new associations, no less than four having been instituted mainly through the efforts of Bros. Edkins, Mitchell, Angell and others. The names of the new associations are as follows: Guelph No. 6, Ottawa No. 7, Dresden No. 8, Berlin No. 9. It is very encouraging to know that engineers are awaking to the fact that something must be done in order to better the condition of steam engineering, and that that can best be done by banding themselves together and helping each other in the knowledge of steam and everything pertaining to the same. I think it will not be long before we will have other associations formed throughout the country.

I have had several letters from engineers asking the necessary information in regard to becoming members of an association.

The associations now in existence have prospered during the year just passed, and it is the wish of your humble servant that they may continue to do so.

Vice-President Geo. Hunt made a few *apropos* remarks on the duty of secretaries of subordinate associations to send in their reports at the proper time, which in many cases they fail to do.

A motion was then passed for the secretary's report to be handed over to the Committee of Auditors.

Next on the programme came the treasurer's report, which showed that the Association's income during the year ending August, 1893, had been $284.79, the expenditure had been $108.53, and that the balance in hand (August, 1893,) was $221.71.

The report was then handed over to the Auditing Committee.

Bro. J. J. York moved that the president be congratulated and thanked for his able address. Carried unanimously.

Considerable discussion then arose as to a suitable button to be worn as a badge by members of the Association, but no definite decision was arrived at in the matter.

A committee on "constitution" was appointed, consisting of Brothers King, Pilgrim, Sutton and Gildhart.

The committee appointed on "correspondence" and "good of the order" consisted of Brothers York, Mooring and Latour.

The committee appointed on "mileage" consisted of Brothers Stott, Hunt, and Angell.

A resolution was passed to the effect that some tangible testimonial should be presented to A. E. Edkins and A. M. Wickens in token of the association's appreciation of their great services. It was also decided that all presidents should in the future be presented with a jewel of some kind at the end of their respective years of office.

Brothers Ryan, D. Robertson, Thompson, Heal, King, Drouin, Angell, Green, Mitchell and Devlin were appointed a committee

for the purpose of carrying this project through in the manner most advisable. The convention then adjourned

In the afternoon the party drove round the city, visiting on their way the Dominion liner "Vancouver" They were hospitably entertained by the chief engineer of that ship, and were courteously invited to inspect the engine rooms, in which great interest was taken. Later on the delegates visited the exposition, where almost the first thing seen was a large banner inscribed with the words "*Welcome to the Stationary Engineers*," placed above the Montreal No. 1 Association's exhibit.

After seeing the various exhibits and witnessing a very creditable "hitch-up" at Captain Renaud's temporary fire station on the grounds, the party met with a very hospitable welcome at the hands of the Exposition Committee, represented by Mr. S. C. Stevenson, manager and secretary, and Mr. Sadler, manager of the machinery department.

Mr. Sadler, in an eloquent little speech of welcome, thanked the delegates for their visit and trusted that it would not be the last time they would see the Exposition.

Mr. Stevenson seconded all that the previous speaker had said, and expressed his wonder at the name borne by the Stationary Engineers of Canada. For his part he thought that far from being "stationary," they were the most progressive body of men he had ever met.

President A. E. Edkins, in acknowledging the kindness of the Exposition authorities, remarked that what Mr. Stevenson had just said reminded him that he also had often been struck by the incongruity of the word "stationary." He would suggest that the association should adopt the name of "Canadian Association of Steam Engineers."

Dist Dep. Bro. Ryan, Bro. York and Bro. Wickens also briefly spoke, and the delegates then drove to their headquarters, the City Hotel.

THURSDAY EVENING.

The president opened the session by stating that an invitation had been made by THE CANADIAN ENGINEER for the delegates to use that journal's office for writing letters in, or for any other convenience they might require.

Bro. A. M. Wickens then read a paper on "Wasted Heat," which will be found elsewhere in this issue.

At the conclusion of Bro. Wickens' paper, Bro. York remarked that the subject had been treated in such an interesting manner, and the paper was such a valuable one, that he thought every word ought to be printed for the use of the public.

Bro. H. Nuttall said it was difficult at a first hearing to grasp the whole meaning of papers on difficult technical subjects. He suggested that in future all papers to be read before the Association should be printed in good time beforehand, and laid before the members, so that they could be prepared on the various subjects and be able to discuss them intelligently.

A motion was carried to this effect.

Bro. Chas. Heal thought that Bro. Wickens, in his remarks on the radiation of heat, might have used a better word, viz., convection.

Bro. Wickens replied that when a solid mass of fire was built underneath a boiler, a heat of several thousand degrees resulted, part of which made its way into the boiler, and it was then said that this heat had gone through the iron plates by radiation, as it was called.

Bro. Mooring thought that heat was radiated in rays from the fire through the iron plates to the boiler. In regard to convection, water was a bad radiator of heat, but a splendid convector.

Bro. Wickens acknowledged, after consideration, that perhaps "convection" would be the better word.

Bro. Mooring next asked what engine it was that would give one-horse-power for each 12½ lbs. of water evaporated.

Bro. Wickens stated that the triple expansion engines on some ocean liners showed efficiency at the rate of 12½ lbs. of water per horse-power. Many engines carrying steam at 160 or 170 lbs. pressure showed a consumption of water equal to that rate; many, on the other hand, with a pressure of, say, 130 lbs., showed up not nearly so good. Some, even at the present day, showed a consumption of 60 lbs. per horse-power.

THE ENGINEER TWENTY YEARS AGO AND NOW.

The next item on the day's programme was the following paper by Chas. Kinsey on the "Duties of Engineers Twenty Years Ago as compared with the Present Day."

"If an engineer of twenty years' experience looks backward at all on his past history, he must often wonder how it is that he has been enabled to keep his situation through all the varied inventions and improvements that have taken place in his profession during that time; inventions that have almost relegated the old-fashioned slide valve engine into the scrap pile, that have reduced the cost of generating steam to a very low percentage, inventions in valves, gearing, cut-offs, boilers, furnaces, grates and steam appliances that would have been ridiculed as impossible only a very few years ago. Improvements in the engineer's lot certainly have taken place as regards location in the factory, ventilation and sanitary arrangements. Time was when manufacturers used to think the best thing they could do for themselves was to put the engine and boiler in a dark and damp cellar where nobody could find them and where a ray of light could never penetrate for fear it would discover a grimy engineer with a pair of overalls, and situated where he would have no room to do anything, and where he would be half roasted every time he opened his furnace doors. Neither his convenience nor comfort was considered, nor had he often even a chance to make his repairs when a breakdown occurred. Poor engineer! after a time spent in a vain endeavor to woo nature through those iron bars, he would sigh heavily and retire once more to his hot engine room and hotter furnaces. As for sanitary arrangements, such a thing was never thought necessary for him, he being a part of the machinery. He was supposed to be a combination of steel and iron, therefore did not require such luxuries. But all these things have passed away, and from fever breeding basements we are placed in first-class ventilated rooms; our sanitary arrangements are complete in every detail, in fact, our state is princely compared to twenty years ago. Manufacturers discovered that we were human beings, that we had brains and intellect, and that if they would only permit us to use them it would put a goodly number of dollars into their pockets. Manufacturers of fifteen years or more ago found out that one of their greatest items of expense was for their power, or commonly styled their coal bill. They had been in business a number of years, and in the natural course of things their business began to grow, and seemed likely to get beyond their capacity, but at the rate their expenses for power were climbing up, they considered whether it was worth the increasing cost of power to build it up. In this state of mind they went to the engine room, where they saw old-fashioned cylinder boilers that had no steaming capacities whatever, being set in a heap of brickwork as if they had been dropped there from some mighty volcanic eruption. They had huge gaping furnaces that extended almost to the smokestack. Those furnaces were constructed to burn coal, and they did; they burnt it with a vengeance. The manufacturers looked still further into those cellars, and they saw old-fashioned slide-valve engines. Those engines had been good machines in their day, but they were built in a time when competition in trade was not so keen as now, and coal bills, water consumption per horse-power and economy in steam had not received a great deal of attention. Those engines seemed to have one settled purpose, viz., that as the old cylinder boilers had been designed for the special purpose of consuming fuel, they would stand by them to the last ditch and would expend all the steam they could. They took steam into the cylinders to the end of the stroke, and exhausted into the atmosphere at a pressure very little less than had been received from the boiler. What a difference in the engines of to-day? If a fly on a hot summer day decided to take a nap somewhere near the exhaust pipe of an automatic cut-off engine, the pressure and noise of the exhaust steam would not even disturb its slumbers. On such a state of affairs the manufacturers decided to quarrel with somebody, and they determined that the torrents of their wrath should descend on the devoted head of that combination of steel and iron—the engineer. The engineer listened to all the abuse heaped on him very patiently, but, at the same time, twenty years ago he was a very independent man, and he had a way of talking back which impressed itself very forcibly on the hearer. He had also been keeping himself abreast of the times, and had found out that great improvements in his profession were taking place in the land. He asked the manufacturers why they did not adopt the automatic cut-off engines, and have their boilers set up in a scientific manner. Then the manufacturers decided to investigate these "new fangled" notions in engines, and after buying them they found they must go a step further and adopt the new and scientific boiler, and after that came the need to build a decent engine room and boiler house, where everybody could see them, where the engineer could get at them to fix them up. To-day the engine rooms look like palaces, and corporations seem to vie with each other who can produce the most splendid engine room. So great is their concern for our comfort, that in one or two places they have fitted up bedrooms for the engineer, so that in case of an accident to the plant, which may require him to work late at night to repair it, he does not need to walk 2 or 3 miles to his home, but turns in right on the spot, and thus gets an hour or two more of rest

than he would otherwise have. Many people may think that under these luxurious circumstances an engineer's life should be one endless round of happiness, and so it might be if he had nothing else to do but enjoy them, but in these days of inventions he requires all his wits and energies to keep his place in the never ending procession of events. After automatic engines and tubular boilers came into general use, he almost imagined that nothing could improve on them, and just as soon as he was getting into an easy-going style then came along dynamos for electric lighting. They staggered and puzzled him for a time, but by dint of serious thinking he gradually mastered them. Then up sprang the high speed engine which was supposed to be better adapted for driving the electric dynamos than the slow speed engines. These high speed engines nearly took his breath away for a time. Indeed at first he almost felt afraid of the strange looking machines, so short, so heavily built, and so stiff they looked to be, but oh! how they did run. No longer could he count the spokes in the fly-wheel. Then he thought that inventors were going mad to make a machine that ran so fast it was impossible to tell where the connecting rod was, but he soon found out there was method in their madness. The engineer had only just got on friendly terms with his high speed engine when along came the compound engines. It is needless to say that when the inventors thrust triple expansion and quadruple expansion engines upon his notice, he was already waiting for them. If they caused him any surprise at all, it was because they had not made them with several more expansions. In the meantime, whilst all these changes had been taking place in the styles of engines, inventors had been busy with the boilers, furnaces and grate bars. Whatever relaxation he got while mastering a new style of engine had to be devoted to studying water tube boilers, safety boilers, sectional boilers, high pressure boilers, new ways of making boilers, new styles of riveting, staying and strengthening, new ways of setting them, different kinds of furnaces, some high, some low, some long, some wide, self-stoking furnaces and some every way, new grate bars, herring bone bars, sheffield bars, rocking bars, dumping bars, and a hundred other bars, steam blowers, air blowers, all sorts of blowers; automatic dampers and smoke consumers, devices for low water alarms, new flue cleaners and scale destroying solutions, coverings for boilers and steam pipes, new systems of heating buildings, and a thousand and one things too numerous to mention, and it is a wonder how he has got through alive. Automatic cut-off engines, high speed engines, compound engines, triple and quadruple expansion engines, boilers of every description, dynamos for arc and incandescent lighting, electric motors and elevators, electric bells for everything—such is the scene that our young man who has decided to become an engineer looks upon to-day. Many of the engineers here present may feel anxious to tell me that they never served a day's apprenticeship in a machine shop in their lives, that technical schools and schools of science were unknown in their day, and they will point to their steam plants with pride and say—are they not a success? does not our firm place the greatest confidence in us? They will ask me if I believe their steam plants are models of success, and if so why I advocate all that machine practice and school of science for the young engineer? To each and all I say your plants are successful, and I believe your first and last thought is for the interests of the firm that employs you, and your firm cannot help but place the greatest confidence in you. A lot of our troubles and mistakes in years gone by might have been avoided had we been trained right and received an education in our profession. So many of us picked up engines in one way or an other in the beginning, that it was only natural we should meet with disasters when improvements began to crowd upon us. To avoid the mistakes that we made, we see that our sons must begin the business with a thorough theoretical knowledge of it beforehand, the practice and experience must come afterwards. Having arrived at this conclusion, there is nothing else left for us to do but put him first into a machine shop, filling up his spare time at the Technical School, then a few courses at the School of Science, and this is just what was done for the young man who was mentioned some time ago, who had decided to become an engineer. Engineers who are handling plants of any size, can afford to have their sons trained properly, for there is no country upon earth where there are better facilities for education than in our Canada, and there is no excuse for ignorance where knowledge can be obtained so cheap. Why not send him to the engine-room thoroughly fitted up in mind to cope with every difficulty. Engineers of to-day must acknowledge that a young man knowing as little as we did 20 years ago about boilers and engines, could not begin to operate the colossal plants that are erected in some of our large cities, and if we intend to hand down the business to our sons, they must have the necessary technical knowledge to enable them to undertake it."

A vote of thanks to Bro. Kinsey for his paper having been passed, Bro. Fred. G. Mitchell (of London, Ont.,) read a paper on the "Steam Engine Governor and its Regularity," the full text of which will appear in next issue.

At the conclusion of this paper, President Edkins explained that its author, after much hard work, had invented what he considered to be a very good governor.

Bro. Wickens, in discussing Bro. Mitchell's able paper, said that if there was any other principle of governing a steam-engine than that in ordinary use, it would surely be adopted. The speed had to be altered before the fly-balls came into any use. With regard to the spring, as greater tension was put on it, the further it had to be pulled up, at a time, too, when the balls were wanted in a *perfectly free state.* What was wanted was a governor with no spring; it was more reliable. There was one difficulty met with by users of ball-governors, and that was that the slightest trouble with it rendered it much better not to have had one at all. In conclusion, he thought the paper a very interesting one, it would pay engineers to follow out the principle of the governor carefully. There was always something in each governor which could be improved by the engineer himself after a little study.

Bro. Mitchell said that it was necessary to offer a resistance of some kind to the centrifugal force. If the balls were revolving in a normal plane and if there was no equilibrium created by a spring, the slightest variation caused the balls to ascend to a higher plane. Something was necessary to act in unison with the gravitation, to offer sufficient resistance to centrifugal force.

Bro. J. J. York paid high and eloquent tribute to the papers which had been read during the evening. Montreal associations had not given enough attention to the various engineering questions. This one connected with governors was very important. He had learnt a good deal about governors from one of the most celebrated engineers in Canada, but he had learnt still more that evening.

Bro. Green said there had to be spring enough or weight enough to draw the governor back. The speed would lift up governors to checker any time provided that the belt was right. A new patent had come out which was simply a combination of joints, lever and a 40 lb. weight. It was essential for the spring or weight to have sufficient tension. He knew an instance of a small engine in a printing office with which nothing could be done. When there was no load on it, it was all right, but drop a load on it and it would take five minutes before running properly. It was found out afterwards that what was needed was to cut six inches off the spring.

Vice-President Bro. Hunt said he had engines under his care of all sorts, and for power where the speed was variable he preferred a spring.

A vote of thanks having been given to Bro. Mitchell for his paper, the convention adjourned until the following day.

FRIDAY MORNING.

The president announced the receipt of a telegram of greeting from the National Association of Stationary Engineers, at that time assembled in convention at Cleveland, Ohio.

The report of the Committee on Mileage was then read, which showed that the total expenses incurred had been $105.15.

The report was received and adopted.

President Edkins moved that the railway expenses of Brother Devlin, of Kingston, be paid by the Executive, though the Kingston Association had not yet become affiliated with the Canadian Association.

After some discussion, in which considerable difference of opinion was manifested, and in which the speakers were Brothers York, Thompson, Wickens, Hale, Ryan and Nuttall, the motion was adopted, chiefly on the ground that it had been at the Executive's invitation that Brother Devlin had come, and the item was added to the Mileage Committee's report.

The report of the Committee of Auditors was then received and adopted.

Vice-President Hunt referred to the *souvenir* book, which had been handsomely got up by the Montreal Association, and said it would be a good thing for the Executive to publish one every year. A committee ought to be appointed for the purpose of canvassing for advertisements.

Bro. Mackey moved that one member should be appointed from every association in Canada to form this committee.

Bro. J. G. Robertson said the Executive ought to pay all expenses. He here suggested also that libraries should be formed in different districts, where engineers might study engineering and mechanical questions.

Bro York moved as an amendment to Bro. Mackey's motion,

that the matter of appointing committees to work in conjunction with the Executive be struck out.

Bro. J. G. Robertson seconded this amendment, and thought the matter should be left in the hands of the Executive alone.

Vice-President Hunt said he agreed with the amendment, on the ground that the Executive had no power to appoint members from subordinate associations for the purpose of forming a committee.

On a division, the amendment was carried.

Bro. York announced that he had just received a letter from Prof. Bovey, inviting the delegates to see the buildings and equipment of the "Faculty of Applied Science," at McGill University.

Resolved, That the communication be placed on file, and a letter of acceptance sent to Prof Bovey.

Bro. Mitchell then presented to the Montreal associations a photograph of London No 5, and was pleased to be able to say that association had been progressing very favorably, five new members having been enrolled quite recently

Bro Ryan moved, and Bro J G. Robertson seconded, That a vote of thanks be given to Bro Mitchell and the London association. Carried unanimously.

Bro Wickens thought it would be a good thing for them to acknowledge some mechanical journal as the official medium of the association, and moved that the *Electrical News* be the one appointed. After the matter had been discussed for some time, the motion was defeated by a large majority.

FRIDAY AFTERNOON.

The report of the Committee on Constitution and By-laws was read. The committee recommended that the article regarding the sending of delegates to the Convention should be amended to read. "Each association of twenty-five members should have one delegate, and one delegate more for any fractional part of twenty-five, subsequently adding: "always provided that the fractional part should not be less than ten, and always provided that no association have more than three delegates."

The report was adopted.

The next item on the programme was the report of the committee on "Good of the Order."

Bro. York suggested that all secretaries of subordinate associations not sending in proper returns should be fined $1. He also suggested that it be considered an unwritten law for every member to address the meeting on one subject at least.

This was moved by Bro Thompson, seconded by Bro. Latour, and carried.

A motion was also passed declaring that the president, secretary and executive should be appointed to form a committee to print the "constitution" in pamphlet or book form, which the subordinate associations could purchase at 10 cents per copy.

After this had been disposed of, a discussion arose as to which was the best class of steam engine.

Bro Wickens said that each engine, as it was known, excelled in some particular, but it was hard to say which was *the* engine. Only those who had had especially good opportunities for observing could feel justified in saying which was absolutely the best. Each manufacturer doctored up his own story, and his report of his own make was scarcely to be relied upon. It was very hard to rise at a moment's notice and make statements which would be given to the world. He believed that for railway work the upright triple expansion engine was the best.

Vice-Pres. Hunt remarked that at Chicago they had all sorts of engines, and it was a growing conviction there that the triple expansion was not entirely satisfactory. For railway work no doubt it was good. But recent tests showed that the moment the load was thrown off the intermediate cylinder formed a drag upon the high pressure. This was why engineers were beginning to look with doubt upon this form of engine for general purposes.

The convention then adjourned, and the delegates were given a trip to Lachine and back by the Rapids, a treat which was much appreciated by all.

SATURDAY MORNING.

The chief business for Saturday morning was the election of officers.

Brother George Hunt (Montreal) was elected president by acclamation.

Brother Thos. Ryan was nominated for the office of vice-president, but declined on the ground that the president and vice-president would then both be in the same city.

Bros. W. Sutton (Toronto) and D. Robertson (Hamilton) were then nominated, and the former was elected by a majority of 6.

For the office of secretary, two were nominated, Bro. Jno. J. York (15 Tara Hall Avenue, Montreal) being elected by a majority of seven.

For the office of treasurer, two were nominated, Bro. Blackgrove (Toronto) being elected by a majority of six.

The other officers elected were, Bro. T. King (Dresden), conductor, and F. Robert (Ottawa), door-keeper.

A vote of thanks was given to Secretary Blackgrove for his great services during the past year; also, one to the scrutineers for the efficient manner in which they had conducted the election of officers.

The delegates then drove to McGill College, where they were received by Professor Nicholson, and conducted through the "Faculty of Applied Science" division. The Professor explained in wonderfully lucid language the uses and meanings of the various objects inspected. Amongst those which proved of the greatest interest to the delegates were the Reauleaux collection of Kinematic models, and a large tank illustrating the flow of water in a compound reservoir system. Many of the models seen exemplified branches of mechanical science entirely new to the majority of the delegates, and opened up new channels of thought and experiment.

Another instrument in which they were a good deal interested was the Viscosimeter, *apropos* of which

Professor Nicholson remarked that they were instruments which all engineers ought to possess. The oils ought certainly to be studied, and the stationary engineers had a great chance to do this. What he would recommend them to do was, to study carefully every phenomenon connected with the lubricating oils, especially the effect of the different chemicals contained in them upon the crank pins.

After the dynamo, triple expansion engine, boiler room, moulding and smith's shops, and many other departments had been visited, President Edkins thanked the Professor, in the name of the delegates, for his reception of them, and for the able and thorough manner in which he had explained what was to be seen, and the convention was then photographed on the steps of McGill College.

SATURDAY AFTERNOON.

W. B. Shaw read a paper on "Electric Motors," which will be given in full in our next issue.

Bro. Wickens wanted to know an easy way of testing the loss in a motor.

Mr. Shaw said the question was extremely complicated and needed many instruments in order to test it properly. Roughly speaking, he thought about 80 per cent. was the average efficiency at the present day.

Bro. Wickens said that every engineer would feel grateful at obtaining knowledge such as had been so ably given by Mr. Shaw in his paper. He did not think, however, that any great fear need be felt because of the introduction of electricity. No doubt in some places where but little power was required, motors were decidedly coming into use, but it was only in such comparatively small places. He moved that a vote of thanks to Mr. Shaw be given.

Bro. Kinsey did not believe electric motors were going to revolutionize the earth; they were not the bonanza they were made out to be. A 15 horse-power engine would cost about $750 per year. But according to Silvanus P. Thompson, who certainly would not be inclined to minimize, the ordinary efficiency of an electric motor is sometimes 90 per cent., very often 70 or 80 per cent., and by no means infrequently as low as 50 per cent. A 15 horse-power motor often really means, therefore, a 7½ horse-power motor, and at this rate would cost $1,500 a year. Then, again, an engine would heat, or help materially in heating, a building in winter, whereas when electricity was employed this was an extra expense. Armatures also were so liable to burn out. An armature of a 15 horse-power motor in one year would cost as much as an engine in twenty years, and it was not nearly as reliable as an engine. He granted that in small shops where only two or three horse-power was required, the motor was a fine invention; also in places where shafting could not be put up. But a motorman's time was entirely taken up, whereas an engineman had plenty of time in which to do other work.

Pres. Edkins wished to know what time the previous speaker considered that engineers had for other work.

Bro. Kinsey stated that he had intended to refer to the case of an engineer having the care of a small engine.

Bro. Mooring said that a plant of over 10-horse power was certainly cheaper than electricity, and electricians admitted this. With regard to the heating of an ordinary building by means of the engine, only a part of it could be heated by exhaust steam.

Bro. Sutton said that when electricity was first introduced engineers were advised to study it; up to the present, however,

they would not have gained much from doing this. Silvanus P. Thompson himself said it was difficult to prevent electricity from going into little eddies and escaping. He therefore did not see how it could be said that 80 per cent. was efficient. Steam was easier to handle than electricity, and if ever he touched electricity (which he hoped he should not) he trusted it would be with only one hand at a time.

Mr Shaw remarked that for his part he never cared to come near a steam engine unless there happened to be a stone wall between it and himself.

Vice-President Hunt said that precautions must be used both for steam engines and electric motors. People made changes from one system to another blindfold; motor men in fixing their appliances ought to make sure they were doing the work properly.

Bro. J. J. York then made a few interesting remarks on "Heating and Ventilation."

He opened by stating that there was considerable room for discussion and thought in this matter He asked his hearers to go with him in imagination and look upon a bevy of girls just home from the country, with ruddy faces and healthy, bright eyes, and then, after that, to see a crowd of girls coming out from some factory, with pale, sallow, unhealthy looking faces. In factories every window was closed up, hermetically sealed, so to speak, and the rooms became full of bad air. Was this conducive to health? Each person required 4 or 5 cubic feet of fresh air every minute. If the water-supply became contaminated in even the slightest degree, a great deal of fuss was made of it usually; but if people were shut up for days and weeks in a dirty and impure atmosphere, nothing was heard of it The best plan to cure it, he thought, was for steam-pipes to be put in the basement, all in one room; a pipe should be carried from there to the room requiring heating, the air being propelled onwards by means of a fan. From the top of the room let there be a pipe to carry the foul air to the outside. This would secure good ventilation, as well as heating. Some might think the above was an expensive way of heating a building. The first cost was perhaps greater, but the cost of maintaining afterwards was certainly less. Members should talk over the matter until next convention, for the purpose of adopting some means for inducing mill-owners to initiate better methods of heating their buildings.

Bro. H. Nuttall asked why the windows of factories were "hermetically sealed."

Bro. York replied that the idea of the manufacturers was to save heat.

Bro. Nuttall remarked that it was because the manufacturers were ignorant of the physiological laws of the human constitution. Employers were not monsters; if they understood that their method was unhealthy, they would not carry it out.

Bro. J. G. Robertson said that at a building which he knew the heating was done by means of a coil consisting of 7,500 feet of one-inch pipe, and by means of a fan 42 inches by 7 feet, running 210 revolutions per minute. By this method there was a constant supply of freshly heated air in the building, and in moderate weather it acted very well and could be regulated easily.

President Edkins and Bros. Nuttall and Green also said a few words.

Bro. Mooring then moved that a vote of thanks should be given to Mr. W. B. Shaw and Bro J. J. York Seconded by Bro. Wickens, and carried unanimously.

It was then moved by Bro. Mooring, seconded by Bro. Gilchrist, that the Executive pay to Toronto No. 1, the sum of $25 per year, at least, in payment of its debt to that body.

The motion was carried.

The next business to be carried through was the election of a place at which to meet next year, which resulted in Toronto being chosen.

The new officers were then installed, each one receiving a short and appropriate address.

A vote of thanks was given to the retiring officers for the past year, and medals presented to Bros. Edkins and Wickens in recognition of their services.

The following district deputies were appointed:—

Prov. Dist Dep. for Ontario—Bro. A. E. Edkins.
" " " Quebec - Bro Thos. Ryan.
Dist. Dep. for Hamilton—Bro. R. Mackie.
" " London—Bro. F. G. Mitchell.
" " Guelph—Bro. J. A. Angell.
" " Montreal—Bro. J. A. Hartenstein.
" " Toronto—Bro. A M. Wickens.

The committee appointed to reply to the address of welcome then presented their reply.

REPLY TO ADDRESS OF WELCOME.

In reply to the address of welcome tendered the Executive Council and visiting brothers by Dist. Dep. Bro. Thos. Ryan to this great, prosperous and beautiful city, the commercial metropolis of our fair Dominion, a city whose fame for hospitality is not excelled in the world, we desire to express our sincere and heartfelt thanks. That our visit will be instructive, profitable and pleasurable we feel confident. The arrangements made for our comfort and convenience and for the transaction of our business show great forethought on the part of your committee appointed for that purpose, and we are sure that they have not been excelled or even equalled in the annals of our convention. That the convention of 1893 will be long looked upon as a landmark in the history of our progressive order is a certainty. One of the many pleasurable surprises, which is a new feature of more than ordinary merit, is your beautiful souvenir. For its compilation and mechanical work it cannot be excelled, and in circulating it among our employers and brother engineers, we have no hesitation in stating that the results for the benefit of our Order will be immeasurable.

(Signed) CHAS. HEAL.
A. M. WICKENS.

A vote of thanks to the Entertainment Committee was then carried.

Bro. Edkins announced that it had just been discovered that a balance remained in the treasury of $50.

One of the most successful conventions ever held then came to an end in the same harmony and with the same good-fellowship which had distinguished it from the very beginning.

THE BANQUET.

On Friday evening a banquet took place at the City Hotel, at which about eighty guests were present. The host had done his best to provide an excellent repast and make his guests happy and he succeeded to the fullest satisfaction of all present.

After the usual toast had been drunk to "Queen and Country," the chairman, Bro J. G. Robertson, of Montreal, proposed the toast, "Steam and Electrical Engineering."

W. Laurie said in reply that he had been to many banquets, but he had never received so much pleasure as at the present one, where were assembled delegates representative of all parts of Canada. He congratulated the Executive upon the great progress the association had made during the last few years. It deserved great credit for the way in which its business had been managed, and this proved what courage, perseverance and energy could accomplish. The association trained up men to be of value to their employers, which was the true way of advancing, and not by combinations and strikes. Some men seemed to think that all they had to do was to get rid of their work in as short a time as they could, never troubling so long as they were through with it, whether it was done well or ill. It was a mistake, however, to suppose that employers do not notice these things. The only way to get on was to show to employers that they had their interests at heart.

W B. Shaw said that a good many people had been saying lately that electricity would very soon supersede the steam engine altogether. He thought, on the contrary, that steam, electrical and hydraulic engineering were like faith, hope and charity, viz., hand in hand. As an instance of a close alliance he cited the equipment of the Crocker Wheel Co.'s factory in New Jersey, whose one large engine in the basement was used to drive an electric generator, the power from which was conveyed by means of wires direct to each machine. There was absolutely no shafting or belting, the motor which operates the lathe being concealed in the head-stock and directly coupled, the speed being controlled by a regulator attached to its supports. In this way each machine was under individual control, and it was claimed that higher efficiency was obtained by this method than by the old one of belting and shafting. He thought the only difference that the advent of electricity would make to engineering was that it would constantly call for a higher quality of steam engines.

Bro. Mitchell (London) than gave a musical entertainment,

The next toast proposed was to the "Manufacturing Interests."

Hugh Vallaner, in reply, after expressing his wonder at the great progress which had been made in the association during his knowledge of that body, stated that he would like to see the efforts to get a Dominion license law for engineers crowned with success. For marine engineers such license laws were already in force. Engineers often had thousands of lives at their mercy; if competent engineers it was well, if otherwise a very grave public danger ensued. With regard to the manufacturers he was pleased to be able to say that most lines in the Dominion were fairly busy. The state of affairs across the line was a hint to Canadians that annexation is

quite unnecessary and against their best interests (applause). There ought to be a board of examiners in Montreal. The association should certainly insist upon this at once. One member might be elected from the association to act in conjunction with the Boiler Inspection Company, and if those two did not agree a third member might be appointed.

J. A. Darling said that the manufacturers ought to take more interest in the association, because engineers are of the utmost importance to them. Plants that are put in now-a-days were much more extensive; they required more skill and more experience to work them.

Bro. Blackgrove then gave a song.

The next toast proposed by the chairman was "Our Sister Associations."

Bro. Sutton, speaking for Toronto No. 1, remarked that that association was recognized by manufacturers and steam users; when they wanted an engineer upon whom they could thoroughly depend, those manufacturers often applied to them, and, with scarcely a single exception, they had remained satisfied to this day. They recognized that their true interests lay in having about them engineers possessing thorough knowledge. The day would come, he thought, when they would have to have a compulsory law Engineers were already coming up by dozens for voluntary examination. A compulsory law would benefit engineers as much as manufacturers, and manufacturers as much as engineers. Trade and commerce depended very much upon the engineer; he believed that if the ledgers of those manufacturers who had failed in their business were examined, and the cause of said failure carefully traced, many of them would be found to spring originally from the engine room.

Bro. Duncan Robertson (Hamilton) then gave a song.

Bro. Mitchell reported that London No. 5 was progressing favorably. He thought the time would soon come when Ontario would be able to boast of a compulsory law like that against the storage of gunpowder near dwellings. There were such laws, but in many cities there are things existing just as bad as gunpowder, and this ought to be prevented.

After a few remarks upon their respective associations by Brothers Green, King, Pilgrim, Thompson, Drouin and York, the president proposed the health of Montreal No. 1. If any proof were needed of the advance of that association, it was to be found in the stationary engineers' exhibit at the exposition, which was a credit to them in every way.

Bros. Ryan and Nuttall endorsed the president's remarks.

The next item on the programme was the toast to "License Law and Inspection."

Mr. Granberg, who rose to reply, said that the Montreal Act of inspection is not properly put in force, owing to the incompleteness of the legal machinery. A license law was as necessary as an inspection law, and both might be passed by the Dominion Government.

The next toast was "to the Brotherhood of Locomotive Engineers."

Bro. Thos. Clark of the Brotherhood of Locomotive Engineers stated that their society was a labor association, and not, like the Stationary Engineers' Association, merely an educational one. It was necessary, he declared, for locomotive engineers to band together for their protection. If they were like their stationary engineering brothers, they would only have to consider the single men who employed them. As it was, however, they had to come in contact with great bodies of men—capitalists—whose only thought was how to put more money in their pockets. He had foretold that railway employees on Chicago lines would not strike during the World's Fair season. His prophecy had come true. The employees did not want to give the enormous travelling public passing from east to west during these few months, cause to say they had been left at sidings by the locomotive engineers They were engineers, but they were also men. (Applause.) With regard to the steam engine being superseded by electricity, he did not think that any fear need be felt on that score. It was true that an enormous speed, say 150 miles per hour, will probably soon be obtainable by means of electricity, but it was necessary to remember that, with electricity employed, such a speed was highly dangerous; at any rate, they would have to get the road bent to carry the cars. What was required of stationary engineers of the present day was that they should educate themselves to know the vast power of the machines they had in hand. There was one thing in which locomotive and stationary engineers would stand together, and that was—legislation. There was more than one Minister at Ottawa who had been materially aided in obtaining that position by the engineers of the country. Let the engineers therefore make their voices heard at the polls, and let them get legislation for the Dominion.

Bro. Robt. Whitehead (the pioneer locomotive engineer of the country) [illegible] briefly addressed the convention, stating that he most thoroughly agreed with the last speaker.

The next toast was the "National Association of Stationary Engineers," coupled with the name of Bro. Wickens, who was an honorary member of that association. Bro. Wickens stated that the National Association had been organized in Detroit some nine years ago. They now had 7,000 members. They were doing a very good work, both for themselves and for their employers; they had been educating their employers as well as themselves. He agreed with the remarks that had fallen regarding legislation. In the United States there are 8,000,000 horse-power in the stationary engines in that country; in England there are 7,000,000 h.p. An ordinary boiler of average capacity has a stored energy equal to 40 lbs. of gunpowder. If engineers in general knew this, and grasped what the fact meant, they would be more careful. There were an enormous number of explosions taking place in America; something like 150 to 160 per annum are reported, and this gives no idea of the enormous number of those that are never heard of. Steam engines were perfectly safe, if handled by men who knew how to use them. Four-fifths of the enormous number of engines previously mentioned had been built during the last twenty-five years. The increase of hands thus called for had brought about the acceptance of many incompetent engineers; while this great number of engines were in course of construction, many improvements were being made, requiring constantly greater ability to handle them. His advice was for the stationary engineers to educate themselves and their employers, to bring influence to bear upon the Government to pass a general license law. The life of the man at the factory was as valuable as the life of the man who crossed the river in a steamboat.

The next toast was the "Executive Council," to which Bro. Edkins replied as follows:

In replying to the toast of the Executive Council of the Canadian Association of Stationary Engineers, which has just been proposed, allow me, as president of the Executive, to thank you most sincerely for the kindly manner in which you received the same. The work of the Executive is to take the general supervision over all subordinate associations, and to establish new associations throughout the country wherever the number of engineers employed may warrant us so doing. As I stated in my address at the opening of the convention, the work done by the Executive during the past term has been very successful. It has, possibly, not been so successful as the more enthusiastic of us may have wished. I myself, for instance, made up my mind (when the association did me the honor, at last convention, of placing me in the chair of the Executive) to organize at least double the number of associations that we have this year, but when I made that resolution I did what many have done before me, counted my chickens before they were hatched.

When we take into consideration the small number of men engaged in our profession on whom we can draw for our membership, compared with the vast number that other organizations have, it will be evident at once that we can never (or at least for a number of years) expect to have such a large membership as the N.A.S.E., for instance, can boast. Taking this fact into consideration, Mr. Chairman, I think that we can with reason congratulate ourselves on the number of new associations which we have added to our membership during the past term. The Executive has spared no effort in making this year a prosperous one in the history of the association, and I desire to take this opportunity of returning my sincere thanks to the other executive officers and the district deputies, Bros. Ryan, Angell and Mitchell, for the strong support and able assistance which they have given me, and I respectfully solicit a continuance of the same to my successor in office.

The organization of the C.A.S.E. is in my estimation a grand thing in the interests of the engineers in this country, and I feel that every practical engineer should come forward and join us, so that we may not only be able to assist him, but also that he may give us the benefit of his experience in the meetings.

It is in the hands of the engineers of this country to make their chosen calling rank high in the estimation of the steam users and our fellow-citizens, by proving to them that we are men who are endeavoring to raise the standard of our calling to the proper level which it should occupy among the trades of our country. The C.A.S.E. has done more for the engineers of Canada than most people are aware, as it has proved to the public, through the reports of its meetings and discussions in the papers, that the stationary engineer of to-day is a much more important person than he was twenty years ago. The sharp competition in all lines of business at the present time requires that manufacturers shall reduce the cost of production of their various lines to the lowest possible price, and the generation and utilization of steam become a most import-

ant factor in this matter. They have heretofore been compelled to instal steam plants and machinery of the most economical and improved type to gain this desired end. Now this is all very good, and is in the proper direction, but as you all know, these modern high-class engines and machinery, with their delicate and complicated valve gear and motions, soon become as wasteful and expensive as the old class of engine, unless the engineer in charge is competent and well up in his business. Now, the object of this association is to help and educate its members in the profession of steam engineering, in order to fit us for our positions as stationary engineers, and there are not wanting instances among our membership to prove that the association is nobly fulfilling its mission, and I am fully convinced, Mr. Chairman, that it would be a hard matter to fully estimate the benefits that have in the past accrued, and will in the future also, to the steam users and stationary engineers of Canada, as a result of the work of the C.A.S E.

Vice-President Hunt added a few observations which were much applauded.

The toast "Our Guests" was coupled with the names of Samuel Fisher and W. E. Gower, who made suitable replies, thanking the Executive for their hospitality.

The last toast on the programme was "The Press," to which Mr. Sibley (of the Montreal *Witness*) and F. Page Wilson (of THE CANADIAN ENGINEER) briefly responded.

After the health of the committee who had undertaken the publishing of the Souvenir had been duly drunk, the evening came to an end with "Auld Lang Syne."

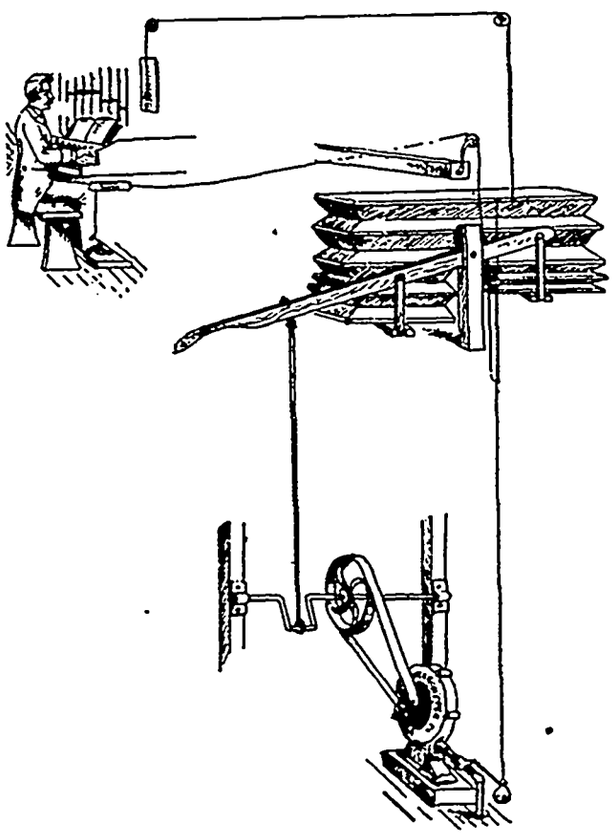
A NEW WATER MOTOR.

A REPRESENTATIVE of this journal dropped into the office of the Welland *Telegraph* the other day, and was shown a new motor which was so highly spoken of by the proprietors that he thought the subject worthy of investigation. The inventor of this motor, whom our representative sought out, is a young Canadian, J. G. Kerr, of Niagara Falls, Ont., who has certainly done honor to himself in the development of the new principle which he has applied to water motors. While electric motors occupy so much attention, the water motor will always have its place where cheap water power and good pressure can be had, and may even be used with great economy under these circumstances in the production of electricity.

The Kerr motor is very simple in construction. It consists of an iron wheel, on the end of each spoke of which is fixed a bucket. This bucket is formed to receive the jet of water in a peculiar way. By the sketch of the bucket here given it will be seen that the water

does not strike the bucket in its centre, the deepest part, but a little to one side, and at an angle so calculated that the volume of water is thrown to the other side, still exerting its force till it passes off at the pointed end of the bucket. In order to maintain this effect constantly and that the water may all escape free from each bucket before it rises, the buckets are placed with their points or scoop-ends alternately in each direction. Thus the water is doing its utmost work and passing off from the buckets on both sides, and none of it is carried round as a dead weight on the wheel. Hence the claim is made for the Kerr motor that it generates more power from a given quantity and pressure of water than any other hydraulic agent; that it will wear longer and is less liable to get out of order; that having no dead centres, it can be started or stopped without assistance, and what is a point of considerable mportance, it will not freeze up in cold weather, as it entirely empties itself when at rest. The construction is very strong and in keeping with its simplicity. The buckets are made of malleable iron and bolted to the wheel by bolts from which the temper is drawn to prevent them from breaking.

This motor, which is made in various sizes from $\frac{1}{8}$ to 20-horse power, can be applied to a wide variety of uses, such as small mills, printing presses, pumps, feed mills, church organs, lathes, dentists' machines, fans, etc., and can be operated at a pressure of 30 lbs. per inch and upwards, though 80 or 90 lbs. give best results. Of course where the pressure is weak a larger size of motor can be used.



The accompanying sketch shows the application of the Kerr motor to church organs. After the water is first turned on the work is automatic and an even flow of air is obtained without any jar such as accompanies the sounding bellows. The organist can himself increase or diminish the power without leaving his seat. This he does by raising or lowering a chain or wire rope at the side of the organ. When the organ ceases playing the water is shut off automatically and remains off till playing begins. These attachments are supplied with the motor so that any machinist can set them up. The manufacturers of this motor are the Kerr Motor Co., Niagara Falls, who will give the reader all particulars.

THE Electric Light Company's Works at Clinton, Ont., were scorched and badly damaged by water, owing to the fire on Aug. 10th, at the organ factory adjoining. Insurance, $1,200.

BRITISH METAL TRADE WITH CANADA.

Below is given the returns of the British Board of Trade, showing the value in sterling money of the exports of leading metals to Canada for the month of July, and the seven months ending July of this year and last. The same returns show also that while £5,826 worth of copper ore was shipped from Canada to England in July, 1892, none went out in July of this year, and the total for the seven months of last year was £10,041, against £6,665 this year.

	Month of July.		7 months ending July.	
	1892.	1893.	1892.	1893.
Hardware and Cutlery	£ 7,483	£ 9,583	£ 54,325	£ 57,340
Pig iron.....	8,024	5,039	28,911	23,409
Bar, etc.....	3,000	1,919	22,406	16,113
Railroad	50,842	113,963	165,349	334,567
Hoops, sheets, etc.....	8,832	5,522	31,510	31,317
Galvanized sheets	7,349	8,419	28,369	36,590
Tin plates.....	16,799	14,757	127,592	103,972
Cast, wrought, etc., iron ..	7,032	11,086	60,005	74,426
Old (for re-manufacture)..	6,109	16,972	42,033	67,046
Steel	16,161	9,596	74,505	72,789
Lead	2,346	1,471	16,045	9,376
Tin, unwrought	2,909	3,299	19,380	13,417

PEOPLE at Chatham, Ont., are talking about establishing an incandescent electric light company.

THE CANADIAN ENGINEER, with this issue, is enlarged by four pages, being now 32 pages besides the cover. Show the paper to your friends and get them to subscribe.

CANADIAN ELECTRICAL ASSOCIATION.

The third Convention of the Canadian Electrical Association was held in the Industrial Exhibition Association's Buildings, Toronto, on Tuesday, Wednesday and Thursday, September 12th, 13th and 14th.

The following was the official programme, of which a full report will be given in our next.

TUESDAY, SEPT. 12TH.

2 p.m.—President's address.
Secretary-Treasurer's Report.
Report of Committees.
General Business.

Paper by Mr. Fred. C. Robertson, Toronto. Subject: "Some of the Causes of Interruption to Telegraph Circuits."

Paper by Mr. A. C. McCallum, of Peterboro'. Subject: "Water Wheels."

WEDNESDAY, SEPT. 13TH.

10 a.m.—Nomination and Election of Officers, and selection of place of next meeting.
Unfinished business.

Paper by Mr. L. B. McFarlane, of Montreal. Subject: "The History of the Telephone in Canada."

Paper by Mr. E. B. Merrill, Toronto. Subject: "Electrical Education."

Paper by Mr. John Langton, Toronto. Subject: "Direct Connected Dynamos and Steam Engines."

Paper by Mr. E. Carl Breithaupt, of Berlin, Ont. Subject: "Electric Street Railways"

THURSDAY, SEPT. 14TH.

7 a m.—Steamer of Niagara Navigation Company to Queenston.

By courtesy of Mr. W. A. Grant, Manager, a special car was taken on the Niagara Falls Park and River Electric Railway from Queenston to Chippewa, and inspection made of the power houses and plant.

Also by invitation of Capt. Carter, the members visited the Falls at Table Rock and Prospect Park, the works in the Tunnel District, the Tower, etc., and took a trip around the Falls on the steamer "Maid of the Mist." Luncheon was provided at the Cliff House, and dinner on the boat during the return trip.

REVIEW OF THE METAL TRADES.

MONTREAL, 15th September, 1893.

There has been no appreciable change in the market since our last report, though if we might venture an opinion we would say it had somewhat improved and evidence points to a fair fall trade.

A good many have thought that the panic in the United States would severely affect trade in Canada, but this opinion does not appear to have materialized to any great extent, although it has kept some from placing their orders; but now that confidence is being restored we may not expect the depression to be felt here very much In fact this market is not affected so much by the American as by the English market, being much more in sympathy with the latter. The coal strike in Great Britain, reported in our last issue, and which restricted importations considerably, is now apparently being settled, but the price of fuel remains at the figure reached during the strike, in consequence of which makers have advanced the price of manufactured iron 2s. 6d. to 5s. per ton. While this may not cause merchants here to raise prices of stocks on hand, it will nevertheless stimulate this market, especially as navigation is drawing to a close, and an advance in the price of steel and iron sheets, angle steel, etc., may be confidently expected. There is a tendency on the part of consumers to buy more freely, and merchants must necessarily lay in a stock for their winter trade.

In agricultural steel large importations have been received during the past month. With a good wheat crop in Western Canada, and a bountiful harvest in general, the prospects for this line of steel are good. Already a good many implement manufacturers are placing orders for their coming requirements.

In copper and tin few sales have been made and values remain about the same. There is no special feature to record in the pig-iron trade. Prices for importation are a little firmer, with not much business offering.

There is not much to report on Canada plates. There seems to be little doing. Some sales of Bosic wire rods have been made, but the quantity will not exceed 500 tons. Prices are, if anything, a little higher.

A good many purchasers of rods have bought all their requirements till next spring, but a few are holding off anticipating lower values, which will not likely be reached this fall.

In rolling mill stock sales to about 1,000 tons have been made of old iron ship plates and angles, and prices obtained are the lowest this season.

Purchasers may not expect prices to go any lower this season.

Industrial Notes.

THE new armory at Brantford, Ont., is now completed.

IT has been decided to build a steel bridge at Bryson, Que.

THE Bridgetown, N.S., furniture factory is advertised for sale.

JAS. ROUSSEAU'S tannery at Sapperton, B.C., is to be rebuilt.

THE new grain elevator at Carleton, N.B., is in working order.

A LARGE new pork-packing establishment is to be erected at Ottawa.

A MOVEMENT is on foot to establish a paper pulp factory at Arnprior.

A SAW-MILL for cutting cedar lumber is to be erected at Port Wood, B.C.

Two large iron boilers have been added to the Riordon Paper Mill, Merritton.

THE Oxford, N.S., Foundry Co. are putting in a new 20-horse power boiler.

A BY-LAW has been voted for the erection of a flour mill at Wawanesa, Man.

THE new planing mill of C. C Baldwin, Port Credit, Ont., is now in operation.

THE market at New Westminster, B.C., is going to be enlarged at a cost of $10,000

A. MARTIN has the contract for building the bridge over the river at Stanhope, Que.

FULLERTON'S lumber mills at Southampton, N.S., are to be turned into a brickyard

THE Cunningham Hardware Co. (Ltd.), New Westminster, are removing to Vancouver.

THE Government are going to build a road from Gibson's Landing to Sechelt, B.C.

JOHN C. MCDONNELL'S new steam saw-mill at Hagarty, Ont., is now in full working order.

ENGINEER LECKIE has commenced work on the new water works at Granville Ferry, N.S.

THE Provincial Board of Fire Underwriters, Vancouver, B.C., have decided to rate saw mills.

THE new engine and boilers at the Granby, Que., Rubber Factory, are now in working order.

ISAAC MCNAUGHTON, manufacturer of harrows, Riverton, N. S., has assigned to John Fraser.

As soon as the river freezes over, a bridge is to be built over the Souris near Wawanesa, Man.

A NEW college is to be built at St. Francois de la Beauce, Que. The building will be 100 ft. by 50 ft.

CHAS. WRIGHT, late of St. Mary's, Ont., has established a wood working factory at Brandon, Man.

KRAUSER'S cooper shop, Waterloo, Ont., has been fitted with a new boiler for bending wood by steam.

GARDINER'S hardware store at Dundalk, Ont., has been burned down. Loss, $12,000; insurance, $5,000.

BISHOP & HALL are talking of moving their scythe and snath factory from Sherbrooke to Waterville, Que.

THE Griffin Car Wheel Co., St. Thomas, Ont, have increased their capital stock from $150,000 to $200,000.

THE Buckler Brick Co., Annapolis, N.S., are shortly going to make a shipment of bricks to the West Indies.

WORK is progressing in the new pulp mill at Milton, N.S. H. Sorette & Co. have the contract for the masonry.

JOHN WHITE is going to erect a saw-mill at Battle River, N.W.T. The machinery is being built in Ottawa.

A. T. WOOD, hardware merchant, Hamilton, has been granted a permit for alterations to his warehouse, to cost $4,000.

THE council of Lemoilou, Que., have decided to purchase a spring some little distance away and establish waterworks.

A. W. SPOONER, Port Hope, is having exhibits of his celebrated copperine at the Toronto, Montreal and Ottawa exhibitions.

IT has been decided to build an annex to the Montreal gaol, and, after a time, to build another story on the main building.

P. MCRAE & Co.'s saw-mill at Calabogie, Ont., has been destroyed by fire, which is supposed to have originated in the furnace. Loss $8,000, nearly all insured.

THE new fire engine house at Sussex, N B., is nearly completed, and work is being hastened upon the new water reservoir.

Two bridges were washed away at St. Casimir, Que., owing to the sudden rising of the Niagarette River during the recent storm.

H. MACKEL fell on a run-way at Gilmour & Hughson's lumber mill at Ottawa, and passing under a band-saw, was instantly cut in two.

LOUIS GRIESINGER'S brewery, Windsor, Ontario, when the additions at present planned are completed, will have its capacity trebled.

A BOILER at Baird's foundry at Woodstock, Ont., exploded the other day, owing to over-pressure. A bystander was badly scalded.

THE Nova Scotia Wood Pulp and Paper Company's new flume near Milton will be 1,200 feet long, and will flow to a pen stock 32 feet high.

THE contract for the Campbell bridge at Colchester North, Ont., has been given to F. Sweet, and that for the Brush bridge to John Wortley.

THE British Columbia Match Factory, at Westminster, is now in working order and is turning out hundreds of thousands of matches daily.

JOHN COATES, C. R. Lee and Geo. Swinburne, Montreal, have joined together under the name of Coates & Co., as gas engineers and contractors.

THE business of John Scott, Galt, Ont., file manufacturer, has been sold to Parkin & Byrne, Arnprior, to which place the plant has been removed.

FRED. BRUGER, in attempting the other day to cross the gang at Kribs' saw-mill, Hespeler, Ont., fell, and was cut to pieces by the large circular saw.

THE lumber trade between Montreal and South America is said to be reviving, and several ships have been chartered to carry the logs to Buenos Ayres.

A THRESHING machine engine owned by Ledore Bros., Walkerville, Ont., exploded the other day, and two men were dangerously scalded by the hot water.

THE Hudson Bay Company will probably spend $150,000 on the erection of new buildings at Winnipeg, which probably they will make their headquarters.

E. GODEIR and H. Legault, Montreal, have formed a partnership as builders and contractors, and will carry on business under the name of Godeir & Legault

IT is estimated by Hiram Walker, who has undertaken the work, that the piping of gas from the South Essex fields to Walkerton will cost about $100,000

R. L. MOFFATT and Albert Kinch, Peterboro, have formed a partnership, and leased the Ontario Foundry Machine Works, which they are going to carry on.

FRED MITCHELL, a nine-year-old boy, wandering aimlessly about the North American Bent Chair Factory at Owen Sound, was caught by a circular saw and killed.

TENDERS are invited for sewers in St Hubert, Chenneville, St. Famille, Dufresne, Logan, Metcalf, Pantaleon, St. Jean Lane, Rachel and Duluth streets, Montreal

W. M BARRIE, of Chesterville, is building a new saw mill at Little Moose Creek near Casselman It is said that he will also build another mill in Casselman soon.

A TORONTO syndicate has acquired the right to bore for water in a lot of land lying west of Yonge street, near Bedford Park. They also may purchase in four months.

C. TIEHL is making an addition to his glue factory at St. Jacobs, Ont. E. W. B Snelder, of the same place, is building a new engine and boiler house for his grist mill.

AT the Trout Creek, Ontario, saw mill the other day, Robert Washburn was killed by being caught in the belting, when he was in the act of placing a small belt on a pulley.

T. A. LITTLE & CO., vinegar manufacturers, have received a permit to build a four-story brick addition to their warehouse on Richmond street, Toronto, at a cost of $3,500.

THE Duart, Ont., Roller Flour Mill has been destroyed by fire, together with a large quantity of flour and wheat. Origin of fire unknown. Loss nearly $6,000, partly insured.

THE Kerr mill and wharf property, at Rosehank, N.B., has been sold by auction to Lawrence Doyle. The price was $4,000. Mr Doyle thinks of making of it a high-class grist mill.

PLANS are still invited for a new market building at Orillia, Ont., those already sent in not being approved.

KIRKPATRICK & TUPPER, shingle manufacturers, Vancouver, have dissolved partnership, the latter having retired.

THE contract for building the new British Columbia Provincial gaol has been awarded to H. McAdie, of Nanaimo, B C.

A FIRE which occurred in the Empire Tobacco Company's premises, Montreal, did damage to the extent of $40,000; insured.

BELLHOUSE, DILLON & Co., Montreal, report a very large demand for the "white cross" cement, for which they are Canadian agents.

ELZEAR BENOIT, carrying on a contractor's business under the name of E. Benoit & Co., Montreal, has assigned. Liabilities, $12,000.

WILLIAM STAIRS, SON & MORROW'S hardware establishment, Halifax, N.S., has been burned down. Loss $120,000; insurance $80,000.

THE machinery engaged by the C. P. R. for the Brock street tunnel broke down last month, causing a serious delay in completing the work.

A NUMBER of the shingle mills of New Brunswick have been closed during the past month owing to dullness of the export trade to the States.

THE Western Wire Mattress and Furniture Manufacturing Co., capital $50,000, will take over the business of J. S. Bailey & Co., Vancouver, B.C.

THE Haras National, Outremont, Que., has been destroyed by fire. Most of the stock was saved. Loss on the building $20,000; insured for $12,000.

THE E. B. Eddy Manufacturing Co's match factory at Hull, Ont., has closed down for a few weeks owing to the overstocked state of the market.

THE Clinton, Ont., Organ Factory has been destroyed by fire, together with all the machinery, stock and tools. Loss about $10,000; insurance $4,500.

W. J SIMPSON and J. W. Boyd have bought the Lachute, Que., saw mills for over $11,000, and after thoroughly repairing them, will begin operations.

ANDREW CLEGG, while oiling some machinery in Mather's lumber mill, Rat Portage, Man., was caught between two cog wheels and crushed to death.

R. PINCOMBE'S oatmeal and cornmeal mills at Strathroy, Ont., have been burned down. Loss $20,000, partly covered by insurance. The cause of the fire is unknown.

H. B WITTON, of Hamilton, has applied for a permit to build a one story factory on Blair Avenue, Toronto. About fifty men are to be employed in the manufacture of glass.

THE Edson-Fitch Company's match-splint factory at Etchemin, Que., has been struck by lightning and burned down. Insured. The work of re-building will be begun at once.

Two engine-houses and two engines at St. Catharines, Ont., belonging to the Niagara Central Railway, have been destroyed by fire. The cause of fire is unknown. Loss $15,000.

THE Oxford roller flour mill and elevator buildings at Norwich, Ont., have been destroyed, together with their contents. Loss, $40,000; insurance, $22,000. The origin of the fire is unknown.

THE Esquimalt Waterworks Co. have made an offer to the Victoria City Council, to sell one-half of its stock to the city for $200,000, which would be spent in extending and completing the works.

THE new gas-holder which has just been completed at Toronto is 112 feet high and has a capacity of 1,750,000 cubic feet. Its constructors were a Philadelphia firm, who imported the necessary steel from England.

A SPARK in the sawdust was the cause of a fire at Sewers & Thompson's saw mill at Turner's Station, Ont., by which the mill and over a hundred thousand feet of lumber were destroyed. Loss, $4,000; not insured.

MILLER BROS.' pulp, straw and woodboard mills, Glenmiller, near Trenton, Ont., have been burned down. Loss over $50,000; only a small insurance. It is undecided whether the mill will be re-built at Glenmiller.

THE Wright Cement Company (Ltd.), Ottawa, has been incorporated. It has for its purpose the purchase of C. B. Wright & Son's business as manufacturers of hydraulic cements, tiles, stone for building purposes, etc.

THE corner-stone of the new Doran wing of the General Hospital, Kingston, Ont., was laid on August 3rd.

G. W. GREEN & Co.'s saw-mill at Kingsville, N.S., has been burned down. Loss, $2,500; insured for $400. The fire is supposed to have been the work of an incendiary.

THE Paton Manufacturing Co., Sherbrooke, Que., have been putting in some new water pipes, and have organized a fire brigade for the better protection from fire of the mill premises.

LEGER & Co.'s three-storey furniture factory, at St. Henri, Que., together with the machinery, have been completely destroyed by fire. A valuable horse was also burnt. Loss about $15,000; insurance $5,000.

THE Montreal Committee of Finance has been asked by the hospital authorities to grant a site for the erection of separate establishments for the reception of those suffering from infectious diseases.—*La Minerve.*

CHARLES L. BAILEY, of Toronto, on behalf of Shurley & Dietrich, of Galt, has bought the R. H. Smith Co.'s saw works, of St. Catharines, Ont., with the machinery, good-will, etc. The price was between $40,000 and $50,000.

AT the annual meeting of the Royal Pulp and Paper Co., at East Angus, Que., the following officers were elected: F. P. Buckland, president and manager; William Angus, vice-president, and W. S. Dresser, secretary and treasurer.

O. MIGNER is going to retire from his boot and shoe business at St. Roch's, Quebec, shortly. The establishment employs 300 hands and turns out an average of 1,700 pairs of boots per day, and will perhaps be carried on by the foreman.

THE water supply at Springbank, Ont., had to be stopped for twelve hours the other day in order to permit of the boilers being thoroughly cleaned. New steam pumps with a capacity for pumping 4,000,000 gallons are said to be necessary.

THE corporation of St. Roch de l'Achigan has given orders to Mignault & Belanger, civil engineers, New York Life Building, Montreal, to prepare plans and specifications for the construction of a bridge of 140 feet span over l'Achigan river.

THE E. B. Eddy & Co.'s planing mill, at Chaudiere, Ont., is being turned into a paper mill, this being the third paper mill the company have built in two years. The match factory, which is now closed down, may also be converted into a paper mill.

AN improvement in the Winnipeg water system is being agitated for. The chief engineer for the Public Works Department says a pure water supply could be obtained from the Winnipeg River above the seven portages, a distance of about fifty miles.

A COMPANY, with headquarters at Montreal, has been incorporated under the name of the Wm. Clendinneng and Son Company (Ltd.), for the purpose of manufacturing and dealing in pipes of all kinds, boilers, steam and plumbers' fittings, elevators, stoves, and machines of all kinds.

THE People's Mills at Guelph, Ont., have been thoroughly overhauled. Two large wings have been added for storage purposes, and a lot of new machinery put in, including two compound engines with a capacity of 350 h.p. Arrangements are being made so that, when the water is fairly high, the whole of the machinery may be run by water.

JOHN COATES & Co.'s tender for lighting Montreal by gas at the rate of $1 per 1,000 feet, with 5 per cent. discount for prompt payment, has been recommended for acceptance by the light committee. The name of the company, which will be formed immediately the contract is signed, will probably be "The Consumers' Gas Co. of Montreal."

ABBOTT'S carriage factory at Ottawa has been completely destroyed by fire. It is supposed to have been caused by a lighted match thrown away by a smoker in a stable attached. Only a few days before a lot of buggies, valued at $7,000, had arrived, and very few of these were saved. Loss on building and stock about $12,000, with little insurance.

NEIL MCPHEE, an employee at the Gurney-Tilden Company's foundry at Hamilton, was at work near the cylinder of a casting mill, when his clothing was caught by a bolt and he was thrown violently into the rear part of the machinery. His left leg was crushed to a pulp between two large cog-wheels and his shoulder bone was broken. He died a day or two afterwards.

SAMUEL ROGERS, J. P. Rogers and A. S. Rogers, of Toronto, and Duncan Robertson, of Montreal, have joined together as partners in an oil firm at Montreal, to be known as the Samuel Rogers Company. The Messrs. Rogers are of the well-known Queen City oil works, and the new company are carrying full stocks of their lubricating and burning oils, etc., in Montreal. The office is 92 McGill street.

THE engineer's report on the city of St. John's water supply for the past year shows there are thirteen miles of leading mains, thirty-seven miles of distributing mains, and twenty-six miles of service pipes. This, with the addition of fifteen miles of pipes added to the west side, makes ninety-one miles. The daily average consumption is 4,829,100 gallons. A second main pipe for Carleton, one of the suburbs, is now considered indispensable. Without it, the engineer says, the fate of Fairville might yet be the fate of Carleton. The sewerage system of St. John was extended during the year by 7,865 feet of main sewers, at a cost of $16,690.

Mining Matters.

GOLD has been discovered near Hagarty, Ont.

A SULPHUR spring has been discovered at Paris, Ont.

A GAS well is to be sunk near Canaan, in Colchester South.

A LARGE find of good copper is reported on the Fish River, B.C.

SPECIMENS of brown mica have just been found at Lansdowne, Ont.

A FOUR-FOOT seam of coal has been discovered at Thorburn, N.S.

B. F. BUDD has located a rich placer bar on the south side of the l'end d' Oreille.

THERE is a report that the mica mines at Charlevoix, Que., will begin operations shortly.

THERE are indications of another gas well on Philip Fox's farm, near Kingsville, Ont.

ORE has been struck on Houser Lake, B.C., assaying 500 to 600 ounces of silver to the ton.

H. LINDERBORN has located a vein of copper near Lardeau, B.C., ore assaying 50 per cent.

A VEIN of hard and superior coal has been struck upon R. F. Keith's farm at Salisbury, N.B.

A SMELTER will soon be in working order at the Hall Mines, B.C. A tram is to be put up also.

OVER ten thousand tons of ore is expected to be carried by the Nakusp & Slocan Railway this fall.

THE Koksilah, B.C., stone quarry has successfully adopted the helicoidal wire system of quarrying.

THE Winkle Consolidated Mining Co., Vancouver, B.C., have been purchasing some new machinery.

ARCHIBALD BLUE, Director of Mines for Ontario, was last month examining the mines at Sudbury.

THE Richardson mine, Isaac's Harbor, N.S., turned out 1,200 ounces of gold during the last six months.

WORK on the North Star mine, near Kaslo, has been stopped, pending the settlement of the silver troubles.

CANADA furnishes nearly all the plumbago necessary for the manufacture of lead pencils in the United States.

THE Provincial Manganese Company, Walton, N.S., has turned out some ore assaying 98.08 oxide of manganese.

THE Travers' mine in the Sudbury district is still closed down. The other mines, however, are working full force.

ALEX. MCARTHUR has sold part of his mining rights at Beauce, Que., to a Boston and Portland syndicate for $130,000.

THE Oliver copper mine near St. Croix, N.B., has been sold to a Montreal syndicate and operations will begin at once.

DR. SELWYN, the director of the Geological Survey, says that Canada has at the World's Fair by far the best exhibit of mica.

CAPT. J. C. HASKINS is opening out a gold bearing vein near Rat Portage. Even close to the surface the average is 9 dwts. to the ton.

THE Surprise Mine has been bonded to some Winnipeg capitalists for $15,000. About 60 tons of ore, assaying at 560 ounces, are on the dump.

AT the Wellington and Northfield coal mines, B.C., the men have accepted a reduction in wages of 10 to 20 per cent. respectively, and work is now going on as usual.

THE *Golden Era* reports that everything is flourishing at the Wild Horse Mine. Thirty men are employed, half of whom are Chinamen, and the pay-roll is about $2,240 per month.

PREPARATIONS are being made for boring for natural gas near Woodstock, Ont.

FOR the Morning Star Mine in Camp Fairview, B.C., $40,000 has been offered.

ABOUT 1,000 tons of ore are on the dump at the Cumberland Mine, Kaslo-Slocan.

A TUNNEL in McDames creek, Cassiar, B.C., is turning out $100 of gold per diem

ALEXANDER CHISHOLM is developing a lithographic stone quarry in Marmora, Ont.

THE Lingham Gold Mine, at Belmont, Ont., has been purchased by Alex. Chisholm.

J. LANE has struck a ledge, assaying 620 ounces to the ton, at the Duncan Mine, Kaslo, B.C.

THE Canada Iron Furnace Co., Radnor Forges, has increased its capital from $200,000 to $300,000.

THE Dominion Coal Company, Hochelaga, Que., have three new coal towers in working order now.

PHOSPHATE deposits have been discovered near Roberval, Lake St. John. They are believed to be valuable.

GEO SPOTISWOOD has just shipped a sample of pure galena from the Frontenac mines, weighing 214 pounds.

THE machinery for the sampling works at Kaslo is being placed in position, and crushing will begin very shortly.

THE water wheel at C. Young's mill, at Young's Point, Ont., broke recently, and the mill had to close down for a few days.

A MAN named Hayden has located a claim near Duncan City which assays 100 oz. silver, 4 dwt. gold and 40 per cent lead

THE Nichols Chemical Co., Capelton, Que., have suspended underground work until further notice, owing to the low price of copper.

IT is reported that bismuth, associated with antimony and gold, has been discovered in the Big Bend mining district of British Columbia.

THE pressure at the gas wells at Hamilton, Ont., registers, at present, five pounds on a steam gauge. The volume is 147 cubic feet per hour.

A GOOD deal of tunneling has been done at the Alpha Mine, on Four Mile Creek, Kaslo-Slocan. Twenty or thirty tons of ore are on the dump.

LARGE quantities of molybenite have been found recently at Calabogie, Renfrew and Mountain Grove. This substance is used for silk dyeing.

THE Tennycape manganese property, near Walton, Hants County, has passed into the hands of the Provincial Manganese Mining Company, Limited.

COAL has been found at Scribner's Brook near Plissville, N.B., which is pronounced to be of the highest quality. Mining operations are to be commenced shortly.

IT is understood that the Golden Smelter is about to start smelting. The ore of the North Star Mine will be reduced to matte and shipped to England.

THE Stratheyre Mining Co. contemplate placing at Fairview, B C., a forty stamp mill The company is said to have spent nearly $120,000 in labor alone.

THE Wilson iron mine at Calabogie, Ont., has been let to the Pennsylvania Steel Company, of Harrisburg, Pa., who have opened also a new mine at Coe Hill.

THE Mountain Chief Mine, near Kaslo, shows a streak of galena two to fourteen inches wide and two to four feet deep. The ore assays 110 to 200 ounces silver

WORK has started again upon the O. K. claim, Kootenay district It is hoped that the character of the ore will become less variable as greater depth is reached.

FRANK BETHUNE reports the discovery of a ledge of fine silver ore some fifty miles from Donald, which measures about eighty feet across and can be traced for two miles.

THE Canada Coal & Railway Co at Joggins' mines, N.S., are drawing a new slope a little way off the main pit, which is expected to increase the output to 600 tons daily.

IN the Wahnapitae district, Ont., a fine sample of gold ore has been discovered It weighs fifty pounds, and is said to be yellow with the quantity of free gold it contains.

H. ANDERSON has the contract for a large amount of development work on the War Eagle and Le Roi mines in the Kootenay district. He is erecting a Burleigh drill plant.

THE North Star Mine, Fort Steel, East Kootenay, has been purchased for $40,000 by a syndicate, composed of prominent C. P. R. officials and others.

THE natural gas at the well on Barton street, Hamilton, has been flowing satisfactorily lately, but the company have decided to bore two more wells before proceeding to lay pipes.

THE Gem City mine, Lake Creek, near Kaslo, has been sold to C E. Benson, of Spokane, for $40,000. The ledge assays one hundred ounces to the ton and is from 1 to 3 feet in width.

THE officers for the B. B. and M. Gas and Oil Co. are:—President, E. Boyt; vice-president, H. Maloney; general manager, Nathaniel Bailey; secretary and treasurer, Joseph E. Maloney.

CHARLES TAYLOR is prospecting for sulphur barytes near St. George, N B. This mineral was extensively mined there some years ago, but the works were abandoned owing to want of capital.

IT is stated that at the Ophir mine, Bruce Station, Ont., there are over 181,000 tons of ore in sight in the pay streak alone. Over $60 a ton has been netted on the ore already taken from this streak.

THE first mercury ore yet discovered in Canada has been unearthed in Ontario, in the shape of cinnibar. Samples are said to have assayed at 96 per cent. The name of the finder has not transpired.

THE lode of copper in A. J. Seelye's mine at St. George, N.B., extends for nearly a mile and is three or four feet in width. Specimens have assayed 32 per cent. There is also a lode of silver ore nearly ten feet wide.

THE *Kaslo Examiner* says that rich dirt, giving $2 to the pan, is being got at near the mouth of the Mouyea River, and prospectors are going into the country as fast as they can. Bonner's Ferry, seven miles away, is rapidly becoming depopulated.

ACTIVE mining and milling are now the order of the day at the Sultana and Northern Gold Company's mines and mills near Rat Portage, Ont. At the former the novel and interesting cyanide of potassium process was introduced recently.—*Rat Portage Record.*

WILSON'S lead-smelting works at Hamilton have been burned down. The plant was badly damaged, and about forty tons of the manufactured lead was destroyed. Loss nearly $10,000; insurance very small. The fire originated in a pan in which some refuse was being burnt.

MR. WARD, geologist, has obtained a permit to mine for coal on Kettle Point Reserve, in Lambton County. He is sure that a bed of bituminous coal exists in this locality, and should his opinion prove correct, he will sink a shaft and begin extensive operations at once.

THE Russell silver mine at Calumet Island, Que., has ore assaying 40 to 54 per cent. of zinc, 10 to 14 per cent of lead, and 12 to 16 ounces of silver to the ton. A main shaft and several minor ones have already been sunk, but operations are expected to begin shortly on a much larger scale.

THERE has been some contention between the owners of the Big Bertha and the Bon Ton claims in Slocan district. It has now been arranged, the work having been done on the Bon Ton claim, that the owners of that mine are entitled to the ore extracted. They will pay for removing it to Kaslo.

THE stone quarry at Wood Point, five miles from Sackville, N.B., owned by the New York Freestone Quarry Co., has been seized by the sheriff of Westmorland, at the instance of creditors, under the Absconding Debtor's Act. The principal creditors are Sackville parties, and the Robb Engineering Company, and Dunlap Bros. & Co., of Amherst.

THREE rich strikes have been made in the Lardeau. All the lodes are well defined and of great size. One of them is on the north fork of the Lardeau, and is composed of copper-silver glance. Another, of grey copper and galena, showing native gold, is on the South Lardeau (Gainer Creek). The third is a big ledge of grey copper-chloride, about eleven miles up Fish Creek from Lardeau City. Great excitement prevailed at Thompson's Landing and Lardeau City on receipt of the news, and at once a rush was made up the creek to stake claims.—*Kootenay Star.*

THOSE on the outside scarcely appreciate the widespread effect that the successful working of the Hall mines will have, says the *Victoria Colonist*. The working of one paying mine in this portion of the world just now, will act as a stimulus throughout the entire section. There is not a town in West Kootenay which will not be benefited by the resumption of work in the Silver King. Many of the business men of Nelson own properties throughout the country that would receive immediate attention if business picked up, as it surely do after work commences on the Hall mines.

Railway and Marine News.

RICHARD BOND, the veteran railroad constructor, died on Aug. 14th.

THE deficit on the Prince Edward Island Railway for last year was $63,731.

THE link between Indian Town, N.B., and Blackville has just been opened.

THE Euphemia Steamship Co., of Yarmouth, N. S., has been incorporated.

A NEW dredge has been built at Chatham, Ont., for the Chatham Dredging Co.

THE I.C.R. are going to build a branch to the brick factory at Southampton, N.S.

THE M. C. R. have reduced the wages of some of their employees 10 per cent.

THE Quebec Central Railway is issuing $500,000 of five per cent prior lien bonds.

H. W. EMBREE & SONS are building a new steam yacht at Port Hawkesbury, N.S.

THE sale of the Buctouche and Moncton Railway has been postponed until Sept. 8th.

THE Montreal Transportation Co.'s new steamer "Kannockburn" is now put together at Kingston.

THE C. P. R. have decided not to build the proposed railway from Cobden to Georgian Bay.

THE surveyors of the Bay of Quinte have completed the work from Trenton to Adolphustown.

THE C. P. R. are about to build a new station at Pembroke, Ont., with a platform 850 feet long.

THE Niagara Navigation Company (Ltd.) has increased its capital from $500,000 to $1,000,000.

MEDLER & ARNOT, Toronto, have the contract for crib-work and piling at the western gap, Toronto harbor.

STEPHEN TABOR has the contract for lengthening the breakwater on the Joggins, N.S., shore by fifty feet.

THE Quebec Central Railroad have finally decided to construct a branch line in the direction of Lake Megantic.

THE new city wharf at Sand Point, N.B., is completed. It will accommodate three average-sized steamships.

THE landing pier at Lawlor's Island quarantine station is now finished. The cost of the work was about $13,000.

THE new wharf at Victoria, B.C., will soon be ready to receive vessels. There is a depth of over 30 feet at low tide.

THE engineers' report states that it will cost $27,000 to rebuild the bridges on the London and Port Stanley Railway.

THE new dredge "Maple Leaf" has arrived at Hamilton, and is going to resume work on the sandbar in the harbor.

THE Baldwin Locomotive Works have just turned out a large new locomotive for the Windsor and Annapolis Railway.

AN engine went over the new Pend d'Oreille bridge for the first time on July 25th, upon which day the rails were completed.

Two new snow-ploughs for the Bangor and Aroostook Railway are being constructed by the Portland company, St. John, N.B.

THE C.P.R. have bought the Montreal and Western Railway, and will begin operating the line as far as St. Jovite this month.

TENDERS are invited for putting a new engine and boiler in the steamer "La Canadienne," Ottawa, giving her triple expansion.

A NEW side-wheel steamer called the "Cambria" has been put on the route between Sault Ste. Marie, Detroit and Windsor.

ON the "Soo" extension line, the C. P. R. track layers have reached a point only six miles from the international boundary line.

THE Boston and Nova Scotia Coal and Railway Co. are trying to secure from the Nova Scotia Government a subsidy of $3,200 per mile.

THE Government steamer "Newfield" has been sent down to repair the cable between Gaspe and the Magdalen Islands, broken last fall.

FOR the first time in its history the Intercolonial Railway shows a surplus. The balance to its credit for the year ending June 30th was $20,181.

CHIEF ENGINEER DALE HARRIS is now at work preparing plans for new bridges across the Ottawa at Ottawa City and Pembroke.

A C.P.R. TRAIN the other day was delayed nearly twelve hours owing to the burning of a small bridge near Portage la Prairie, Man.

THE New Brunswick Railway Co. have elected Robt. Meighen, of Montreal, president, and J. Kennedy Tod, of New York, vice-president.

PLANS are being prepared by the amalgamated Gatineau Valley and Pontiac Pacific Railways for a bridge across the Ottawa River at Nepean Point.

ALEXANDER MITCHELL, the chief engineer of the Shelburne & Queens, N.S., Railway, says the work of locating the line will be commenced at once.

IT is expected that the laying of rails on the Montreal and Western Railway will, within the next few days, be completed as far as Chute aux Iroquois.

THE steamer "North King," having on board a large excursion party from Rochester, struck a rock near Massassaga Park, Ont., the other day and was disabled.

JAMES KELLY completed the submarine drillings in connection with tunnel under the Northumberland Straits connecting Prince Edward Island with the mainland.

THE seizure by the sheriff of the rolling stock of the North-West Central Railroad promises further to prolong the contest for the possession of that Manitoba road.

THE judges of the Court of Queen's Bench have decided that they cannot authorize the receiver for the M. and N. W. Railway to pay the employees their overdue wages.

THE C. P. R. have made an arrangement with the Pembroke (Ont.) Waterworks for the supply of water for their engines and station house there, at the rate of $600 a year.

OVER one hundred new flat cars, turned out by the shops at Cobourg, have been sent out to the Ottawa, Arnprior and Parry Sound Railroad, to be used in construction work.

THE offer of Bourgoin & Cadieux, of Montreal, for the building of extensions to stations to house police wagons and horses in that city, has been accepted. The tender was $17,800.

THE steamer "Mascotte," of St. John, N. B., built for the purpose of handling wrecks, has been destroyed by fire in Pachena Harbor. The crew were saved. The cause of fire is unknown.

THE officers for the Mainland and Nanaimo Steam Navigation Co. are as follows:—President, re-elected, A. O. Campbell; managing director, Capt. Rogers; secretary and treasurer, C. W. Whiley.

THE total quantity of freight moved on all the Canadian canals during 1892 was 3,031,736 tons, being an increase of 129,690 tons. The increase was noticeable chiefly upon the St. Lawrence system.

J. E. BROWN, captain of the steamship "Alcides," which went ashore at Anticosti, has been suspended for two months, on the ground of not having taken sufficient extra precautions during fog.

THE officers of the Mainland and Nanaimo, B.C., Steam Navigation Company are: President, A. O. Campbell (re-elected); managing director, Capt. Rogers; secretary and treasurer, Charles W. Whiley.

THE steamship "Straits of Gibraltar," plying between Montreal and Glasgow, and laden with coal for Fairbank and Bailie, collided with icebergs in the Strait of Belle Isle, and has become a total wreck.

THE Lindsay and Haliburton Railway will very likely be extended through the Algonquin National Park to Mattawa, thus affording almost direct communication between Toronto and the Upper Ottawa.

THE schooner "Laura," belonging to J. & J. T. Matthews, Toronto, sank in a storm off Charlotte on Aug. 12th. The captain and crew saved themselves by launching a boat and using a coat as a sail. The ship, which was carrying a cargo of coal, was valued at $3,000; not insured.

THE engineers of the Gatineau Valley Railway have had a good deal of trouble at Venosta, Que., in constructing an embankment, owing, it is supposed, to the ground being merely a sort of crust over what was once a lake.

THE Metropolitan Steamship Company and the International Steamship Company contemplate operating a line of steamships direct from New York to Eastport, thence to St. John, N.B., using the terminal facilities of the International at those two points, and

those of the Metropolitan at New York. It is the intention to make some changes in one of the large steamers of the Metropolitan line, which will make an excellent ship for the route.—*New York Times.*

THE jury on the "Etta Stewart" inquest, recommended the placing of a bell buoy outside Shutin Island, where there are dangerous shoals.

THE St. Catharines *Journal* reports that the Niagara Central Railway is applying for additional aid from the city, without which the company says the line will have to be closed.

THE steamer "Dorcas" of Sydney, C B., having the barge "Etta Stewart" in tow, was lost in a storm off the coast of Nova Scotia, on Aug 22nd. Seventeen lives were lost.

THE following have been elected officers of the Pembroke Southern Railway Co. —President, W. B. McAllister; vice-president, Thomas Hale; treasurer, Alexander Millar; and secretary, J. G. Forgie.

G. A. MOUNTAIN, engineer of the Ottawa & Parry Sound Ry., says 80 miles of the road will be in operation before the end of the year. The C.P.R., who had surveyed a rival road, have given up the contest.

THE four weirs in Lubec Narrows have now, by the commission appointed to enquire into the boundary line at Passamaquoddy Bay, between Canada and the United States, been decided to be on the Canadian side.

THE C P. R round house at Smith's Falls has been burned down, with the exception of one division. Four engines were destroyed and two disabled. The cause of the fire is a mystery. Loss estimated at $50,000.

THE I. C. R. yard, at Moncton, now covers 100 acres, the workshops occupying eight. Within the town limits there are 18 miles of track and sidings. The company employs in the various shops and offices over 1,000 persons.

THE route of the French-Canadian Steam Navigation Co., the first boat of which line started from Rouen on August 19th, is Rouen to Rochelle, and thence to St Pierre Miquelon, Quebec and Montreal. The winter terminus is Halifax.

THE contract for the construction of steel piping, with plates and flanges, required in connection with the Sault Ste. Marie Canal, has been awarded to the Central Bridge and Engineering Co., Peterboro The price is about $45,000.

THE harbor commissioners, Montreal, ask for tenders for 10,000 square feet of hemlock timber, 4,000 cubic feet of square pine timber, 5,500 running feet of round and flat pine timber, and 45,000 lineal feet of round and flat hemlock timber.

AN accident occurred a few days ago on the G T. R. at St. Liboire, Que., owing to a disconnected switch. The train ran off the track, and fifteen freight cars were completely smashed The brakeman was killed and the engineer badly injured.

THE engine house and forging shops at Sorel, Quebec, with a quantity of valuable tools and machinery belonging to the Ontario & Richelieu Steamship Company, have been destroyed by fire. Loss, $25,000, insured. The cause of fire is unknown.

GILLIES & Co., Carleton Place, Ont., have just completed a launch for the Inland Revenue Department, to be used for running down smugglers in the Lower St. Lawrence. She is fitted with a ten horse-power compound engine, and can make ten to twelve miles per hour.

THE lock gates on the Canadian canal at Sault Ste. Marie will probably cost $100,000 The two lower main gates will each be 44 feet 6 inches in height, and the lower guard gate 27 feet 6 inches, whilst the upper main and upper guard gates will each be 29 feet 6 inches high.

THE steamship "Montreal," belonging to the Richelieu & Ontario Steam Navigation Co., has been ordered to Sorel for repairs It is hoped that, by some alterations to the machinery, the consumption of coal, which hitherto has been excessive, will be materially reduced.

THE Kingston Locomotive Works are making two new engines for the G. A. and P. S. Railway. One of them is a freight engine, and, it is said, will be among the heaviest in the country. Her cylinders are to be 18 x 26, and she will be able to pull 45 loaded cars up a slight incline with ease.

THE Government has entered into a ten years' mail contract with Mr Huddart, of the new Australian steamship line from Vancouver, the terms of which call for a 15-knot service, passage to be made in twenty-one days, and another steamer equal to the "Miowera" and "Warimoo" to be placed on the service within two years.

THE new Union Station at Toronto will consist of four buildings. The main one will be six stories high, will have 110 feet of frontage on Front street, and will be 136 feet deep Another portion will be known as the waiting room block and will have a frontage on the new Union street of 180 feet. A new train shed will also be built, 500 feet in length and 80 feet wide The latter is expected to be completed about Christmas, and will be made entirely of steel and iron. The estimated cost of the new buildings is half a million dollars.

The Patent Review.

RECENT CANADIAN PATENTS.

43,748 Charles G. Sandberg, Gerois, Missouri, means for opening shutters.
43,749 George D. Hamilton, Innisfail, Alberta, metal fence.
43,750 Martin Wanner, Denver, Colorado, process for refrigeration and refrigerating apparatus.
43,751 Same as 43,750.
43,752 Harvey Waddell, Chicago, wardrobe bedstead.
43,753 Daniel T Caldwell, Kensico, N.Y., vending machine.
43,754 Frederick Page Cobham, Warren, Penn., extension table.
43,755 James F. McElroy, Albany, N.Y., storage heater for street cars.
43,756 Samuel C. Sams, Aspen, Colorado, car coupling.
43,757 Max Kustermann, Berlin, Germany, machine for printing on matches.
43,758 Wm. Hornsby, Grantham, Eng., engine operated by explosion of combustible mixture.
43,759 Louis Sabatier, Ragnols, France, gas and petroleum engine.
43,760 Samuel Hudson Wright, Dublin, Ireland, clip for holding papers, or for other purposes.
43,761 Bradley Hatch Phillips, Fredonia, N.Y., adding machine.
43,762 Jesse Kinney, Windsor, Ont., puzzle.
43,763 Samuel Evans, Chicago, Ill, process for chipping glass.
43,765 Carmille de Borman, Brussels, Belgium, sign and advertisement.
43,766 Arthur Gravel, Montreal, hydrant.
43,767 James Sangster, Buffalo, N Y, gas lighting and extinguishing apparatus.
43,768 Charles Andrew Gildemeyer, Haddonfield, N.J., changeable sign and label.
43,769 Charles Rogers, New Plymouth, New Zealand, apparatus for receiving written messages, orders, etc.
43,770 David Pásztor, Berlin, Prussia, belt fastener
43,771 Verner Frederick L Smidt, Copenhagen, Denmark, art of producing cement
43,772 Jacob Roberts, Catasogua, Pa., furnace.
43,773 " " " machine for forming horseshoes and horseshoe blanks
43,774 Wm. O. K. Ross, Montreal, fare box.
43,775 Jacob J. Poaps, Osnabruck, Ont., animal trap.
43,776 Benjamin A. Pickering, Woonsocket, R.I., rubber boot.
43,777 James R. Haydon, Cleveland, Ohio, submarine boat
43,778 Charles Butterfield, Nottingham, Eng., letter press and lithographic cylinder printing machine.
43,779 William E Richards, New York, ladder.
43,780 Joseph Wm. Cheney, Three River, Mass, loom
43,781 George G. Lafayette, Brockville, Ont., incandescent lamp socket.
43,782 Adeline Boyer, St. Therese de Blainville, P.Q., impts. dans de nouvelles et utiles ameliorations aux medicaments dit ouguents.
43,783 Wm. T. Near, Bridgeport, Conn, printer's galley.
43,784 Ernest G. Hoffmann, New York, hollow wheel or roller.
43,785 Earl Porter Wetmore, Helena, Montana, electric heater.
43,786 Joshua L. Jones, Chicago, Ill., trunk fastener.
43,787 Frank Overton La Grange, Indiana, cistern cleaner.
43,788 Seldon S. Casey, London, Ont., grip fence tool.
43,789 Nina H. Riffard, N.Y., self-treating needle.

REMOVE RUST.

Before painting iron work it is necessary to see that it is absolutely free from rust, which has the baneful habit of spreading under the surface of paint. Linseed is permeable by air and moisture, and in time the paint will be flaked off by the rust underneath, exposing the iron to the destructive agent oxygen in the presence of water. It is necessary, says the New York *Engineer*, to remove all the scale possible from wrought iron by means of stiff wire brushes, and then to remove the rust by a pickle of very dilute acid, which must afterward be thoroughly washed off before the paint is applied. The surface of the iron should be dry and at least moderately warm before it is primed. Hence the specifications usually call for the priming with red lead, to be done by the iron manufacturer before its delivery to the job. It has been suggested that rust may be quickly and thoroughly removed from iron by coal oil. This should afterward be washed from the surface with benzine, which should be allowed to evaporate before painting, otherwise the coal oil, being practically non-drying, would inevitably cause the paint to peel from the metal. Red lead, to secure the best results, should be thoroughly incorporated with the oil in a mill, and not merely stirred in by hand.

TOO LITTLE STEAM ROOM.

The danger and impracticability of using boilers with too limited steam room may be explained thus, says a high authority: Suppose the entire steam room in a boiler to be six cubic feet, and the contents of the cylinder which it supplies to be two cubic feet; then at each stroke of the piston one-third of all the steam in the boilers is discharged, and consequently one-third of the pressure on the surface of the water before that stroke is relieved; hence it will be seen that excessive fires must be kept up in order to generate steam of sufficiently high temperature and pressure to supply the demand. The result is that the boilers are strained and burned. Such economy in boiler power is exceedingly expensive in fuel, to say nothing of the danger. Excessive firing distorts the fire-sheets, causing leakage, undue and unequal expansion and contraction, fractures, and the consequent evils arising from external corrosion. Excessive pressure arises generally from a desire on the part of the steam-user to make a boiler do double the work for which it was originally intended. A boiler that is constructed to work safely at from fifty to sixty pounds was never intended to run at eighty and ninety pounds, more especially if it had been in use for several years Boilers deteriorated by age should have their pressure decreased, rather than increased. One of the first things that should be done in manufacturing establishments would be to provide sufficient boiler power, and in order to do this, the work to be done ought to be accurately calculated, and the engine and boilers adapted to the results of this calculation. Steam users themselves are frequently to blame for the annoyances and dangers arising from unsafe boilers and those of insufficient capacity. For motives of false economy they are too easily swayed in favor of the cheaper article, simply because it is cheap, when they should consider they are purchasing an article which, of almost all others, should be made in the most thorough manner and of the best material. In view of the fearful explosions that occur from time to time, every steam-user should secure for his use the best and safest.

GAS ENGINE v. ELECTRIC MOTOR.

The chief advantages of a gas engine compared with a steam engine are that it requires practically no care, and that all the heat and dirt inseparable from the use of the latter are done away with. The use of steam engines and boilers in small buildings is sure to decrease as the cost of running them becomes more level with that of running a gas engine or electric motor. The *Boston Journal of Commerce* gives some interesting comparisons between the three forms of power. The amount of gas used by gas engines has been gradually reduced so that engines lately brought out use but fifteen cubic feet of gas per indicated horse power per hour. Upon this basis the cost of running an engine of 25-indicated horse power would be $25 \times 15 \times 10 = 3750$ cubic feet of gas a day, or $3.75 at $1 per thousand. A 25-horse power motor would cost nearly twice this amount for current, but would have an advantage in delivering more of the power in useful work. The power lost in friction is larger in the gas engine than in the motor or even the small steam engine. This should be considered, for it means more power required to do a certain work by the gas engine than either of the others. But this item is much less now than in early gas engines, but even this disadvantage is offset by the economy of gas. As a comparison with a steam engine, an engine of this size, 25-horse power, would certainly require three and one-half to four pounds of coal a horse power an hour, which at the most favorable calculation would be $3\frac{1}{2} \times 25 \times 10 = 875$ pounds of coal a day, worth $2, and added to this are water and attendance, which would bring the cost something above $4 a day, certainly not less than this. There is an advantage also in the close regulation of the gas engine, adjusting the consumption more closely to the load than the steam engine would do, and lacking, also, the fixed charge that the electric companies make, whether the current is used or not. The heat losses, from radiation and other sources, are quite a constant figure in the steam plant, no matter whether the load is 25 horse-power or 15 horse-power, so that the best results can come only when the full power is used. With gas engines as now constructed this is less true, and there is a considerable variation possible in power without considerable increase in the consumption of gas per horse-power. The large friction loss in the gas engine is a decided disadvantage when a large engine is working under low powers, but despite these disadvantages the gas engine for small powers holds a great advantage. There is another interesting point in this connection. An arc lamp of 1,700 candle-power requires one horse-power to produce it, and in a gas engine this can be obtained at an expenditure of twenty to twenty-two cubic feet of gas an hour. This same quantity of gas burned in the ordinary way would supply five 4-foot burners, giving 16 candle-power each, or a total of 80 candle-power. Thus it appears that 20 cubic feet of gas used in a gas engine will, by means of electricity, give twenty times the amount of light that it will when burned from gas tips. The one uses the gas in the production of more heat than light, and the other uses the gas in the production of light with almost no heat.

THE largest search light in the world is now being set up at the World's Fair. The reflected beam has a luminous intensity of 375,000,000 candles. The carbons for the electric light were specially made for it, and are 22½ and 15 inches long, respectively. The power of this search light is reported to be enormous.

THE compound engine is economical mainly through the saving it effects in losses that are common to the single-cylinder engine. For this reason we often find it is difficult for some engineers to determine just where its economy exists. Steam is admitted into an engine at a high pressure and expanded in the cylinder, doing work until it has no more pressure. This is all that can be gotten from it, and the question then arises, how does working the steam through several cylinders get more work from it? If this was all there was to the problem there could be no gain by working the steam through two cylinders instead of one, but, rather, a loss in the increased friction of the two cylinders. The economy arises from the fact that steam is condensed in the cylinder at the beginning of its stroke, and is re-evaporated at the end of the stroke. In the single engine this re-evaporated steam goes to the atmosphere or condenser and is wasted, while in the two-cylinder engine it goes to the second cylinder and does work. The loss from condensation in the multi-cylinder engine is much less than for an equal expansion in a single cylinder engine, and this fact gives the superiority of the compound principle for equal pressures.—*Boston Journal of Commerce.*

AMONG the many thousand electric motors now in common use, says the *Electrical World*, probably 90 per cent. are provided with rheostats for turning on the current gradually with no provision either against leaving the rheostat handle on intermediate points or for preventing the rush of current which occurs when the current is shut off and then turned on again. A starting bore has been designed which entirely removes these sources of trouble. The starter consists of a fireproof box made of slate and iron and carrying an arm provided with a spring in its hub, which tends to keep the arm in its extreme left hand or off position. The arm is made of iron and is held in the "on" position by coming up against a small electric magnet, iron to iron. So long as this magnet is energized the arm will be held firmly against it with an inappreciable expenditure of power. On shutting off the current the magnet lets go its hold and the handle flies back to its "off" position and opens the circuit to the motor. A valuable feature, however, possessed by these starters is that the magnet does not immediately let go its hold of the handle when the current is shut off, and thus allows ample time for the shifting of the circuit from one dynamo to another before the motor has stopped revolving. Should the current, however, be shut off long enough to allow the motor to nearly stop, then the magnet lets go, and no harm results when the supply of current is again turned on. The design carefully avoids experimental resistances, uses old-fashioned coils and takes plenty of room to put them in.

THE NIAGARA TURBINES.

The turbine wheels to be used at Niagara Falls are of the new type, on a horizontal shaft, and known as the new double discharge turbine The water is conducted to the wheel from a canal near the top of the cliff, by means of an eight-foot pipe, made of steel plates, extending in nearly a perpendicular line to the mill, which is designed for two separate power plants The water enters the large flattened-cylinder casing at the bottom, and circulates around the wheel and its guide casing, and is admitted to the wheel proper or runner, which is placed upon a horizontal shaft, the motion being vertical. The wheel, or runner, is in reality a double wheel, which splits the water, or divides it into equal quantities on receiving it from one set of gates. After the water has operated upon the runner it is discharged horizontally and in opposite directions, immediately passing in a downward direction through the curved elbows, to which are attached draught tubes on each side of the wheel casing. These tubes are extended down to a distance of some 18 to 20 feet from the centre of the wheel shaft, thereby operating to some extent through the atmospheric pressure, in connection with a hydraulic pressure above the wheel. The runner is made of steel, iron and bronze, the segments carrying the buckets being bronze, and weighing 13½ tons. The whole runner weighs nearly four tons. The runner is made of such diameter as to secure 230 revolutions per minute, under a practical working pressure of 130 feet. There are no gears or belts for communicating the power to the machinery, but at each side there will be connected two grinders, or four in all, requiring about 1000-horse power or 250-horse power each, in addition to which there is considerable other machinery driven independently of the grinders. The entire weight of each plant of wheels is 28 tons.—*Electrical Engineer.*

ELECTRIC LIGHT CARBONS.

With different lamps and with different kinds of composition the rate at which the two carbons burn away varies somewhat, but when trimming the trimmer generally allows double the length of positive (or upper) carbon to that of the negative. Arthur F. Guy, writing in the *Electrical Engineer*, gives the result of a series of tests recently made by him with the Brockie-Pell "full" arc lamp. The current used by him was 10 amperes, the pressure 40 volts, the energy consumed by the lamp being 400 watts. He found that the positive carbon burned away at the rate of 5-6 or .833 inch per hour, and the negative carbon at the rate of ⅜ or .375 inch per hour. The diameter of the carbons used was 13 mm., or ½ inch, which for a full arc lamp, or one taking 10 amperes, is the best size With a half arc, or one taking six to seven amperes, carbons of 11 mm or 7-16 inch in diameter should be used; for a small lamp taking about five amperes, about 9 mm. is suitable; whilst for a very powerful lamp such as a searchlight, taking perhaps a current of 50 amperes, the size would be about 24 mm. or nearly one inch in diameter The rate of consumption of these larger-sized carbons is less than the smaller-sized ones, the burning being slower as the carbons increase in thickness. Carbons smaller than 9 mm. for five amperes, and those larger than 40 mm. for, say, 130 amperes, do not burn well, it being very difficult to obtain a well-formed crater, consequently the light is unsteady. It is the custom now in the best kind made to insert a central soft core in the positive carbon; these are called cored carbons. They are naturally more expensive than the other solid kind, but they give a better, softer, and steadier light. The soft core tends to keep the crater in the centre of the carbon, and promotes a more regular burning; the light also is purer and whiter. There is a great art in manufacturing electric light carbons, each maker having some little secret of his own in compounding the ingredients that form the paste. Gas-retort carbon, or gas coke, as it is called, is crushed into a fine powder and then mixed with several things, as pitch, oils, etc.; the compound is passed through a number of processes, then subjected to great pressure and finally baked in the furnace. Provided a good lamp be employed, the character of the carbon soon proves itself; a bad and impure specimen burns irregularly, splutters, and is continually breaking its arc, and so causes the light to fluctuate up and down, and, above all, the light given off is often a greenish-red or a purple color, making those on whom it falls have a very bilious look. A good carbon, however, acts very differently. it burns steadily, with little waste, the light is pure, full and white, and perfectly steady. Coated or coppered carbons are those which are coated over with a thin deposit of copper, to conduct the current better. A single-carbon lamp means one that has only one pair of carbons, and a double-carbon lamp one that has two pair, so that when the first pair is burnt out, the lamp changes over on to the second pair. The usual length that carbons are cut is about 16 inches for positive, and 8 inch for negative, so that the single lamp will burn 16 hours, and the double lamp for 32 hours. The consumption will not reach 1 inch per hour for the positive, as the carbon stumps will testify; in any case the carbons should never be allowed to burn down to less than 1 inch away from the holders, otherwise the holders will get heated and burnt.

A number of experiments are being made to test whether the pneumatic tires, such as are in ordinary use for bicycles, can be fitted economically to light road wagons. One inventor suggests the placing of an extra rubber tube outside the air tube in order to protect it from being injured by stones.

It is not often that the engineering world is called upon to witness the completion of a work nearly 2,500 years after it was first projected; but such is the case with the canal through the Isthmus of Corinth Projected 600 years before Christ, agitated again 300 years later, actually begun by the Emperor Nero, it is completed in 1893.

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Canadian Association of Stationary Engineers.

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CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

The Canadian Association of Stationary Engineers, Toronto No. 1, held their regular meeting on September 11th, with President Wilson Phillips in the chair. One member was initiated and an application was received from another to become a member. Under the head of "Good of the Order," the following questions were answered and illustrated on the blackboard by past President Blackgrove :—

Q. What would be the difference in percentage of strength of joint as compared with solid plate in the following joints.

Thickness of plate, $\frac{7}{16}$ in.; diameter of rivet, $\frac{5}{8}$ in; pitch, 2.27 inch? A. 72%.

Thickness of plate, $\frac{7}{16}$ in., diameter of rivet, $1\frac{1}{4}$ in.; pitch, 2.29 in? A. 69 97%.

Q. Is there any advantage in making girth seams double riveted? A. No.

Q Is there any advantage in securing the flange of a dome by double rivetted joint? A. No.

Q. What size of boiler should be put in to heat a building containing 300,000 cubic feet of space and run a ten horse-power engine? A. Thirty h.p.

Q. What would be the safe working pressure of a boiler 60 in. diameter, $\frac{7}{16}$ in. plate; joints same as first question above, 60,000 lbs. tensile strength, Dalzell steel? A. One hundred and twenty-five pounds to the square inch.

On August 25th, the usual meeting was held, with Vice-President Butler in the chair *pro. tem* Two members were initiated, and an application for membership was received. The two alternate delegates, Bros Sutton and Gilchrist, were asked to fill the places of Bros Lewis and Phillips, who cannot attend the convention of engineers to be held in Montreal.

After the ordinary business was disposed of, a long discussion took place on questions that are expected to come before the engineers' convention, and final instructions were given to the delegates who are appointed to represent the association.