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For THE CANADIAN ENGINEER.

HORSELESS VEHICLES.

BY J. H. KILLEY, HAMILTON.

Horseless carriages have been in use in France and Germany more or less for the last three years. At the present time it is stated that more than 1,500 motor vehicles for various purposes, run by kerosene and gasoline vapor and atmospheric air, are now at work, as also numbers of bicycles and tricycles. The cost of running these machines over all grades on the common roads is less than one-half of animal traction, and in most cases not more than one-third. A tricycle lately, in Paris, France, has run over 10,000 miles of roads, and is now in good condition to run the same distance. Its weight, including its oil charge, is only one hundred pounds. Slightly over one gallon of kerosene, it is claimed, will run it with one passenger one hundred miles. A bicycle with the same size motor weighs eighty pounds, and it is claimed that it will travel forty miles per hour on a level road.

One company in Paris, the Abeville Hackney Cab Company, have two hundred motor cabs, either built or in process of construction, for the hackney cab trade of Paris. Last year a competitive test took place between Paris, Lyons and Rouen, in which twenty vehicles took part, the kerosene machinery doing the best work. Another test took place this year, $10,000 being given in prizes to the machines which the judges claimed to be best.

The use of animal power on the ordinary roads will sooner or later, to a great extent, be superseded by mechanical power. This has been effectively demonstrated by the late competitive test between Paris, Bordeaux and back to Paris, a distance of seven hundred and fifty miles; the $10,000 being distributed in prizes to the vehicles which were considered best in the opinion of the committee of experts and others who were appointed to determine this matter. In the competition there were seventeen petroleum motors, seven steam motors, and two storage battery electric. One and all of the prizes were captured by the oil driven vehicles, the first having arrived back at the starting point in Paris in 48 hours and 56 minutes after leaving Paris, at the rate of fifteen and one-third miles per hour for time and distance. Some of the gradients on the route are stated to be from six to seven in one hundred, or a rise of 360 feet in one mile. The other oil cars were in from five to seven hours after the first. A steam vehicle, from which much was expected, and a favorite with those inclined to bet on the result, took over one hundred hours to cover the distance, and some of the others did not arrive at Bordeaux at all. The storage battery carriages stopped before getting half way to Bordeaux, a number of bicycles of the ordinary kind accompanied the motors, but were soon out-distanced. The roads travelled over were not of a favorable character, in fact, they were purposely chosen so, to determine the true status of the different vehicles. The petroleum ones are stated to have been covered with mud from the wet and rough roads, but in other respects were in perfect running order. The vehicle taking the first prize of 8,000 francs was the second to arrive at Paris. It is a four-seated one, with room for baggage and stores. The first to arrive got the second prize, as it only had two passengers. They each carried oil on the run for two hundred miles, the cost of the oil for the four-seated rig averaging one cent per mile there; the oil being much dearer than in Canada, the whole cost of running being about one-third that of animal power doing this distance. It must be borne in mind that horses could not do the work in the time stated. The whole route of the race was crowded over by interested spectators. In the event of an accident no outside help was allowed, the occupants of carriages having to carry on their own repairs if any. Not to do so, put them out of the race. The French and German engineers should have the credit of bringing motor vehicles to a successful issue. These, like the gas engines, were originated in France. I recollect the Lenoir gas engine in use, in France, forty years ago, made somewhat on the same lines as those of the present day. The success of the French competition has aroused both English and United States engineers to the fact that a very large business will be done in these machines in the near future, not only as carriage and wagon motors, but for general power purposes. The English High Road Act prevented mechanical power being used on the high roads, as it could only be done under very stringent regulations, and that during the night only. This kept back the business for the whole time that the French and Germans have had them in use, and left England behind in this branch of manufacture. Now, however, the law will be altered, the

bill having been read for the first time in the British house, and will be passed immediately on the assembly of the next parliament, placing petroleum vehicles under the same regulations as the ordinary traffic. As a consequence, some of the most eminent of the English agricultural and other engineering firms are preparing to go very largely into their manufacture. The London *Engineer* has offered 1,000 guineas ($5,250) to be run for by high road motor carriages in the near future. The judges will be gentlemen in whom the public will have entire confidence, so that the business of manufacturing them will be one of great importance in the near future there.

Our neighbors across the border are also preparing to take advantage of the altered state of matters in this respect, a large factory being now equipped for their manufacture at Long Island City. Another is in operation at Baltimore. Chicago is also moving in the matter. It is intended there that a prize competition for a large sum will take place in the States in the near future; the Chicago *Times Herald* has offered $5,000 to be contested for in November next. Price lists for petroleum motors for bicycle, tricycle, road carriages, yacht engines, and stationary land engines, are also in circulation. A 4 h.p. yacht engine of this class is offered to be placed in Hamilton for $180; this includes shaft and reversing gear, but when it is considered that the motor only weighs 60 lbs., the price appears to be ample. A two cylinder engine for a bicycle or tricycle is stated to weigh 12 lbs. I have been repeatedly asked if the petroleum is used to get up steam in these engines. I have simply to say that there is no steam or steam boiler. The petroleum is vaporized for each stroke of the piston, and is mixed with 10 to 12 parts of atmospheric air. It is fired by an electric spark from a small battery or from an incandescent platinum wire into an expansive vapor, giving a pressure on the motor pistons of from 150 to 180 lbs. to the square inch. This, in a thermo-dynamic sense, is very much more economical than steam. In the best steam engine not more than 10 per cent. of the heat is realized as power, while in the best form of oil engine 30 per cent. is stated to be so realized. It is time that Canadian manufacturers were moving in this matter, instead of importing many thousands of dollars worth of them as in the bicycle trade; build them here to start with, and employ our own mechanics; the construction of the latest design is of a very simple character.

THE LAWRENCE GAS MIXING AND ATOMIZING PROCESS.

As mentioned in THE CANADIAN ENGINEER, a new company is being formed, and will probably be in operation next month, for operating in this country the Lawrence system of gas mixing and atomizing. At the present date over three-fourths of the capital has already been subscribed, and the new company, whose headquarters are in Montreal, will probably be ready for actual business in the course of a month. The company is incorporated as the Canadian Cold Process Gas Co., Ltd., with a capital of $100,000, and the provisional directors are: Robt. Bickerdike, Hon. A. W. Ogilvie, G. N. Ducharme, F. J. Freese, Wm. Abbott, J. G. Ross and W. P. O'Brien.

Of the many processes that have been brought out within the last few years for the improvement and cheapening of gas, the Lawrence system is remarkable, not only for the economy effected in gas consumption, but for the ease with which the system can be applied both to existing works and to towns where no gas plant exists. The attachment of the "mixer" to an existing gas plant can be made in a day and without closing down, and no change is necessary in the ordinary style of burners, either for lighting or heating. One main or any number of mains may be thus changed to the new process independently, or a branch or any number of branches. The process can be applied also to coal or water gas.

Gas companies, by the use of the Gas Mixer and Atomizer, can extend their business over a wide area without the cost and trouble of laying mains. By the addition of an air pressure machine, of which there are many different styles on the market, small towns, factories, churches, dwellings, etc., may be lighted more economically and satisfactorily than by any other method now in use—the illuminating power being greater in proportion to hydro-carbon used. Used for isolated lighting and heating, the gas can be changed in two minutes from a pale blue flame for heating in the daytime, to a soft, rich, white light in the night-time. The gas may be employed for driving gas engines, cooking, heating, blacksmithing, soldering, the laundry, etc. Being absolutely free from sulphur and other injurious matter, it can be used in the most delicate metal working.

The exhibition that is being given daily in Montreal shows excellent results. Tests made here show that ten times the ordinary illuminating power of the Montreal gas is obtained when the gas is put through this process, while the consumption is reduced one-half. When applied to the Auer light the result is proportionately satisfactory. With this light only ½ cubic foot of gas was consumed as compared with 3 cubic feet of coal gas.

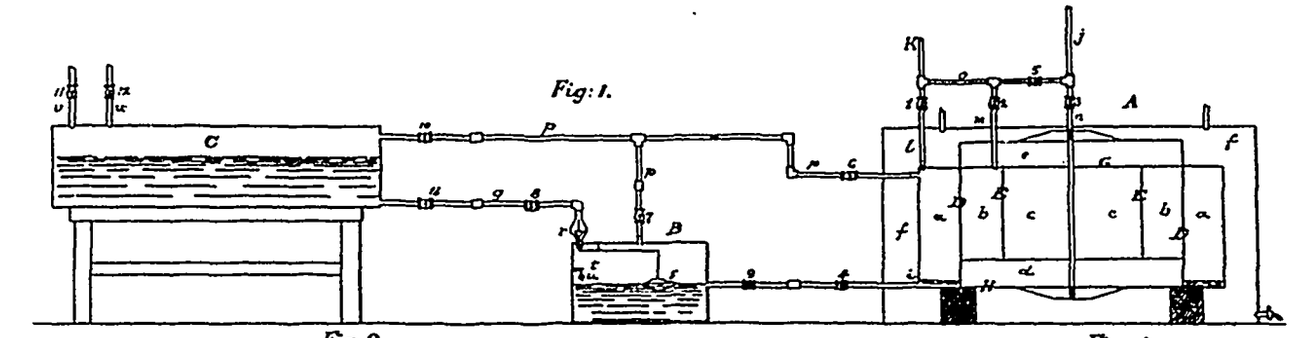
Professor William Foster, M.A., F.C.S., Dr. John Hopkinson, F.R.S., Professor A. Vernon Harcourt, F.R.S., and Professor Adolph Levy, all noted gas engineers and chemists, and Professor D. Monnier, of Paris, have made exhaustive tests and reports which show an average economy under many different conditions, of some 63 per cent. in use of the Lawrence Atomized Gas. Patents have been taken out for the process in all the principal countries of the world.

The fundamental principles of the Lawrence process are—the introduction of the hydrocarbon at a very low temperature below the degree of vaporization; the hardening of the particles (whether originating in the gas or in the liquid carbon) by chilling; and the atomizing of these particles of carbon, etc., by friction. While heat is the idea of all other processes, cold is the foundation of this. The introduction of vaporized hydrocarbon for the enrichment of gas is always followed by condensation, except where the temperature has been raised to the decomposing degree, in which case great loss in illuminating power results. The particles of carbon, etc., cannot be atomized except by heating to the point of decomposition, or by friction and attrition—or rather by the friction of attrition—when hardened by cold; and without atomization, perfect combustion cannot be attained. It is shown by the tests made here, that the thorough atomization of the Lawrence process not only ensures the highest illuminating results; but the perfect combustion thus attained, destroys the sulphur and other unpleasant properties, which render ordinary gas so unpopular with consumers.

The mechanical appliances used in this process are:—An enriching chamber in the outer circle of a copper tank, and means for introducing any desired quantity of oil from one pint to three gallons, per 1,000 feet of gas (each pint raising the efficiency of the gas by one candle-power, per thousand feet); a mixing and chilling chamber on a raised platform thoroughly insulated; an attrition chamber within, with suitable feeds, inlets and outlets.

the space under the platform is filled with the non-conductor, such as pulverized charcoal, sifted ashes, or asbestos cement. The partition *D E* between the chambers is soldered gas tight to the cover *G*, and rest on a coarse heavy cloth covering the bottom of the chambers.

The gas or air to be treated enters the enriching chamber *a* at the top through a pipe *Z* provided with a cock, and by means of a gas-tight partition *g* near the



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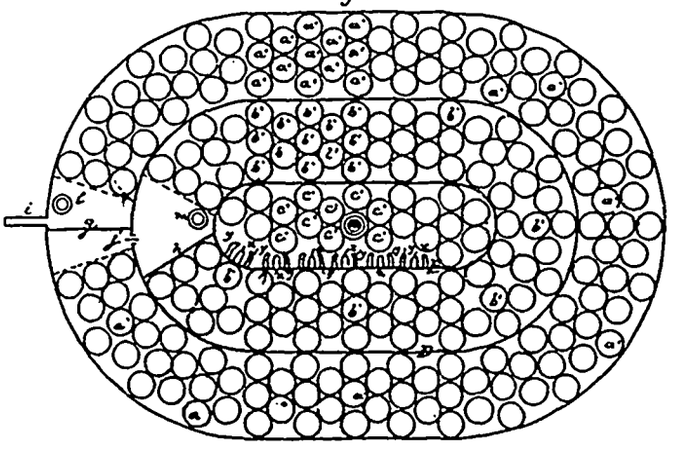

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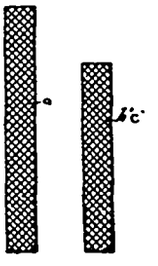

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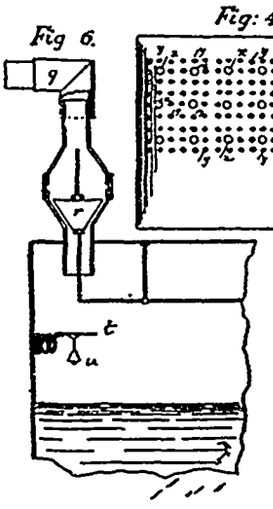

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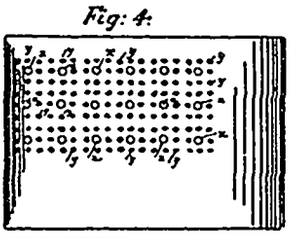


The diagram will help to show the plan of construction. Figure 1 is a vertical section of the whole apparatus. Figure 2 is a sectional plan on a larger scale, showing the arrangement of the cylinders in the several chambers. Figure 3 is a separate view of one of the cylinders of the outer chamber, and of one of the cylinders of the middle and inner chambers. Figure 4 is a front elevation of the innermost chamber, showing the arrangement of the tubes through which the gas or air passes from the middle chamber into the innermost chamber. Figure 5 is a vertical section on a larger scale, taken through the centre of the central tube of the groups of tubes. Figure 6 is a detail view in vertical section on a larger scale, showing the inlet valve and the bell of the feed box. The same letters and figures of reference indicate the same parts in the various figures here drawn.

The machine *A* is divided into three concentric chambers *a*, *b*, *c* by internal partition *D E*. The outer chamber *a* is the enriching chamber; the middle *b* is the mixing chamber, and the inner chamber *c* is the friction or atomizing chamber. Each chamber is filled with perforated metal cylinders a^1, b^1, c^1, placed close together. The cylinders in the outer chamber are filled with absorbent material, such as porous wood fibre; those in the middle chamber are filled with mixing and stripping material, such as mineral wool, and those in the innermost chamber are filled with an imperfect conductor of heat, such as charcoal. The cylinders of the middle and inner chamber are supported on a raised platform *d* and reach to the top *G* of the machine, and

inlet the gas or air is compelled to traverse the whole extent of the chamber to reach the passage *f*, through which it enters the mixing chamber *b*, wherein a partition similar to that in the enriching chamber compels it to pass through that to the inner chamber *c*, which it reaches by way of the group of tubes. The mouths of all the tubes are flattened, and have their ends slightly bent inwards, so that the gas jets impinge on the central jet coming from the central tube. From the central chamber the gas passes through perforations with an outlet pipe *n*, and thence to the burners through the pipe *f*. A direct inlet pipe *m* is provided for the gas or air, so as to increase or decrease the illuminating power at pleasure. The pipes are connected by a cross pipe *o*, provided with a cock 5, so that gas can be made to pass to the burners without entering the machine. The chamber *e* on the upper side of the cover *G* and the chamber under the platform *d* are filled with non-conducting material by which the temperature of the water in the water jacket *f* is prevented from affecting the temperature in the chambers *b c*, in which a low temperature is produced by the passage through them of gas kept cold by the atomization of oil from the chamber *a*. The machine is entirely submerged in the water jacket *f*. The oil is fed through a pipe *i* provided with cocks 4 and 9. One end of the pipes connects with the feed box *B* and the other passes through the water jacket into the outer chamber. Oil is fed from the reservoir *C* to the feed box *B* through a pipe filled with a conical inlet valve *r*, preferably of carbonized silk

cork. A valve rod, suspended from the feed box by an arm, has a float *s* by which the valve is brought down on its seat and thus regulates the depth of oil. An apparatus is provided for ringing a bell when oil falls upon the metal plate *t*, and the ringing of the bell indicates that the valve is working all right. The apparatus works as follows: The pipe *K* being connected with the gas or air pipe and the pipe *Y* with the burners, the operator opens the cocks 13 and 8 of the pipe *q*, allowing the oil to flow into the feed box. By opening cocks 9 and 4 of the pipe *i* the oil pours from the feed box to the chamber *a*. The cylinders of the enriching chamber should be charged with oil. When cock 3 is opened the air is allowed to escape through the outlet pipe *n*. Cock 2 on the inlet pipe *m* is next opened, and a minute later on the inlet pipe *l*, cock 5 on the pipe o is then gradually closed. When the water in the water jacket has become cold, cock 2 on pipe *m* is closed. The gas or air then circulates through the cylinders a^1 taking up carbon, the quantity of which varies according to the gravity of the oil and the temperature of the gas. From the enriching chamber, the gas or air charged with carbon passes through the opening 2 into the middle chamber, where it is thoroughly mixed in its passage through the cylinders b^1, and all super carbon is stripped out and absorbed by the packing in the cylinders, returning to the enriching chamber by percolation through the cloth on the bottom. When the gas has passed into the inner chamber through the flattened tubes, the cold blast serves to atomize the carbon and render the union with the air or gas complete. It should be remarked that the gas or air does not come in contact with the oil in the enriching chamber; but only with the packing in the cylinders. By these means, the illuminating power of the gas supplied to the burners can be varied, and gas supplied of a given power.

STATIONARY ENGINEERS, REAL AND IMAGINARY.

BY O. E. GRANBERG, MONTREAL.

At times we find men in positions for which they are not qualified, having worked themselves in by some peculiar combination of circumstances and a large amount of "cheek"; but their position is only a question of time. The men who fit themselves for a position will get there in time. Let me illustrate how this came about in a case. I was recently at a town making inspections and examining engineers. I found one chief engineer holding first-class papers from "such a place." He had to get a certificate from me, as the law now stands; and after examination he offered me $50 for a first-class. I gave that man a third-class, and I gave his second engineer a second-class—because the one man had got the position, but had not fitted himself for it, and the other man had fitted himself for the position, and now he got it.

You cannot keep a man back for any length of time if he is fit to take his place in the front. But it appears to be hard to make men understand this. How often do we hear men who have been engineers for many years grumble at what they call their bad luck, and accusing everybody of trying to keep them down, and finding fault because some one that used to be their fireman at one time was now holding a good position, with a good salary. While they were kept down they were unlucky, and the other fellow was lucky. There is no such thing as luck, in my opinion it is cause and effect. The one man has taken the trouble to qualify himself for a good position, and the other has been too shiftless to do so. The one man gets a good salary because he is worth it, and his employer can afford to pay it and have a profit left on that man's work. The other man has small wages, but his employer pays him more than he is worth, and would be glad to get rid of him at any time.

Another thing I have noticed is that some engineers are never quite ready to do a thing when it should be done. They put it off until some other time, and waste, and often expensive breakdowns, follow before they get to it, when a few minutes or hours at the right time would have saved their employer many dollars. They had broken their tools the last time they used them, and had been too slack to put them in order again, so that they could be used when needed, or they had left them kicking about until they were lost, strayed or stolen. Then they are very prompt at bell time in the evenings. As a rule, you will find them standing with their hand on the valve ready to shut her off at the first stroke; they had got their coat and hat on long before this, and before the engine stops the engineer is 100 rods down the street. He feels he has done his duty; he has put in his ten hours, and he is paid for no more. He comes in the morning, and at about five minutes to starting time he begins to oil his engine, and to do what he should have done the night before; at ten minutes past starting time some one comes to know what is the matter, and is told to get out, that the engine will be started when it is ready, and not before. I knew of one case where the engine was started before it was ready, because the manager came in and ordered the engineer to start up: he was packing his piston-rod, a thing he should have done the night before, and he at once started with the gland left on the rod, and the engine was smashed. Such men, when they find themselves out of work, think they are badly used. Then I find engineers that are afraid to dirty themselves with doing anything about the engine and boiler; they leave that part to the fireman and seconds, if they have one, and to the fireman alone if they have no seconds, and they themselves will stamp about, swearing at everything and everybody, but will take good care not to do anything themselves. Their position is above that; but the fact is often that they know so very little about the engineering that they are afraid to show their ignorance by attempting to do anything more than find fault with everything that anybody else does.

Then, again, you will find the man that goes to the other extreme. He wants to do it all himself. He thinks he is the only man that can do it right. Or, he thinks that if he lets some one else do a part, they, in time, will become as wise as himself and he could not stand that; so he goes on, making life a burden to himself and everybody belonging to him.

Now, the true engineer is generally to be found between the two extremes. Engineering has assumed such proportions as an agent of modern progress and civilization, that it has given birth to a profession whose scope and functions are not very clearly defined. The engineer's duty, in the performance of his daily work, involves the application of the laws of nature in various ways; to understand and explain which require a wide range of scientific knowledge. While there are to be found engineers whose intelligence and acquirements would shed lustre on any calling, there are others

who, by their loose disregard of correct rules, show that they are sluggish in the acquirement of the knowledge so essential to engineers. This is to be regretted, in view of the vast amount of property and number of lives entrusted to their care.

I am sorry to have to say that too often when I try to point out to engineers the necessity of qualifying themselves for their calling, the effort is met with the old, old question regarding the relative merits of theoretical and practical engineers; or, the comparative value of theory and practice. The practical engineers, who have no theoretical knowledge, scoff at theorists; and the latter sneer at the former.

Now, it requires but little experience on the one hand, and not much study on the other, to show that each are equally important. Both parties should know that "theory and practice" make perfect; and the man who has these two combined will excel in whatever he may undertake to do. Therefore, let me impress upon you as engineers to combine theory with practice, and prove the one by the other. This object may be attained by devoting a portion of our time to study and self-culture. And this association has been organized for this very purpose, and is spreading itself all over the Dominion in order to stretch forth a helping hand to the engineers whose early training has been neglected, and who are now debarred from the advantages of a good education. And, let me say, such engineers need have no cause for despondency, because the extra exertion and effort required to educate himself will confer advantages of their own which a school life cannot develop.

Of course there may be men in this calling, as in all others, who will fail, however much they may try to accomplish in the way of educating themselves. Still, the effort will do them good. This failure arises from the fact, that though morally all men may be equal, intellectually they never can be. Consequently, the ability of men to educate themselves varies in proportion to the amount of natural intelligence they possess.

Study gives quickness of apprehension; enables a man to profit by the recorded experience of others; develops a power of appreciation and concentration; enforces exactness and accuracy, and, if properly directed, teaches us to classify facts, make proper deductions, and reason correctly.

The knowledge acquired from books and engineering journals is of great value to the engineer, as without it he can never be fully qualified for his duties. He will be lacking in certain information which can only be obtained from them, and owing to the want of which he is almost sure to be narrow-minded, and slow to receive new ideas, or estimate the value of old ones. Such persons, if occupying positions of authority, are apt to be intolerant of other people's opinions, and to assume that all knowledge begins and ends with themselves. They over-estimate their own ability. They are apt to be self-conceited—a quality which too many, in every walk of life, possess—mistaking it for an independent spirit.

Another expression I often meet with is, "I am no book-engineer" now; this expression betrays their ignorance of the manner in which some of the most valuable books on engineering originated. These books were written by engineers of experience, who wished to advance their profession, and thought that if their successors could commence their studies where they left off, and have the benefits of their experience, that they might be able to advance and improve still further, leaving the benefit of their experience again to posterity, and so the art would advance with the ages—as much information may be had from the works they have left us in a few weeks' time as from many years of observation and trial.

I find in my travels among engineers in the country, that one drawback to their advancement is: the lack of *books and papers on engineering. They do not appear* to know what books to get and where to get them. And, if more associations were started and properly conducted, it would be a help to engineers. I have the honor to belong to one of these associations, and I suppose it to be a fair sample of the other associations—if not a little better.

Now, we have an educational night every other week, and at these meetings the time of the association is *never* taken up by *useless discussion* that results in some officer or member getting up and resigning his office, or saying he will never enter the room again while brother so and so is in the room. I say nothing of this kind ever happens in our meetings, there is nothing but brotherly love and good feeling—each willing to bear with each other's shortcoming. And then the educational part is so instructive to those who are not so far advanced in arithmetic.

Now, a great deal has been said about examinations of engineers and license laws: and as an examiner I wish to say that there are more difficulties to be overcome in the impartial execution of the law than appear at first sight. In the first place, it is difficult for a man to determine with any certainty the ability of an engineer by any theoretical examination alone, and *I like to have the candidate show his ability by practical* demonstration. Another point is that it is very difficult for a stranger to judge a man's qualifications as an engineer, with any degree of certainty, in comparison with those who are in daily intercourse with him; and I feel that, in order to produce beneficial and satisfactory results, the examiners must be theoretical, practical, painstaking men, who have performed all the duties of an engineer.

It is quite common to find men who have had charge of engines for 15 or 20 years who can only take second or third-class certificates, simply because they are of limited education, and could only imperfectly express what they knew; while others, who could furnish no possible evidence of ever having had charge of an engine and boiler, and who did not possess any of the qualifications so essential to an engineer, obtained first-class certificates, because they were theorists and good mathematicians.

It is quite common to find blatant individuals who have no reputation for ability, sobriety and industry, parading first-class certificates, which they obtained because they had abundance of assurance; while many practical and unassuming men are almost afraid to apply for a certificate, lest they should be degraded to a *third or fourth-class engineer; while theorists and* mathematicians should have their due meed of merit, it would be unjust so far as awarding certificates is concerned, to place them above men who, although possessing only a limited education, had shown by years of industry, truthfulness, and successful pursuits of their calling, that they were perfectly reliable in every respect.

Another point I wish to touch on is, that I often find that after a man has been recognized as an engi-

neer, by receiving a certificate, he often shows a lack of interest in acquiring a more extended knowledge of the duties of his calling, and frequently becomes too conceited to take instruction from others, or even ask a question, although the answer might put him in possession of a fact of great value to himself.

On the whole, I am of opinion that the condition of engineering cannot be much elevated by examination and awarding of certificates.

The only way lies in the motto of Canadian Association of Sanitary Engineers: "Better education and mutual improvement."

For THE CANADIAN ENGINEER.

THE INDICATOR AND ITS USE.

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

When first I undertook the work of treating this subject, I had no thought that it would find its way into print, but it was believed by a few that it might possibly be of some real benefit to others, not members of the No. 14 branch of the C.A.S.E., if I would agree to its going into print, and through the kindness of the editor of THE CANADIAN ENGINEER a few tit-bits of my first remarks before the members of Peterboro' Branch of the stationary engineers, society were published in the February number; through lack of time I have been unable to put my notes into a readable form. The endeavor will be made to put the subject as plainly as possible, so that "he who runs may read," and only the simplest figuring will be made use of.

In the February number mention was made of the uses to which the indicator could be put. The manner of presenting this subject is manifold. Of books and writings upon the indicator there is no end; and doubtless much that will appear in those papers to many may prove only to refresh the memory.

The object for which the indicator card is taken, the manner in which it is obtained, the mechanism employed in its production, are doubtless by this time familiar to most readers of THE CANADIAN ENGINEER; to describe the various reducing motions at this time would be needless. The correctness of long and short connections to the indicator from the engine cylinder are no doubt settled points in the minds of most readers. The object of these papers upon the indicator was to deal principally with the cards taken, the methods in use to enable a correct interpretation of them, what to do to secure the best results, and to note the influence of the indicator upon the development of the steam engine.

In the February number a brief sketch of the invention and history of the indicator was given, and the great improvement of the modern indicator over that of Watts' was doubtless noted.

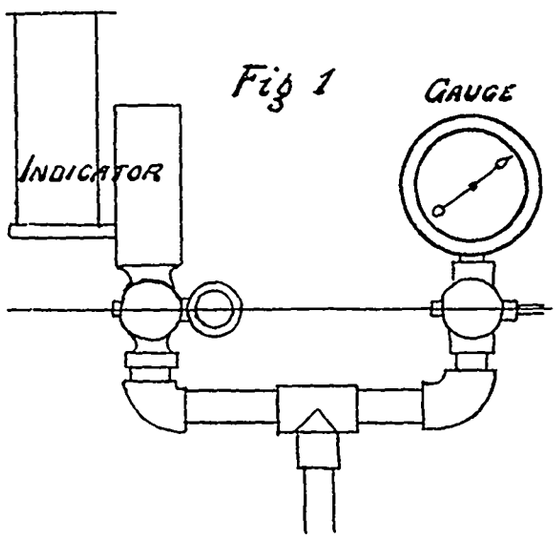
The builder of the modern high speed engine owes many thanks to this useful instrument, and no doubt the boilermaker also would be benefited by its use if properly applied.

Too much care cannot be exercised in the use of the Indicator to secure a correct diagram, and as the liability of errors taking place are many, it is well to note a few of the most likely ones. The movement of the pencil is at times liable to be erroneous, from the fact that it may not move equal distances vertically, for equal movement of the piston of the indicator at different portions of the stroke, or the pencil may not move in a straight line vertically. Sometimes, owing to friction of the piston in the cylinder of the indicator, the pencil may not locate itself accurately. As a test to determine the ease with which the instrument will work, having the indicator placed vertically, without the spring being attached to the piston, raise the pencil motion to its highest position, it then should fall back to its lowest or home position with ease; or place the thumb over the hole by means of which the steam is admitted to the cylinder, first raising the pencil to its highest position, the pencil motion and attachment to piston will move at a uniform rate to their home position. Ideas will suggest themselves as to the tests one should make to determine the correctness of pencil motion when freed from the influence of the steam and spring.

However, as the error from irregular movement of the pencil is more liable to take place at the extreme travel, we may conclude to reduce the height of the card.

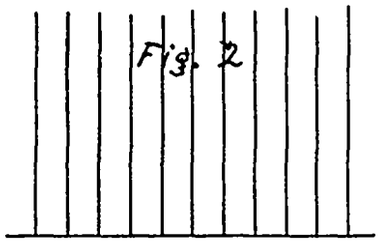
The spring, through constant use, may become weak and therefore will not record correctly the changes in pressure, and from the use of many makes of indicators in service at different power plants, from which the writer has taken test cards, this has been found to be the case, comparing the springs used with springs that had been calibrated, to be employed in the test.

The error due to the want of proper elongation or compression of the spring for equal changes in pressure cannot be well overcome, and we should try other springs.



The springs in use should be constantly tested, a very simple method is to connect up the indicator to a test gauge as shown on Figure I. Care must here again be exercised to take steam to indicator and gauge from some place on the main steam pipe where there is no fluctuation of pressure; places will be suggested to one's mind where best to make this test. When in readiness, turn on steam to gauge and indicator. Allow them to warm up, noting the pressure on gauge; by pulling the cord give motion to the drum, at the same time bring the pencil to the paper on drum and record the steam pressure line, close off the steam from the instrument and record the atmospheric line. Taking the paper upon which we have recorded the pressure, by means of the scale we can then measure what pressure has been recorded by the indicator. If the result agrees with that of the gauge we may safely use that spring, but should the gauge register the greater pressure the spring is heavy, and if less the spring is light. A remedy to allow the use of such springs is to make a new set of scales.

Through inaccuracies of the reducing motion, the action of the drum may not be correct in that the movement of the drum may not travel equal distances for equal distances travelled by the crosshead, and right here many errors take place. The reducing motion requires frequent examination when using the indicator. To determine the correctness of the reducing rig, place the engine on either centre, have the indicator properly attached to reducing motion; upon the paper or drum first draw a horizontal line by pulling the cord to drum, marking the position of crosshead upon the guides when at one of the centres, divide the travel or stroke into any number of spaces upon the guide, move the engine carefully until the crosshead mark is over the mark on the guide, and so on throughout the stroke, at the same time having the spring detached from indicator piston; raise the pencil vertically upon the paper from the horizontal line drawn as each station on the guide is reached; if, then, the divisions on the paper are equal as shown by Figure II., the principle of reducing motion is correct. Frequently, however, error may take place after such a test, as the inertia of the drum due to its fast movement may cause it to reach or overthrow, and cause distortion of the card; this is particularly true at high speeds, as any effects from inertia will be shown by an increase in length of the diagram. The amount of this error has been found by experiment to be from 0.5 to 1.5 per cent. of the correct length of card, at 250 revolutions per minute, with the best tension on the drum spring. As the piping to indicator may cause error, care must be exercised again. The pipes may be too small or too great in length, may lack being properly clothed, and the steam rapidly condensing in the pipes may not be able to return back into the cylinder, and thus produce a rough and erroneous diagram.



It must then be noted that it is of first importance that the diagram shall be true, and when we note the freedom with which the indicator is used in many hands, doubts arise in one's mind as to the accuracy of many results obtained. Liability to error appears at every point, and the degree of error increases greatly with increase of speed, and we cannot be too critical in our use of the indicator. The errors we are not conscious of are the ones sure to mislead us. We require, then, that the conditions for a correct diagram shall be that the movement of the paper coincides with that of the piston, we require that the movements of the pencil shall simultaneously and precisely represent the changes of pressure of the steam in the cylinder end to which the indicator is attached.

I have gone at some length in the endeavor to show the liabilities of error in the use of the indicator, and to some this may appear as superfluous, but from observation of the use of the indicator in the hands of many who should know better, I have felt constrained to confine my remarks entirely to this part of the subject. Our next consideration will be that of the card.

THEORIES OF THE FORMATION OF ICE.

There are a great many things that are known about the nature of ice, but though the subject, like that of cement, is of never failing interest, some points in the behavior of ice are as great a mystery to the skilled engineers of this generation as they ever were to the American aborigines, whose untutored minds contemplated the formation and disappearance of ice in the forest streams of this country centuries ago. For instance, the very process of freezing is one the nature of which has not been positively solved. It is commonly supposed that once a skim of ice forms upon the surface of water, the accretion thereafter is all from beneath; in other words, that the freezing goes on at the bottom of the first shell of the ice—but is it so? Thomas Pringle, C.E., of Montreal—who has made ice formation the subject of years of practical study on river and lake—in a conversation with a representative of THE CANADIAN ENGINEER, expresses the confident opinion that ice grows from the surface, and not at the bottom, a theory which we do not remember to have been put forward on the subject. He has tested this point at various times and in a variety of ways. He has placed bricks on the surface of ice in a canal and found that in a comparatively short space of time the brick would be buried in the ice, and this process he has carried out until bricks would be buried to the depth of three feet in the ice. It might be objected that the heat of the occasional winter suns would warm the bricks sufficiently to sink in the ice, but he has disproved this by having the bricks covered with snow, which would completely exclude the sun's rays. Again, traces of snow are to be found in snow-covered ice where the cold is extreme and where the ice formation is rapid. Mr. Pringle's theory is that while ice is apparently dry and solid, it is in reality porous and that the growth of the ice is by the formation at the surface, to which the unfrozen water is drawn. So far from there being any growth on the under surface, there is actually a wearing away of ice there, as in running streams. Associated with this theory is the fact that ice will frequently grow to a level higher than the normal water surface; though sometimes, on the other hand, the surface of the ice is found to be below the water line, facts which may be tested by boring through lake ice.

The action of *frazile* and anchor ice—which are the same in their nature—involves more than one mystery which has never been solved. This ice forms in rapids on intensely cold days where the surface of the water is ruffled by wind, or agitated by the ripples of the rapids. Any one who has watched over a rapid of a Canadian river when the thermometer is below zero and the sky is clear, will have seen thousands of bright glistening lines, like cambric needles, mysteriously start from the surface and dive to the bottom. These are the materials that form frazile and anchor ice. They are formed in the first place under the agitation of the water, if not because of that agitation; but why do they dart down so rapidly, and why again are they not broken up by the same agitation and inequality of current below, as the water goes tumbling onward? These bright needles go darting down with a rapidity equal to the stream itself. What force draws them down, and what force holds them in masses of eight or ten feet thick in the midst of such a vast pressure as must be exerted by such a volume of water? There are holes in the St. Lawrence where "frazile" has been

known to hold to the depth of 80 feet, with water surging by and through it. It does not form in solid cakes like surface ice, as many unacquainted with ice formation might suppose, but remains as it is formed—a sort of "slush," like half-melted snow.

Why, we ask, is it formed in this way, and how is it held against the enormous force of a rolling tide, like the St. Lawrence rapids, for instance; and why, again, does the whole mass loosen its hold upon the bottom of the river, and rise and float away (as it does before a mild spell is about to set in), while the thermometer may be still at zero? Whatever the cause, such is the action of frazile ice, and whenever masses of it rise and float down, no barometer is a surer indication of an ensuing spell of soft weather.

It may be that a kind of magnetization takes possession of these fine ice needles, and that the mass of the anchor ice is demagnetized by the change of the weather. We note that the beautiful auroral displays of Canadian winter nights are a sort of electrical storm, and are accompanied by changes in the weather, and it would be interesting to know if any one has noticed the coincidence of this and the loosening of "frazile ice." If any of our readers have observed this or other phenomena, we should be glad to have a record of their observation.

For THE CANADIAN ENGINEER.

HOW FINE SHOULD CEMENT BE GROUND?

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

There is probably no test to which we submit Portland cements, in which the lines are being drawn tighter than that of fineness.

Not many years ago 10 per cent. residue on a No. 59 sieve was satisfactory, then 5 per cent. on the same sieve was demanded, until now-a-days our societies are demanding a cement which will laugh at a No. 50 sieve, and escape with only 10 per cent. vanquished by a No. 100 sieve. Of course, those who study the nature of cements know that the finer the better, other things being equal, and the demand for fineness is largely justified. But let us, on the one hand, consider when this demand should be made, and when not, and where we are going to stop, and, on the other hand, let us appreciate fineness at its full value where needed, and give our Canadian Portlands full justice and appreciation.

Cements are used in such numerous ways for such various purposes, that hard and fast rules can hardly be laid down; instead, let us rather try to have all engineers so posted on the subject as to enable them to use proper judgment in selecting various grades for different purposes. For instance: If we wish to fill water pipe joints with cement mortar, we have Mr. Coffin's experiments to show that a 1 to 1 mixture will allow less percolation by water under pressure than either a richer or leaner mixture, and, certainly, a very ordinary coarse English or Belgian Portland will be amply strong for the purpose. Again, German and English experiments show that the maximum efficiency for abrasion in sidewalks, etc., is that of a 1 to 1 mixture, and a very coarsely ground Portland will do for this; while, where strength pure and simple is needed, as in concrete and heavy masonry, the economy of fine grinding can be fully realized.

As to where we are going to stop in our demands it is hard to say, but it is almost certain that until a larger percentage of our engineers and architects actually demand certain fineness, see that their demand is carried out and satisfied, and make such demand intelligently, *i. e.*, with a knowledge that fineness must be paid for because it costs money to grind fine, and are willing to pay for it, instead of buying a coarser article, because it can be had 15 or 20 cents per barrel cheaper; until this time comes—and it is not here yet—we shall not give the encouragement that we ought to those manufacturers who give us a finely ground cement. Germany is in the van in fine grinding, but our Canadian makers are a good second, and let us realize it. It is hard work to make many people believe that we are really able to get A1 Canadian Portlands, but let them investigate it themselves and find out the advance that one or two years has made. It is invidious to institute comparisons, but we have several brands that are becoming uniformly good, and they need all the encouragement we can give them; they make a small portion of what is used in the country. Let us hope that the fullest knowledge will convince engineers that we have in our midst makers of this key to engineering works that are able to give us fine sound cements; let us encourage them to make all we need in the near future.

"HE TIED THE SAFETY VALVE DOWN."

The above is a photo-engraving of the mill of Geo Fensom which was blown up at Elmwood, Ont., in June, as reported in THE CANADIAN ENGINEER. Mr. Fensom has a sense of humor, and takes his loss more philosophically than most manufacturers would, as may be gathered from the following letter written to the Babcock & Wilcox Co.:—

SIR,—Your letter, also your book, "Steam," came duly to hand a few days ago. I am very much pleased with the book, as there is a great deal of very valuable information in it.

I had my mill let to a man that ran it with the safety valve tied down—result, the mill was blown down, and costing me $3,000 to rebuild. I send you by this mail a photo of the mill, taken a few days after the explosion. There was not a brick left on foundation of engine house You can see the shell of boiler lying on a pile of brick, looking like some old hide, with flues scattered all around 100 yards away If it is not too much trouble, would you please send me price of a boiler, also amount of room required to place it in I will make good use of the book you sent, and will try and let others have benefit also With best thanks, I remain, yours truly,

GEORGE FENSOM.

Upon which Mr. Bonner, agent of the Babcock & Wilcox Co. makes the following comments. "This letter is an illustration of the good natured way in which some people accept misfortune, and at the same time gives us some idea how men feel after they have been 'through the mill.' They are looking for improvements. Even if the safety valve is tied down, there is no necessity for such wholesale destruction of life and property. Absolutely safe boilers are to be had, and certainly no better evidence is needed that only the best is the cheapest WM. BONNER."

POWER OF STREAMS.

Herewith is a table that shows the number of pounds of water that will pass through an orifice an inch square under various heads from one to ten feet; also the foot-pounds of work there are in those quantities of water, the net foot-pounds per minute utilized by a wheel with a rating of 80 per cent, and the horse-power developed by the wheel:—

Head feet.	Cubic feet per min. (actual).	Lbs. per min. 62½ lbs. = 1 cubic foot.	Foot lbs. per minute (gross).	Net foot lbs. per min. (80 per cent. realized).	Horse power (80 per cent. duty).
1	2.1376	133.2437	133.2437	106.592	.003412
2	2.0272	188.6955	377.2910	301.913	009149
3	3.6992	230 5835	691.7505	553 400	010770
4	4.2752	266 2935	1065 1740	852 139	025822
5	4.7808	298.0032	1450.0160	1160.013	035152
6	5.2352	326.3275	1957.9650	1566.372	.047466
7	5 6576	352.5671	2468.5997	1974 880	.059845
8	6 0480	376.992	3015.936	2412 749	073114
9	6.428	399.7312	3597.5808	2878 065	.087214
10	6.7648	421.6725	4216 725	3373 380	.102252

A common opinion respecting the power of flowing streams is nearly always exaggerated. A current of large area conveys an idea of an almost irresistible force, when in fact it may represent but a trifling power. The following table shows the work represented by the current of streams. The force that may be utilized, or the head, seen in the third and fourth columns, is very slight and is the height to which the water will rise when obstructed. This depends, in a measure, on the shape of the obstructing faces

Velocity of Stream. Miles per Hour.	Velocity of Stream. Feet per Second.	Equivalent Head. Feet.	Inches.	Pressure. Pounds per square inch.	Total Energy. H.P. per square ft. Sec. Area.
1	1 467	0.033	0.43	2.1	0.0055
2	2.933	0.134	1.62	8.4	0.0445
3	4.4	0.300	3.69	18.9	0·15
4	5 867	0.534	6.42	33.0	3·355
5	7·333	0·834	10 07	52.5	0 694
6	8.8	1.200	14.30	75.6	1.2

A NEW ELECTRIC ORGAN.

In the Church of St. John Baptist, Paradise Row, says the St. John *Sun*, there is in successful operation an electric organ containing many new features.

Electric organs have hitherto been a dismal failure, owing to the complicated mechanism used in their construction, but in this instrument such simple means have been adopted as to point to a very successful career for the new invention. Up to the present time electricity has been employed in organ building for the purpose of operating small pneumatic valves, which admit air under high pressure into another set of large valves, which in their turn operate the valve or pallet. The abolition of the pneumatic valves has long been felt desirable, but the heavy touch of large organs has caused organ builders to use them in order to render the instrument playable. The disadvantages of pneumatics are numerous. The construction is complicated and expensive. The response to the touch is slow, so that phrasing is almost out of the question, and last but not least, they are constantly out of order.

R. P. Strand, organist of Trinity Church in this city, is the inventor of the new electric organ, and it is simply wonderful to see the amazing rapidity with which the most florid passages can be executed. Trills and reiterated notes which have hitherto been a laborious task are rendered in the easiest manner possible on this organ. One great point the inventor claims is, that he has swept away the troublesome pneumatics from every part except the draw stop action, and here, where there is no quick repetition needed, they are not open to the same objections. The organ is operated by a direct electric system. There is no intermediary between the magnet and the valve, therefore the response is absolutely instantaneous. The entire construction is so simple that there is little to get out of order, and that little can be replaced at merely nominal cost and in a very short time.

The mechanism for coupling the different keyboards to each other or to the pedals—which is entirely electrical—is as simple as it is ingenious. There are no draw stops, but instead a small keyboard is placed above the swell keys, from which the various stops are controlled. Pistons placed beneath the keys control the stops in various combinations, which may be either fixed or changeable by means of a small switchboard placed inside the organ, where the organist may vary any of the combinations to suit his own taste or the requirements of the music. Another piston enables the organist to throw on the full organ at one touch. All the pistons are reversible, shutting off all stops not required in the combination.

Mr. Strand has been working on this invention for the past five years, and seems to have successfully solved the problem of applying electricity successfully to organ building.

In the electro-magnetic apparatus in the organ, about twenty-five miles of copper wire have been used, and the number of connections made for the conveyance of current to all parts of the instrument has been about 10,000.

THE CHICAGO DRAINAGE CANAL.

BY THOMAS C. KEEFER, C.E

Chicago has been struggling for the last forty years with her drainage system. Her lake frontage is low, and the principal portion of the business section was originally drained by the Chicago river with its branches and forks, which are stagnant streams in dry weather. After much effort to flush these still water cesspools in the dry season by pumping water into their upper levels, it was determined to cut through the dividing ridge between Chicago and the Illinois river and send the sewage into the latter. This was done in 1871, but it was soon found that the fall between this summit cut and Lake Michigan was so slight that when the lake was lowered by wind, the current was reversed and the sewage came back through the city and into the lake, where it, as before, affected the water supply. Six years ago the city determined to make the canal through the dividing ridge so deep and wide that it would maintain a constant flow from the valley of the St. Lawrence into that of the Mississippi. This work was commenced in 1892, and is now all under contract. It will be double the width of the Lachine canal and nearly double its depth, when fully enlarged, or twenty feet. It will be about twenty-eight miles long, and is estimated to cost about as many millions; or a million dollars per mile, the total excavations reaching 40,000,000 cubic yards. It is designed to handle the sewage of 3,000,000 people, and when the full dimensions are reached it will be capable of abstracting from the St. Lawrence 600,000 cubic feet of water per minute This will be about four per cent. of the low water flow of the Niagara river, and about three per cent. of that of the St. Lawrence at Montreal. There is no authority for this diversion of the waters of the lakes except an Act of the Illinois State Legislature The only defence of it (besides that of necessity, which recognizes no law) is that "it is the accepted geological teaching that the great lakes at one time emptied into the Gulf of Mexico." It is an accepted legal maxim that if you divert water from the channel of a river in order to utilize it for any purpose, you must return it to the same river again. This is done at Niagara Falls without any influence on the levels of the river where navigable. The diversion in such a case is sending the water through a useful channel to do its work on the wheels, instead of falling ornamentally over the cataracts.

The Chicago enterprise is an abstraction, not a diversion, and is so looked upon by every one out of Chicago. Engineers estimate a reduction in the lake levels, below Superior, from three or four to seven or eight inches, and the Federal Government has appointed a commission to ascertain the probable effect of Chicago's sewer upon the navigation. If a permanent reduction of the lake levels is established every harbor is affected, as well as the deepened channels in St. Mary's, Detroit, and St Clair rivers, and the carrying capacity of the lake fleet will be diminished to the extent of perhaps millions of tons, and their earnings reduced at least a million of dollars each year. Under these circumstances, although the matter is a fair subject for protest by Canada, little interest has been shown here, because there is a certainty that this "abstract right" will be tested without effort or expense upon our part Some in Chicago, as well as outside, have connected this big drainage ditch with a scheme for making Chicago an ocean port—because, so far as it goes, the ditch will be a magnificent ship canal—being wider and as deep as the Suez and Manchester canals, but its dimensions have been determined entirely by the flow required so as to dilute the sewage of three millions, that it may not become objectionable to the dwellers on the Illinois river. It would only make Chicago an ocean port *via* the Gulf of Mexico, and ocean steamers, except, perhaps, the smaller ones (fruit steamers from the Gulf, etc.), would not find it profitable to stem for a thousand miles the current of the Mississippi, and then ascend the Illinois river nearly three hundred miles, with about five hundred feet lockages to reach Chicago Chicago may be assailed by injunction from the navigation interests of the harbors and shipping of other States. The charter of the State of Illinois may legalize any pollution of the waters in that State, but if the dwellers on the Mississippi should scent an odor and a lawsuit in this gigantic sewer of so rich a city, she may also be attacked from the rear as well as the front. The enormous quantities of

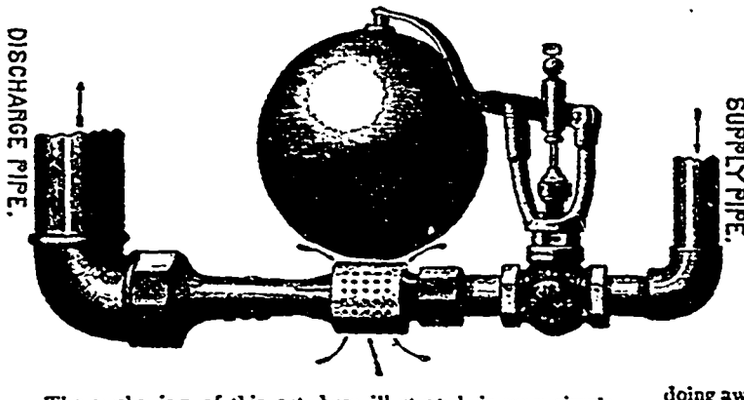
excavation in so short a canal have given rise to the invention of new methods of handling the material—and to the employment of machines and power to a greater extent than elsewhere—resulting in a great reduction of the cost. Channelling machines put a smooth face on the rock sides of the canal; hydraulic dredges suck up all that can be made fluid enough and spout it over the spoil banks. Air hoists are used to clear out the large rocks. Belt conveyors carry off earth, as they do grain from a vessel. Steam shovels, of half a dozen patterns, fill cars, which are sent over "cantilever conveyors" "bridge conveyors" and "incline conveyors," emptied and returned to place without manual labor.—*Montreal Witness*

AIR IN FEED-WATER.

In a paper read in Germany on the rusting of boiler shells, the author concludes that the most serious cause is the introduction of air with the feed-water. If the feed-water enters the boiler near the low water level he concludes that it will soon be expelled with the steam, unless it has a chance to accumulate in pockets. Such pockets rust rapidly The feeding, he advises, should be completed before stopping for the day, so that the water standing in the boiler over night shall be as free from air as practicable. Faulty construction, the author believes, is the frequent cause of internal rusting. For preventing rusting he recommends. First, whilst the boiler is working (1) Removing air from the feed-water before it enters the boiler. (2) Removing air from the water whilst in the boiler, and preventing its accumulation in pockets, etc. (3) Addition of chemicals to the feed-water. (4) Protective coatings applied to the inside of the shell. Second, whilst the boiler is standing idle—(1) Removing all moisture from the boiler, (*a*) by blowing it off whilst hot, (*b*) by producing an air current through it, (*c*) by placing hygroscopic bodies inside. (2) Direct protection of the shells, (*a*) by painting with tar, varnish, etc., (*b*) by covering with protective paints, and such an alkaline coating as milk of lime. (3) Protecting the shells from varying temperatures by keeping the draught in the flues constant, and so as to prevent moisture alternately depositing and evaporating on the shell. (4) Protecting the shell by completely filling the boiler with water from which all air has been expelled.

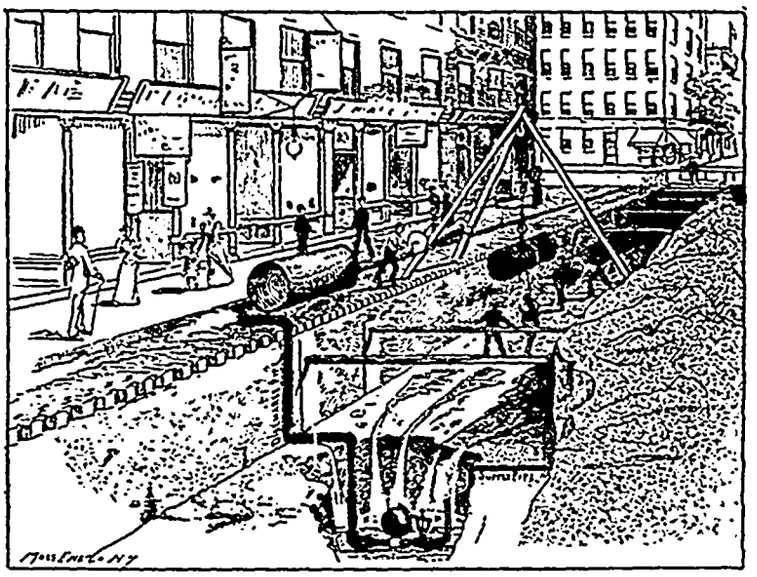
THE BRAENDER JET PUMP.

The Braender Jet Pump and water elevator is an automatic device for removing water from cellars, excavations, drains, wheel-pits, etc. In digging trenches it frequently happens that water will accumulate and resort has to be had to steam or hand pumps, entailing not only considerable expense, but delay in construction work, which is often very serious With one of these pumps the breach can be kept dry without watching or without night labor to keep it open for work during the day; and where more than one pump is required they can all be connected to one discharge pipe, angles being of no consequence in the working of this pump. The same remarks apply to wet cellars, which can be kept free from water by having a suitable depression connecting it with the service pipe or tank.



The mechanism of this cut, here illustrated, is very simple. It consists of only three working parts The jet, which sucks and elevates the water to be removed, is of brass and being entirely free from working parts, such as plungers, stems and valves, has nothing exposed to injury or wear To this jet is connected a double disk brass valve with metal seats and ground joints; requiring no leather or other packing; and as the water to be removed does not pass through this valve, being only used to regulate the supply of pressure water, is not exposed to injury or liable to stick or clog The valve is operated by a brass lever and copper float-ball, which is so attached to the stem as to make the opening and shutting of the water supply valve entirely automatic.

As soon as the water to be removed accumulates the float-ball will rise, which opens the valve, admitting the water under pressure through the supply pipe. The water being forced through a small opening causes a vacuum or suction, and draws the accumulated water, forcing it and the supply water through the discharge pipe, and thus continuing until all the water accumulated is removed. The float-ball will then fall and close the valve, shut off the water supply and cease pumping till more water accumulates. It works



RELIEVING A DRAIN BY BRAENDER JET PUMP.

under a moderate pressure of water, which can be obtained from the service pipe connected with street mains, or from a tank supplying water with not less than 10 lbs. pressure, or, in case of mud, from a connection made to a steam or hot air pump The greater the pressure the larger the body of water it will remove in a given time. It can be operated by a jet of steam instead of water, with equally good results. This pump, which is an American invention, is now being manufactured in Canada by Garth & Co., proprietors of the Dominion Metal Works, Montreal, who have been appointed sole makers and agents throughout the Dominion.

ACETYLENE.

No recent chemical discovery has excited more interest than the direct production of acetylene. The calcium carbide process may properly be termed direct, for in it the carbon is first united to calcium, and secondly to hydrogen, the calcium being supplied by lime and the hydrogen by water. One private residence in the city has a small acetylene plant with which the house can be illuminated, or which can be used to enrich the ordinary gas. If the calcium carbide can be produced commercially—and promoters state most positively that it can be so produced—it will have a great effect upon the production of artificial light.

Political economists, who have devoted some thought to the influence of modern scientific progress upon the condition of the word, recognize in the modern development of artificial illumination one of the most powerful instruments for the civilization of mankind. In old times the dark streets of cities were dangerous, because they were haunted by robbers, who only lacked subjects because the people were afraid to go abroad after dark. When Argand invented his cylindrical lamp burner with central draught, he made one of the great steps forward in artificial lighting. The invention of plaited candle wicks, chemically treated, which, as the candle burned, would bend over and burn away, was considered a great discovery and achievement in its day, as doing away with snuffers. Then gas was introduced and proved to be the greatest civilizing agent for cities. When the streets were adequately lighted, crime at once diminished.

In recent years the electric arc light has proved the best street illuminant, but gas or the incandescent electric light remains the favorite indoor illuminant. In the co-development of gas and electricity some interesting cycles or transformations of energies have

resulted or have been worked out. Gas is primarily made for the purpose of giving light. When burned in the explosion gas engine it gives, from the physicist's standpoint, a far more economical result than is attainable with the steam engine. In the commercial sense the economy, owing to the high cost of gas, disappears.

The gas engine burns some twenty feet of gas per horse-power hour, which gas represents an illuminating power of sixty to one hundred or more candles. For the production of such gas four pounds of bituminous coal suffice, which give also as side products a material amount of coke and a quantity of coal tar. If a gas engine drives a dynamo, we may get from it incandescent lights as much or more candle power than from the original gas burned as such, while if we use arc lamps the production would be vastly increased. In the new acetylene process, a similar but more complicated cycle exists. Power is expended in producing an electric current. The current is led to an electric furnace, where it heats to an almost immeasurably high temperature a mixture of lime and carbon The lime is reduced, and gives calcium carbide. This substance is treated with water, and every pound evolves five cubic feet of acetylene, enough to give 250 to 300 candle power of light for one hour.

Thus if we know how much horse-power is expended per hour in producing a definite yield of the calcium carbide, we can compare the economy of the different cycles. As a matter of figures, it is enough to say that they come out about the same. But the new product effects other results. It diminishes the minimum size of gas holder required for the usual exigencies of gas supply. A one-foot burner gives perhaps forty candle power, or as much as ten feet of ordinary gas would give. Hence a gas holder of one-tenth the ordinary size could be used. The new gas is made without heat, and without any dangerous agent such as gasoline. Finally, when the gas is made it is a permanent one. The utter simplicity of the apparatus and process is also striking.

One of the curiosities of the carbide is that it will not burn. It can be drawn out white hot from the electric furnace and cast into moulds. A piece can be held in a Bunsen burner without the least effect. But if a drop of water is put upon the stony substance it effervesces, and the gas can be lighted and will burn like a piece of wood for a few seconds until the water is exhausted. Then it goes out.

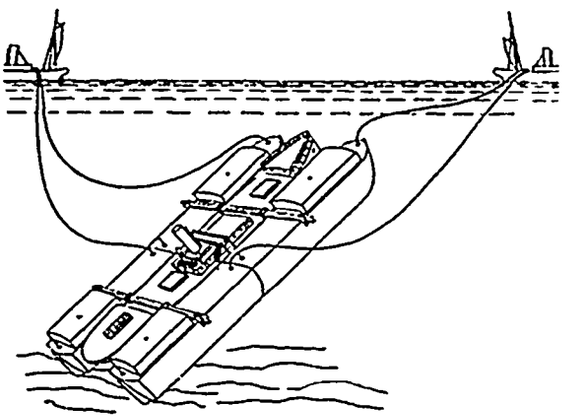
Merely as a matter of scientific interest it is to be hoped that the commercial production will soon be accomplished. The merciless judgment of the balance-sheet has wrecked many a most ingenious scientific triumph. It is to be hoped that acetylene will fare better.—*Scientific American.*

CANADA'S FIRST ALUMINUM CANOE.

The first aluminum canoe made in Canada was completed a few days ago at the workshops of George R. Prowse, St. James street, Montreal. This craft is built nearly on the lines of the Peterboro canoes, and her dimensions are as follows. Length, 16 feet; beam, 30 inches; depth, 12 inches; weight, 55 lbs. Of the total weight 35 lbs. are aluminum and 20 lbs. wood. The aluminum, which is No. 18 w.g., was brought in sheets from Germany, and over 3,000 aluminum rivets were used in her fastenings. A cement of white lead was used for the seams, but it was believed she would have been water-tight without this. There is a water-tight compartment in the bow and one in the stern, so that she would float well in case of capsizing. The cost is about $100. She has a very smart look, and acquitted herself admirably at the races at Valois, near Montreal, on the 3rd inst. She was entered in the four-paddle canoe contest with four cedar canoes. She led from the start, and was the only canoe of the five which did not swamp in the choppy sea which prevailed that day. Mr. Prowse has already had an enquiry regarding these canoes from the United States

RAISING SUNKEN SHIPS.

The two methods commonly adopted in raising sunken ships are by means of "camels" or by coffer dams. The "camels" are vessels anchored above the submerged ship, and having hawsers passed around it and made fast to the camels. The difficulty of this method is that the camels may capsize if the weight of the ship is too great, or if they are allowed to sink too deep in the water. The second method is only practicable where the ship is sunk in shallow water, and is, moreover, very costly.



The *Marine Engineer* of London describes the above illustrated scheme of an English inventor, which our contemporary recommends as practicable. The invention consists of two sinkable and raisable iron submarine vessels which are adapted to operate under two strong steel girders placed transversely across the deck of a sunken ship, to which they are attached in a most simple and efficient manner.

This submarine vessel is constructed somewhat in the form of a canal boat with an air-tight deck, and having an air-tight bulkhead across the middle extending from under the deck to the keelson, thus leaving two vast chambers, one in the fore and one in the after part, either of which can be filled with water, or emptied, independently of the other.

On the deck of the submarine vessel fore and aft, are constructed two permanent air-cases or air receptacles, of such dimensions as not to prevent the vessel from sinking when its chambers are filled with water, although they are of sufficient dimensions to retain its deck uppermost when submerged, thus rendering the submarine vessel non-capsizable and exceedingly buoyant when resting at the bottom of the water. When the submarine vessels are required to be raised, the water is driven out of the chambers by forcing air down a pneumatic hose, as is done in the case of a diver.

By regulating the admission or escape of air through the pneumatic hose, the ends of the submarine vessels can be raised or lowered to any convenient angle with the greatest nicety, and they are, it is said, capable of being easily moved to any required position by means of their great buoyancy.

The construction of the submarine vessel is on such lines as to render it perfectly navigable when floating on the surface of the water; it can be operated (irrespective of tides) in any depth of water where divers can work, and can be constructed of such dimensions as to be capable of raising ships of very large tonnage.

AN AERIAL RAILWAY.

Among the most recent projects for rapid transit is one by which the cars are suspended, and the motive power is electricity. As the centre of gravity is very low, derailment in this form of aerial railway is practically impossible. A road built on this plan has been designed by M. Langen for Berlin and other places in Germany. The system is adopted for ordinary rapid transit or high-speed service, it being claimed that a speed of 186 miles per hour can be attained. Friction plates prevent the derailment of the wheels, and they are secured to the motor case in the usual manner, the shocks being taken up by springs. The car is fastened to the motor in such a way by a centre pin as to permit of lateral play, and is suspended by springs, ensuring easy riding. Each truck has four wheels, and is provided with brakes, which take hold of the rail at top and bottom. Each car has two motors and seats fifty people.

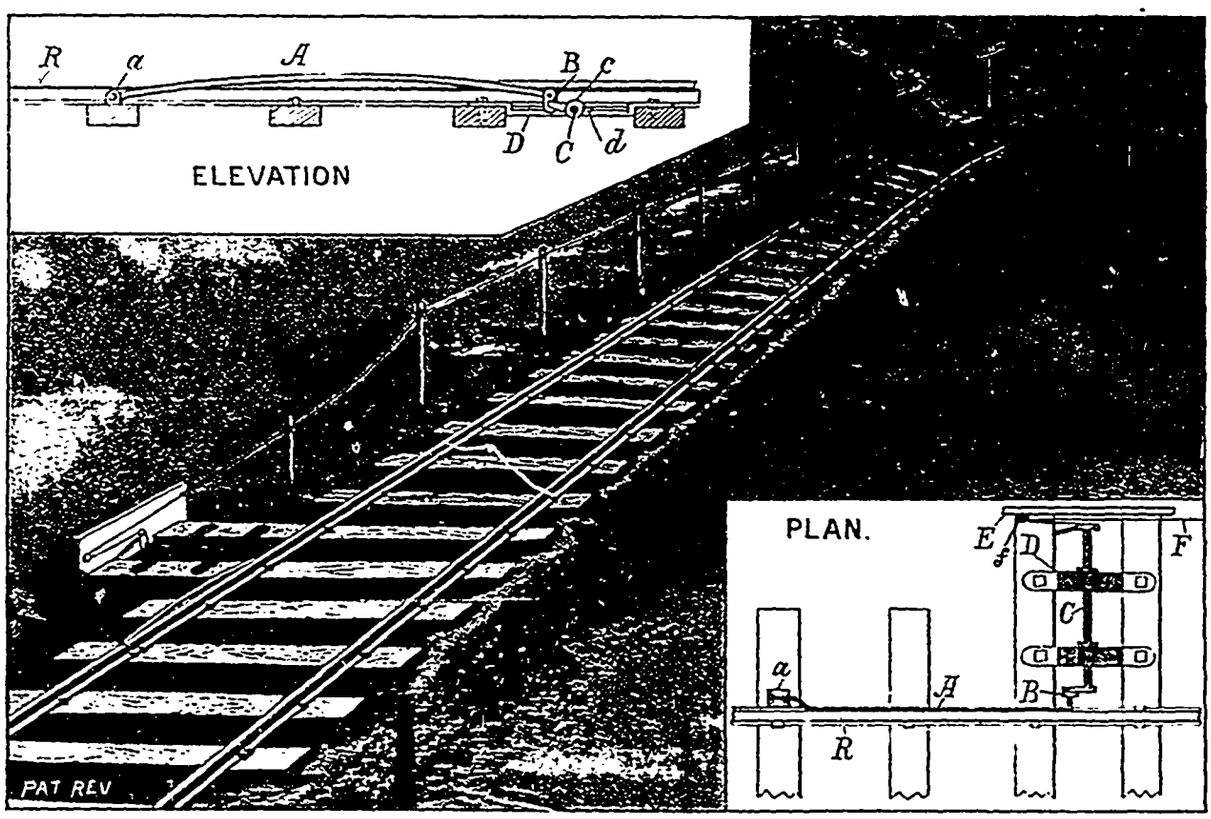
The girders supporting the track are constructed on the cantilever plan, and secured to single or double columns specially devised to suit the conditions of the street on which the railway is built The current is supplied by three carefully insulated wires to the motors and are protected from contact with other wires The block system is utilized; in case of a stoppage of a car between stations, no collisions with other cars can occur, as no electricity is supplied to the following block until the stopped car has left the block The cars are equipped with an automatic brake

A trial line has been erected at Deutz, and permission to build a line has been granted by the cities of Elberfield and Barmen, which will be in operation within a year.

GRANT AUTOMATIC RAILWAY-CROSSING SIGNAL.

The number of dangerous level crossings on the railways of this country makes it almost the imperative duty of the railway companies to guard these crossings in some way or other, as the number of accidents taking place at these points is still a very serious thing To place gates and gate-men at all crossings is a practical impossibility, on branch lines especially, where, perhaps, only two or four trains pass in a day, and the cost of both would likely be more than the profits

A device here shown, has been in use on the G T R at Cannifton, near Belleville, for some time past After being slightly improved, it was removed and put up at Ernestown, where it proved satisfactory, and we understand is highly spoken of by Mr Stephenson, superintendent of the Grand Trunk, and by the men who have had charge of the device.



A curved depression lever *A* is pivoted in lugs *a* secured to a tie close to the foot of the rail, and turned sideways so that the main portion lies close to the head of the rail and rising slightly above the tread of it. The free end of this lever is connected by a link *B* to a crank on a rocking shaft C, which is journalled in bearings *D* between the two long ties. An upright arm or lever is secured to the other end of the rocking shaft, and to the end of this arm the signal-wire F is attached. Cams *c* and stops *d* (see elevation) are provided to hold the shaft and depression lever in the proper position; a spring attached to the "wire" arm returns the lever to rest after every depression. The wire *F* is returned over pulley *f* on the block *E* to the gong or bell at the crossing, springs being inserted to take up the slack, and also to prevent too severe a shock on the striking mechanism.

The actuating mechanism may be used with any bell or gong, but it is most efficient when used with the special striking apparatus which is placed under the gong, and is so arranged that for every wheel of the engine and cars depressing the lever, a wheel having a series of pins on its face is revolved a small portion of its circumference by means of a reciprocating rod operated by the wire; the bell is struck by the hammer being operated by the pins, of which there may be any number, but it is generally so arranged that four or more depressions are made, *i.e.*, four wheels of the train pass the lever for every stroke on the gong; this makes the bell give out clear and distinct strokes. The mechanism is boxed in.

The main advantages claimed for this device are The curved depressing lever, which gives a gradual depression, compared with the devices that are struck, as it were, with a blow as sudden as a blow from a hammer, this, together with the spiral springs, is designed to take off any jar from the bell mechanism, and consequently reduce to a minimum the chances of any derangement of the apparatus.

Daniel Grant, the inventor, resides at No. 8 Laurier ave., Toronto.

BRITISH COLUMBIA MINES.

P. Alex. Peterson, chief engineer of the Canadian Pacific Railway, arrived home in Montreal on the 3rd inst. from a trip to British Columbia. Mr Peterson visited the Slocan Star mine in the Three Forks district, as well as the War Eagle and Le Roy mine in the Trail Creek country. At the Le Roy they are down 350 feet, and he was told that they were getting six ounces to the ton, or an average of $55.

The ores are similar to the Sudbury ores except that they contain gold instead of nickel. Their constituents are sulphur, iron and copper. The Trail Creek mines are of a new creation, and the greatest activity is seen on all sides. The Josey and O K mines' products are lead and free gold.

Mr. Peterson stated that the ores here are much sought after by United States smelters, as they contain an excess of iron. At Pilot Bay the smelter had run out of dry ores, but those who have them are working away vigorously, so the want will ere long be supplied.

The Silver King Co., of which Sir Joseph Mutch is president, are going to build a smelter at Nelson, and they are now at work on what is called a wire tramway, extending from the mines down to Nelson, a distance of 4½ miles. This company, which embraces a great deal of English capital, are getting out a large amount of ore, the present quantity being from six to seven thousand tons. The chief engineer explained that this ore averaged about 5 per cent. copper and gives 50 ounces of silver to the ton, while picked samples run as high as 15 per cent. of copper and 150 ounces of silver. The company in question has shipped some ore to England and the United States, but as Messrs. Fraser & Chalmers, of Chicago, are to build them a smelter, they will be able to do the work themselves.

The Silver King Company have about 100,000 tons of ore in sight. The Silver Star mine has already sent out from six to seven thousand tons of ore, and the company will build a concentrator half way down the mountain side.

AN IMPROVED FORM OF CATTLE GUARDS.

From time immemorial it has been the custom of railroads to build pits at the points where wagon roads cross their right of way, to keep cattle from straying thereon. These, however, were expensive to keep up, owing to decay of timbers, and made it difficult to keep the track from settling at such points They also prove very annoying whenever a derailment occurs near one of them, as if the train is going at speed an expensive wreck is almost sure to occur There being two of these pits, one on each side of the road crossing, in nearly every mile of track on American roads, it is easy to see that some desirable substitute has long been looked for.

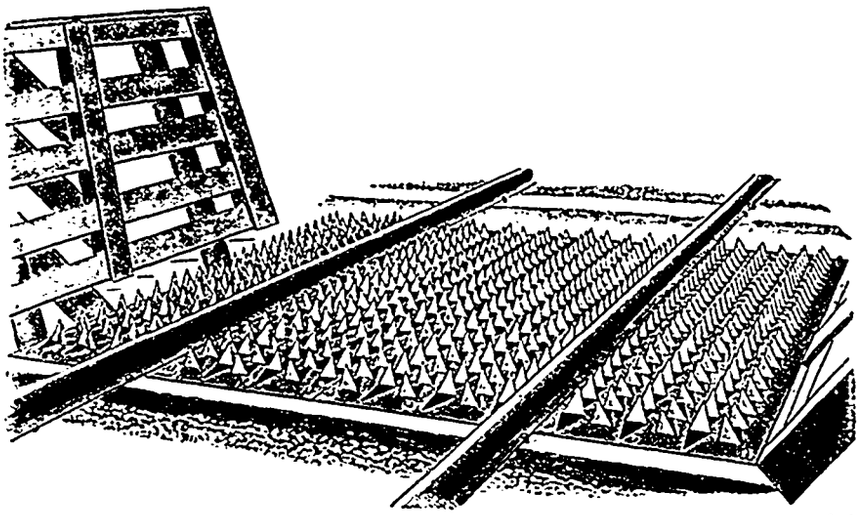


FIGURE 1.

Within the past few years various appliances have been introduced in the nature of different arrangements of bars or rods of steel, which could be laid directly upon the ground, and, from the construction, were more or less difficult for cattle to cross. These were called "surface guards," and have attained a large sale. It has been difficult, however, to find one which it was impossible for stock to cross, and many of these devices have been objectionable from lack of durability on account of the action of the elements, and they also frequently make a disagreeable rattling noise when trains are passing over them at speed.

We illustrate above, in Fig. 1, a new candidate for this line of work, in the Sheffield Guard, which certainly seems as if it were a device that would effectually prevent all kinds of stock from crossing, and be therefore the article which railroad men have been seeking for a long time.

It consists of four interchangeable sheets of steel boiler plate, in which sharp teeth are struck up very close together all over the surface, presenting a seemingly impossible barrier to straying stock of all kinds.

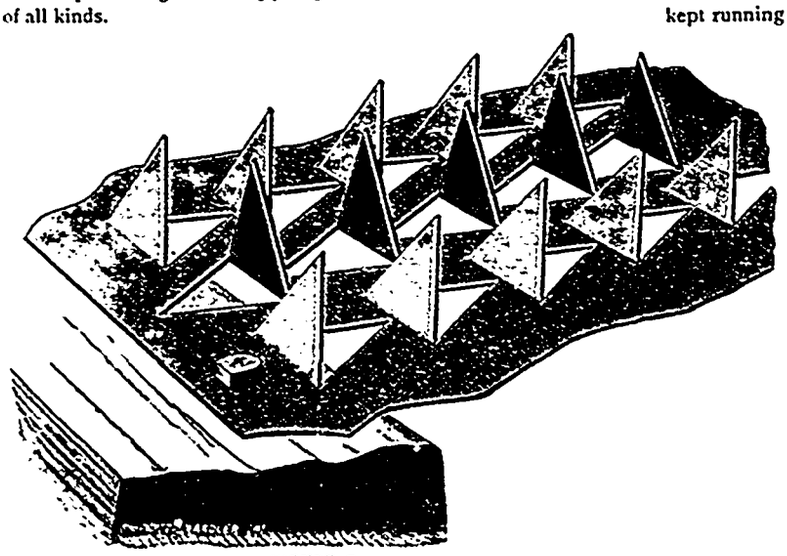


FIGURE 2.

Figure 2 shows an enlarged view of a small portion of one of these plates, showing the arrangement of the teeth much magnified, but illustrating the closeness with which they come together. The points are little less than three inches apart in each direction, from which it will be seen that it is almost an ideal guard, it being apparently impossible for any animal to step upon it without coming in contact with one or more of the points, which, of course, are painful, and the animal turns back rather than venture further against the long array of formidable teeth.

Another strong merit seems to be its simplicity, as there are rods or bars to become broken or displaced, and no previous preparation of the track whatever is needed for it to be put in place. It is also not liable to the objections raised against other guards of lack of durability, and the weight of the metal precludes its being noisy by reason of passing trains. In the standard style, the Sheffield Guard is covered with a heavy coat of asphaltum, or, at an additional charge, the sheets are furnished galvanized.

It is made by the Sheffield Car Co., Three Rivers, Michigan, and has already been adopted as their standard guard by a number of the leading roads.

LITERARY NOTICES.

The annual report for 1894 of the city engineer of Omaha has just been issued. The report contains several interesting plans and colored diagrams of city works, with very elaborate tables giving details of the cost of the various works of the year. The volume is highly creditable to Andrew Rosewater, its chief engineer.

One of the finest specimens of catalogue work we have seen for many a day is that just issued by the B F Sturtevant Co., of Boston This is the 83rd catalogue published by this company, and relates exclusively to the "Ventilation and Heating of School Buildings" The cover is of sheep skin, and the letter press is in handsome style, on imitation vellum. The pages containing the engravings are printed on toned coated paper, and the illustrations are beautifully executed. Not only is its outward appearance thus attractive, but the contents are exceptionally well put together, and form a most instructive treatise on the science of heating and ventilation in the class of buildings dealt with.

The prospectus of the Michigan School of Mining contains 50 pages of matter, and shows the work of that institution to be up to all the requirements of modern mining enterprise. The staff of professors is a large one and the scope of teaching very comprehensive. Copies of the prospectus may be had by addressing Miss Frances Hanna, librarian, Mining School, Houghton, Mich.

A very dainty catalogue is that just issued by the Kingston, Ont., Vehicle Co., manufacturers of buggies and bicycles. Since the company started last year they have turned out some beautiful specimens of buggies and phætons, while the "Frontenac" bicycle cannot be equalled for strength and beauty by any wheel made in Canada, nor can it be excelled by any made in the States. In both branches of their business the Kingston Vehicle Co. have been kept running to their fullest capacity ever since they started.

The fourth annual report of the Bureau of Mines of Ontario has been issued. It makes a volume of 261 pages, with a separate set of maps, showing the Rainy River district and the regions in the vicinity of Rainy Lake and Manitou, Wabigon and Eagle lakes, geologically colored. The report is very instructive.

Readers of "Pen and Sunlight Sketches," issued by the Grand Trunk Railway, will be easily convinced that this great and far-reaching system affords facilities for holiday trips to suit every variety of taste and every sized pocket. The sportsman may use the Grand Trunk to hunt or fish beside a thousand streams or lakes, while the health seeker may sue the soft sea air of the Atlantic, or while away a happy week on the waters of our northern wilds.

The best descriptive tourists' guide ever issued under the auspices of the Richelieu and Ontario Navigation Co., has been published this season, under the title of "Beauty spots of Canada." It describes graphically the beautiful scenery to be reached in the west and east on the route of this company's travel, and the book is handsomely illustrated with numerous photo-engravings.

The index of current technical literature lately inaugurated by the *Engineering Magazine*, of New York, gives an additional value to that admirable magazine, which is now without equal among publications of its kind.

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

Editor CANADIAN ENGINEER:

SIR,—Through the columns of THE CANADIAN ENGINEER I wish to call the attention of certificate holders of the Ontario Association Stationary Engineers, who have this year so far failed to send in their renewal fees, to Art. 7, Sec 2, of the Constitution and By-laws, which are incorporated by Act of the Local Legislature. It reads as follows, viz.: "The certificates shall be issued for one year, but shall remain the property of the board, and must be returned to him within 30 days after the holder thereof has been notified so to do."

A notice was sent out in January last to every certificate holder, yet there are quite a number who have neither returned certificates or sent in fees. A further notice will be sent out in course of a few days to all who have failed to renew, and after 30 days from date of said notice all certificates not then renewed will be cancelled, and means adopted to collect the certificates. The board feel it their duty to adhere strictly to the Act, as it would be unfair to holders of certificates who pay their fees, if we allowed engineers to carry old certificates in place of renewing.

The renewal fees for this year are $1.25, $1.00 and 75 cents for 1st, 2nd and 3rd class respectively, and they have been reduced by 25 cents each for next year. I would also request certificate holders who change their place of residence to communicate same to me by post card.

Yours very truly, A. E. EDKINS,
Registrar.

139 Borden street, Toronto, 1st August, 1895.

At the last meeting of Toronto No. 1 there was a good attendance. In the absence of President E. J. Philip, the chair was occupied by District Deputy A. E. Edkins. After general routine business had been disposed of, the officers elect for the present term were installed by Bro. A. E. Edkins. The new officers were called upon to speak, and in responding they one and all assured the members that they would do all in their power to advance the interests of Toronto No. 1. The full list of officers of Toronto No. 1 is as follows: President, Walter Lewis; vice-president, Samuel Thompson: rec. secretary, Jas Huggett; cor. secretary, Thos. Eversfield; fin. secretary, W. Butler; treasurer, S. M. Wickens; conductor, Martin Mose; doorkeeper, Albert Slute.

The following is a list of the officers of Carleton Place Branch, No. 16, C.A.S.E., elected for the present term:—Past president, George H. Routh; vice-president, Jos. McKay; rec. secretary, A. M. Schofield; fin. secretary, J. M. Hamilton; treasurer, John McFarlane; conductor, Thos. Meehan; doorkeeper, W. M. Taylor; trustees, A. Nichols, J. D. Armstrong, J. M. Hamilton. This branch is in good shape. Its membership does not grow very fast owing to the limited number of engineers in the town, but what members we have are wide awake. We meet every Monday evening at present, but we are thinking of changing it to twice a month during the hot weather. Branch No. 16 wishes the sister branches success, and also hopes to see a number of other branches soon. Wishing THE CANADIAN ENGINEER prosperity. A. M. SCHOFIELD, recording secretary.

SOCIETE MUTUELLE D'INGENIEURS MECANIQUES DE LA PROVINCE QUEBEC.

Editor CANADIAN ENGINEER:

SIR,—Permit me to drop a few words regarding an interesting meeting that was held in our hall, Cour St. Laurent de Montreal, recently. We had a visitor from Quebec, that is, the worthy president of the Cour Champlain, Mr. Lavigne, who reported very good news from that branch, which is progressing well. He expected that before long all the engineers of Quebec and Levis would become members. Education among the engineers of Quebec is well advanced; for without mentioning names, there are many good engineers in the old city. There were about seventy-five members present at our meeting, some of whom made very good speeches regarding the qualification of engineers. EPHRAIM VALIQUET, vice-president, 106 Bourget St Henry

LIBRARY PROJECT FOR MONTREAL, NO. 1.

DEAR SIR,—Some time since the members of Montreal, No. 1, decided to establish a library of scientific works and books of reference, as noted by you in the last number. The money was to be raised by subscription, and also from the profits on a grand picnic to be held at Hudson I regret, however, that the picnic part of the project has not been as great a success as it might have been had the weather been favorable on the day appointed, July 27th. It threatened rain all morning, which kept the people away: in fact, just as the train pulled out it came down in torrrents, and continued all day. On reaching Hudson the train was placed on a siding and the members and their friends, about 250 in all, made the best of it What with songs, stump speeches dancing in the small depot, etc. a very enjoyable time was spent. The committee held a meeting shortly after reaching Hudson, and decided to postpone the games, for which there were many valuable prizes, until the following Saturday, on the Exhibition Grounds those on the train having their tickets returned to them. The following Saturday, much to the disappointing of the committee, the weather looked very bad in the morning, but cleared up in the afternoon, so that the games were carried through to the satisfaction of everyone. Although the receipts at the gate did not pay the extra expense incurred, the committee were determined everybody should have their money's worth There was also a lacrosse match between the members, which furnished unlimited amusement for the spectators, as quite a number were new at that game. In conclusion, I may say that the committee wish to thank all those who have so kindly aided them in this enterprise, both by their money and prizes, and their presence. The committee are more than ever assured that the engineers of Montreal have many good friends among the steam users and merchants. I shall endeavor to have ready for your next issue a statement of the library fund, which will be pleasant reading. B. A. YORK, secretary.

The Hamilton branch C.A.S.E. held an excursion to Brantford on the civic holiday, 5th inst.

James Devlin, executive secretary C.A.S.E., was in Montreal a few days ago, en route for a two months holiday. Happy man.

At the last meeting of the Montreal Branch of the C. A. S. E. Thomas Ryan, J. G. Robertson and E. Valiquet were elected delegates to the forthcoming convention at Ottawa, with J. Murphy, J. Marchand and A. Harkenstein as alternates.

The question of the precise date of the forthcoming convention of the stationery engineers at Ottawa in September has been discussed by the executive, several of whom are in favor of having the meeting at the same time as that of the Canadian Electrical Association, which is the 24th, 25th and 26th. Up to date of going to press no decision has been arrived at.

The members of the Canadian Association of Stationary Engineers throughout the whole Dominion will sympathize with W. G. Blackgrove, vice-president of the executive council, in the bereavement he sustained last month in the death of his two children. To an affectionate father such as Mr. Blackgrove is, such a loss is "a distressful stroke," and one calculated to make him and his fellow engineers realize the great fact of human mortality.

At a meeting last month of the Winnipeg branch of the Canadian Association of Stationary Engineers the following officers were elected: President, G. Hazlett; vice-president, Thos Gray; recording secretary, J. Sutherland; financial secretary, A B. Jones; treasurer, R. Sutherland; conductor, E. Simpson; door-keeper, J. Harrison; trustees, G. Hazlett, C. E. Robertson and Thomas Gray. District Deputy C. E Robertson installed the new officers.

THE BALL-NOZZLE FIRE JET.

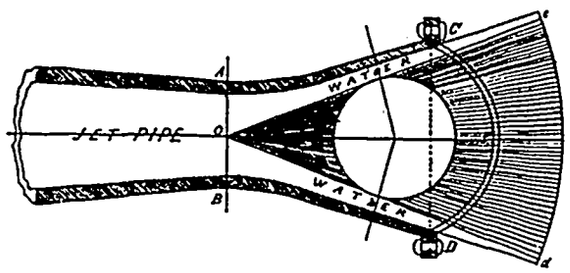
Several subscribers and correspondents have asked for the May number of THE CANADIAN ENGINEER, containing the solution of the ball-nozzle fire jet paradox, by Charles Baillairgé, C.E. of Quebec. As that issue of the paper has been quite exhausted, we favor these enquirers and others who are interested by reproducing Mr. Baillairgé's article, which is as follows:

The action of the "ball-nozzle fire jet" was considered contrary to the laws of nature, so the American scientific papers said. Not only was it thought so by scientists in general, and by hydraulic engineers, but by the inventor himself. To be sure, I merely announced the solution in general terms and without any explanatory diagram, as due to the formation of a vacuum behind the ball, and the scientific world may therefore be still sceptical on the subject or as to the true explanation having as yet been arrived at.

I am led to this conclusion from the fact that even the scientists and hydraulicians of our "Canadian Society of Civil Engineers" seemed at first sight to doubt the correctness of my enunciation of the solution, and directed the secretary to write me for a graphic and scientific explanation of how the mere pressure of the atmosphere could resist or counteract a pressure of may be 100 lbs to the inch against the rear of the ball.

Now, as seen by the diagram, there is no pressure against the ball, or only that of friction at the circle of contact between the ball and water. The pressure is in the moving water, and is expended, not in pushing the ball, but in expelling the water through the annular space *ab*, around the ball, and between the ball and conical or divergent nozzle, *ABCD*, the ball so adjusting itself, of

course, that the sectional area of the funnel-like jet of water at *ab*, or area of the annulus, becomes equal to the sectional area of the solid jet at *AB*. and the thickness of the jet or breadth of annulus at *ab* goes on decreasing, of course, as the diameter of the cone increases at *cd*, where, supposing the velocity still the same as at *AB*, less the diminution caused by the resistance and pressure of the air, the area at the annulus at *cd* is still the same or so much greater as the velocity at *cd* is less.



Of course the water, when first let on, forcibly projects the ball against the confining wires at *CpD*. In the meantime, the friction of the water around the inner periphery of the apex of the cone *AOB* quickly sucks away the water from the concave-conical space behind the ball, thus creating a vacuum towards which, or away from the confining wires, the atmospheric pressure pushes back the ball until, as already said, the area of the annular space for the water around it becomes adjusted to an equality with that of the solid water at *AB*.

Of course, in company with all other technologists or engineers, I can only see with the eyes of faith what I here describe, as the sold brazen funnel *ABCD* cannot be seen through, and even if it could, or if the nozzle were of glass, still would the glass and water and vacuum be all of a color, and the vacuum unseen; but that there is a vacuum there, that there must be one, must be just as obvious to the scientist as if it could be proved to exist; nor even can the engineer doubt it, when he knows how in sewers the current of water carries a current of air along with it, or as a current of water will, and does, draw away with it a film of the quiescent water it is in contact with, and those of your readers who have in your April issue studied "Taylor's System of Air Compression," cannot believe in it any more than in the explanation of the "fire nozzle paradox," unless they admit, as Taylor explains, that the water sucks down the air with it, though in this case the proof is evident from the fact of the existence of the compressed air as evidenced by its power motor action.

THE BALL-NOZZLE MYSTERY.

Editor CANADIAN ENGINEER:

SIR,—In last number of *Scientific American*, New York, is an attempted explanation of the "ball-nozzle mystery," but of course it would have been *infra dig* for the editor of such a paper to acknowledge that their solution had been given some two months before by the undersigned, as published in your issue for May last.

There is no *necessary* gyrating motion of the ball but what may be due to eccentricity of position of the ball in the cup, depending on an irregularity in its construction.

Neither is the exact position of the vacuum given which is behind the ball and extends up to the zone of contact, as otherwise the pressure behind the ball would be more than a match for the atmospheric pressure, and the ball be pressed forcibly against the retaining wires.

C. BAILLAIRGE.

City Engineer's office, Quebec, Aug. 2nd, 1895.

QUESTIONS ON THE QUEBEC LAND SLIDE.

Editor CANADIAN ENGINEER.

SIR,—Referring to an article in the last issue of your paper on "The Quebec Landslide," would it not be well to let the public know the names of the persons—or some of them—who saw the water standing one hundred feet deep in the fissure, and by whom the soundings were made? Also, why the water was not pumped out, or the people who were killed removed before the cliff upset? To an ordinary reader these points would be interesting.

Yours truly,

JOHN MCDONALD.

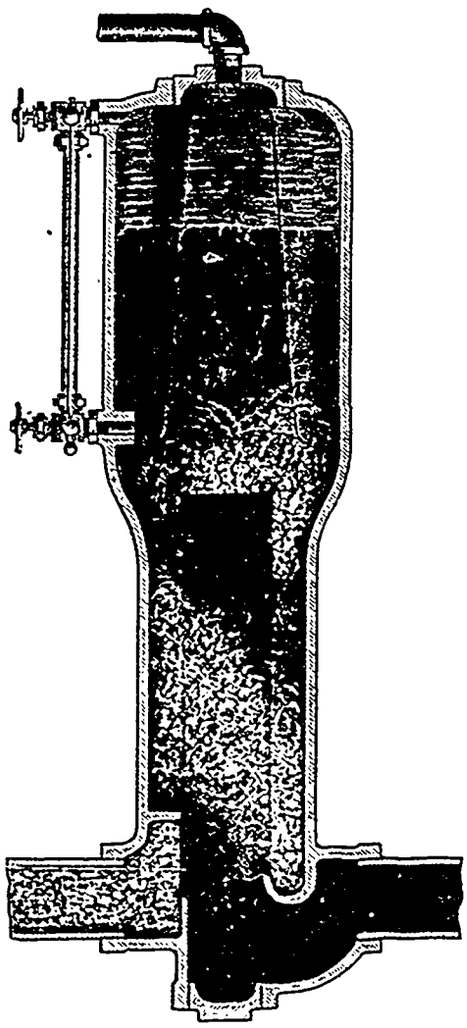
Halifax, N.S., July 25th, 1895.

WORK is now going on at the new Hudson Bay Company's grist mill, at Prince Albert. The mill will be one of the largest in the North-West.

THE STRATTON SEPARATOR.

The following is a letter from Prof. R. C. Carpenter, of Sibley College, Ithaca, N.Y., reporting a test made of the Stratton Improved Separator this year:

"I send you with this letter a short summary of the test which we have made on the Stratton Separator. The results show that the separator is practically perfect, and removes all the moisture which can possibly be taken out by mechanical means. I think we will make another test in which we inject water into the steam pipe, thus increasing the percentage considerably of water in the steam supplied. This latter will not be of great practical interest, but will bring out, of course, the capacity of the separator for extraordinary conditions. If you have no objection, I will publish a copy of this report in the next number of the *Sibley Journal*, and for that purpose would be pleased to have you loan us an electrotype showing vertical section.



"TEST OF STRATTON IMPROVED SEPARATOR.—For this test the steam pipe leading to the separator was surrounded for a portion of its length with a jacket which could be filled with water to any desired height, the purpose of the water jacket being to condense as great a per cent. of the steam as possible. The discharge of steam from the separator was led to a surface condenser, where it was condensed and the amount carefully weighed. The drip of water discharged from the separator was led to a barrel standing on a pair of scales, and accurate weighings were made of the water taken out from the steam by the separator. A throttling calorimeter was placed in the steam pipe directly after the steam left the separator. Pressure gauges were placed either side of the separator Observations were taken and the results reduced by Messrs. Collins, Hubbard and Thomas of the class of '94. The following is the general summary of the results. The steam supplied to the separator contained moisture, the percentage of which varied from a little over 5 to nearly 21. That discharged from the separator was in every case nearly dry, it containing in every instance less than 1 per cent. of moisture. The separator was worked up to its full capacity, and there was no appreciable reduction of pressure. The summary of the results of different runs is given in the appended table. During these runs the water was kept at a constant height in the separator:

No. of Run	Pressure of Steam.	Moisture in Steam Supplied Separator. Per cent.	Moisture in Steam Leaving Separator. Per cent.	Quality of Steam Leaving Separator. Per cent. of Dry Steam.
1.....	60	6.55	0.95	99.05
2.....	61	17.2	0.94	99.06
3.....	62	15.31	0.9	99.1
4.....	76	15 6	0.6	99.4
5.....	61	20.9	0.8	99.2

The Goubert Manufacturing Company, New York city, who are sole manufacturers of the Stratton Improved Separator, are represented in Canada by Wm. T. Bonner, 415 Board of Trade Building, Montreal.

REVIEW OF THE METAL TRADES.

MONTREAL, Aug 10th, 1895.

We have to report that the improvement referred to in some recent reviews is still maintained, but the increase is not as rapid and the revival is not as great as many anticipated. It may, however, be looked upon as more solid and lasting than if it had been acquired by "leaps and bounds," and consequently, buyers have more confidence, and this coupled with the advance in values has had a tendency to increase the volume of trade.

Generally speaking, the increased prices noted in last report have been maintained, and the tendency is still more upward. A strike among the tinplate workers of South Wales has decreased the production and stiffened the prices a good deal, and it will, no doubt, interfere with deliveries against orders previously booked. Canada plates are fully 10 cents per box dearer than a month ago Pig iron remains unchanged, though, if anything, the market is weaker, with a tendency to lower prices There is not much to note in other lines.

Industrial Notes.

SHERBROOKE, Que., is to have a new Episcopal church.

ST. ALBANS, Que., will spend $20,000 on new schoolhouses.

THE new school house to be built at Carberry, Man., will cost $11,000.

J. Y. GRIFFIN'S pork factory, Ottawa, is to be enlarged this summer.

A NEW Anglican church is to be built at Waterloo, Ont., in the near future.

THE city of Chatham has decided to buy the water works there at $145,000.

A PLANING mill will be erected at Aylmer, Ont., by C. A. Price of that place.

ST. CATHARINES, Ont., is considering drainage extensions which will cost $15,000.

HULBERT'S shingle mill, at Sprucedale, Ont., recently destroyed by fire, is being rebuilt.

IT has been decided to enlarge the St. Vincent de Paul Hospital, at Belleville, Ont.

THE woolen mill at Odessa, Ont., owned by B. A. Booth, has been badly damaged by fire.

THE sisters of the Precious Blood are preparing to erect a large nunnery at Sherbrooke, Que.

W SMYTH is about to erect a saw-mill and shingle factory at Bensfort, near Peterborough, Ont.

THE inhabitants of Sarnia, Ont., wish to spend $2,500 on improvements to their water supply system.

PENNSYLVANIA capitalists have visited Hamilton, Ont., looking for a site wheron to erect a big nail factory.

THE Breithaupt Leather Company, Berlin, Ont., are adding new machinery and other improvements to their tannery.

MCDONALD'S mill at Killaloe, Ont., burnt. It is thought that a locomotive spark caused the fire There was no insurance

THE contract for the new Argyle school at Winnipeg has been secured by J. Shaw & Co. Operations will be begun at once.

THE Canada Wire Mattress Co., of Toronto, whose works were recently destroyed by fire, are removing their business to Montreal.

CARLETON PLACE, Ont., will spend $1,550 on an extension of the water system.

VICTORIA, B.C., is about to spend $25,000 on an extension of the sewerage system.

OPERATIONS have been begun on the new bridge to be built over the St. Lawrence at Brockville.

THE oatmeal mill at Pilot Mound, Man., owned by Dow & Curry, is being fitted with new machinery.

W. Y. PETRIE'S saw and flour mills at Holstein, Ont., were destroyed by fire July 18th. Loss, $15,000.

THE contract for the new public school building at Edmonton, Alberta, has been let to K. A. McLeod for $6,275.

THE St. Croix Cotton Mill Co., St. John, N.B., is constructing a $7,000 extension. The contract was let to J. McKenzie.

RENFREW, Ont., town council will ask for tenders for a new high school in a few days. The cost will be about $7,000.

G. MARTIN, proprietor of the Victoria mills at Lindsay, Ont., is building a three-story extension to his mill measuring 33 x 105 ft.

THE Kaslo, B.C., council have bought land on which it will erect a council chamber, police station, fire hall and clerk's office.

W. R. MCKENZIE and R. Olding have the contract to erect a Y M.C A. building of brick and stone, at a cost of about $10,000, at New Glasgow, N.S.

A NEW water tower, bought in Chicago for $7,000, has been added to the Toronto fire brigade. It will be operated by the Ronald fire engine.

INCORPORATION is being applied for by the Belleville, Ont., Bay of Quinte Hedge Co., capital stock, $35,000. To construct wire fences and wire tools, etc.

THE buildings of the Smith Wool Stock Company, shoddy manufacturers of Toronto, were damaged by fire on July 10th to the extent of $2,000. Insured.

THE Thousand Island Club is desirous of erecting a grand Casino on some suitable spot on one of the islands. They propose to spend $100,000 on the building.

THE Perth Water Works Co., of Perth, Ont., will probably begin work on the new water works very soon. The sum to be expended is from $15,000 to $20,000.

A LARGE flour mill will probably be built at Moosomin, Assa., in place of the one owned by Smith and Brigham, which has been sold, and will be moved to Elkhorn, Man.

ANOTHER building for the manufacture of street cars is to be erected in Peterborough for the Canadian General Electric Co., of Toronto. The building will measure 60 x 300.

THE Brunette saw mills near New Westminster, B.C., which were destroyed by fire last month, are being rebuilt. The mills were managed by J. Wilson, New Westminster, B.C.

ROE & GRAHAM, iron founders and machinists, Ottawa, have dissolved partnership, G Roe having retired; the business is being turned into a joint stock company, as mentioned elsewhere.

THE London, Ont., Street Railway Company has awarded the contract for the construction of their bridge at York street to the Central Bridge Engineering Company. The work is to be completed Sept. 14.

THE Ocean House, the summer hotel on Hamilton Beach, was burned to the ground on July 17th. It was owned by Brierly Bros. and insured for $13,000, which covers the loss. It will not be rebuilt till next season.

H. LUMSDEN, employed in McLaughlin Bros. lumber mills at Arnprior, Ont., was dangerously injured there on July 16th. He was whirled in the shaft several times, and had both arms broken, besides internal injuries.

THE contract for the construction of a bridge over Newman's Brook near St. John, N.B., has been let to Wm. Lewis & Son for $2,885 and $10 per cubic yard masonry. The bridge must be completed by November 1st.

THE erection of the new town and fire hall at Carleton Place, Ont., has had to be postponed, as the lowest tender was $5,000 in excess of the estimated cost. The ratepayers will be asked to countenance an additional grant of $5,000.

A FRENCH count is going to join the ranks of Canadian manufacturers; Vicounte Flavigny de Bouthillier is to enter into negotiations with the Comptoir Ceramique Francais to run the stone and chinaware factory at St. Johns, Que., owned hitherto by Macdonald & Co.

A NEW fire hall, costing $2,045, is to be built at Midland, Ont.

A SAW MILL is to be erected by J. C. Anderson, at San Juan, B.C.

THE school board of St. John, N.B., are to build a new school to cost $12,000.

PURVES' mill at Carleton Place, Ont., recently destroyed by fire, is to be rebuilt.

A NEW engine and boiler have been put into the Uxbridge, Ont., piano factory.

A NEW roller mill is to be erected at Shelland, Ont., during the coming month.

IT is proposed to build a bridge across the Assiniboine river near Greswold, Man.

THE Riordan Paper Company, Merritton, Ont., intend enlarging their machine shop.

A NEW railway bridge is to be built across the Columbia at Revelstoke, B.C., during the fall.

THERE is some talk of establishing a rolling mill in Quebec city, but no names are made public.

THE St. John, N.B., city council have resolved to build a new bridge at a cost not exceeding $4,500.

A NEW co-operative creamery was opened at Renfrew, Ont., last month, by Lord and Lady Aberdeen.

NEGOTIATIONS for moving the Burn's type-writer factory from Buffalo to Brantford have fallen through.

A FACTORY for making ornamental brick has been established at Shallow Lake, Ont. R. J. Doyle is the owner.

A FIRE destroyed the Forkasch Fertilizing Company's works at Toronto Junction, on July 23rd. Loss about $10,000.

G W. GOUINLOCK, Toronto, is receiving tenders for a large office building, to be known as the Foresters' Building.

THE town of Maisonneuve, an eastern suburb of Montreal, has decided to borrow $225,000 for municipal improvements

IT is proposed to build a new wing to the Chateau Frontenac this autumn. The hotel is owned by officers of the C.P.R.

Two wings are to be built to the Baptist Church, Peterboro, Ont. The contract for the work was let to T. D. M. Croly.

THE plant of the Watson Manufacturing Co., manufacturers of agricultural implements, Ayr, Ont., is to be sold by tender.

THE vinegar and pickle works at London, Ont., owned by L.V. Ludwig, were destroyed by fire July 29. Loss about $10,000.

A NEW line of gas pipe is to be laid from the gas fields of South Essex to Windsor, Ont. A branch will be run to Essex village.

JAS. PENDER & Co., nail manufacturers, St. John, N.B., are building a new warehouse. Ed. Bates of that city has the contract.

WINNIPEG is advertising for tenders for the supply of additional sewer pipes and catch basins. It is estimated that the cost will be about $3,000.

J. W. LEWIS & SON have the contract for building the Newman's Brook bridge at St. John. Price $1,885 for bridge work and $10 per cubic foot for piers.

J. ANGUS, an aged foreman in E. B. Eddy's Co., sulphite works, Hull, Que., was caught in the belt of a revolving pulley a few days ago and seriously injured.

E. BAYNES & Co.'s iron works at Victoria, B.C., were destroyed by fire a few days ago. The firm had important contracts on hand, and the plant will be replaced at once.

EDWIN GILLETT had an arm taken off at the Grand Trunk car shops in Brantford on the 15th July. His arm was caught and drawn in among the cogs of a machine.

A FIRE, which started from sparks from the cupola of the furnace, took place in Cowan & Co.'s foundry, Galt, the other day, but was put out before much damage was done.

THE Ontario Steam Logger Co., Toronto, has been incorporated, with a capital of $250,000, to manufacture snow traction engines for hauling sawlogs, timber, etc.

THE bridge across Vaughan's Creek, at foot of Hardscrabble Hill, is in a very dangerous condition. It is understood the Department of Public Works at Fredericton has in contemplation the erection of a new bridge.—*St. John Telegraph.*

THE Marble Rock dam, the property of the Gananoque Water Power Co., was blown up on the 2nd inst. by dynamite. There is a suspicion that the work was done at the instigation of parties who feared their lands would be flooded when water was shut off from the factories.

GOODERHAM & WORTS are to build a $1,000 engine-house for the private fire engine at their distillery, Toronto.

THE Bank of Hamilton has taken out a $9,000 permit for improvements and enlargements of Livingstone buildings, Toronto.

THE waterworks at Middleton, N.S., are to be purchased by the town, and C. O. Foss has been chosen as arbitrator for the town.

PLANS of the traffic bridge across the Saskatchewan at Edmonton show an iron truss 703 feet long, with spans of 234 feet each.

A FEW days ago the Jenkes' Machine Co.'s foundry at Sherbrooke, Que., was saved from destruction by the efficiency of the firm's own fire plant.

ON the the 22nd ult. H. Newens, employed in the Cook Shire Milling Co. sawmill at Sawyerville, Que., was caught in the shafting and instantly killed.

THE County of Amherst, N.S., are putting in a Robb-Armstrong seventy-five horse power engine to run the machinery during the exhibition at St. John, N.B.

VIAU & LACHANCE, contractors, of Hull, Que., have obtained the contract for building the Post Office and Customs House at Portage-la-Prairie. The cost is $25,000.

THE Wood, Cargill Co., Armstrong, B.C., has been incorporated with a capital stock of $125,000, to take over the milling business of E. C. Cargill & Co., at that place.

THE old sheds on the ground at the corner of St. Valier and Voltigeur Streets, are being demolished to give room for the construction of Mr. Polley's new factory.—*Quebec Telegraph.*

PERTH, Ont., is to have a waterworks system costing $50,000. The system will be owned by a limited company for the space of ten years, after which the town will have the option of purchase.

IT is reported that Geo. Gillies of Gananoque, will remove his machinery to Toronto, where it will be amalgamated with the plant of the late Ontario Forge and Bolt Co., which he recently purchased.

THERE was an interesting baseball game between the employees of Samuel, Benjamin & Co. and Rice Lewis & Co. at Hanlan's Point last month. The Samuel-Benjamin representatives won by a score of 21 to 7 runs.

DR. WILSON, mayor of Edmonton, and Father Lacombe have visited Ottawa, with the intent of obtaining from the Government a subsidy towards the building of a new $60,000 bridge across the Saskatchewan river.

A $50,000 sewer in St. Henry, a suburb of Montreal, caved in the other day, for a distance of 600 yards. It was built only in 1893. The cause is attributed to the work of a steam roller and the soft nature of the soil.

THE Hamilton *Herald* of August 1st says: "The directors and shareholders of the Hamilton Iron and Steel Company announce that the smelting works will most assuredly be completed and in operation by January 1, 1896."

A FIRE broke out in the Goold Bicycle Works, Brantford, the other day. The blaze originated in the boiler room and set fire to the ceiling, burning through into the japanning room immediately above. The employees have their own fire protection, and worked so well that the flames were soon extinguished. Damage about $200.

THERE is an opening in Collingwood just now for a soap factory. This is an article that is always needed, and the location of the Meat Co. here indicates that a soap factory should follow. There is also an opening for a first-class foundry. This need it is hoped Mr. Dixon will soon fill. The work is here and in sight, but at present has to be done elsewhere. Just so long as steamboats run and saw-mills cut, there will be abundance of work here for a foundry.—*Bulletin.*

A NEW steam flour mill is being built at Elkhorn, Man., to be finished in time for the new crop. The company building it is the Elkhorn Milling Co. Capital, $10,000, and is composed of Joseph Broadley, T. D. Cavanagh, Robt. M. Coombs, W. M. Cushing, J. W. Carwin, Charles H. Freeman and S. H. Greenwood. The new company have purchased the mill building and machinery of the Assiniboia flour mills at Moosomin, including the electric light plant and steam heating apparatus. A gang of workman are now busy taking out the machinery and getting it in shape to move to Elkhorn. The capacity of the mill when completed will be 75 barrels per day. D. W. Rowland is manager. He was formerly head miller for Leitch Bros., of Oak Lake.

THE contract for supplying the piping for the Hartland, N B., water works has been granted to W. H Thorne & Co. The system is to be completed by September 1st.

PIGGOTT & SONS' planing mill at Windsor, Ont., was completely destroyed by fire on the 30th July. The cause of the fire is unknown. The insurance will not cover loss.

TWO laborers on the Parry Sound Railway near Whitney, Ont., last month were seriously injured by a blast of dynamite, a third man had his skull crushed in by flying rocks, and died a few hours after.

MACDONALD BROS'. recently purchased mill, at Killaloe, Ont., was destroyed by fire a few days ago, supposedly by a spark from an Ontario and Parry Sound locomotive. Damage, $2,500. No insurance.

MEAFORD, Ont , council has decided to build a bridge over the Big Head river at Moore's mill. The contract for the bridge, which is to be of steel, was secured by Hunter Bros , Kincardine. Price, about $1,000

P. H. ROTHWELL, representing the Dominion Cold Storage Co , made application to the Toronto city council for exemption from taxation of buildings and machinery for a warehouse for refrigerating purposes.

THE recommendations of the City Engineer, of Toronto, to go on with the waterworks tunnel under the bay, have been urged by the Mayor in a special message endorsed by the Board of Trade. The cost would be about $670,000.

THE contracts have been let for the new factory to be erected by Manson Campbell, at Chatham, Ont Piggott & Sons have the contract for supplying the material for the woodwork. Bechard & Oldershaw will do the brickwork.

IT is said that the bridge between Brockville, Ont., and Morristown is to be constructed at once. Engineers Smellie and Howland have been excavating on the Canada shore for anchor piers to fasten the ends of the cantilevers.

CHAS. ALGAR, of Hudson, N.Y., has visited Belleville with a view to establishing a blast furnace. His proposal is upon the basis of a free site to be used only for blast furnaces, exemption from taxes, and $5,000 a year after the mills are running.

THE Hamilton city council have accepted the offer of the county of Wentworth to purchase the J. Barton street jail for $35 000, and thus the long controversy is ended. The city now owns the jail, and the county will pay for the keep of its prisoners.

AT the examinations for admission to the study of architecture, which have concluded before the Province of Quebec Association of Architects in Montreal, the following candidates passed, the names being given in order of merit: F. Dubrieul, L A Venne, L. Lionais and J. A. Morin

A LARGE number of mills, both in Ontario and Lower Provinces, have ceased running owing to the lack of water in the rivers. Most of the mills having steam are being kept going by that means, and a number of mills are being fitted with steam against the recurrence of drought.

JAS MILLER, formerly manager of the Miller Extract works at Mortimer, but recently a resident of Pennsylvania, has resigned from the company's employment and come to Chatham to engage in the foundry and machine shop business with his son. All who know Mr. Miller, especially his yachting friends, are delighted to have him come to Chatham to live.—*Chatham, N.B., World.*

WM. GOLDING, C.E , whose contributions to this journal will be remembered by many, has made a report on the disastrous explosion of the Union Cotton Press, at New Orleans. It appears from Mr. Golding's report, that the explosion resulted from the improper use of the feed pump, which cracked the lower plates of the boiler, thus letting out the water and exposing the surface of the flues.

THE city council of Hamilton, Ont., invited Engineer Kuiching, of Rochester, N Y , to report on the state of the sewage of Hamilton Mr Kuiching stated that the flow of sewage into the bay was rapidly polluting that body of water. He recommended that a plant for chemical treatment of sewage be installed. Such a plant would cost $125,000, and the cost of running annually would amount to $30,000.

MESSRS. STAFFORD, of the Glengarry Machine Works, at Lancaster, have received an order for eight machines for the manufacture of fibre chamois The machines are to be sent to England, where the Fibre Chamois Co. have established a new factory. Sending Canadian machinery to Great Britain is a somewhat unusual occurrence, and is certainly an evidence that Canadian manufacturers are progressing rapidly.

R. C DONALD & Co., of Moncton, have obtained the contract for the construction of the I.C.R freight shed at Halifax, N.S. The price is about $34,000.

GRENFELL, Assa., school district, is borrowing $7,000 with which to erect a new school-house, and Moose Jaw is borrowing $4,000 with which to erect an addition to its present school building.

THE saw and planing mill of J. Peggot and Sons, at Windsor, Ont., was entirely destroyed by fire July 30th. Loss $20,000; insurance $10,000. The fire was suspected to be of incendiary origin.

S A. MCAULEY'S Door and Sash Factory, at Millstream, Kings Co , N B., was burned to the ground several days ago. No insurance. The loss is heavy, as all the tools and machinery were destroyed.

THE by law for the bonus of $25,000 to the Empire Tobacco Factory has been carried at Granby, Que. The company will, therefore, move from Montreal, and are to be in their new Granby factory in November

SLEEPER & AKHURST, of Coaticock, have just finished a very fine mowing machine, built on an entirely new plan; it has an endless chain gear and 6 foot cutterbar, and will, we believe, be the coming machine for general use.—*Sherbrooke Examiner.*

THE superintending engineer of the St. Stephen, N B., waterworks was charged on August 2nd with wilfully blasting rocks with dynamite in a careless manner and thereby endangering human life. The superintendent was sent up for trial, and gave bonds for $2,000 to appear in October.

THE town council of Petrolia, Ont , which has needed a good water supply for some time, recently offered a bonus of $500 for the discovery of a good source from artesian wells. A well has been sunk, resulting in the discovery of an underground basin 4½ miles distant yielding 200 barrels per hour, and pipes are to be laid.

AN accident occurred at the Londonderry, N.S., Iron Works, on Sunday, 21st July Three men were at work feeding the furnace when an explosion took place. They were badly splashed with the melted iron D. Eaton died in two hours, and a man named Campbell was very seriously injured, a third man was slightly hurt.

H. A LOZIER & Co.; of Cleveland and Toledo, bicycle manufacturers, have purchased the Barnum Iron Works at Toronto Junction from the Molsons Bank, and propose manufacturing bicycles on an extensive scale. They require some additional land, and have made arrangements for the construction of a large factory adjoining the present premises.

AN accident happened at the rolling mills building, at Guelph, on the 19th ult. The last beam of the frame was being put in position when a rainstorm started, preceded by a whirlwind, which blew the building to the ground, together with three workmen William Tuck, of Guelph, was seriously injured, both collar-bones being fractured. It is thought the injured man will recover.

SINCE the Montreal city council has awarded a ten years' contract to the city gas company at $1.20 per 1,000 feet for illuminating gas and $1 for cooking gas, H. S King, representing the Whessoe Manufacturing Co., of England, has returned to Montreal, and says the gas controversy will not be ended till the citizens have gas at 60 cents per 1,000, which his company is prepared to furnish.

THE concern known as the "Continental Twine and Cordage Company" have been looking for a site for a proposed cordage factory in Canada, and Hamilton and Brantford have been visited. The machinery, except the motive power, will be of American make. The scheme contemplates a branch in Quebec for supplying the maritime provinces with vessel and fishermen's supplies.

THE CANADIAN ENGINEER in its last issue states that the Dominion Government has granted $10,000 to the building of a post office in Rat Portage. It must be a mistake, intended for Portage la Prairie. Inquiry to the contrary has been sought. We only wish it were true, for if any town needs a post office, Rat Portage is the most deserving.—*Rat Portage Record.*

THE London, Ont., city council has awarded the contract for asphalting eight of the principal business streets to the Barber Asphalt Co., of Buffalo, the price being $2.65 per sq. yd. for Trinidad asphalt. Among other tenderers were Toronto Construction and Paving Co.; Kramer-Irwin Rock Asphalt Co., Hamilton; Ontario Paving and Construction Co., Detroit. John F Connolly, Toronto; N. & M. Connolly, Toronto; Barber Asphalt Co., Buffalo, Furin-Bambrick Co., St. Louis. The lowest tender was that of the Toronto Construction and Paving Co., $2.26 per sq. yd. The Barber Company undertook to keep the streets in repair for five years.

THE Gooderham & Worts Company expect to have a very complete pumping plant of their own. Their principal object in installing this plant is to give them better fire protection, but one pump will be kept in constant use for supplying the distillery with all water used for manufacturing purposes. Compound condensing pumps will be used, and the steam furnished by a pair of 200 horse power Babcock & Wilcox wrought steel high-pressure boilers.

THE annual meeting of the directors of the Niagara Falls and Clifton Suspension Bridge Company was held at Niagara Falls, N.Y., a few days ago The following were elected as officers: President, C. H. Smythe, Clinton; vice-president, Jno. F. Moot, Oswego; treasurer, J. M. Bostwick, Buffalo; secretary, F. De W Smythe, Clinton. One of the most important matters discussed at the meeting was the proposed new bridge, and definite action was taken by authorizing the advertisement for bids for the mason work. The bridge must accommodate the present carriage and pedestrian traffic, and trolley cars besides. The span at this point is over 800 feet. There seems to be little doubt now that the construction of the bridge will be proceeded with as soon as possible.

ONE of the factories in the west end of Toronto which has an appearance of steady and satisfactory activity is that of the Northey Manufacturing Company. In one room of this factory, which we were privileged to visit this week, and which is 250 feet in length, with continuous shafting down either side, were to be seen some giant lathes and drills turning out giant pumps and condensers. Here is a compound duplex pump for the waterworks of Westville, Nova Scotia; there is a huge iron casting, weight four tons, for the Winnipeg Street Railway Co., to be fitted as a condenser, with 816 brass tubes. This company is busy also on contracts for the Dominion Coal Company, of Cape Breton; the St. Henri Chemical Company; the Morse Soap Company, etc.—*Monetary Times.*

THE Cut-Nailmakers' Association of Canada met at the Windsor Hotel, Montreal, a few days ago, to decide as to the advance or reduction in price of nails for the next three months. J. H. Peck, of Peck, Benny & Co., presided, and among the others present were W. McMaster, Montreal Rolling Mills; G. McKedy, of the Pillow & Hersey Company, Wm. Abbott, of Abbott & Co., Mr. Robertson, of the Harris Manufacturing Company, and Charles Doolittle, of the Ontario Rolling Mills Company. Considerable discussion took place on the increase in the price of nails which had been made by the American manufacturers, and while no definite decision has as yet been arrived at, an increase in price may be looked for.

THE new Union Station at Toronto will probably be finished by Exhibition time. The approaches are in course of construction and will look well. The York steeet bridge, connected with the station, which is to span the tracks between Station and Esplanade streets, has not yet been commenced, and there is no certainty as to when it will be. Its erection rests with the Canadian Pacific Railway Company. At the last meeting of the city council a resolution was passed ordering legal proceedings to be taken against the company if the erection of the bridge be not forthwith commenced. The final span of the bridge at John street remains still incomplete, as it was two months ago. The first two spans, covering the Grand Trunk tracks, have already been built, but there is an unsettled dispute between the two companies as to the final span which will cover the C.P.R. tracks. The city has in the meantime erected a stairway from the bridge to the ground for the convenience of wayfarers going to the waterworks. The C.P.R.'s new freight shed on the waterfront, west of Simcoe street, is being rushed ahead, and the filling in of the waterfront south of the Union Station proceeds apace.

Mining Matters.

A MICA mine at Lac a Castor, Saguenay district, has been sold for $20,000.

TRAIL Creek shipped 1,410 tons of ore during the first half of July, valued at $66,615.

MR. HUMPHREYS will put in a stamp mill at his claim near Nelson, Toad Mountain, B.C.

THE Princess claim on the Silver King road, near Nelson, B. C., has been bonded by the Neelands for $200,000.

AT the Bunker Hill and Sullivan Mines, Warden, B.C., 150 men are employed, and this force is to be doubled.

THE result of the partial clean-up at the Nelson Hydraulic Company's mine at Forty-Nine Creek, B.C., was between $4,000 and $5,000 for 120 hours work.

PROSPECTORS are said to be discovering gold in large quantities in and around Lake Winnipeg.

SEVERAL strikes of Galena are reported from the neighborhood of Cape Horn, on Arrow Lake, B C.

THE Cliff on Trail Creek, B.C., is developing a streak of ore which assays as high as $121.60 in gold.

EFFORTS are being made in Vancouver, B.C., to establish an ore smelter. The company will probably secure the bonus abandoned by another company.

PORTER BROS., railway contractors, have bonded claims known as the Daisy and Black Fox, on the Kalsa River, Kaslo, B.C. The amount of bond is $15,000.

THE Halls Mines Co., Ltd., of Nelson, B.C., has placed an order in the hands of Fraser & Chalmers for the machinery for 100-ton smelter to be erected in Nelson.

AN unusually great flow of oil was struck on Thompson's farm near Wallacetown, Ont., a few days ago. The oil is now 61 feet deep in the well and is flowing rapidly.

J. GRANT has bought the Maple Leaf, a rich galena mine, near Lanark, Ont., and will spend $10,000 in development. The claim is within a mile of the C.P.R. main line.

G. J. PARTINGTON and C. E. Willis have a lease of the Oxford gold mines of Lake Catcha district in Halifax county, N.S., and are forming a company to operate the mines.

AN extensive iron deposit has been located on the farm of G. James, near Merrickville, Ont. An American syndicate is said to have offered Mr. Jones $2,000 for the mining privileges.

A NEW camp has been started between Sheep and Lost Creeks, close to Salmon Siding, B C Many promising claims have been located. The N. & Ft. S. R. is putting in a wagon road.

A LARGE iron deposit has been discovered at Dudswell, Que., on the property of J George It is being opened by American capitalists Gold has also been discovered in paying quantities in the same district and is being worked.

THE Government-boring for oil in the Assiniboia district, N.W.T., is again in progress this summer. The boring has now reached a depth of one thousand feet. The contract depth is one thousand two hundred. No oil has been struck yet.

B. H AHIR, on behalf of English capitalists, has purchased the Black Jack mining property at Rat Portage. A custom mill will be started to crush ore sent in by outsiders. Over a year's supply is now ready for milling.

THE iron mine at Bluff Point, near Calabogie, Ont., was closed down last month owing to the inability of the company to keep out the water with the present machinery. The company intend to *put in new machinery and will start again on a large scale.*

THE *Canadian Colliery Guardian* reports that W. F. Libbey, manager of the mine at North Brookfield, N.S., has worked an abandoned gold mine known as the McGuire mine, and the other day brought in a bar of 231 ounces.

A SALE has been made of the Black Jack property at Rat Portage, and reduction works erected near the railroad bridge. It is the intention to put the reduction works in shape for the treatment of ore, and also to provide machinery for custom work.

A CORRESPONDENT at Slocan says: Amongst the highest assays of ore received this year is that from the IXL, a recent location between Twelve Mile Creek and Springer Creek. The returns were 774 ounces in silver and $105 in gold. This claim is on a branch on the left side of Springer Creek, about 2½ miles from the lake.

A GOOD deal of excitement was caused in East Kootenay, B.C., by the discovery of an extensive ledge of gold-bearing quartz along the banks of a creek known as the Bug-a-boo. The Hon. F. W. Aylmer and James White are interested. The ledge extends over 6,500 ft., and sampling throughout its whole length gives an average value of $52 to the ton.

THE remaining half interest in the Stemwinder claim, Boundary Creek, B.C., has passed out of the possession of R. Denzler, into the hands of Messrs. Farrell and Midgeon, of Butte, Mon., who, last fall, acquired the other interest in the claim. The announcement made by W. T. Smith, who purchased the property for the above-named gentlemen, that work would be commenced at once, by sinking a shaft two or three hundred feet deep, will therefore be received by all with great satisfaction, says the *Midway Advance*, and the acquisition of the proprrty by such men of known influence in the mining world, may mark a distinct era in the history of our progress.

THE largest number of gold areas ever taken up by one person in Nova Scotia were taken by F. W. Christie, C.E., on August 2nd. Mr Christie is acting in the interest of English capitalists, who are largely interested in South African properties and a cyanide process.

THE Rat Portage reduction works and about eight mining locations have been purchased by E. Brusewitz, of Lon on, Eng. It is the intention to equip the reduction works with improved mining machinery at once At this rate, mining development will be active in the district.

THE Parrott Smelting Co, of Butte, Montana, have, since the beginning of the year, been quietly securing all the good mining properties that were to be purchased in the vicinity of Kettle River, B C Their last purchase was the Snow Shoe claim, in Greenwood camp. Price, $40,000.

J. HARDING, St. John, N.B., is forming a company, mostly of Montreal capitalists, to work the shale deposits of Baltimore, N.B. By experiments with locomotives, shale has been found, when mixed with coal, to give forth an intense heat. Large quantities of it will in future no doubt be used as fuel.

CAPT. E. C. DAVISON proposes opening a new coal mine near South Edmonton, Alta. Borings have revealed a supply of coal of superior quality, and it is proposed to sink a shaft at once. Heretofore coal has been taken out from the outcroppings along the bank of the river. The coal mines at Anthracite will be running this month.

CAPTAIN MOORE states that the concentrator at New Duluth is in excellent order. The tramway is nearly ready for work. The rails are laid, and the cars are on the ground. A quantity of ore is ready for shipment. It is estimated that when the whole of the company's works are in full swing, say, by the end of September, they will employ 500 men.

THE Calabogie Mining Co. have elected the following directors for the ensuing year. Hon. P. McLaren, J. G. Campbell, W Hicks, J. F. Thompson, M. R. Dodds, J. A. Allan and J. M. Walker. At a meeting of the newly appointed directors, J. G. Campbell was elected president, Hon. P. McLaren, vice-president; J. A. Allan, secretary, and J M. Rogers and H. Moorhouse, auditors.

THE camps on Sheep and Lost Creeks, Salmon River, B C., are attracting considerable attention. New strikes of quartz are daily reported. Several of the claims have already been bonded to a New York company, promoted by George J. Goodhue Mr Goodhue's company will do considerable development work this year. A town site has been staked, and already about 30 or 40 prospectors are camped on it.

THE New Denver, B C, *Ledge*, of July 25th, says. "By degrees the big mines are beginning to get their outputs down to the railway, and henceforth shipments will be more regular. The Slocan Star re-commenced shipping this week, having sent out 100 tons yesterday to the Omaha smelting works Shipments will be made from this mine in 100 ton lots for the next few months. The Noble Five and concentrator people are seeking car space also, and they will ship heavily There yet remains about 100 tons of Alpha ore to go out, which will clean out the bins."

PROFESSOR GOODWIN, of the Kingston School of Mines, writes to the *British Whig* explaining how ore submitted to the school is treated. He says that, during the milling process, samples of the ore are taken as it comes from the elevator, and also from the "tailings" as they go into the trough. The concentrates are dried and a sample taken. Assays are made on these samples to show what gold there is in the ore, and how much of it the stamp mill will take out, the quantity that goes into the concentrates and into the tailings. The gold extracted by the mill is refined and becomes the property of the owner of the ore.

EXPERIMENTS have recently been made by Professor Kinsey Lanius, of Spokane, at Baker City, Or, upon Trail Creek, B.C., ores, with results that will interest all mining men. The Le Roi, Josie, Cliff, O.K., and War Eagle each gave him two tons of ore for experimental purposes. Of this ten tons he shipped 600 pounds to Baker City to run it through a mill. A telegram was received from him last night by C. Crossman stating that it is a complete success, saving 95 per cent. of the Le Roi gold, War Eagle 97, Josie and O.K. 100. This is a secret process, including the application of a solution by means of a battery in the mill. It becomes a free milling process, calculated to dispense entirely with smelting, and treating the ore on the ground.—*Midway Advance.*

PERHAPS the most interesting of the foreigners at the Joggins, N.S., coal mines is the Newfoundland element, says the Halifax *Herald*. The miners from "the ancient colony" divide themselves into bands of ten each each band occupying one hut. There is a captain appointed by the residents of each hut. The captain attends to the financing of the company, and exercises considerable authority over them. These Newfoundlanders leave Joggins for the fishing grounds in the codfishing season, and some go on whaling voyages during their absence. The interiors of the huts show the nautical character of their occupants. The men sleep in bunks, which are arranged as on board ships. Some time ago, one of these Newfoundland men died, and the body was to be taken home. A casket was procured, and the body was laid in a bed of table salt, and completely covered with that substance It was explained that when men died on fishing voyages off Newfoundland that their bodies were preserved by the use of salt. There are now thirty Newfoundlanders at the Joggins.

THE School of Mining, Kingston, will organize a party to go out on a prospecting tour up the Rideau Canal to the north of Frontenac and adjoining counties. The objects of the tour are to train men in the methods of prospecting for valuable minerals, and with this end in view, to make a practical study of the geology of the district. The travelling will be done by canoes, which, with the camping outfit, will be provided by the School of Mining Each member of the party will pay his personal expenses reckoned at about fifty cents a day for three weeks A deposit of twenty dollars must be made with the Bursar by each member of the party, not later than Aug. 20th. At the end of the tour the unexpended part (less two dollars) will be returned. The party will leave Kingston on Tuesday, Sept. 3rd, and will be led by W. G. Miller, of the School of Mining. As the number is limited to twelve, those who wish to join the party should apply immediately.

C. KING, the American geologist and explorer, author of "Mountaineering in California," and other books, has been visiting British Columbia mining properties, and writes in a letter to the Chicago *Inter Ocean* as follows: "Although this is British territory, it is curious to note that nearly all the exploration and discovery is being done by American prospectors, and about all the development by American miners. The British Columbian profits in various ways, but he stands dazed before the audacity and knowledge of the mining adventurers from the States. Thus far only a general prospecting reconnaissance in force has been accomplished for the whole region south of the Canadian Pacific Railway, resulting in the discovery of many valuable and some brilliant mines. But it is already certain that the whole field described is one broad mineralized area. The chief points of demonstrated value are the district of Slocan, in the West Kootenay division—where excellent silver-lead mines are being exploited, and where the two metals occur in unusually high percentages in veins, with every evidence of strong extension and permanency—and Trail Creek, in West Kootenay."

NOT since the big Finnell strike of last fall has New Denver been so excited as during this week. The excitement has been caused by the innumerable rich discoveries reported from Springer creek. This stream empties into the lake at Slocan City, and into it are running a number of smaller creeks, which have been given names of prospectors of the camp. Along the banks of all these locations have been made, the principal ones being within a small radius, and not more than seven miles from the lake. Springer creek was looked at in 1891, but no attention was paid to it till last fall. This season opened up with some good assays, the first being the Nancy Hanks, with 218 ozs. silver and $8 in gold This is put out of sight by subsequent discoveries, till now the whole country is talking. All the claims, and there are close to one hundred of them, carry gold beside silver. As high as $314 has been obtained, and upwards of 3,000 ozs. in silver. Dry and wet ore have both been discovered on the creek, and the native and leaf silver on some of the properties is truly astonishing. Lemon, Twelve, Ten and Eight Mile creeks have also shown some splendid ore from new strikes of late.—*New Denver, B.C., Ledger.*

MR. ERNST LECHER, in *Wiedemann's Annalen*, discusses the different aspects of the question whether, when a cylindrical magnet rotates about its axis, the lines of force due to it are stationary or rotate with the magnet. The former was Farady's original view, the latter has been maintained by Tolver Preston and others. After showing that all the experiments hitherto quoted as decisive one way or the other may be equally well interpreted on either assumption, he describes some test experiments which show that the lines of force stand still while the magnet rotates.

Railway and Marine News.

THE small steamer "Queen of the Isles" was sold at Kingston, Ont., a few days ago for $1,600.

IT is said that New Zealand has decided to grant a subsidy of $20,000 to the steamers running to Vancouver, B.C.

THE St. John, N.B., Board of Works contemplates the reconstruction of wharf sheds, the cost being estimated at $4,000.

THE R. & O. steamer "Canada" grounded in a fog off Cacouna on the 4th inst, but was got off without serious damage.

IT is expected that the boulders in the Sault Ste Marie channel will be removed in time to have the new canal opened during August.

THE Wm. Hamilton Manufacturing Co, Peterborough, have an order from contractor Onderdonk of the Trent Valley Canal for four large upright boilers.

CONTRACTS for lighthouse supplies have been awarded by the Minister of Marine at Ottawa. This includes a contract for six boilers to Carrier, Lane & Co. of Quebec.

THE G. T R give notice that they intend to build a branch line of railway from the Queenston quarries, connecting with their line at or near St David's station in the township of Stamford.

THE Ottawa locomotive engineers have withdrawn their delegates from the Trades and Labor Council They claim that their constitution did not allow them to belong to such an organization.

C. PATTERSON, Shulle, N.S., has been awarded $2,500 by the Massachusetts court for damages to the schooner "Frances Arthemus" when in collision with the United States ship "Maria Steele."

MEASUREMENTS made in the St. Lawrence, at Montreal, during the last week in July, showed the water to be 26 feet 7 inches, which was as low as that recorded in 1872. The measurement of 1872 was the lowest known till then.

THE contract for building the Welland branch of the T. H. & B. railway has been awarded to M. P. Chapman & Co., of Watkins, N.Y. The first fifteen miles have been sublet to Maxey, Larsen & Co. The grading is expected to be finished by September 15th.

MR. WM. MITCHELL, manager of the Drummond County Railway, informs a Montreal *Herald* representative that he is placing 700 men to complete the grading and earth work on the railway from Moose Park to Chaudiere. Half of these men are Canadians and half Italians.

PRELIMINARY work has been started on the proposed international bridge between Brockville and Morristown. During the past few days a gang of men under Engineers Smellie and Howland have been excavating on the Canadian shore for anchor piers to fasten the ends of the cantilevers.

THE Canada Atlantic Railway has purchased, at Ottawa, a right of way from the Central Station to the Canal Basin. This route will be more satisfactory than the one formerly agreed upon, as easy access to the canal basin will give better facilities for loading and shipping from the docks.

THE Peterboro' and Lakefield division of the Trent Valley Canal, for which Brown, Love & Aylmer have the contract, is to be started at once. It has been found that the work can be more economically done by following the Otonabee River, although it is nearly double the distance at first mapped out.

ONE day recently the Nova Scotia Steel Company received a cable order from St. Johns, Nfld., for a large crank shaft for the steamer which is going north in search of the Peary expedition. In about ten days the shaft was despatched by I. C. R. to Sydney, where it was shipped on the s.s. "Colina" for St. Johns.

THE people of Pembroke now expect the early completion of the Pontiac and Pacific Railway to their town. W. Dale Harris, general manager, and Mr. Resseman, superintendent, have been at Pembroke arranging for an approach to the town. They are also to make a preliminary survey of a proposed route eastward to Waltham, the present terminus of the railway.

THE new Dominion Line steamer "The Scotsman," came into Montreal, on Sunday, August 4th. "The Scotsman" is the largest freight vessel coming to Montreal. Her dimensions are: Length, 470 feet; breadth of beam, 49 feet; and depth of hold, 35 feet 6 inches. Her gross tonnage is 6,041; net, 3,867 tons, and she is capable of carrying 9,000 tons of freight. The new vessel was built specially for the freight trade.

A MEETING of the shareholders of the South Shore Railway, of Nova Scotia, has been called for Sept. 4th, at Yarmouth.

A COMMITTEE of the Toronto city council is to be appointed to confer with the C.P.R. as to the building of a railway direct from Toronto to Sudbury.

AT the last meeting of the Montreal Harbor Board, the chief engineer reported that the building of the new tug "Aberdeen" was progressing slowly but favorably.

HOLD & LUKES, contractors, Montreal, have completed track laying for the branch of the Quebec Central Railway from Tring to Megantic. The branch is to be open soon.

RAILS are now laid upon the new Tring branch of the Quebec Central Railway as far as its junction with the C.P.R. at Megantic village. Freight trains now run direct from Quebec to Megantic.

C. WRIGHT reports that the logs are getting down to the Georgian Bay very slowly, in consequence of low water and continued westerly winds. Georgian Bay is eighteen inches lower than last year, making it difficult for deep draught tugs to get into the rivers. —*Orillia Packet.*

FIRE broke out at Lethbridge, in July, in the Alberta Railway and Coal Company's round-house. The building was seriously damaged, also the stored locomotives and the president's private car. Engineer Burrel rescued his engine, the cab of which was on fire, and with it drew out the other rolling stock. Estimated loss, $20,000.

THE Minister of Marine and Fisheries says the Government intends sending a suitable steamer to Hudson Bay next spring in the interests of the Marine and Fisheries Department, the Customs and the Interior Departments. The vessel will also be used for service in connection with the Hudson Bay Railway interests.

ON the 1st inst. there was only 9 feet of water in the western gap of Toronto Bay, and the water is so low in other parts of the bay that some of the ferry steamers have had to stop running to the island. The water was 12 degrees below the zero mark, and is the lowest on record at the office of the harbor commissioner.

ENGINEERS have been making the final surveys for the section of the T., H. & B. Railway between Hamilton and Toronto, and F. S. Upton, one of the directors, states that the line will be started next month and finished during the autumn. The section from Welland to Waterford may be finished before the end of the year. There will be a double track on the Hamilton-Toronto section.

C. D. RAND, promoter of the Fraser Valley and Burrard Inlet Railway, has received word from England that funds will be forthcoming to go on with the work, which will include a bridge across the Fraser River, at Westminster. The *Columbian* says the *bona fides* of the London syndicate are placed beyond question, by the announcement that their forfeits of £12,000 to the Vancouver city council, and £8,000 to the Westminster city council, are ready for deposit as soon as the councils put the bonus by-laws before the ratepayers.

THE steamer "Daisy" was burned near Hastings on the Trent River on the 3rd inst. She was towing Rathbun's drive to Healy Falls, and was captained by Clare Calcutt. The fire started while the majority of the crew were asleep and originated from the explosion of a coal oil can. The crew had a very narrow escape, all having to jump into the river and swim to the crib of the drive, but not before some of them got severe scorchings. The engineer had his whiskers and hair singed off and the captain his face severely burned and both legs badly scalded. The steamer was owned by H. Calcutt, of Peterboro, and was valued at $3,500. It is a total loss, but was insured.

ANOTHER serious break, involving several days' delay to traffic, occurred in the Cornwall canal. The barge "Kildonan," when she had entered lock 17, had her stern hawser parted by the surge of water and she ran into the upper gates, breaking them off their hinges, and being thrown back against the lower gates broke them also. The tug "Dunbar," lying by, was carried through stern first, and the engineer, Pendergast, had a narrow escape from scalding from a broken steam-pipe. The barge "Glenora" and the pontoon boat "John Page" also suffered. On examination it was found that six gates were damaged or disabled. This is the second serious accident at the canal this summer, and there appears to be something wrong in the management. The *Star* correspondent says the cause of the accident seems to have been that the valves in the lock gates were opened too quickly by the men in charge. The barge "Kildonan" had all her lines out and was entirely stationary, but the surge of water from above broke her stern line, which was new rope and supposed to be equal to any emergency.

THE Great Northern Railway is making preparations to hold its end up at Bonner's Ferry in the competition for the Slocan ores that will begin as soon as the Kaslo-Slocan line is in working order. A new spur from the main track and a wharf has been constructed at Bonner's Ferry, and a warehouse is to be built.—*Nelson Miner.*

THE Kaslo & Slocan Railway has a thousand men at work, and is expected to be running this fall. A level grade has been found from Bear Lake to Sandon, and the way is being cleared up from Cody Creek. A switchback has been graded across the creek to take the ore from the concentrator that the Slocan Star is about to build, which will have a capacity of two hundred tons a day. The Canadian Pacific Railway is anxious not to be cut out of the business of this region, and is surveying a line alongside of the Kaslo-Slocan track for several miles.—*Midway, B.C., Advance.*

THE St. John *Telegraph* is informed that H. D. Troop, acting for the Bay of Fundy Steamship Company, is negotiating for the purchase of the twin-screw steamer "Sandy Hook," now at New York, to be placed on the bay route If this vessel is secured, the "Monticello," it is said, will run between Windsor, Hantsport, Yarmouth and Halifax. The "Sandy Hook" is a fast boat, and can make the trip from St. John to Digby in a little over two hours.

THE steamer "Cibola," of the Niagara Navigation Co., was burned early on the morning of the 15th July, at her dock at Lewiston, on the Niagara. The fire started in or about the engine-room, but it is not known how it occurred. Wm. Hammond, the third engineer, was burned to death, and Jas. Woodward, second engineer, had to jump into the river and swim for his life. The "Cibola" was built at Deseronto, Ont., in 1887, and cost $160,000. She was insured for $75,000 A good deal of the machinery can be used again, and as the iron hull was but little damaged, she will be refitted.

PRESIDENT S. Caldecott, E. Gurney and E. B. Osler, of the Toronto Board of Trade, had a conference with Engineer Keating a few days ago regarding Toronto's water supply. It appears that the water in the bay is ten inches below zero, there is only a little over nine feet of depth in the western gap, and the steel conduit is in some places less than nine inches under water. Close to the point where the ferry boats pass it, the conduit is covered by a trifle over four feet of water. Should one of these vessels accordingly get out of her course, she would cut the pipe in two and leave Toronto without any lake water. So serious do the officers of the Board of Trade consider the situation that they discussed the proposed tunnel scheme with him thoroughly, and are laying the information before the Council of their body.

THE Yarmouth *Telegram* has the following items on railway construction in that part of Nova Scotia.—Work is progressing favorably at Argyle. Four gangs of men are rapidly completing the section between Belleville and Argyle, to be ready for tracklaying by the first of August.——Foreman Stuart has the road-bed for track-laying from Broad Brook to Argyle street, and will move his men along the line through Arcadia.——E. S. Fraser, Assistant Engineer, is engaged in placing track centres on the line between here and Salmon River.——Harry Townsend, the contractor for masonry, has commenced operations. The masonry work on bridges is to be completed by the 15th of September, to be ready for the steel superstructures——Warren Taylor, of Salisbury, N B, who has the contract for 80,000 sleepers for the Coast Railway, will begin the delivery of sleepers early in August.——Contracts have been signed with the Central Bridge Co. for the completion of the Tusket and Salmon River bridges. They are to be completed and erected in place on or before the 15th of October. ——Two thousand five hundred tons of rails were purchased in England on the 2nd July by John A Brill, president of the Nova Scotia Development Co., and will be delivered at Yarmouth during August.

THE annual meeting of the Lake St. John Railway Company was held last month at Quebec The gross earnings of the main line for the year show an increase of $17,895, those of the Chicoutimi extension an increase of $10,922. The net earnings of the main line show a gain of $14,931 over the previous year. The settlement of the Lake St. John district has made fairly good progress during the past year. More new settlers have gone in than during any previous year since the railway was completed. The dairy industry continues to make rapid progress, and cheese now constitutes quite a considerable item in the traffic of the railway, the quantity carried last year having been 1,114,000 pounds, against 522,000 in 1893. The number of passengers carried during the year on the whole system was 122,941, as compared with 109,515 in 1893, and the number of tons of freight 145,770, as against 133,150 tons. The freight is largely lumber and wood products, including pulp and pulp wood The election of directors for the ensuing year resulted as follows: Frank Ross, president; E. Beaudet, 1st vice-president; Gaspard Le Moine, 2nd vice-president; T. A. Piddington, Hon. P. Garneau, John Theodore Ross, Hon. F. Langelier, M.P., Jules Tessier, M.L.A., Gavin Moir, Hon. George Irvine, and Edwin Hanson, Montreal.

Electric Flashes.

EGANVILLE, Ont., is to have an electric light plant installed in a few days.

IN London, Ont., the Bell Telephone Company is laying its wires under ground.

THE Belleville, Ont., electric railway is now completed, and the first car went over the track a few days ago.

A WOMAN fell from a Hamilton, Ont., electric car on July 26th and was killed. She was about 35 years of age.

E. A. C. PEW intends applying to the legislature at its next session for a charter for a trolley bicycle road from Toronto to Niagara Falls.

RHODES, CURRY & Co., of Amherst, N S., have a contract from the Halifax Electric Street Railway Co, for 14 street cars and a $20,000 car house.

THE Light, Heat and Power Co, Lindsay, Ont., has been incorporated with a capital stock of $70,000 to supply electricity for light, heat and power.

WINDSOR, Ont., will spend $6,000 on the city lighting plant. Part of this sum will be used for the purchase of a boiler and other machinery for the dye house.

THE St. John, N.B., city council, has made a contract with the Electric Street Railway Co., of that city, for a supply of electric light for five years at $85 per lamp.

Two boys were killed by the trolley cars at Toronto on July 13th. The coroner's jury brought in a verdict declaring the company to be culpably negligent in not sufficiently instructing their motor men.

THE Babcock & Wilcox Company are installing a pair of their 220 horse-power wrought steel boilers in the new Bell Telephone Building now being erected at the corner of Notre Dame and St. John Streets, Montreal.

THE General Electric Co., Schenectady, N.Y., have received an order for two 48-inch 100,000 candle power search lights, to be used in illuminating in various colors the falls of Niagara. The Michigan Central Railway will defray the expense.

THE Dundas County Telephone Co. have completed their lines from Kemptville to Chesterville, and have 100 miles of poles ready for wiring, connecting the villages of Morrisburg, South Indian, South Finch, Avonmore, Monkland, Metcalf, Moorewood, Vernon, Duncanville and Kenmore.

WHILE repairs were being made to the electric elevator in W. J. Gage & Co 's warehouse, Toronto, on the 6th inst., the patent brake gave way, and the cage dropped 50 feet, killing Charles Howe and James Welch; the latter is a lad of 16. Charles McBride also had an arm and leg broken.

E L BARR, formerly with the Canadian General Electric Company, and more recently travelling salesman for the Wallace Electric Company, Chicago, has been appointed secretary of the latter company, *vice* Max Berg, who resigned. Mr. Barr is a younger brother of M. D. Barr, formerly manager of the Canadian General Electric Co.

THE street lighting of St. John, N.B., has been awarded to the St. John Electric Railway Co. for six years at $85 per lamp per year. This applies to all parts of the city except the north end, which continues to do its own lighting. By the contract with the railway 129 lights will be furnished, while in the north end 71 lights are supplied. The former price for the city was $75 per lamp.

THE Halifax Electric Street Railway Company are installing another battery of 500 horse-power of the Babcock & Wilcox Company's new wrought steel boilers These boilers are to supplement the 500 horse-power battery which they have been using for the past five years to operate their electric light plant. A third battery of 500 horse-power, Babcock & Wilcox boilers, will be added later on.

THAMESVILLE, Ont., has had an electric light system installed.

ST. THOMAS, Ont, will have its streets lighted entirely by electricity. Ninety lights will be required.

THE Brice Electric Works of Hamilton, Ont., are increasing their plant, and expect shortly to move to larger premises.

THE Nanaimo, B.C, Electric Light Works, owned by J Hunter, have been sold to the Nanaimo Electric Light Power & Heating Co. for $50,000.

TELEPHONE connection has been established between Herbertville and Chicoutimi, and the line is being extended from Chicoutimi to Lake St. John.

THE Dominion order-in-council, putting into force the electric motor inspection regulations, published in our last two numbers, was passed on the 2nd inst.

THE electric car system of London, Ont., is now in workable shape. The initial trip of the new system was made on August 6th, and was entirely successful.

Two men named W. Montgomery and D. Anderson were injured in the Winnipeg Electric Street Railway power house last month by the bursting of the blow-off pipe.

DR. F. L. BOYD, of London, Ont., brother of Chancellor Boyd, died in the hospital at London, on July 6th, from injuries received a *few days before in a collision with a trolley car.*

WM DAVIS & SONS, contractors, have the contract for building the dam and power houses of the Lachine Rapids Hydraulic Co., whose works were described in the June ENGINEER.

THE Street Railway Co. of Brantford, Ont., has been granted permission to lay 1,200 feet of additional track on Colborne street, provided the company agree to place fenders on all the cars.

E. BRAGG, chairman of the electric light committee at Victoria, B.C., has written to the mayor of the city pointing out defects in the system, and suggests that $2,400 be expended on improvements.

THE bonus of $5,000 voted for the extension of the Hamilton, Grimsby & Beamsville Railway to Beamsville, is not likely to be earned, as the municipality demand payment for the right of way. The time will soon elapse.

THE Electric Street Railway Company of Toronto has issued $1,500,000 first mortgage 4½ per cent. sterling bonds. Of this amount over $1,000,000 was issued in Canada and the remainder in London. Twice the amount of the required sum was offered.

THE contract between H. J. Beemer and Quebec city for the new electric railway there has been signed, but work has not started pending the settlement of some disputed points connected with the street rights. The company contend for a monopoly of the tracks on some streets.

E. A. C. PEW intends applying to the legislature at its next session for a charter for a trolley bicycle road from Torouto to Niagara Falls. To be a cinder track, with electric power furnished from overhead trolley wires. Edison has stated that such a project is entirely feasible

THE Ontario Company's gas wells at Mallot farm, near Windsor, Ont., were, on July 28th, the scene of a conflagration caused by lightning striking and igniting the gas. It was nearly an hour before the men succeeded in extinguishing it, at the risk of their lives.

AN *accident happened on the new electric road from Niagara* Falls to Lewiston. A prominent party of railroad men and citizens were making the initial trip, when the car jumped the track and several persons were injured, though not seriously.

THE first truck with electric motors for locomotive work to be used in Canada, was shipped from Ottawa a few days ago by Ahearn & Soper. It is a specially constructed truck of heavy steel, and weighs with the motor over eight tons. The motors combined have a capacity of 120 horse power. The truck will be used for hauling freight cars.

AUGUSTE HAMELIN is suing the Montreal Park & Island Railway for $5,000. Hamelin, who is deaf and dumb, was employed as a laborer at track work, and was struck by a car. He says the company were aware of his infirmity when they placed him at the work. Moral for electric railway companies—don't put deaf and dumb men at track work.

THE Halifax, N.S., Electric Street Railway have under *construction a car house 150 ft. long by 69 ft. wide. It will be fitted* with track accommodation and transfer tables sufficient to accommodate 40 cars. The equipment of the company will include about 20 closed cars, furnished with the latest improved girder track and two 15 h.p. electric motors.

TENDERS for the electric light supply of Charlottetown were opened last week. There were four tenders, from the Royal Electric Company, G. Full, W. Doull, and D. A. Starr, of Montreal. A fifth offer was made by Mr Perley Welsh to manage a plant if the city buys one, and he guarantees the reduction of cost by about 50 per cent. The council has not yet accepted the offer of any of *the tenderers, and it is expected that some days will elapse before* a decision is arrived at.

Niagara Falls, on both sides of the river, is having a railway building boom. The Lehigh Valley Railway has determined to have an independent road of its own, and the people are talking of the C.P.R. getting an entrance to the Falls. The boom is mainly in electric railways. A company, of which Alexander Manning, Toronto, is president, obtained a charter, which empowers them to acquire the property and rights of the old horse car line. The new company have power under their charter to convert the old line into an electric system, and they have applied to the town council of Niagara Falls for a franchise. Some time ago the new company through its solicitor, offered a by-law to the council for adoption, which nearly took the breath away from the town fathers. The council promptly rejected it, and the new by-law practically confines the company to the streets at present occupied by the horse car tracks, and gives no monopoly of the streets. In the meantime William Kyle, of Toronto, is pushing his project for an international belt line electric railway. Mr. Kyle is backed by such capitalists as A. E. Schoelkoff, H. Nielson and J. M. Brinker, of Niagara Falls, so that the sinews of war are assured him, while the councils of Drummondvilie and Niagara Falls have passed resolutions urging the Ontario Government to grant a charter to his company. The new Niagara Falls and Lewiston Railway, or the Gorge Railway, as it is more likely to be called, will run, when completed, from Lewiston to the Falls on the American side, down close to the foot of the precipice. Although the last mile or so of the roadbed has not been completed, Capt. J. M. Brinker's company, who are the promoters, have opened the road from Lewiston to opposite the Whirlpool Rapids. Some six carloads of people were present by invitation to participate in the ceremony.

Personal.

W. J. COLESTON, boiler inspector, St. John, N.B., was married a few days ago to Miss Mary A. Moran, of that city.

BY the will of Thomas Dockray, civil engineer, Toronto, who died June 29, $6,000 has been left to the widow of deceased.

PRIVATE HAYHURST, of Hamilton, who has won the Queen's prize at Bisley, was for two years an employee of John Bertram & Sons, Dundas, Ont

L. R. JOHNSON, engineering superintendent of the C.P.R. Steamship Co., Vancouver, was in Montreal last month and visited the leading railway works of the city.

A. S. GRANT, an old Elgin county boy, has been engaged by the South African Gold Mining Company, as managing engineer. Cecil Rhodes is the president of the company

E. F. BUTLER, engineer at the Soo paper mills, and T. Sweeny, were drowned in the river at Niagara Falls, on August 4th. Butler was 45 years old, and leaves a wife and three children.

W L. MCKENZIE, engineer, has left for his winter's work, superintending the construction of the railway bridge over the Ottawa, at Mattawa, on the Mattawa and Temiscamingue Railway.

CHAS. WHITLAW, senior partner in the milling firm of Whitlaw, Baird & Co., of Paris, Ont., died last month. He had been nearly half a century in business, and was much respected.

THE friends of Geo. P. Brophy, vice-president of the Ottawa Electric Railway Co., will sympathize with him in the loss he sustained the other day by the death of his two sons, Walter, aged 20, and Edward, aged 13. The unfortunate lads were drowned with two others while canoeing at Aylmer.

R. G. STEWART, civil engineer in the G.T.R. offices, Hamilton, fell from the platform of a moving train at that city on the 3rd inst. The wheels of the car passed over his right leg, and the foot was cut off clean. His condition is critical. Mr. Stewart is married and lives at Burlington.

GEO. E. JAQUES, the well known steamship forwarder, of Montreal, and manager of the Merchants' Line, took ill in a street car on the 3rd, and died shortly after being taken to a doctor's office. He had left his house in perfect health. Heart disease was the cause of death. Mr. Jaques was born in Montreal, in 1842.

P Bowler, formerly electrician, in the employ of the City of Westminster, B C, has removed to Montreal, Que, having purchased the Felix House, 505 Craig Street.

Manager S. R Break, of the Detroit Railway Company, has resigned his $2,500 position rather than work on Sundays. Mr. Break is a Canadian, formerly of London, Ont

John Wilson has for the third time been elected member for Govan, Lanarkshire, in the British House of Commons. Mr. Wilson is senior member of the firm of Thomas Robertson & Co., metal merchants, Montreal.

W. H Frost, proprietor of the Smith's Falls malleable iron works and brother of F T Frost, the Liberal candidate at the last election, is a candidate in the North Riding of Leeds and Grenville, Que. Mr Frost is also a Liberal

D. Stevens, several years inspector of steam boilers and machinery for New Brunswick and Nova Scotia, has been appointed General Marine Superintendent of the Dominion. J. P Esdaile, of Halifax, succeeds Mr Stevens as machinery inspector

Capt C F. Cox, assistant engineer in the Department of Marine and Fisheries, was drowned at Gatineau Point three miles below Ottawa. He was seized with cramps while bathing and went down in the presence of his wife and daughter.

R B Langdon, a large railroad contractor in the North-West, died at his home in Minneapolis last month Mr. Langdon, with his partner, Mr. Sheppard, built large sections of the C.P.R. between Portage la Prairie and the mountains in 1881-82

Professor Chapman, who has for so many years been connected with the University of Toronto in the capacity of professor of mineralogy and geology, has resigned It is understood J. B. Tyrrell of the Dominion Geological Department will be a candidate for the position, along with many others

The death of Mrs. Wm. B Parks, the wife of Engineer Parks of the ferry service, will be learned with deep regret by numbers of friends. Though the termination of her illness was not altogether unexpected, yet it came suddenly upon many who were not aware of its progress. The bereaved husband has the sympathy of the community in his sad loss.

J F Torrance, formerly of Montreal, was found dead in bed at Rossland, Ont., on July 17th. The cause of death is believed to have been paralysis Mr. Torrance was a well-known mining engineer, and had been connected at various times with many of the mining properties of Canada. He took his degree of B A at McGill in 1872, and proceeded to the study of mining engineering, in the faculty of Applied Science, in which he subsequently took the degree of bachelor.

Thomas L. Walker, M.A., of Queen's University, Kingston, and Robert O. King, B Sc of McGill University, Montreal, have each been awarded one of the scholarships founded on funds derived from the London exhibition of 1851. The scholarship entitles the holder to $750 a year for two years, while pursuing studies in foreign universities Mr. King, whose portrait appeared in a recent number of The Canadian Engineer in connection with honors he won at the last examinations at McGill, is a son of R. W. King, the inventor of one of the best automatic knitting machines known.

David MacCutcheon, a citizen of Montreal for the past thirty years, and well known in mechanical circles, died last month, aged fifty-one years. He came to Canada from Scotland thirty-three years ago, and was very highly esteemed by all acquainted with him He had been for twenty-eight years with Cuthbert & Son, machinists and brass founders, his employers placing a high value upon his integrity and ability He leaves two sons, Samuel H., of Boston, and David W., of the G T R. His widow and sons have the sympathy of their friends in their great loss, for Mr. MacCutcheon was a consistent Christian, and will be much missed

Chas. Macdonald, a young Canadian whom many readers will remember as an invited guest at the opening of the McGill Engineering Building (where he appeared as a vice-president of the American Society of Civil Engineers), has won the greatest prize of recent years in bridge engineering. His design for a railway bridge to cross the Hudson river between New York and Jersey City by a single span of over three thousand feet, nearly double that of the longest existing span, has been accepted by the New York State Bridge Commission. The total length of this bridge is less than that of the Victoria and other bridges in Europe and America, but it surpasses all others in that it spans the river from pier line to pier line, a distance of 3,110 feet, without intermediate support, and in that the cost is estimated at $25,000,000. It will be a six track railway suspension bridge, 125 feet in width, with steel towers 557 feet in height, resting upon foundations of solid masonry to a depth of 125 feet below high water. There will be twelve steel cables supporting bowstring steel trusses, hinged in the centre of the span, and rising 200 feet above the roadway at the highest point. The Union Bridge Company, of which Mr Macdonald is the senior partner, has guaranteed the construction within the estimate. This company has been reorganized since June 1, Mr. Macdonald's former partners having retired, and having been succeeded by Andrew Onderdonk, well known in Canada. Mr. Macdonald is a son of W S Macdonald, of Gananoque.—*Witness*

The Patent Review.

47,120 Davis Colby, Ore Roaster Company, Middlesboro, Kentucky, ore roasting kiln

47,122 Woolf Valve Gear Company, Minneapolis, engine.

47,124 W J. Anthistle, London, Ont., pipe mould.

47,127 E Julien and T. Berthiaume, both of Montreal, safety appliance for street cars

47,132 L. S. Beardsley, Nangatuck, Conn., supporting insulator for electric wires

47,136 M K Bowen, Chicago, street car heater.

47,144 Alexander Car Replacer Manufacturing Company, Scranton, Pa., car replacer.

47,146 A. Johnson and H C. Black, both of Oakfield, Cal., can making machine.

47,147 R McCully, Philadelphia, crushing machine.

47,148 A. S McCaskey, Chicago, electrical signalling system

47,150 C. Kimplen, Chicago, crushing or grinding machine

47,162 B. F Sparr, Brooklyn, steam engine.

47,163 J. D. Young, steam and hot water radiators.

47,167 Canada Switch Manufacturing Company, Montreal, lock for railway switch gear.

47,168 F. W. Wheeler, Montclair, N.J., pumping engine

47,171 A. Worthington, Brooklyn, sectional steam boiler.

47,177 J. M. Saland, Port St Père, France, method for utilizing exhaust from engines.

47,183 J. B Reed, Toronto, guard for street cars

47,193 Max Nirdlinger, Milwaukee, apparatus for manufacturing artificial fuel.

47,194 A. Worthington, Brooklyn, boiler setting.

47,199 D. N. Bertram, St. Katherines Works, Edinburgh, Scotland, pulp strainer.

M V Nichols and J. A Fraser, both of Port Arthur, electric trolley attachment.

47,210 The Choquette Canal and Harbor Dredging Company, dredging apparatus.

47,215 G Barnett and H. Barnett, assignee of J. Gosling, all of Philadelphia, method of forming rolls for manipulating metals.

47,217 D. F Réaume, Montreal, assignee F X. Gagné, St Aimé Que., art of making woven wire fences

47,218 A. R Durrenback, Alsace, Germany, boring apparatus

47,219 G A Seidel, Norristown, Pa., car coupler.

47,222 W J. Hinphy, Montreal, street car fender.

47,227 J. F. Gleason, F. S. Patch and W C. Spear, all of Quincy, Mass., device for filling joints of metal pipes.

47,244 J F. McIlroy, Albany, N Y., system of electrical distribution.

47,256 G. J Altham, Swansea, Mass., power transmitting apparatus

47,266 H W Nipper, London, Ont., steam engine

47,271 W. M. Gross, Spokane, Washington, excavator.

47,279 J D Grey, W. B. Price and A. Sharp, all of Baltimore, direct acting steam engine.

47,284 C D. Mosher, New York, steam generator.

47,289 Automatic Tank Company, Camden, N.J., water elevator.

47,293 J. B Hill, Bowling Green, Ohio, traction ditcher

47,313 H. O'Hara and J. A. Wallace, both of Melbourne, Australia, spark arrester.

47,316 Long Manufacturing Company, Cleveland, Ohio, dumping apparatus for railway cars.

47,317 J. B Brand, H. Shackell, and C L. Franklyn, all of Milwaukee, Wis., method of and apparatus for melting snow drifts.

47,325 H. A. Majewski, Berlin, Germany, process of and apparatus for manufacturing artificial marble.

47,338 The Mining and Dredging Power Company, New York, steam vacuum pump.

47,348 R. Powell, Cleveland, Ohio, nail machine.

47,362 E. E. Gold, New York, thermostatic steam traps.
47,367 T. Laverdiere, Village de Beaupre, Que., wire fence stretcher.
47,368 C M. Kimball, Toledo, Ohio. street sweeping machine.
47,399 Consolidating Car Heating Company, Albany, N.Y., rotary engine.
47,406 B. D McConnell, Cote St Antoine, Montreal, sewer well.
47,407 T. Craney, Bay City, Mich., evaporator.
47,412 J. A. Moys, Hampstead, London, Eng., centrifugal separator for molten metals.
47,416 J P Oliver, Brunswick, Colony of Victoria, Australia, machine for distributing or collecting metal on roads.
47,426 N. Burr, Batavia, Illinois, stave machine.
47,433 J O Beazley, Baltimore, vaporizer
47,442 R. G. Underwood, Yonkers, N Y., method of and apparatus for casting.
47,450 W R. Baker, Watertown, N Y., water closet flushing device
47,452 E. Heyde, East Saginaw, Mich., steam steering apparatus
47,460 Mining and Dredging Power Company, New York, dredge.
47,468 J B. Hall. Toronto, danger signalling device.
47,489 W Schmidt, Villa Henkel, Hesse Nassau, Germany, valve motion for steam engines, etc.
47,491 R Hunter, J W. Hackett and D Robertson, all of Vancouver, B C., method of driving circular saws.
47,500 L. T. Austin and B E. Cronkhite, both of Rossville, Ill., threshing machine.
47,504 A. B Woodhard, Wellsville, N.Y., machine for making wire fences.
47,509 J Vanes, Brazil, Ind., steam boiler
47,527 H. W Stebbins, West Carrolton, Ohio, paper pulp digester
47,531 E E Gold, New York, steam heating system for railway cars.
47,532 J. O. Pew, North Bloomfield, Ohio, fastening for metallic roofs.
47,537 S W. Cately and A. M Ettling, both of Cortland, N.Y., thill coupling.
47,548 Canada Switch Manufacturing Company, Montreal, switch lock for railways
47,550 W G Adams, Westport, N Y., rotary engine.
47,556 T A. Aldridge, Bridgewater, Somerset, Eng., roofing tile
47,564 W. P Skiffington, New York, and A G. Paul, Boston, method of heating.
47,565 Canadian General Electric Company, Toronto, lightning discharge protector for electric apparatus
47,566 Canadian General Electric Company, Toronto, detector for electric current meters.
47,568 Canadian General Electric Company, Toronto, safety device for arc lamps.
47,569 J. S Heaton, E. R Wilson, A. M. Webber, W. A. McGrath and M. L. S. Bunckener, all of Shelbyville, Kentucky, car coupler.
47,576 J. E Worswick, Americus, Georgia, and A. E. Worswick, Montgomery, Ala., car wheel brake-shoe and dresser.
47,582 The Western Wheeled Scraper Company, Aurora, Ill., road scraper.
47,583 J. M. Morris, Salt Lake, Utah, car replacer.
47,584 C. O. Thierne and A. Pelinski, St. Louis, Mo., machine for cutting boiler tubes.
47,600 A. E. Trevithick, Montreal, track-clearing apparatus.
47,613 C. V. Broughton, Buffalo, N.Y., signal telegraph
47,617 W. Armstrong, Toronto, Ont., pump.
47,632 A I. Gravier, Paris, France, dynamo.
47,642 F. L. Decaire, Montreal, apparatus for cleaning gullies.
47,647 C. Kimplen, Chicago, rock-breaking machine
47,650 G Wright and A. Allister, both of Winnipeg, deodorizing apparatus.
47,652 Gates Iron Works, Chicago, ore crusher.
47,653 W. C. Dillman, Brooklyn, railway switch
47,668 E. F. Steck, Chicago, water tower.
47,674 A. F. Murchie Kirkland, N.B., spark arrester.
47,678 C D Jermyn, Hamilton, Ont., tube boiler.
47,684 O Beaudry and C. Leblanc, both of Ottawa, device for operating switch.
47,705 E Foster, Leamington, Ont., feed steamer boiler
47,728 L. D York, Portsmouth, Ohio, rolling apparatus.
47,732 R. B Ham, Grand Rapids, Mich., combustible vapor engine.
47,739 J P. Roe, Pottstown, Pennsylvania, cover for manholes, etc.
47,755 J D. Pickles Buckland, Manchester, Conn., pulp beating machine
47,766 M. A. Kennedy, Pembroke, Ont., tree stump extractor.
47,784 C. F. Kaul, Madison, Neb., draft regulator for brick kilns.
47,789 A McDougall, Duluth, Minn., method of, and apparatus for, sub-aqueous mining.
47,790 E. Shydecker and H. S Brown, both of San Francisco, steam boiler.
47,792 E. Julien and T Berthiaume, both of Montreal, street car.
47,793 L O. Burk and D Hopson, both of Borning, Ark., valve gear for steam engines.
47,795 C. E Davis, Chicago, controller for electric motor
47,807 P. MacGregor, Ottawa, electric heater.
47,819 J. Cotter, Kansas, Mo., furnace and boiler combined.
47,828 P S Ross, Newark, N J., sub-aqueous rock-breaking chisel.
47,832 C. Klettner, Cincinnati, automatic railway car protector.
47,849 W. E. Everitt, New York, machine for spreading plaster, Paris green, etc.
47,850 J. F. McLaughlin, Philadelphia, closed conduit electric railway.
47,858 F. Stevens and R. R. Kesteven, both of Philadelphia, electric switch or circuit breaker.
47,859 J. H. K. McCollum, E. Crickmore, T. E B. McCollum, M. B. R. Gordon, J. W. Sweatman, and T. W. Hector, all of Toronto, Ont., electric motor.
47,865 The Thomson Houston International Electric Company, Portland, Maine, electro-magnetic reciprocating pump.
47,873 C. E. Hebard, Grand Rapids, Mich., electric uterine battery.
47,891 T. Heppell, Leafield House, Chesterle street, Durham, England, machine for cutting coal stone, etc.
47,900 J H. Finley, Buffalo, N Y., pneumatic elevator.
47,918 Canadian General Electric Company, Toronto, multiphase motor.
47,933 C. Wegener, Berlin, Prussia, furnace for burning coal dust.
47,794 E. L. Schanck, L Center, and H F. Owen, all of Delaware, Ohio, wire fence.
47,796 F. S. Mead, Montreal, gas engine
47,797 J. L Stambough, Standart, Texas, wrench.
47,815 J. A Caldwell, Bay Ridge, N.Y., steam boiler.
47,816 J. Deritis, Detroit, Mich., storm door and screen combined.
47,817 F. Engelhorn, Waldhof, Germany, method of preparing iron derivatives of albumen.
47,818 G Booth, Toronto, range boiler.
47,820 G. F Day and W. Hunter, both of San Francisco, Cal.
47,826 C. J. Reed and G. Stahl, both of Philadelphia, Penn., magneto electric inductive apparatus.
47,839 W Hinnicks, Milwaukee, Wis., machine for crushing, pulverizing, and mixing minerals, etc.
47,841 G. Hargreaves, Syracuse, N.Y., switch
47,842 J. E. Ronk and H. L. Shultis, both of Fort Wingate, New Mexico, aquatic bicycle.
47,844 T. Mounce, Toronto, hasp lock.
47,852 W. C. Lipi, Syracuse, N Y., nail.
47,855 S. R. Hawthorne, Hartford, Conn., roofing.
47,862 C R. Barber, Cleveland, Ohio, process of and apparatus for electro-plating.
47,863 Canadian General Electric Company, Toronto, multiphase motor.
47,867 G. H. Kinter, G. D. Teeler, and G. Tait, all of Buffalo, N.Y., car brake.
47,934 R. G. Beker and G. E. Small, both of Montreal, automatic rivet making machine.
47,935 Thomson-Houston International Electric Company, Portland, Me., electric railway.
47,936 H M. Paine, Newark, N.J., mode of controlling magnetic energy.
47,944 R. M. McDonald and A. McDonald, Dalmuir, Scotland, electric battery.
47,949 E. S. Manny and W. Robinson, both of Montreal, hot water tank.
47,951 E. Maloney, Rochester, N.Y., door knob attachment.
47,954 P. A. Myers, Ashland, Ohio, pump.
47,955 J. B. Van Vlack, Van Vlack, Ont., cold storage chamber.
47,965 M. A. de Palacio, Madrid, Spain, submerged way.
47,967 J. A. Kinsella, Lancaster, Ont., cutter for cheese boxes.
47,970 J. Cinnamon, New Brighton, N.Y., device for heating and ventilating houses, etc.
47,971 J. N. Murphy and G. F. Murphy, both of Springfield, Ill., steam valve.
47,977 S. G. Emerson, Tweed, Ont., sling lock.
47,979 L. C. Packham, Detroit, Mich., car coupler.
47,983 A. J. Fowler and J. Young, both of London, Ont., liquid fuel burner.
47,984 J. W. Abrahams and H. A. Merlin, both of Allegheny, Penn., sheet metal pipe.

47,895 R. S. Bozon, Birmingham, Eng., portable forge.
47,987 J. W Turriff, Toronto, street sprinkler.
47,991 S. S Casey, London, Ont., clip for metal and wire fences
47,993 T. J. Hume, Atchison, Kan., cash register.
48,000 J. T. B. Selman, Toronto, filter.
48,001 N P. Wedge, Shrondhyenn, Norway, wood-pulp boiler.
48,003 A R. Bostwick and J Duff, both of Detroit, Mich., fog signal.
48,005 A R. Davis and J. N. Bogart, both of Napanee, Ont., drain grading instrument.
48,011 H. S. Buckland, Fremont, Ohio, clamping device.
48,015 J. Whitesmith, Manilla, Ont., punch for reducing size of holes in metal plates.
48,018 G Fraser, New Glasgow, N.S., railway spikes and method of manufacturing same.
48 024 C F. Laib, New London, Wis., railway.
48,026 J. S Calkins, Hastings, and S. T. Rose, Kalamazoo, both of Michigan, reducing wheel for steam engine indicators.
48,027 F S Bond, Philadelphia, Penn., automatic funnel
48,030 C W Vanderburg, Wellington, B.C., steam generator.
48,034 E Wright, Worcester, Mass., pipe wrench.
48,035 B. W Smith, Delphos, Ohio, balance valve.

AMERICAN PATENTS TO CANADIANS.

Hanbury A Budden, Advocate and Patent Attorney, 517 New York Life Building, Montreal, reports to THE CANADIAN ENGINEER the following patents issued to Canadian inventors by the U. S. Patent Office.

541,226 Edmond N. Cusson, Montreal, die for stamping cigars.
541,389 Edward J. Devine, Port Arthur, Ont., electric train-signal.
541,156 David H. Ferguson, Montreal, tobacco-pipe
541,105 David Menard, St. Paul d'Abotsford, Que., horseshoer's stand
541,107 Economical Gas Apparatus Construction Company, Limited, Toronto, assignees, apparatus for the manufacture of gas.
541,116 Wm H. Pearson, jr., assignor to Economical Gas Apparatus Construction Company, Limited, Toronto, means for supplying oil to superheaters in gas-making apparatus.
541,127 John G Smith, Montreal, gas governor.
541,807 Harman Bunker, Barrie, press.
541,468 Robert Bustin, assignor of five-sixths to R. K. Jones, St. Johns, W. Vanwart and J. R. McConnell, Fredericton, N.B., car fender.
541,472 George Cunin, Montreal, machine for making crimped stove-pipe elbows.
541,737 John Galt, Toronto, hot water boiler.
541,610 Charles L. Higgins, Montreal, assignor, rubber boot or shoe
541,548 Eli H. Hilborn, Toronto, clip for attaching and holding in book-covers, counter-checks, manifold copy-books, etc.
541,766 Fred D Linton, Toronto, rotary snow-plow.
541,773 Frank S Mead, Montreal, gas engine
541,641 Wm. J Still, assignor to C. Riordon, Toronto, electric motor
541,580 Alfred E Trevithick, Montreal, track-clearing apparatus.
542,393 George B. Meadows, Toronto, Ont., treating wire cloth for screens
542,273 James H and A R Munro, New Glasgow, N.S., combined paper cutter, book marker and fastener.
542,375 Charles R. Scoles, Hillsborough, Ont., excavating machine.
542,292 Charles A. Sullivan and T. J. Best, Montreal Que., hot water circulating boiler
542,926 William J. Clarke, Trenton, Ont., electric annunciator.
542,875 Alexander Dobson, Beaverton, Ont., cleaning attachment for dust collectors.
542,799 Edward Gurney, Toronto, Ont., boiler
542,739 Eben Perkins, St John, N.B., machine for making horse-shoe nail blanks
543,420 David T Baxter, Hamilton, Ont., autographic register.
543,127 Thos. J. Byers, Eganville, Ont., carrying case.
542,993 A. A. Davidson, Victoria, B.C., device for baby food regulators.
542,994 Wm J. and R H Dawson, Cannington, Ont., invalid bed.
543,378 Robert G H. Dillon, Long Point, Ont., hand wheel cultivator.
542,989 Henry M Dinning, Montreal, Que., sash-fastener.
543,090 Grace H. D. Harris, Toronto, Ont., rug-fastener.
543,027 Joseph Lachance, St. Francois, Que., nut-lock.
543,139 Gedeon Pierard and V. Guinet, Montreal, Que., high or low water alarm for steam boilers.
543,054 Joseph P Rogers, Toronto, Ont., oil-can and lamp-filler.
543,410 C. H. Taylor, assignor of one-half to W. T. Ross, R. W. Sutherland and H. Millen, Montreal, Que., hydraulic air-compressing apparatus.
543,411 Assignor to J. R. Fair and H. Millen, trustees, Montreal Que., hydraulic air-compressing apparatus.
543,412 Assignor to J. R Fair and H. Millen, trustees, Montreal, Que., hydraulic air-compressing apparatus.
543,360 Wm. W. Towne, Danville, Que., heating-stove.
543,223 Joseph A. G Trudeau, Ottawa, Que., alternating electric motor.
543,070 Albert S. Weaver, Hamilton, Ont., bicycle.

AMERICAN PATENTS.

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

Selden S. Casey, London, Ont., metal fabric.
Jules Colas, Montreal, draining well.
Silas Fader, Vancouver, B.C., car for transporting coal, etc.
George McRinney, Hamilton, Ont., instrument for laying out stair-stringers.
James Morrison, Toronto, Ont., valve.
Daniel D. Wilson, assignor to W. B Close, Toronto, hand fire-extinguisher.
Thomas A. Briggs, Niagara, Ont., paper-feeding machine.
Wm. Chandler, North Bend, B.C., lamp-wick trimmer.
W. H. Laird, Toronto, and J. R. Barclay, Montreal, assignees, magnetic ore-separator.
John L. Jones, Toronto, cinder-shifter.
John A. Sinclair, Kingston, book-holder.
David T. Baxter, Hamilton, combined carbon-roll holder and temporary binder for manifolding tablets.
Charles W. Lutes, assignor to R. Muir, Winnipeg, tea-chest.
Joseph H. Mantion, Hull, Que., match-split coiling machine.
Henry E. Moffat, Galt, Ont., oil-extractor for exhaust steam.