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MISSING

The Canadian Engineer

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The Canadian Engineer.

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CIVIL, MECHANICAL, ELECTRICAL, LOCOMOTIVE, STATIONARY MARINE, MINING AND SANITARY ENGINEER, THE SURVEYOR, THE MANUFACTURER, THE CONTRACTOR AND THE MERCHANT IN THE METAL TRADES.

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CONTENTS OF THIS NUMBER

The articles now running in the Canadian Engineer on the Electrical Power Developments of Canada, will be reprinted in book form, with diagrams and folding plates. Price $5.00 per copy Advance orders received.

Subscribers who intend binding the last volume of The Canadian Engineer, and who require a copy of the index, will please advise us at once

INTER-IMPERIAL POSTAGE AND INTER-IMPERIAL TRADE.

It speaks volumes for the insight of the men who compose the Montreal Board of Trade that while they are all purely commercial men they have a statesmanlike perception of the influence of literature upon trade, and hence they were the first important organization to congratulate Sir William Mulock, the Postmaster General, on reducing the postal rates on newspapers and printed matter going to Great Britain to the level of our domestic rates. For four or five years Sir William Mulock has at various times asked the British Postmaster General to make the same reciprocal arrangement between the Mother Country and Canada, as has existed between Canada and the States ever since Confederation, under which arrangement printed matter is exchanged through the post-office at the domestic rate of each country, but the Canadian offer has always been met by that attitude of inertia which calls up Tennyson's characterization of "the stony British stare." However Sir William persevered and in the case of letter postage was able at last to get a mutual reduction to the penny (two cent) rate which has become a memorable postal reform by being extended to nearly all parts of the Empire. And now the fence that has barred out literature from easy circulation between the two countries has been partly broken down by the British office consenting to the admission of Canadian papers. books, catalogues, etc., at the domestic rate of Canada, We join the Montreal Board of Trade in congratulating Sir William Mulock on this step in advance, which is destined to have a momentous influence on the literary, social and trade relations of Canada and the Empire, because it is now only a question of a short time when cheap postal rates from Great Britain to the Colonies will follow as in the case of Imperial penny postage and the freer circulation of British literature over the British world will make itself felt in all phases of life.

A few Canadian editors having personal knowledge of the extent to which cheap newspaper and book and catalogue postage was being made the instrument of promoting the trade of United States manufacturers and merchants with Canada, and how this trade is maintained in spite of the preferential tariff in favor of British goods, took up the matter in the Canadian Press Association three years ago, and that association has done something to strengthen our Postmaster General's hands each year since.

The editor of the CANADIAN ENGINEER was asked recently to make a statement of the case for cheap postage as it bore on the trade of Great Britain with Canada. As the subject is of real importance to British and Canadian manufacturers we make a few quotations from this article, which appeared in *Britannia*, of London and Glasgow, a magazine devoted to the closer union of home country and Colonies :—

"Taking the term 'press' to mean not merely newspapers, but periodicals, books, and even trade catalogues, it is the writer's purpose to show, from the recent history of the press in Canada, that the Mother Country is in effect maintaining, in the form of postal restriction, a tariff wall against its own trade throughout the English-speaking world. And the same restrictions that are suffocating trade between the Mother Country and some of her most important daughter-nations is also beginning to stifle that free interchange of thought and sentiment which is the life of an Empire separated by the seven seas. The postal relations of Canada and the United States afford a striking example of the commercial benefits of an unhampered interchange of the products of the press, and the fact should warn the people of Great Britain against continuing a policy that chokes off a million pounds' worth of trade for the sake of a thousand pounds in newspaper postage.

Profit has never been an object in the postal service of either the United States or Canada, and, more than once, laws have been in force giving free transportation to newspapers from the offices of publication, on the ground

that the small loss in public revenue involved was more than recompensed by the educative influence of cheap newspapers among the people. This liberal view obtained in Canada as far back as 1851, an Act having been passed in that year and remaining in force till 1855, by which papers and periodicals devoted to education, science, agriculture, temperance and other special subjects, were carried free if published within the then Province of Canada. From 1859 to 1882 the charges on newspapers from publication offices varied from a small fraction of a cent. per copy (the papers being graded according to frequency of issue) up to one cent. a pound, but in the latter year all newspapers and periodicals from offices of publication became free, and remained so till 1898, except that free delivery was not accorded within the city or town where a paper was published. In 1898, to make up for the loss of postal revenue immediately incident to the introduction of the Imperial penny postage scheme (in which it will be remembered Canada led the way), newspaper publishers were assessed in postage at the rate of a quarter of a cent a pound, the rate being increased on July 1, 1900, to half a cent (one farthing) a pound. Even then free postage was not altogether done away with, as papers were allowed free to points within a zone of forty miles from the office of publication—though this is, it must be confessed, a rather illogical and certainly inequitable proviso, borrowed from United States legislation, by which it was intended that the rural newspapers should be "helped along" with a form of Government charity. . . . In such a large field for literary enterprise, and under such generous treatment, United States newspapers and the trade and technical publications are not only crowding British publications out of Canada, but have been for years rapidly gaining ground in South Africa, Australia, and, in fact, wherever the English language is the medium of printed thought; and everywhere they are heralding the introduction of American machinery and manufactures. With such a large home market for profitable subscriptions, the United States publisher can well afford to lose something on foreign subscriptions, if need be; though even here the loss is more than made up by the increased prestige he gets by bringing in foreign trade to his enterprising advertisers. The large circulation which United States technical and trade publications have obtained in recent years in Great Britain and her Colonies, is, in fact, one explanation of the great foothold American manufacturers are obtaining in the markets of British Dominions. This was exemplified strikingly in South Africa in such centres as Johannesburg, where skilful advertising, joined to the efforts of active agents, developed such a large trade in electrical, mining, and other machinery and manufactures up to the outbreak of the war, and again since the war closed . . .

Now, the effect of these cheap postage rates between Canada and the States is this: that a single mail train will sometimes bring into the Union Station at Toronto one hundred sacks of United States papers, or more than the total sacks of British mail matter (books, papers, and letters) passing through the same distributing centre in a whole week. Old post office employees can remember when the amount of British mail matter was at least equal to that coming in from the States . . . As a rule, the religious, educational, and technical papers and the higher class of literary papers of the United States are admirably conducted; but unfortunately, the United States papers having the largest circulation in this country are the "yellow" journals and equally "yellow" cheap magazines, that are most harmful to Canadian youth, and if Canadian public men do not see the baneful effects of this turbid tide in the present generation, they assuredly will in the one now growing into manhood and womanhood. Here and there, it is true, a British periodical still maintains a hold, but, as a rule, their Canadian circulations have declined almost in proportion as United States publications have increased. How could it be otherwise, with free trade in literature between Canada and the United States and on the other hand the enormous tax of eight cents (4d.) per pound on papers, etc., between this country and Great Britain?

Then, as to the commercial aspect of the question—not only have we this great circulation of the United States literature, but United States manufacturers also advertise largely in Canadian papers, and the result is seen in the remarkable circumstance that to-day, in spite of the fact that since 1898 British goods have entered Canada at a rate of duty 25 per cent. less than those from the United States, and 33½ per cent. less since 1900, United States trade with Canada is still gaining. That trade follows the press and not the flag, between countries with a common language, is clear from the postal history of these three countries, for not even the geographical contiguity of Canada and the United States can explain away the fact that, against tariff conditions adverse to the extent of one-third, the United States has increased her exports—chiefly manufactured goods—to Canada from $53,685,657 in 1891 to $110,485,008 in 1901, while Great Britain's exports here, which were $42,047,526 in 1891, stood at only $43 018,164 in 1901. Moreover, since the preferential tariff has been increased to 33½ per cent. in favor of Great Britain, her exports to Canada have fallen by over one and three-quarter million dollars, while those of the United States to Canada have increased by $640,000. . . . In their heart of hearts the people of the United States believe their manifest destiny in this twentieth century is to hold the primacy in the Anglo-Saxon world, in social and moral influence as well as in trade, and if they gain such a proud position it will be by the moral influence of their press. The ambition is not unworthy, but it is only sportsmanlike to arrange that the conditions for the friendly contest should be at least fair and equal. Will the British Government and people meet the demand of the times, or will they continue to fish on the plan of throwing the mackerel to catch the sprat?

COLOR PHOTOGRAPHY.

J. S Plaskett, a graduate of Toronto University, who has recently been appointed to a position in the new meteorological observatory at Ottawa, seems to have solved the problem of photography in natural colors, on which so many scientists have been experimenting for a long time, with more or less success. Mr. Plaskett first photographs through red, green and blue glass separately, and then takes the prints, which are of course in the complementary colors, super-imposes them and photographs through the three, the result producing the natural colors of the original. The register must of course be perfect or the colors will overlap and make a bad jumble. Ordinarily speaking the mixture of red, green and blue should produce black, but through some property of aniline dyes a dark red is produced. Mr. Plaskett has also succeeded by the use of ortho-chromatic plates and a yellow screen in eliminating the misty effects so often seen in photographs.

RAILWAY ACCIDENTS AND THEIR PREVENTION.

The remarkable epidemic of railway accidents to which we had occasion to refer in our last two issues has not yet died out. During the last month they have continued with more or less frequency, the most serious having been a smash-up which occurred on the Grand Trunk a short distance north of Guelph. A number of cars on the express left the track, without any apparent cause and rolled into the ditch, which was full of icy water. A large number of persons were seriously injured and two children drowned. The coroner's jury, while unable to fix the responsibility, recommends the appointment of a Government inspector, who shall examine into railway accidents, making an inspection of the wreck, condition of the track, etc., as far as possible before the wreck is removed and repairs made. This suggestion seems to be in the right direction, though there would be serious practical difficulties in carrying it out, as it might be impossible for the inspector to reach the spot within a reasonable time.

A collision on the C.P.R. near Cooksville, resulting in the loss of the lives of one or two trainmen, seems to have arisen from a somewhat similar cause to the terrible disaster at Wanstead, namely the placing of an inexperienced telegraph operator in a position of great responsibility. Cheap labor at the telegraph key means, as it does in many other positions, serious loss in the long run, far exceeding the temporary saving, to say nothing of the resultant loss of life.

In England the railways do not use the telegraph for dispatching trains, but are compelled by law to use what is known as the staff system. The system is simply this: At every station there is what is known as a staff master. He has a key to a room containing the tickets or permit cards which allow a conductor of a certain train to go on to the next station. This conductor takes the staff, with the key attached, to the next station, and the train coming the other way brings it back. The staff master is unable to get into the room and consequently cannot give out permit cards for conductors until he has the staff in his possession again. This means that the track is clear. If there are several trains to leave a station they are regulated, so that they run within, perhaps, ten minutes of each other, and the conductor of the last train leaving is given the staff. When it is returned, the staff master can release any other train that may be waiting. In this way no chance is taken with telegraph operators, and there is absolutely no possibility of a collision. The law provides that where a railroad is unable to use the system on account of the amount of traffic on its road, it must put down double tracks. An engineer, now resident in Canada, who worked for the Stockton & Darlington railway over thirty years ago, the staff system being then in use, says the road of a hundred miles of single track was so operated that there was never a life lost by two trains meeting between stations. The only disadvantage is that the system is slower than the telegraphic system used on this side of the ocean, as there must be some delay in changing staffs at every station. This is a trifling reason when we consider the loss of human life involved.

The loss of life among engineers is a serious matter too for the survivors. The Locomotive Engineers' Insurance Society has had an unusual number of assessments during the past four months. The Locomotive and Engineers' Journal for February gave notice of twenty-two engineers killed while on duty, the January number announced seventeen killed and the November and December issues sixteen in each month. Nearly every man met his death in a collision. Some means will have to be found to put a stop to this wholesale destruction of human life on the railways of this continent. If the companies will not adopt precautions the Government will have to step in and compel them to.

THE COAL COMMISSION AWARD.

The report of the Commission appointed last October, on the recommendation of President Roosevelt, to investigate the circumstances of the great anthracite coal strike, has been presented. In brief the Commission recommends a general increase of wages amounting to in most instances 10 per cent.; a nine hour working day; eight instead of twelve hour shifts and relief from Sunday labor without loss of pay for engineers, firemen and pumpmen; arbitration in case of disputes; a sliding scale by which the miners' wages are increased 1 per cent. for every 10 per cent. increase in price of coal; check weighmen to be paid by the miners; uniform distribution of mine cars and any increase in size of cars to be accompanied by proportionate increase in rate paid per car. There is to be no discrimination by either the mine owners or the miners on account of membership or non membership in a labor union; the present methods of payment for coal mined shall continue unless changed by mutual agreement; concerted effort on the part of the mine workers to limit output except by agreement with operators is forbidden; work is not to be suspended pending settlement of matters referred to arbitration; boycott and violence are condemned; the demand that coal mined be paid for by weight is refused; interposition of the State militia in the coal regions to preserve peace is justified. The commission recommends a stricter enforcement of the laws in relation to the employment of children; and legislation by the Federal and State governments, providing, when the public interests call for it, for compulsory investigation of difficulties, similar to the investigation which this commission has made.

The miners are not satisfied with the award—it could hardly be expected that everyone would be. They are very much disappointed because payment by weight is refused, as this was one of their most important demands. It is to be earnestly hoped, notwithstanding this disappointment, that the effect of the award will be to prevent such another strike as occurred last year, with its disastrous effects upon all classes of industrial pursuit.

An estimate is given of the losses occasioned by the strike. These losses the commissioners estimate as follows:—To the mine owners, $46,100,000; to the mine employees in wages, $25,000,000; to the transportation companies, $26,000,000.

INDEPENDENT TELEPHONES.

We are glad to notice more healthy signs of public attention to the telephone question, which has become for Canada a more serious problem than it is now, or ever was, in the United States. When the Canadian Bell monopoly is defended, and its interests even advocated, by a cabinet minister as was the case when this company's application for an increase of capital came before parliament last year, it is time the people of Canada, and especially those intrusted with the governance of our cities and towns, begin to realize what new tribute will be laid upon them in the near future as fresh power is acquired. The remarkable development of the work

of independent telephone companies in the U.S. in recent years of which we have given statistics continues and the Bell is no longer the dread of cities and communities who formerly felt helpless in the grasp of that great corporation. The light is fairly dawning in Canada now, too, and news items in this issue show that our cities and towns are at last beginning to realize that their souls are their own. This dawning light comes not so much because the cities and towns have not felt that they were charged excessive rates for a very indifferent service with antiquated instruments, as because local men with money are now waking up to the fact that independent companies properly organized and with the sentiment of the people at their back have a really good investment by which the profits of the telephone business may be retained in their own town and reward their own enterprise instead of swelling the too-well-filled pockets of a few rich men in other cities.

But after all the question of starting independent companies should be determined, not by a feeling of resentment against the Bell monopoly, however much this feeling might be justified, but by a cool calculation on the part of local investors as to whether they can give a better service to the people, at a more reasonable price, and at the same time secure a good return for the money invested. The remarkable thing in the history of the independent telephone movement in the States is that in spite of the poor management of many of these local companies starting as they have without previous experience and putting in unwisely chosen managers, there have been scarcely any cases of absolute failure, while those few cases of unprofitable investment have been due to causes which would have shown worse results in almost any other business.

It is gratifying to learn that Port Arthur and Fort William, whose well equipped independent systems were described in a recent issue, have shown themselves proof against the blandishments of the Bell Company, which would be delighted to take over and pay for the municipal systems now working there. As will be seen in our news columns Toronto Junction is moving to have a municipal system of telephone, and Hamilton is considering a second offer from the United States. Welland, Ont., and Newtonville, Ont., are establishing independent exchanges, while in Montreal some New York gentlemen have just purchased the franchise of the Merchants' Telephone Co., a local competitor which the Bell Company thought it could safely neglect.

Let the good work of independent telephones go on and later on the question of long distance connections can be dealt with by legislation in the interest of independent companies when they become a stronger aggregation. The problem of long distance connections is not so serious a drawback, as we have already shown. In the course of ordinary business the majority of out-of-town calls are within a radius of fifty miles, and groups of independent companies working together can supply these calls in the majority of cases; and where longer distances are to be reached the Bell is still available to those who wish to pay the rate. The opinion of Mayor Urquhart, of Toronto, who is a lawyer and has studied this matter, is that the solution of the long distance problem is to be found in legislation compelling the Bell Company to furnish at a reasonable rate, connections with local companies whose subscribers require such service.

—The magistrates before whom the charge of conspiracy in the Bell Telephone case came at Whitevale failed to agree, one being for conviction the other for acquittal. The matter has however come before a higher court, an indictment having been laid against the company at the sessions for the County of York. The Grand Jury found a true bill, but the parties were not ready to go on and the trial was laid over till May. The penalty, if found guilty, is in the case of companies, a heavy fine.

—A deputation of about fifty, representing the Canadian Manufacturers' Association, waited on the Government at Ottawa on March 19th, to urge a re-adjustment of the tariff. The deputation stated that the Association was preparing schedules suggesting what changes should be made, which they would submit to the Government in confidence, but the Minister of Finance thought they should be made public. Of course no intimation was given as to what the Government intends to do, and the budget speech will be awaited this year with more than usual anxiety.

—Recent statistics of the iron ore trade of the United States show that the market for Lake Superior ores is developing in a marked manner in comparison with ores from other districts. This means that in years of depression when the demand slacks off, many of these other mining regions will drop out of the producing list, while Lake Superior will remain in evidence. In view of the mining areas that await development in the Superior district north of the United States boundary, this fact will have a significance to Canadian trade.

—It is announced that under a charter, amended and re-enacted at the last session of the Dominion parliament, work is to begin in the spring, on a canal connecting the Richelieu river at St. John's with the St. Lawrence opposite Montreal, a distance of 18¼ miles. It is to be pushed vigorously and completed within two years. The canal must have a width of not less than 80 feet at the bottom and a depth of not less than 9 feet, but we are informed it is to be made 14 feet deep so as to correspond with the St. Lawrence Canals, with provision for an increase to 21 feet. This is an old scheme revived. It is a short cut and will save 83 miles of a detour by way of Sorel, but it may have the effect of diverting some Canadian trade to New York, the St. Lawrence route not being an attractive one in the eyes of marine underwriters.

—Although on the market less than four years the steam turbine of the Parson's type appears to have made its way rapidly as a generator of electrical power by alternating current. The employment of turbo-generator units of low frequency and high voltage appears to give high efficiency as well as to save floor space. The Westinghouse Machine Co., which makes this type of steam turbine, reports that it has in successful operation 4,000 kilowatts of this class of generator and has 75,000 k.w. contracted for. Among railway plants that are being thus operated are the Metropolitan Ry. Co. and the Metropolitan District Ry. of London, Eng., aggregating 30,500 k.w. for operating the London "Tube" and surface railway systems. The former plant will employ three 3,500 k.w. units and the latter eight 5,000 k.w. units, the largest turbine machinery yet contracted for. Two United States railway installations are those of the Cleveland, Elyria & Western Ry. Co. and the Consolidated Railways and Lighting Co., of Wilmington, N.C., each of which will

generate alternating current power at a central station, employing transmission lines and rotary converter substations along the right of way. It is claimed that the steam turbine has proved itself to be specially adapted for operation in parallel, whether as a reserve power in connection with steam engine driven machinery or for operating central stations or industrial establishments. The fact that the Hartford Electric Light Co. and a large factory in Connecticut have added to their first installations of the turbine is pointed to as a proof of the commercial success of this type of power producer.

—It will be a surprise to many to learn that horseless vehicles were known in the middle of the sixteenth century, and that steam was their motive power long before the same agency made possible the railway. As early as the thirteenth century, Roger Bacon predicted that vehicles would be propelled by machinery, thereby causing himself to be suspected of the Black Art. For three hundred years afterward no one succeeded in manufacturing such a conveyance as Bacon imagined. Then, Johann Haustach, of Nuremburg, invented a machine which would actually move along the road, driven by powerful springs. His best record was a mile and a quarter in an hour. The year 1763 saw the first steam car, invented by Cugnat, a Frenchman. It was a success, and the inventor was instructed to make a steam gun carriage for his Government. The vehicles of Cugnat and Haustuch were both tricycles. The latter applied his power by a ratchet on the front wheel. Scott Russell, who designed the Great Eastern, added to his reputation about sixty years ago by building an automobile which was so useful that it was operated as a coach in Glasgow. It was so cumbersome and so noisy that its use was prohibited. For 45 years automobiles were dead, till about ten years ago they were revived in France, M. Serpollet being the first to bring out a fast-running and handsome carriage. Appearance, safety, speed, durability, cheapness—these are the demands on the manufacturer to-day. The last has not yet been reached, but as the price for the bicycle came down, so will it with the automobile, and a first-class motor-carriage can probably be had before long for $200. One of the most novel uses to which we have heard of the automobile being put, is hunting deer and other big game in Colorado. In one case a band of deer actually followed the carriage. Some of the cowboys tried to lassoo it.

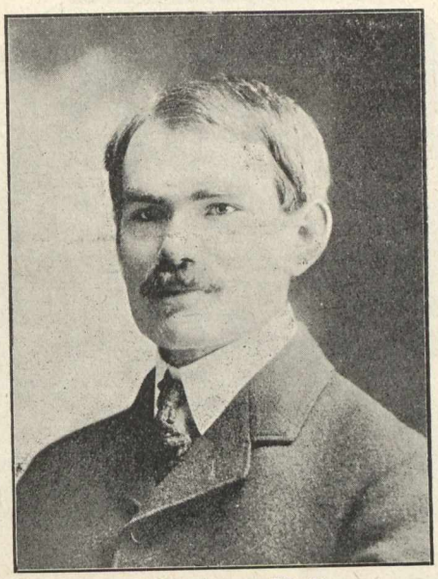
THE DE FOREST WIRELESS TELEGRAPH SYSTEM.

The de Forest wireless telegraph system is the invention of Dr. Lee de Forest, Ph. D., a graduate of Yale University, of the class of 1896. Dr. de Forest's work at Yale was supplemented at the Armour Institute of Technology, Chicago, in whose laboratories the constant and untiring efforts of the inventor were devoted to the problem, and the present invention is the product of years of patient research and experimentation along original lines.

Practically all systems, except the de Forest, use the induction coil for sending, and as receiver the old Branley coherer tube, with the tapping or decohering device introduced by Popoff, and improved by Marconi or Tissot. The disadvantageous features entailed by the use of the coherer are: the necessity of a mechanical decohering device; the complication of apparatus involved; its uncertainty of action, and, most important of all, the time lag, by reason of which the speed of word transmission is limited to the capacity of the receiving instruments, and on account of which great care must be observed by the sending operator not to exceed in speed the ability of the receiving instrument to record his messages. Fifteen words per minute is the maximum speed of the coherer systems. With the advent of the de Forest-Smythe responder, the receiving device of the de Forest system, and the most important element in space signalling, this condition assumes a different aspect, inasmuch as the responder is absolutely automatic in its action, obviating the necessity of coherers, decoherers and induction coils, affording absolute precision and accuracy in operation, simplicity of construction, and rapidity of word transmission, in this instance only limited to the skill of an operator. Under ordinary conditions a speed of forty words per minute can be easily maintained. It is extremely sensitive, even to weak currents, enabling the apparatus to work over long distances.

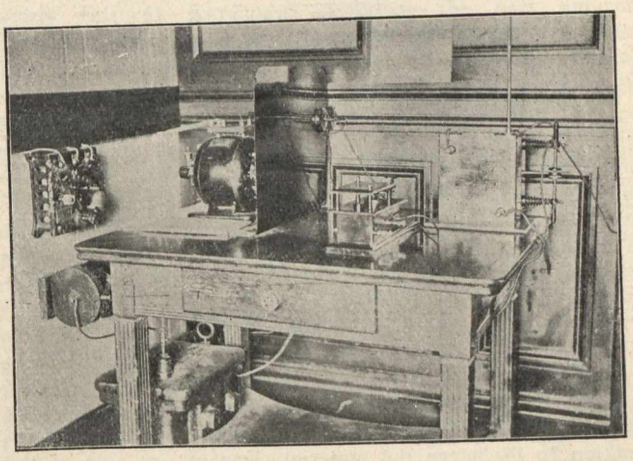
The messages, or aerograms, as they are officially known, are sent with a Morse key, exactly like that used in sending messages by wire. The dots and dashes, which are recorded at the receiving station by waves of electricity, are taken from a telephone receiver. The apparatus required is neither very extensive or complicated beyond the understanding of those who have only an elementary knowledge of electricity.

The de Forest system is based on an alternating current of electricity. Where a direct current is used, at points



Lee de Forest, Ph. D.

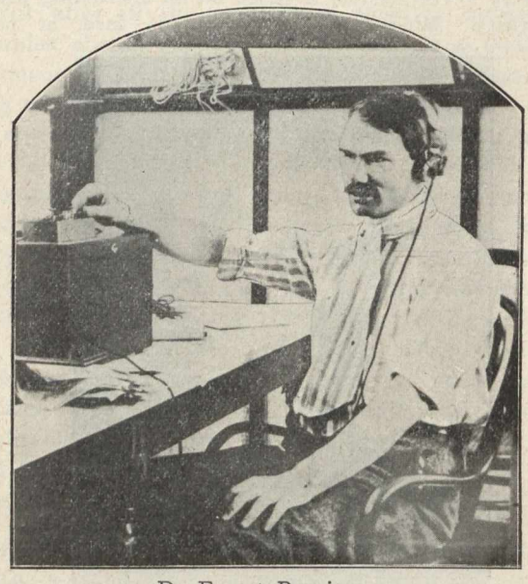
where the company has not erected its own power stations, a motor-generator is used to turn it into an alternating current. The current passes through a step-up transformer, which increases the voltage or pressure and reduces the amperage of volume. In one test ten amperes were taken from the lighting wires and transformed into 25,000 volts and half an ampere. The current then goes into the condenser,



De Forest Transmitter.

which is charged with the total voltage. An ordinary telegraph key is connected with the condenser. The condenser and the upright wires from which the messages are discharged are separated and at the same time connected by a

narrow opening called a spark gap. When the key is held down, electrical oscillations or waves are automatically discharged from the condenser across the spark gap into the upright wires. These oscillations are very rapid, running about 120 a second. When released from the upright, or sending wires, they travel with the velocity of light, which is 186,000 miles a second. Dots and dashes are produced by manipulating the key. Each dot is made up of many oscillations, but they are so close together that all that can be distinguished is a sharp crack. Dashes are made up of so many more oscillations that they sound like a roar. Oscillations from the sending wire induce similar oscillations in any similar upright wires they encounter. These induced or sympathetic oscillations at the receiving wire break the current in the anti-coherer or responder, which the de Forest system employs as its receiving instrument. The current in the responder flows through a fluid conductor composed of oil and water. When the electrical waves from the sending station shoot down the wires at the receiving station into the responder they generate gas bubbles in

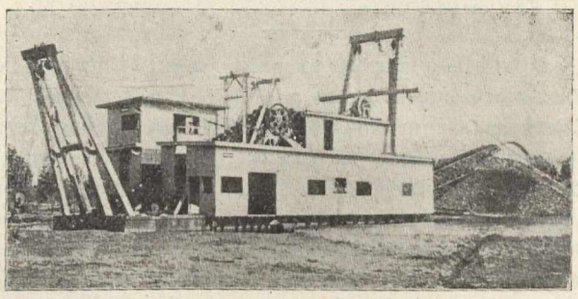


De Forest Receiver.

the fluid. Being non-conductors, these bubbles interrupt the local current, and repeat the dots and dashes released hundreds or thousands of miles away. A telephone receiver is connected with the responder, and the operator hears the clicks produced by each wave. The dots come in as a short series of clicks. They are easily read. It is in the anti-coherer or responder that the de Forest system differs particularly from the Marconi system.

ELECTRIC DREDGE FOR ATLIN.

A new development in the Atlin District in British Columbia is the introduction of gold dredges. A dredge of this class is being built by the Western Engineering and Construction Company, of San Francisco, and will be operated entirely by electricity. The power will be generated by water, and at a point two miles from the dredging ground, and will be transmitted by wire. The dredging machine proper will be similar to those in use in the Oroville District in California. The machinery includes buckets to take the material from the bottom, a steel copper into which the gravel is emptied, revolving screens, a separate chute for carrying off large stones and boulders, and a sluice-box for saving the gold. The stone-chute will be of sufficient height and inclination to discharge the material clear of one side of the boat, so that no obstruction can take place on account of the accumulation of tailings. The fine material will be carried off at first by sluices extending over the stem of the dredge. A tailings elevator will be provided when it becomes necessary to stack the tailings at a greater distance from the bolt. The Atlin gold is generally coarse and easy to save, but the dredge will be provided with finer screens and gold-saving tables, to be used if it should be found necessary. The machinery for this dredge will be carried by steamer to Skaguay; then by the White Pass and Yukon Railway to Caribou; by teams to Tagish Lake; across that lake by steamer and then on the narrow-gauge portage road to Atlin Lake, where a steamer will carry it to its destination. The season in Atlin is very short, and work is being rushed with the expectation of having the dredge in operation by next July. The utilization of water-power through the medium of elec-



Electric Dredge for Atlin.

tricity will be of special advantage in Atlin, where fuel is scarce. The electrical equipment, which is supplied by the Westinghouse Electric and Manufacturing Company, includes two 180-K.W. belted alternators, which are to be driven by waterwheels; two type F, variable-speed induction motors, with controllers; two standard type C induction motors for driving the pump, one of 20-h.p., and the other of 50-h.p., and a 15-h.p. type C motor for operating screens.

STEAMBOAT ENGINEERS FOR THIS YEAR.

The following engineers have been appointed to the vessels named, in addition to those mentioned last month: Steamer Paliki, Arthur E. Foote; str. Theano, Richard McLaren, second engineer; str. Midland Queen, J. G. Fisher; str. Midland King, E. Abbey; str. Lord Stanley, John Nesbit; str. Hiram Dixon, R. Grierson; str. King Edward, Samuel Beatty; str. Tionesta, L. Smith.

PIG IRON PRODUCTION IN CANADA.

The production of pig iron in Canada for 1902 shows an increase of 74,581 tons, or over 30 per cent., as compared with 1901. The total production in 1902 was 319,557 tons; in 1901, 244,976 tons; in 1900, 86,090 tons. Of the production in 1902, 302,712 tons were made with coke, and 16,845 tons with charcoal. The basic pig iron was a little over one-third of the production, namely, 107,315 tons and bessemer iron 9,000 tons. Spiegeleisen and ferromanganese have not been made since 1899. On December 31, 1902, Canada had 14 completed furnaces, 7 in blast and 7 idle. Of these 9 were equipped to use coke, 4 to use charcoal, 1 to use mixed charcoal and coke. In addition 4 coke and 2 charcoal furnaces were built or partly built.

The following table gives the total production of all kinds of pig iron (including spiegeleisen and ferromanganese) in Canada from 1894 to 1902. The figures are in long tons:

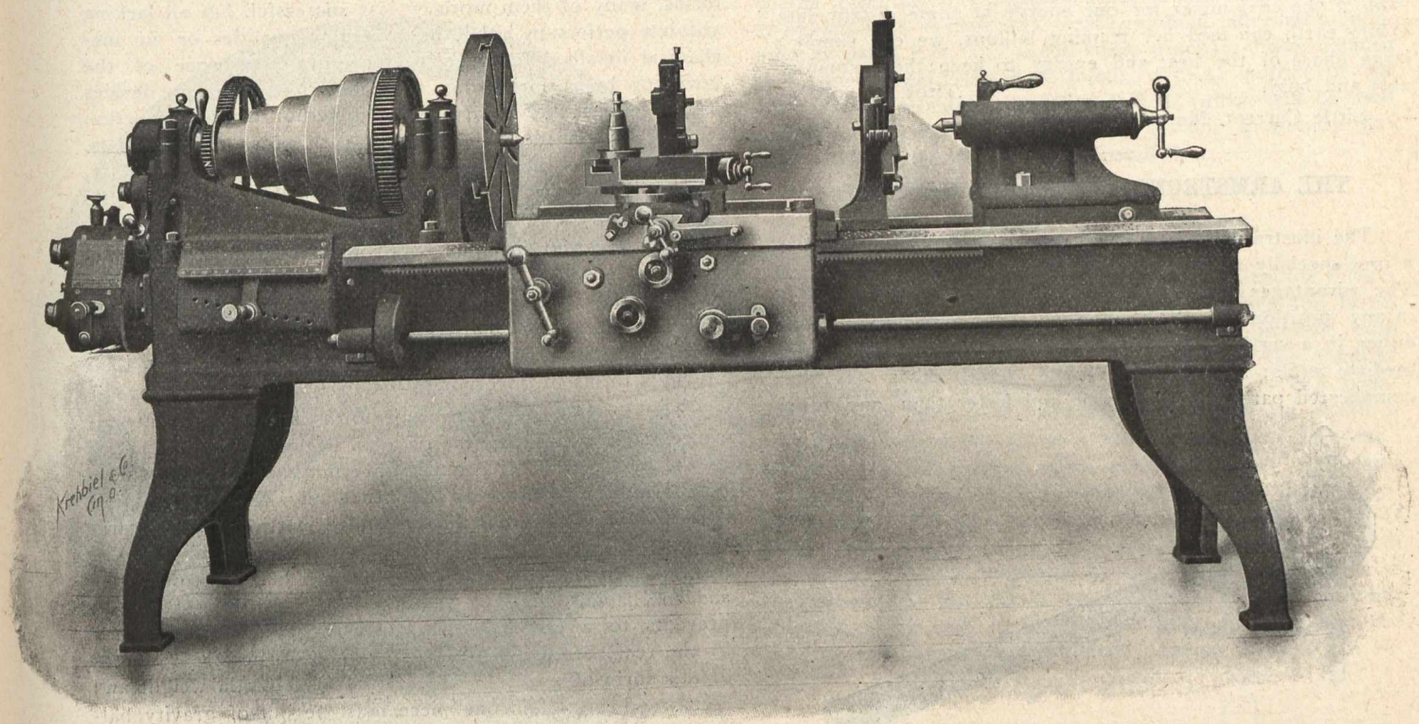
1894	44,791	1899	94,077
1895	37,829	1900	86,090
1896	60,030	1901	244,976
1897	53,796	1902	319,957
1898	68,755		

On December 31, 1902, the unsold stocks of pig iron in Canada amounted to about 20,000 gross tons, as compared with 59,472 tons at the close of 1901 and 12,465 tons at the close of 1900. The above figures come direct from the manufacturers, as given to the American Iron and Steel Association.

"THE AMERICAN" LATHE.

The American Tool Works Co., Cincinnati, Ohio, is placing on this market, through its Canadian agents, the Fairbanks Co., of Montreal, an 18-in. lathe, known as the "American." It has a range of forty-four changes of thread and of forty-four changes of feed instantly obtainable without removal of a gear, and it is said the entire series of threads or feeds can be obtained, each change complete, and ready to work, in thirty seconds. The headstock is massive, and the cone has five steps for wide belt. In connection with the back gears, ten changes of speed are available, arranged in geometrical progression. Spindle is of a high carbon, special steel, accurately ground, with large hole running through it. Spindle bearings are of the best quality of anti-friction metal, and are provided with automatic ring oilers. Tailstock is of the offset type, which permits the compound rest to be set in a plane parallel to the bed. Set-over screws and a graduated scale are provided for turning tapers. The bearing on the bed is long. The spindle is of large diameter and has liberal movement.

Carriage is substantial; is provided with liberal T slots, and is gibbed to bed its entire length. Bearings on the V's



are not recessed but have a scraped contact the entire length. The lead screw is located on the inside of the bed, and imparts motion to the carriage directly under the cutting tool. This construction obviates all that tendency to twist or lift the carriage off its seat. The screw-cutting feature has many points of excellence. All gears are cut from the solid and all shafts are made from high carbon steel, accurately ground. The four-speed box is mounted on the head end of the bed, and by means of clutch members, operated by suitable knobs conveniently located, four changes are instantly obtainable. This in connection with a cone of eleven gears, mounted on the inside of bed, any one of which can be engaged instantly by means of a sliding tumbler gear, makes forty-four changes obtainable, as stated.

ELECTRIC POWER FROM ONTARIO WATERS.

As the ownership and use of Niagara are likely to be live questions during the present session, it may be well for your readers and the public generally to take stock in our hydrodynamic assets at large. In Western Ontario (the peninsular portion), we are apt to think that our only supply must come from Niagara and the Grand river, with a little from the Thames and smaller streams. But while this may be true to them, the Government and Legislature are bound to take a wider view, and act for the good of the whole people—future as well as present. I think that to give municipal enterprise a free hand with Niagara is right; but let the provincial power (and cash), be reserved for a grand development of the latent possibilities of our grand country. To make my meaning plain to the untravelled reader, I premise that two great plateaux occupy the centre of Eastern North America. The more southerly, lower, and smaller is now partially filled with water, and forms the basin of the St. Lawrence and the Great Lakes, with their fertile banks and arable plains. This is 230 feet above tide level at Kingston, and nearly 600 feet in Lake Superior, which latter figure gives the maximum power derivable from that basin and its tributary waters. Of this amount, Niagara river concentrates one-half in about forty miles, and the available portion, 163 feet, in one grand cataract, whose power equals that of a million of Mazeppa's fiery steed. But it is very costly to harness, and its very size precludes the hope that it can ever be made wholly available. The centre of the peninsula portion of Ontario has no lakes, and its elevation is not enough to give its streams much power. What there is has been fairly well utilized and is very valuable.

The second plateau is a granite ridge, widening in many portions to more than a hundred miles, and is in shape nearly like an Esquimaux snowshoe—the heel entering Ontario at Gananoque, and extending and widening to Lake Simcoe, and flattening at North Bay to allow the Ottawa Ship Canal a ready passage. It again expands going northwestward, and once more contracts a little at Rat Portage, where our interest in it ends. It is crossed back of Kingston by the Toronto line of the C.P.R. and Kingston and Pembroke railways, where a specimen section can be examined. Its base is Laurentian rock in irregular hills and pinnacles, with the intervals filled with lakes, peat bogs, or clay flats—all retentive of water. Its whole length is about 1,050 miles, and its average width nearly 100, giving an approximate area of 84,000 square miles, all well adapted as a grand reservoir for the rains of summer and snows of winter. And it discharges uniformly round its whole vast circumference of about the length of the main line of the C.P.R. in cascades toward the Great Lakes by a short, steep incline, and towards James' Bay by an abrupt escapement of about 1,200 feet, and then gentle plains toward the sea. Imagine, if you can, the Moose waters as a fan, 300 miles from east to west along the rim falling over cliffs of lime and sandstone, 1,200 feet in a few miles, then converging,

with frequent long lakes and occasional rapids, to one channel, as it enters the Arctic waters at James' Bay. There is probably nothing to surpass it on earth, unless it be the east side of the Andes, and the north slope of the Altar mountains in Liberia.

Much of this plateau is arable, some well timbered, all healthy; and the fish, peat, mines and hunting will render it desirable, even though its winters sometimes touch 40 to 60 degrees at the highest points in extreme snaps. Its slopes are all available for the purposes of civilization; and a belt line of electric railway would practically encircle New Ontario and much of the older portions as well. Its fuel resources are grand—firewood, peat, coal or electric energy are available on the whole circuit; and a population of twenty millions might live sumptuously on its developed resources. Such a treasury of health, wealth, and power ought to remain ever in the hands of a Government whose sole aim would be to conserve its capabilities for the good of its inhabitants.

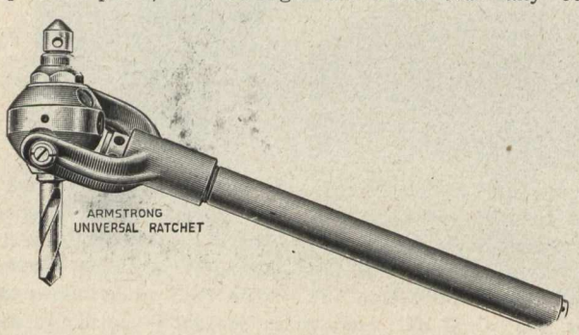
Only a competent examination of a circuit of about 2,700 miles, and say 100 up and down each stream would justify a definite valuation, but enough has been written to satisfy your readers that we are one of the great powers of the future, and allay all fears that we will become the servant of the coal miner for our energy at some distant date. While earth can feed her teeming billions, we can supply a large share of the heat and energy to keep them comfortable and busy.

THOS. FROOD.

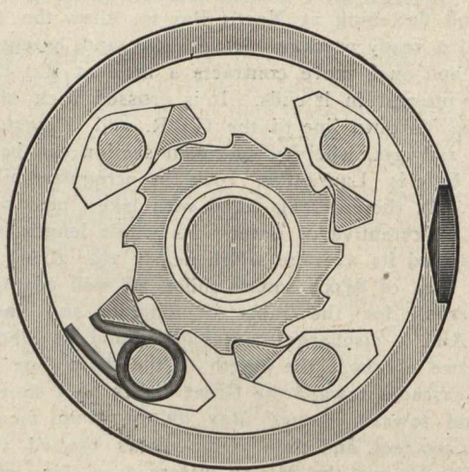
Little Current, March 20th, 1903.

THE ARMSTRONG UNIVERSAL RATCHET.

The illustrations show the Armstrong Universal Ratchet, a tool specially adapted to drilling holes in cramped places. The advantages claimed for it are that it will drive a drill in any position where it is possible to move the handle either in a vertical or horizontal direction or at any intermediate angle; it has no ball joints, bevel gears or other complicated parts; it is stronger and faster than any other



ratchet; it is useful where the ordinary ratchet is useless; for ordinary work the handle can be rigidly fixed, almost instantly; its use will often save the great expense and loss of time incident to the disconnection of heavy machinery



for needed repairs. The movement of the tool is a new one. Even a vertical motion of the handle will drive the drill, and two inches of motion is sufficient. In No. 6 size, there are twelve large teeth in the ratchet and five pawls which engage one at a time. Thus the pawls catch sixty times in a revolution, giving greater speed than other ratchets. The ratchet has been adopted by the United States navy, and is made in two sizes, No. 4 and No. 6, by the Armstrong Bros'. Tool Co., Chicago, U.S.

THE ROBB-ARMSTRONG-SWEET GOVERNOR.

The design of centrifugal governors has occupied the attention of engine designers and builders ever since steam engines have been used, and particularly of late that form of governor which is placed in the fly-wheel of the engine and is attached to, or forms part of, the valve-driving mechanism and arranged to vary the point of cut-off of steam in the cylinder automatically. It has been found especially difficult to get a governor powerful enough to operate the valves and valve gear regularly and, at the same time, to give sufficiently close and quick regulation to meet the very exacting requirements for driving electric generators, particularly for lighting or combined lighting and power service and for parallel operation of alternating current generators. This type of governor has appeared in almost numberless forms, many of them more or less successful, but all lacking absolute perfection either in governing qualities or in mechanical details. In order to prevent disturbance of the governor by reciprocating valves, various friction devices have been used as a part of the governor or in connection with it, such as double eccentrics, dash pots, drag springs, etc., and while these give a certain measure of stability, they prevent quick regulation and are liable to cause the governor to race or hunt.

The governor invented by Professor John E. Sweet was a decided advance over earlier types, having a less number of parts, only one weight and one spring, the governor system in perfect gravity balance in all positions, and great centrifugal power with less friction in the moving parts than previous forms of governor.

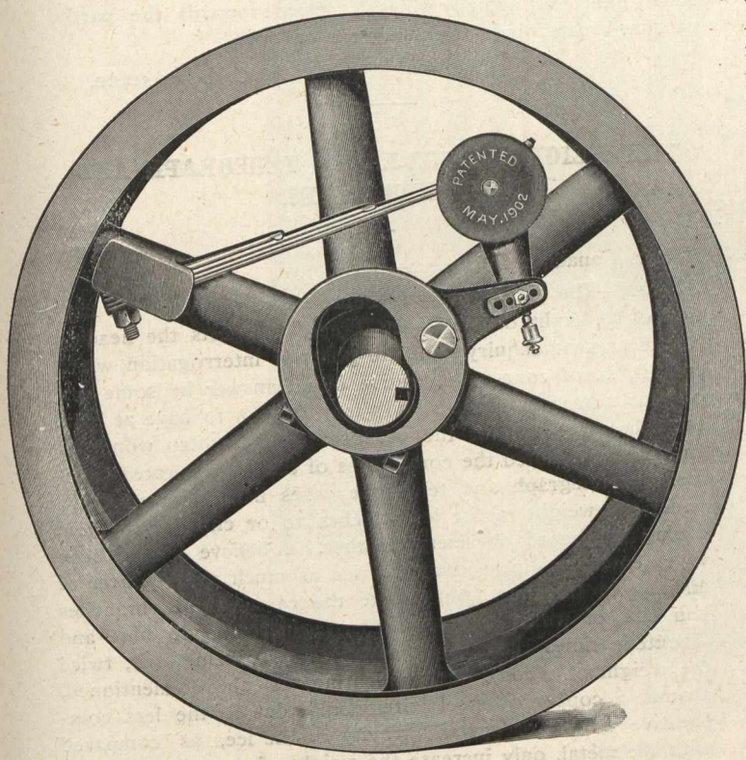
The Rites' type of governor forms another step in advance, as it utilizes the inertia of a heavy weight suspended in the fly-wheel to give quick governing. The arrangement of the inertia governor is such that any change of speed causes the fly-wheel and the suspended inertia weight or arm to which the eccentric is attached to change their relative positions, so that the cut-off is changed quickly to meet a sudden change of load. The inertia of this heavy arm also prevents, to a certain extent, disturbance of the governor by the reciprocating motion of the valve. The disadvantages of this form of governor are (1) that the inertia weight and eccentric being all in one piece must be out of gravity balance in order to have centrifugal force, and the governor system not being in balance, is caused to oscillate, especially at slow speeds. (2) The strain due to the centrifugal force and gravity of the heavy inertia arm is carried directly by the suspension pin, making great pressure and friction on that pin, which is not easily lubricated; therefore, both from the absence of gravity balance and because of the increased strain and friction, the designer cannot introduce very much centrifugal force, with the result that the regulation is influenced greatly by any variation in the friction of the valve or valve gear, tight or loose packing of the valve rod, change of steam pressure, etc, and if the suspension pin gets dry, as it is liable to do while moving under heavy pressure, the governor is sure to regulate badly. (3) Although inertia tends to overcome friction and cause quick movement, unless the movement is controlled by powerful centrifugal and centripetal forces, the governor will not be stable, and the Rites' type of governor cannot have these powerful forces without being correspondingly out of gravity balance, nor without great strain and friction on the suspension pin.

The real controlling power in a governor depends upon the amount of the unbalancing of the centrifugal and centripetal forces, and this may be made sufficient in amount (1) by a great change of speed, or (2) if the centrifugal and centripetal forces are strong, a small change of speed will cause a considerable unbalancing of the forces and a cor-

respondingly quick change of the governor to a new position where the forces are again in balance. If there were absolutely no friction or inertia in the moving parts of the governor, any unbalancing of the forces would cause the governor to move instantly to a new position where the balance would be restored. The more friction there is, the slower the mechanism will adjust itself to the new position, and the effect of slow movement is to allow a further change of speed, and that the governor will move too far and then come back, with the result that there will be a constant hunting to find the proper position.

In the Robb-Armstrong-Sweet governor, the centrifugal weight is carried by the spring directly, so that the heavy strain due to centrifugal force is not brought on the suspension pin, which merely carries the eccentric and is not subject to any strain or friction except that due to the driving of the valve gear. The governor system is in gravity balance in all positions, because the eccentric is made to balance the centrifugal weight, the principle of balancing being the same as that invented by Professor John E. Sweet and employed in the Straight Line engine governor.

The centrifugal weight may be very heavy without bringing undue strain on the spring, because a large part



of its centrifugal force is carried by end pull on the flat leaf spring, so that the inertia of the weight is sufficient to prevent disturbance by the reciprocating motion of the valve gear, and the weight is so placed that it also gets the effect of inertia for quick regulation. The result is an extremely simple and powerful governor, in which there is not enough friction to prevent the governor from changing position almost instantly, and no possibility of racing when properly adjusted.

The eccentric being under reversing strains, from driving the valve gear, allows the oil to reach the rubbing surfaces of the suspension pin and brush, so that there is practically no friction or wear. Other important advantages are that by means of a similar adjustment of the link connecting the eccentric and centrifugal weight, the governor may be adjusted to any degree of sensitiveness or close regulation; if desired, the engine may be made to vary only one revolution from no load to a full load, and the operating engineer by simple directions may change the speed of the engine at any time.

In short, the results obtained with the governor are very remarkable and without precedent in the whole experience of the engine building trade. High speed engine governors are ordinarily tricky pieces of machinery, with unlimited ability to make trouble; they are prone to get out of adjustment even with the best of attention and certain to do so if the care is but ordinary. Only an engineer who has had experience with various types of governors can properly appreciate the ease and certainty with which the necessary adjustments are made on this one, and the absolute integrity with which they are maintained. In these respects it stands alone—no other governor compares with it in these all-essential qualities.

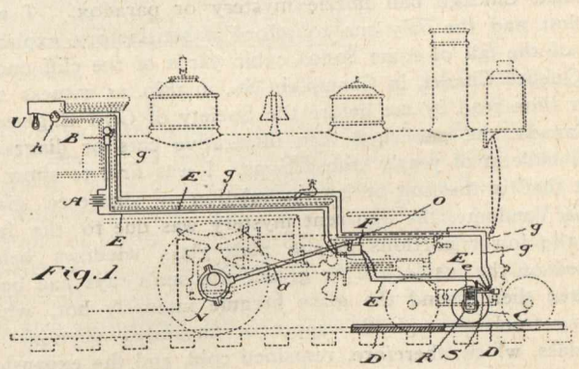
This governor is the joint invention of Mr. E. J. Armstrong, of New York, and Messrs. D. W. and A. G. Robb, of Nova Scotia, based on Professor Sweet's invention, and is patented in the United States, Canada and European countries.

ELECTRICAL IRRIGATION.

Electrical machinery is coming to be widely used for purposes of irrigation in the arid regions of the West, and is transforming deserts into well cultivated and productive fields. The Consolidated Canal Company, of Mesa, Arizona, is arranging to furnish water for a large area and is installing in its power plant the following apparatus, recently purchased from the Westinghouse Electric and Mfg. Company: A 300-kilowatt, three-phase, revolving-field alternator, running at 400 R.P.M. and 11,000 volts, which is direct coupled to a water wheel; also three 50-h.p., type C motors of 200 volts, 7,200 alternations, and 850 R.P.M., which will be used in operating irrigation pumps. All of this machinery has been shipped and is now being installed.

AN ELECTRIC TRAIN SIGNAL.

The illustration shows an invention to lessen the danger of accidents on railways, made by Wm. J. Hare and James P. Hare, both of Toronto. Its object is to prevent both rear-end and head-on collisions. It will warn the engineer of a switch which is open, and, accordingly, acts as a semaphore, but it informs the engineer that trouble is ahead a long distance from the ordinary semaphore, switch, or drawbridge. The invention is called an electric train signal, and its working is effected by electric power, which is generated in the cab of the locomotive, by means of a dynamo or batteries. The current passes to a commutator situated under the boiler, which is connected by an eccentric to the axle of the locomotive; this causes a vibratory motion in the commutator, which reverses the current alternately, so that the positive and negative wires change position at each half re-



volution of the driving wheels. From the commutator the current passes to a wheel specially constructed, which consists of a combination of several parts, but which when put together is as solid as one piece of metal, though one-half is perfectly insulated from the other, so as to allow the current to flow out on one side of the wheel returning by the opposite side. An intermediate rail is necessary, so that the current may pass from one engine to another. This rail is a wood stringer and is a trifle higher than the ordinary steel rails. Two pieces of metal, which act as conductors, and not weighing more than eight pounds per yard, are placed on top of the wood stringer, but separated from one another by a piece of the stringer which projects between the con-

ductors. The current from the specially constructed wheel which touches the intermediate rail, and which is situated between the pony wheels on the locomotive, flows out of one side of the wheel to the conductor on the intermediate rail; this current connects with the current from the wheel on the approaching engine or with the switch or semaphore, draw-bridge or station house, and thus a complete circuit is formed, as the current passes through the commutators on both engines and from one to another along the two conductors on the intermediate rail. The result of this complete circuit causes the ringing of a bell in the cab of both locomotives, so that the engineers are aware that there is danger either ahead or behind. The inventors claim that they can regulate the circuit to suit the requirements of the road, from a half mile and upwards. The circuit is regulated by the voltage. The reason for the intermediate rail being higher than the ordinary rail is that where two tracks cross one another it must disappear, and the special wheel consequently clears all railroad tracks at a crossing. The current at all crosses and switches is carried underneath by means of wires which rejoin the conductors on the other side, all the switches must be equipped with the intermediate rail in order to notify the engineer on an approaching train that a switch is open or closed. In order that the locomotive engineer may be aware that a switch is open, another mechanical device is necessary. An apparatus, which works automatically, is located at the switch. It is placed in a box and allows the current to pass through it, and thus causes a complete circuit, which causes the bell situated in the cab of the locomotive to sound the warning of danger. This device renders a semaphore unnecessary, as the engineer is aware of its position long before he reaches it. The station master and crossing-keeper are also provided with an apparatus by means of which a circuit is formed, thus enabling them to communicate with an engineer on a moving train, at almost any desired distance.

THE FLAT IRON BUILDING, NEW YORK.

Editor, Canadian Engineer:—

SIR,—The New York Herald calls upon scientists to explain how it is that the effect of wind currents of high velocity, 40 to 54 and up to 72 miles per hour, at the Flat Iron Building, New York, had the effect of blowing windows outward, instead of in the opposite direction. Though not vain enough to call myself a scientist, I was certainly (and be it said to the honor of Canada), the first to explain the so-called Chicago ball nozzle mystery or paradox. I was the first and the only one to afford a satisfactory explanation of the fall of some 80,600 cubic yards of the cliff under the Quebec Citadel, in Champlain St., in 1889, as witness the paper then read by me before the Society of Civil Engineers of Canada, and published with illustrative cuts or diagrams in its bulletin of yearly transactions. I was first to show in court that in the suit at law in relation to shattered glass at the Vendome, the apparent mystery was due to the fact that the lower portions of the plate glass windows being painted on the inside a dark green, the sun's rays had been arrested thereby and the glass became intensely hot, while passing freely through the upper or unpainted portions of the glass, which, therefore, remained cold, and the expansion of the heated portions tore them away from the remainder of the plates, in the same way as on pouring boiling water into a thick-bottomed tumbler, the difference in expansion between this and the thinner sides of the tumbler causes the one to separate from the other. I explained to the satisfaction of English engineers the anomaly between the indications of the anemometer and the 20 per cent. and 40 per cent. discordances witnessed on a trial of wind pressure at the Firth of Forth Bridge, in Scotland, and the Tower Bridge over the Thames in London. It was I who explained to the satisfaction of the United States press why during the cyclone which some years ago visited the city of St. Louis, Mo., the walls of houses along the track of the tornado were found to have fallen outwards or upon the public thoroughfares. instead of inwards, as it was supposed they should have done.

Well, I think I am on the right scent in this case of the wind vagaries at the New York Flat Iron Building, in attributing the projecting outwards of the smashed windows to the fact that the velocity of the wind left a vacuum in its wake, and that the atmospheric pressure from within, reacting against this more or less rarefied outward air, caused the glass to burst outwards, and fall, as the fragments are said to have done, on the adjoining sidewalks and carriageways. A fact analogous to this is presented in the action of the so-called venturi hydrometers or water meters, which remained a puzzle for some time, on account of the pressure at the throttled portion of the pipe being so much less than on the full-sized bore at either end of the throttle, due to the greater velocity of the water through the smaller bore of pipe. That the velocity of the wind should be responsible for such a vacuum in its wake is abundantly proved, and can be witnessed by anyone, when, after the passing of a street car at less than half the velocity above mentioned, and in fact at about only one-tenth of such velocity—eight to ten miles an hour—any stray piece of paper or other such light substance may be seen to rush after the car, and when one feels actually oneself drawn towards the partial vacuum created by the passing car or train.

C. BAILLAIRGE,

THE WEIGHT OF ICE-LADEN TELEGRAPH AND OTHER WIRES.

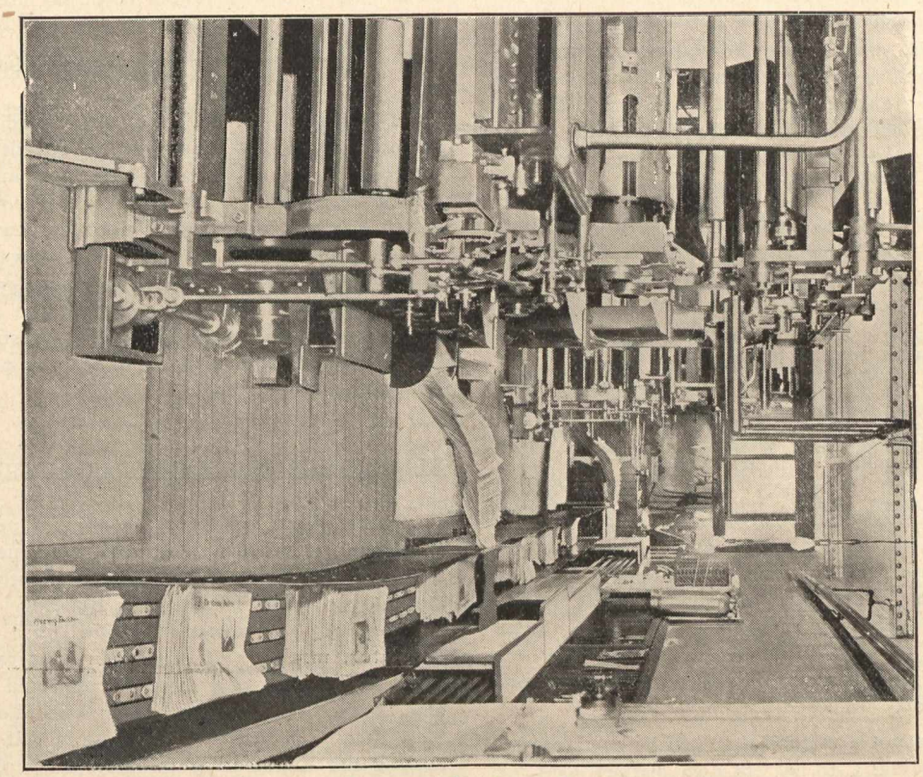
Editor, Canadian Engineer:—

SIR,—The article in your February issue, under the caption of "Weight of Ice-Laden Trees," suggests the heading to the present enquiry, and the point of interrogation which ends it, is, of course, suggestive of an answer by some one of your numerous readers, who may happen to have at hand the necessary data for the purpose. I have often wondered and almost doubted the correctness of the oft-reiterated statement of telegraph and telephone wires being broken down under the weight of the ice attached to or clinging to them during a blizzard or sleety weather. I believe I have seen wires enveloped in a coating of ice as much as a quarter of an inch in thickness, but unlike the cases of the branches you cite, of which the weights were increased to nine and seventeen times their original weight (i.e., being, say, twice the weight of wood), such a coating, as above mentioned, around a copper or steel wire would, due to the less comparative weight or specific gravity of the ice, as compared with the metal, only increase the weight of the wire by about 100 per cent., or renders it double its original weight, when coated with ice ¼-inch thick. Without going into closer calculations, it suffices to say that since a steel wire, for instance, in addition to its own weight, will bear so many more times its own weight, as due to the stress upon it, in the case of a suspension bridge, it could not possibly give way under the slight additional weight of such a coating of ice as here supposed. Now then, Mr. Editor, what is the truth of this statement of wires giving way before a storm. Do the wires actually break or part at any portion of their stretch or span from post to post, or is the expression, "wires broken," merely due to the wires being blown down from the posts, and thus grounded in a way to render them inoperative, or to portions of the line being blown over, posts and all; or, again, does it happen that the wires are sometimes more thickly incrustated in ice than supposed by me, and to what extent more thickly, and to such an extent as to render them impotent to bear their own weight? or, again, is it that the force of the wind may sometimes in bringing down a portion of a line, posts and all, thus create such a jerk or thrust upon a wire as to cause it to snap asunder? Will you or some one of your now numerous and well informed correspondents enlighten me on this head?

C. BAILLAIRGE,

CONVEYER FOR PRESS ROOM.

A carrier, having some novel features, has been installed in the press room of the Philadelphia Evening Bulletin. There are three parallel roller chains, of special design, running on edge. The conveyer trough is of sheet iron and of sufficient depth to carry piles of 200 papers safely. The action of the carrier is steady and practically noiseless. Its trough occupies scarcely two feet in width and it winds in a tortuous course around various obstructions in the most amazing fashion, always with the same easy movement. Mr. Loveland, chief engineer of the Evening Bulletin, has supplied an auxiliary carrier from the fly box of each press to the side of the main carrier. It consists of two parallel Ewart chains, which convey the papers from the fly box to a shelf alongside the trough of the conveyer. The fly box is thus able to stand upright and to easily lift the papers, in counted bundles of fifty to the chains of the carrier. The movement of this auxiliary carrier is so timed that the ink dries sufficiently in transit to prevent smudging of the papers in handling. There are seven large quadruple presses in the Bulletin press room, each turning off 16-page papers finished at the rate of 48,000 per hour. Before the introduction of the link-belt carrier, fourteen men with fourteen trucks were kept busy carrying these papers from the fly-boxes to the circulation department. The carrier does away with all these men, their confusion and wages, and does the work better, quicker and with unvarying efficiency. Mr. McLean, the president, states that if the carrier did not save a penny in wages, it would still be a good investment, because it dispenses with the maddening confusion of fourteen healthy men rushing to and fro with their fourteen trucks in the none too ample avenues between the rapidly moving presses. The Link-Belt Engineering Company, Nicetown, Philadelphia, who devised and installed this conveyer, make conveyers for various purposes, and appear to be able to adapt the means to the end for almost any purpose.



Conveyer for Press Room.

ADVANTAGES OF ACETYLENE.

M. Masi, a prominent Italian scientist, who has recently completed an extended series of observations upon the hygiene of acetylene lighting, found that the gas in burning consumes less oxygen and gives off less carbonic acid gas and water vapor than is the case with other methods of lighting, excluding, of course, the electric light. In a confined locality it produces less heat than either gas, candles or petroleum, and it does not give rise to ammonia, nitrous acid or carbon monoxide. M. Masi's conclusions are that acetylene does not present any more danger from explosion than gas or petroleum, and that it is cheaper for a given candle power than all other methods of lighting.

The brick work over the boilers in the engine room at the pulp mill at Hawkesbury came down with a crash recently, carrying with it several steam pipes, and several men were scalded.

A. Leschen & Son's Rope Company, manufacturers of wire rope and aerial wire rope tramways, with headquarters at 920 to 932 North First St., St. Louis, Mo., have opened an office and warehouse at 1717—1723 Arapahoe street, Denver, Colorado. This gives them four branch offices and warehouses in addition to their headquarters at St. Louis, the others being New York City, Chicago, and San Francisco. The A. Leschen & Sons Rope Company not only manufacture all of the ordinary grades of wire rope, but they are sole manufacturers of the Hercules Colored Strand Wire Rope and of Patent Flattened Strand Wire Rope. They also manufacture automatic tramways, which load and unload automatically, likewise several types of friction grip tramways, and also single line and two-bucket tramways.

ELECTRIC WELDING.

W. L. Gorton, of Cleveland, Ohio, writing about electric welding, says that it has been looked upon as of only laboratory or purely technical interest. A number of the larger manufacturers of the United States are now using it with marked success. Electric welding machinery is made almost entirely special for the various classes of work to which it is to be adapted. The requirements for the process are, first, alternating current of 40 to 50 cycles, and 100 to 300 volts difference of potential. The machinery for doing this work is made in sizes from 1 to 150 kilowatts. The metal to be welded may be from the smallest size wire to sections containing from 12 to 14 square inches. The

welding machine is a plain alternating current transformer (usually of the oil or closed type), mounted in a wrought or cast metal frame securely bolted to two plain gun metal or copper platens or tables on which the clamping device for holding the various objects to be welded are placed. Some machines are built where the motions are practically automatic, for welding wires in circles, tires for baby carriages, etc. These machines are not built for any larger capacity than ¼-inch square metal or its equivalent. On top of the platens is fitted devices for holding any form of work which it is feasible to electrically weld.

The capacity of machines varies according to the cross-section of material to be welded. A small automatic machine for welding No. 9 or 10 wire has a capacity of 5,000 to 6,000 welds a day, while the larger apparatus welding from two to four square inches of iron, or metal, in round, hexagon, square or rectangular shapes would have a capacity of from 200 to 500 welds per day respectively. The amount of energy required for doing the work is directly in proportion to the cross-sections of metal to be welded together within the time that the weld is made. To illustrate, if 20-h.p. is required to electrically weld one square inch of wrought iron or steel in 40 seconds, double that horse-power would be required to do it in half the time; however, if 80 seconds are taken the horse-power element will not be exactly halved, due to the conducting effect of the clamps holding the work, which becomes, when long time is required, an important element in the horse-power taken to do the work.

It is probable that there is not a large manufacturing establishment in the country in which a great number of welds are made daily where electric welding could not be advantageously applied. It is necessary, however, to plan the work distinctly for electric welding, as the application of this method in the same line as former methods is not entirely successful, and for that reason more than any other, electric welding has not become popular because the manufacturer would not introduce a machine into his works which would take the metal as it had usually been prepared for the forge and electrically weld it, and further would not consider a modification of the forms to meet the conditions required. So marked an advantage has accrued to a number of pioneers in this line, that despite the fact that the process is at the first start expensive, owing to the equipment, it is now generally recognized, where a large number of pieces are required to be welded having uniform cross-sections, as being the most reliable, trustworthy and least expensive method.

Electric welding is not a method that will be ever universally adopted for welding. It has its own distinct field of usefulness, and every manufacturer would do well to examine carefully its merits to be certain that he is not missing by failure to equip his factory with this process, an important element tending towards labor saving and the increase of his profits.

ENGINEERS' CLUB OF TORONTO.

The Engineers' Club of Toronto held two meetings during March. On the 5th a discussion took place on the subject of Ventilation, Heating and Plumbing, led by A. M. Wickens, who arrived at the conclusion that the Plenum system fulfilled all the requirements better than any other, especially where ventilation is of the first importance. On March 10th the Club attended a meeting of the Ontario Association of Architects, and took part in a discussion upon the Standard of Building Construction, adopted by the Canadian Fire Underwriters' Association. The question was opened in a paper by J. B. Laidlaw, in which he pointed out that the underwriters are seeking to encourage a better class of construction with lower rates. The danger of shingle roofs was also brought out. The advisability of having a uniform thread for fire hose was also advocated, so that if called to a fire in another city the appliances could be used. Chief Thompson, of the Toronto Fire Brigade, who was present, is to see what can be done in this matter. On March 20th the Club listened to a paper on Railway Location, by Prof. J. G. Kerry, of McGill University, Montreal. We hope to give this paper in a future issue.

FLOW OF MOUNTAINS.

An official of a railway which runs through the Rocky Mountains is convinced that the mountains are always on the move. "We find from actual experience," he says, "in maintaining tunnels, bridges, and tracks in the mountains, that the mountains are moving. It costs a railway passing through the mountains a great deal of money in the course of ten years to keep the tracks in line, and maintenance of tunnels is even more expensive. Drive a stake on the side of a mountain, take the location with the greatest care, and return after a few months, the stake is not in the same location. The whole side of the mountain has moved. This experiment has often been tried, and in all cases the result proves that the mountains are moving. The mountains are gradually seeking the level of the sea."

CANADIAN ELECTRICAL ASSOCIATION.

The annual convention of the Canadian Electrical Association will be held this year in Toronto, on Wednesday, Thursday and Friday, June 10th, 11th and 12th. The local committee consists of all members of the Association residing in Toronto, with J. J. Wright, as convener. P. G. Gossler, of Montreal; A. A. Dion, of Ottawa, and J. J. Wright, of Toronto, are a committee to award prizes for papers of superior merit. It is expected that the convention will be largely attended, especially by the Western members, and that the programme will combine in a profitable degree instruction and pleasure.

ELECTRICAL EQUIPMENT AT QUEEN'S UNIVERSITY

Lately there has been placed in Queen's University, at Kingston, a modern electrical equipment costing $5,000. Most of it is located in the handsome structure just erected and known as the Engineering Building. At present electricity for light and power is supplied by a 25-kilowatt 110-volt generator, made by the Canadian General Electrical Company, of Toronto, and directly connected to a McEwen engine, made by the Waterous Engine Works Co., of Brantford, Ont. The exhaust steam from this engine is used for heating the Engineering Building, and connections are made so that measurements can be taken in the way of experimental work for the benefit of the students. In connection with the light and power plant, a 110-volt storage battery, of 320 ampere hour capacity, is installed. Provision is made so that when the need arises the capacity of this battery can be enlarged to 560 ampere-hours. This battery will be charged by means of a booster, direct-connected to a motor, and will be arranged to automatically assist the generator when the load reaches a certain amount. Provision is also made for the installation of two more separate generating units. The storage is primarily intended for experimental purposes, but is used for lighting during the evenings and when the power load is small. For experimental work there is a specially designed, 10-kilowatt, rotary convertor, made by the Westinghouse Company, of Pittsburg, Pa. This convertor will give either a two or a three-phase current, and is intended to change the direct current from the power plant to an alternating current for general experimental work. It is excited from a small exciter, placed direct on the shaft of the converter. This method of excitation secures uniformity in speed when the converter is changing direct current to alternating, and is the very latest method adopted by the Westinghouse Company. Two kilowatt transformers, arranged for changing three-phase to two-phase, raise the voltage of the alternating current from the rotary to the standard voltage of 110 or 220. This converter can also be used as an alternating current generator, being driven by separate direct current motors. For ex-

perimental work a 10-h.p., 220 volt induction motor, made by the Westinghouse firm, has been placed in the well equipped electrical laboratory. This meter is supplied by the rotary above referred to. There are about 1,000 lights (incandescent), in the lighting system, but there are seldom more than half this number in use at any one time. The wiring and lighting system is the most modern obtainable, and was mostly done by the electrical firm of Breck & Halliday, of Kingston, Ont. In the wiring, standard precautions have been taken to guard against fire. The experimental electrical laboratory also contains a number of small direct-connected motors, and various other auxiliary equipment, such as standard ammeters, volt meters, watt meters, etc., etc. In this plant the latest tendencies to so install storage batteries that the surplus energy (when the load on the dynamo is light), may be used to help out the dynamo when the load is heavy, have been taken advantage of.

It is the intention to add to the equipment again next year and the outlook is that every portion of the engineering department will in a short time be as modern and adequate for instruction purposes as in the older engineering schools. Most of the electrical apparatus was placed in position under the direction of Professor L. W. Gill, B. Sc., who has charge of the Department of Electrical and Mechanical Engineering at Queen's. There is a growing demand for training along these lines. The School of Mining started eight or ten years ago, with but eight students in engineering, but there are now about one hundred and fifty.

FUTURE ECONOMIES IN COAL CONSUMPTION.

Competent authorities have reckoned that even now we do not get more than 10 per cent. of the calorific value of the coal consumed, taking one source of consumption with another. Clearly, then, if we get, says the Iron and Coal Trades Review, but 10 per cent. of the available energy, there is yet a vast field for the exercise of engineering skill in reducing the enormous waste of 90 per cent. Lord Armstrong stated, some years ago, that without carrying economy to extreme limits, all the effects now realized from the use of coal could be obtained by an expenditure of half the quantity. Economy in the use of coal may be obtained in the following directions: 1. A more perfect combustion—that is, from the same amount of fuel more heat units must be developed. 2. Improved appliances for saving this heat and transmitting it into energy. Not only must these increased heat units do more work, but each individual heat unit must directly develop more energy. 3. Recuperation of so-called exhausted energy—that is, the heat must continue at work until the actual limit of exhaustion has been reached. The use of gases instead of solid fuel is an example of the first direction in which we are to look for improvement in the more economical use of fuel, and a great deal is being done in this direction both at home and abroad. [While there is doubtless a great amount of waste in the direction indicated, we question whether it amounts to anything like 90 per cent.—Ed. Engineer.]

THE B. GREENING WIRE CO.

The works of the B. Greening Wire Co., Limited, of Hamilton, have been extended very much during the last twelve months. Their handsome and commodious offices, built upon the site of the old office, are now occupied, and the increase in the staff employed there gives some idea of the largely increased business this company is enjoying. There is a special three-story brick building put up this year for the manufacture of poultry netting, which is one of the new lines only recently introduced, but which has gained such a reputation on the market that the company has already had to put up this special building and double the plant; and the product of the enlarged plant is sold up to its full capacity. The weaving plant has been largely added to, and a new tower for painting fly cloth has been erected. This firm has now been manufacturing wire rope and weaving heavy wire cloth for upwards of fifty years, and can justly claim to be not only pioneers in that line of business, but also in wire drawing. Wire is made here for all purposes, besides the products of wire, such as wire rope of different grades, wire cloth from the heaviest steel mining screens, slab or refuse burner tops for sawmills; all kinds of drying floors, such as oatmeal and malt kiln, woolen and cotton drying floors, for grain cleaning machinery in grist mills, threshing machines and fanning mills, down to the finest wire cloth; also perforated metals in steel, zinc, brass, copper and aluminum, and, in fact, everything that can be made in wire.

The Messrs. Greening are descendants from an old family in England that have always been in the wire business, Nathaniel Greening having started the firm that is in existence to-day at Warrington, England, in 1799. The present firm here was started by Benjamin Greening, in 1858, and incorporated by his son, S. O. Greening, president of the present company, in 1889. The firm has a warehouse at 422 St. Paul street, Montreal for the convenience of Eastern customers, where everything is carried in stock, with Mr. J. H. Hanson in charge.

SMALL GAS ENGINES USING CITY GAS.

Among the papers read at the annual meeting of the Canadian Society of Civil Engineers was one by Homer M. Jaquays, of the Applied Science Department of McGill University, on the economy of small gas engines using Montreal gas.

The author referred to the development of the gas engine in the past ten years as being little short of marvellous, and went on to say: Notwithstanding the fact that most attractive thermodynamic problems and possibilities of high heat efficiencies were always presented by the gas engine, its development during its early growth was neglected because of the difficulties, chiefly mechanical, that necessarily had to be overcome before it could become of practical use. Manufacturers, following the path of least resistance, strove by improving the steam engine to obtain greater economy in heat engines; and indeed obtained the desired result. But with the high pressures used at the present time in the multi-cylinder engines, it is obvious that, without superheating, the limit of economy in this direction has been practically reached. Accordingly, during the past ten years serious attention has been directed to internal combustion engines, and the rapidity of the gas engine's development has amply repaid all work done towards its improvement. Previous to 1893, the majority of engineers were doubtful about the gas engine as a prime mover; to-day units of 2,000 to 4,000 horse-power are being constructed, while those of 1,000 to 1,500 horse-power are in operation.

Herbert A. Humphrey gives, in Engineering, an interesting table, showing the gas engine horse-power installed and in process of manufacture by the chief builders of Europe and America. In England, Crossley Brothers and the Premier Gas Engine Co. have supplied, or are about to supply, 7,600-h.p., averaging 345-h.p. per engine. On the continent four leading manufacturers have made, or have in process of manufacture, engines capable of developing 115,000-h.p., the average unit being about 675-h.p. This table gives a record of 271 gas engines of over 200 horse-power each, and aggregating 148,500 horse-power in Britain and on the Continent made by four or five leading firms. While the production of gas engines in America is hardly as large as in Europe, three firms in the United States have made, or are making, engines capable of developing over 33,000-h.p. in units varying in size from 300 to 4,000 horse-power. These figures, which do not include units smaller than 200-h.p., merely indicate how rapidly the gas engine is being developed, and how widely it is employed at the present time. In Canada, the gas engine is not used to such an extent as its popularity elsewhere would seem to indicate that it should be. This may be occasioned by

natural influences, which would exclude the gas engine, even granted that it is a most economical heat engine. It is probable, however, that, in addition to this, there are other reasons. In most power installations it is doubtful if the idea of using the gas engine as a prime mover is ever entertained; and while there are places where at present it is, doubtless not the best and most economical prime mover to be employed, there are just as surely others where it asserts its superiority.

That there should be hesitation about installing gas engines here is not surprising. The mere fact that there is such a scarcity of information concerning the consumption of engines using Montreal illuminating gas that it is almost if not quite impossible to arrive at the cost of running them, might account for it.

The paper then gives an account of tests made on two engines that form a part of the equipment of the Department of Mechanical Engineering at McGill University. For convenience, these engines are referred to as Engine No. 1 and Engine No. 2.

Montreal illuminating gas was used in all the tests. The average calorific value of the gas is taken as 620 British thermal units per cubic foot, and was determined by tests made on the Junker calorimeter.

For complete combustion one volume of this gas requires 5.85 volumes of air, and at atmospheric pressure and at a temperature of 60 degrees Fahr., one cubic foot weighs 0.03079 pounds.

In all the trials each engine was running on its governor, and the brake load was kept as constant as possible during each trial. The gas was metered by means of dry meters, one on the main gas supply and one on the igniter circuit. All meters were calibrated by means of a standard wet meter after the trials and the readings were corrected. The brake horse-power was obtained in each case by means of a brake on the fly-wheel of the engine. The load was measured on a Fairbank's weighing machine, weighing to one-eighth of a pound. Both engines were fitted with hot tube igniters, and as it is impossible with this means of ignition to have successive explosions occur at exactly the same point in the stroke, the indicated horse-power cannot be calculated with any degree of accuracy. Because of this the indicated horse-power is not included in the results, but indicator diagrams taken during each trial by means of Crosby indicators are appended. The revolutions were obtained by means of a revolution counter attached to the crank shaft of the engine. The trials were, for the most part, of one-half hour duration, and the revolutions, gas meter readings, brake loads, etc., were recorded every five minutes. The greatest error in the results occasioned by reading the gas meter is probably not over two per cent. The chief dimensions and particulars of engine No. 1 are as follows: Cylinder diameter, 8.5-in.; length of stroke, 12-in.; hot tube igniter, governor of the hit-and-miss type; Otto cycle.

The trials of this engine were all made on December 18th, 1902, and, as stated previously, the engine was run on the governor with approximately the same mixture of gas and air throughout all the trials. The engine ran continually during the series. Indicator diagrams were taken, but no explosion counter was used, and because of this and other difficulties referred to previously, the indicated horse-power is not worked out. The results of some of these tests are here shown:

Trial No.	1	2	3	4	5	6
Revs. per minute	208	208	208	208	204.3	204.5
Load on brake	9.19	18.88	29.06	39.0	48.0	60.0
Brake horse-power ..	0.827	1.700	2.62	3.51	4.25	5.31
Total gas per hour (cubic ft.)	199.5	201.0	221.0	224.0	263.0	260.0
Total gas per hour used by igniter (cub. ft.)	6.0	6.0	6.0	6.0	6.0	6.0
Gas per hour used in cylr. (cubic ft.)....	193.5	195.0	215.0	218.0	257.0	254.0
Gas per brake-h.p. per hour used in cylinder (cubic ft.)	234.0	115.0	82.1	62.1	60.5	47.8
B.T.U. per B.H.P. per minute	2420	1184	848	642	625	495

The mechanical efficiency, as obtained from previous trials, was, at full load, about 0.80.

The chief dimensions of engine No. 2 are: Cylinder diameter, 7.5-in.; length of working stroke, 8.4-in.; length of compression stroke, 5.34-in.; hot tube igniter; governer of the hit-and-miss type; Atkinson's cycle.

This engine has one working stroke for every revolution of the crank shaft and, in all, four strokes per revolution. The admission, compression, expansion and exhaust strokes are all of different lengths. The tests of this engine gave the following results:

Trial No.	1	2	3	4	5
Revolutions per minute	133	138.2	143.5	138.0	138.5
Load on brake	39.75	32.25	25.5	17.62	9.0
Brake horse-power	2.28	1.91	1.57	1.04	0.54
Total gas per hour (cub. ft.)	95.3	92.9	90.3	86.6	80.2
Gas per hour used by igniter (cubic ft.)	6	6	6	6	6
Gas per hour used in cylinder (cubic ft.)	89.3	6.0	84.3	80.6	74.2
Gas per brake H.P. per hour used in cylinder (cub. ft.)	39.1	46.7	56.8	85.4	165.0
B. T. U. per B. H. P. per minute	405	472	587	882	1701

The mechanical efficiency of this engine is, at full load, approximately 0.70. In all the above results the British thermal units per brake horse-power per minute are found from the gas actually used in the cylinder. The gas required for the igniter is not included as it is a constant quantity at all loads and should be considered separately.

When running under the most efficient load, the consumption per brake horse-power per hour is less for engine No. 1 than for engine No. 2, due probably to increased compression and size. Larger engines would show a further decrease in B. T. U. per horse-power per minute. As the load decreases the gas per brake horse-power per hour increases very rapidly. The figures, however, demonstrate (1) the importance of running engines of this type at approximately three-quarters to full load. (2) That the size of the units should be so chosen as to make this possible, and (3) that where there is a great variation in the load there should be multiplicity of units if attendant conditions do not recommend otherwise. The cost of gas for running engine No. 1, at full load, for one hour a day for three hundred days, would be, with gas at $1 per thousand cubic feet, approximately $9 for the gas used in the cylinder, and twenty-five cents for igniter gas per brake horse-power. The amount of water necessary for cooling purposes varies with the seasons. A large number of trials performed at various times throughout the year, gives twenty gallons per brake horse-power per hour, as an average quantity that need not be exceeded. Assuming fifteen cents as the cost of 1,000 gallons of water, the cooling water would be, on this basis, ninety cents per B. H. P. for one hour a day for three hundred days. The following table shows the cost of gas and cooling water for one horse-power for one hour a day for three hundred days:

	Cylinder gas.	Ignition gas.	Cooling water.	Total.
Engine No. 1 . ...$	9.00	$0.25	$0.90	$10.15
Engine No. 2	11.73	0.90	0.90	13.53

The lubricating oil will cost approximately the same as for a steam engine of the same size.

The attendance required by gas engines is a minimum and the cost for this relatively small. Very little skill and knowledge in engineering matters are demanded from the attendant since his duties are practically confined to starting, stopping and oiling. The cost of running the above gas engine compares favorably with the cost of running steam engines of the same size. If we assume fifty pounds of steam

as the amount used per brake horse-power per hour, which is a fair value for single cylinder engines of the size in question, and six pounds of water as evaporated per one pound of coal burnt, the coal used per brake horse-power for one hour a day for three hundred days would be one and one-quarter tons. This at four dollars per ton would be five dollars. The water would cost approximately twenty-five cents at the above rate. If we consider the extra cost of boiler plant, piping, attendance, etc., necessary for the steam engine, the advantage that the gas engine has of making a much more compact and convenient plant and the fact that it can be run by others than licensed engineers, the difference between the cost of the two is slight. The gas engine cannot, however, without a gas producer, successfully compete with compound steam engines except in places where the conditions are peculiarly favorable.

In places where there is no gas supply and where the conditions do not recommend the building of a producer, an oil, instead of a gas engine may be used. Engine No. 1 is designed for either gas or gasoline, as a working substance, and it is hoped, shortly, to furnish figures giving the comparative cost of running this engine with each. Reports are favorable as to the running of oil engines. The results of tests show about the same number of B. T. U. used per B. H. P. per minute as do those of the gas engine. Assuming 310 as a fair value for the B. T. U. used per B. H. P. per minute by an oil engine, we can easily arrive at an approximate cost of fuel for an engine using kerosene oil (Canadian). A sample of this oil, when tested in the Junker calorimeter, gave a calorific value of 18,600 B. T. U. per pound. Taking 8.3 lbs. to the gallon, the British thermal units in one gallon are 154,380. With oil at twenty cents per gallon, the cost of oil per B. H. P. for three hundred hours would be approximately $7.20. This compares favorably with the cost of operating gas engines. The cost of gasoline will not differ much from that of kerosene oil.

Mr. Coffin, in the Journal of the New England Water Works Association, gives the following table on the comparative cost of pumping water by means of gas, gasoline, oil and steam engines:

COMPARATIVE ANNUAL COST OF PUMPING WITH DIFFERENT KINDS OF POWER.

	Oil Engine.	Gasoline Engine.*	Gas Engine.		Steam Engine.	
Average daily pumping. Galls.	Oil at 9c. per gal.	Gasoline at 9c. per gal.	Gas at $1 per 1,000 cub. ft.	Gas at 50c. per 1,00 cub. ft.	Coal at $5 per ton.	Coal at $4 per ton.
50,000	$ 770	$ 735	$ 920	$ 675	$1,230	$1,160
100,000	1,250	1,200	1,580	1,035	1,740	1,600
200,000	2,200	2,050	2,815	1,820	2,525	2,300
300,000	3,085	2,875	4,000	2,510	3,130	2,850
400,000	3,920	3,640	5,140	3,150	3,700	3,350
500,000	4,745	4,400	6,270	3,780	4,200	3,790

The above prices include attendance, repairs and supplies, interest (4 per cent.), depreciation (3 per cent.), and fuel. These figures indicate that in small units, at any rate, the internal combustion engine can, as far as cost is concerned, successfully compete with the steam engine; while the employment of gas and oil engines for driving electric lighting and pumping machinery, for automobiles and marine work, has long passed the experimental stage. Perhaps under no conditions does the gas engine promise more than in connection with, and when run by the gas from blast furnaces. So great has been its success already in this relation that one enthusiast has ventured to prophecy that "the day is not far distant when iron will be a by-product of the blast furnace, and furnaces will be primarily gas producers, while steam engines will have to be sought for in museums." It is probable that even the most ardent supporters of the internal combustion engine do not look for this state of affairs in the immediate future. But when we realize that smelting one ton of iron supplies gas equal to 9,000,000 British thermal units and that the gas is more than three and one-half times as efficient, when used in the gas engine as when used in steam boiler furnaces, and when, moreover, we bear in mind the successes of the past decade, we cannot but expect from these engines much more in the near future than has been, or is at present being accomplished.

*Gasoline is now much dearer, being about 17 cts. in the United States and about 24 cts. in Canada

CHANGES IN UNITED STATES PATENT LAWS.

The following particulars, relating to changes in the Patent Laws of the United States, are supplied by Ridout & Maybee, patent solicitors, 103 Bay street, Toronto. These changes went into effect last month:

Section 4,887 is amended so that the inventor now is allowed twelve months after the date of filing of a foreign patent for the same invention in which to apply for a patent in the United States or four months in the case of a design. This rule only applies when the actual issue of the foreign patent takes place before the issue of the United States patent. An addition has been made to this section, which applies to foreign countries granting similar privileges to citizens of the United States. By this addition those who have applied for patents in a foreign country and have subsequently applied for patents in the United States, under the conditions of the previous part of this section, will be granted all the benefits which might follow from having the date of the foreign application, taken as the date of the United States application, but no patent will be granted for an invention or design patented or described in a printed publication in the United States or any foreign country more than two years before the date of the actual filing in the United States, or which has been in public use or on sale in the United States for more than two years prior to such filing.

Section 4,892 is also amended, the most important change to Canadians being the requirement that the authority of the official, before whom the oath attached to a patent application is taken, "shall be proved by certificate of a diplomatic or consular officer of the United States."

Section 4,896 is amended to permit the executor or administrator of a deceased inventor, not domiciled in the United States at the time of his death, to apply for a United States patent on the invention.

Section 4,902 has been amended to permit foreigners to file caveats in the United States Patent Office, a privilege heretofore strictly confined to United States citizens.

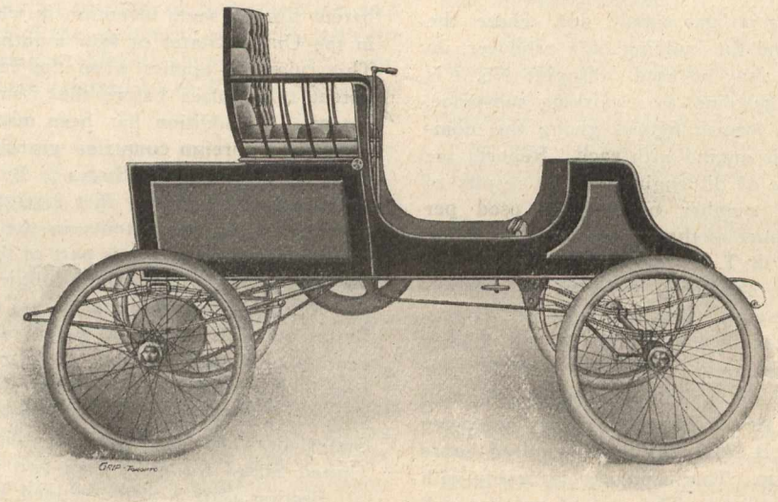
THE SINGING ARC LAMP.

At the Toronto University conversazione, one of the most interesting entertainments provided was the singing arc lamp, the properties of which are not yet thoroughly understood. Everyone is familiar with the buzzing in the telephone, caused by a passing trolley car. A German, named Simon, of Frankfort, investigated the matter and in 1857 invented the singing lamp. A gramaphone in a distant room is attached to the telephone, and the wire brought to the room where the lamp is placed. The wires of the telephone and lamp are wound tightly around a single core. The induction is so complete that instead of the hissing and sputtering at the junction of the carbons in the lamp, the sound from the gramaphone is distinctly heard. This lamp, which belongs to the School of Science, is the first in Canada, having arrived a couple of months ago.

THE DOMINION MOTOR AND MACHINE CO.'S RUNABOUT.

Some months ago, we referred to a new motor carriage, shortly to be put on the market by the above firm. The following description gives details of the motor carriage: It weighs, complete, about 800 lbs., and is equipped with 4½-h.p. gasoline engine. It has two speeds, forward and reverse, the forward operated by a lever on the right-hand side, the reverse by a pedal, operated by the left foot. Speed of carriage is controlled by throttling, increase of speed being

given by advancing the time of ignition and retarding of same when necessary to slow down. A combination muffler, perfectly controls the exhaust, so that for city running it is practically noiseless, but for heavy country roads it can be opened up and all the power of the engine utilized. The transmission and compensating gears are fitted with phosphor bronze, oil-tight pinions, which run noiselessly. The brake is a powerful band, applied by pedal to the right of the reversing pedal. A gasoline tank holds sufficient fuel for the average 100-mile country run. The water tank is small and compact, and holds one gallon. The water is carried through cooling coils, under front end of carriage, and is circulated by a small centrifugal pump. The body of the carriage is of the latest improved type, and is finely finished, equipped



with two elliptic springs in rear, and two half-elliptic ones in front end, the rear end springs being carried by a swinging link and a yoke allowing them to move as the carriage body goes up or down from irregularities in the road, etc. They are fastened to an axle at the top, fixed in bearings so that they can move. The clip which holds the spring to the main axle is fastened to it by a flexible joint to the truss rod, the other end being fastened to the same centre line as the engine crank shaft. This truss rod forces the axle back as it swings on the top of same holding the chain, at all times at a uniform tension. The front springs are attached to the body by an extending body loop thus pulling the axle forward by the spring and enabling the wheels to stand a greater shock than by any other arrangement. Tires are supplied single or double tubes; wood wheels furnished if the purchaser prefers them. The steering lever can be placed either at side or in the centre. The price of this runabout is $750. This company are also building a heavier type, with 8-h.p. motor, equipped with folding front seat, artillery wheels, Dunlop tires, leather top and rubber storm curtain. This will be put on the market next month. It costs 40 per cent. more than the runabout.

CANADIAN MINING INSTITUTE.

The annual meeting of the Canadian Mining Institute was held in Montreal on the 4th, 5th and 6th March, Charles Fergie, president, in the chair.

Reports showed that the membership increased from 331 to 453. The students' mining societies of McGill and Queen's universities had been affiliated with the Institute, and the number of students now on the roll was 92, in addition to the active members. The treasurer's report showed receipts for the year to be $6,331, this including a grant of $3,000 from the Dominion Government; while the disbursements were $5,656. Cash balance on hand, $1,632.

The president, in his annual address, said the past year had showed greater development in mining than any preceding year. The total value of the mineral production he put at about $70,000,000. The production of coal in the Dominion was approximately 6,685,654 tons, as against 5,784,845 tons in 1901. Of this, Cape Breton produced 3,500,000 tons, an increase of 2,500,000 tons in five years. Altogether, Nova Scotia last year produced 4,725,480 tons of coal. That province also produced 214,293 short tons of pig iron, 104,331 tons of steel, and 28,279 ounces of gold.

E. D. Ingalls, of the Geological Survey, presented preliminary statistics showing the production of non-metallic materials to be about $28,016,964, metallic substances, $35,652,768, so that allowing for products for which no returns were made, the total would be about $64,970,732, or somewhat less than in 1901.

B. T. A. Bell, the secretary, claimed that the actual production was over $71,000,000, but Mr. Ingalls explained that Mr. Bell's figures included some duplications.

Eugene Coste read a paper on Mining Statistics, and at the close of a discussion on the subject, a committee was appointed, as follows, to secure uniformity between the Provincial and Dominion Governments for gathering information: Eugene Coste, Dr. Adams, Dr. Goodwin, Prof. Miller, Messrs. Fergie, Bell, Craig, Hobart and Hardman; Mr. Ingalls, as representing the Geological Survey, and the directors of the provincial mining bureaus, Mr. Gibson, of Ontario; Mr. Obalski, of Quebec; Mr. Robertson, of British Columbia, and Mr. Gilpin, of Nova Scotia.

T. W. Gibson, chief of the Bureau of Mines of Ontario, read a paper on Mining in Ontario. He valued the production of Ontario at $13,577,000, an increase of $2,155,000 over 1901. This gain was distributed over the nickel industry, the iron mines and blast furnaces of the province. A considerable amount was also contributed by the minor minerals, such as corundum, while the cement and clay industries had been very prosperous.

Frederick Hobart, of the Engineering and Mining Journal, of New York, gave some material for serious thinking, in an address on the possibilities of mining in Canada, dealing more especially with iron and copper. It seemed to him that the opportunities for the iron trade in Canada had not been realized, and probably it would take some time to realize them. There was no doubt that Canada contained an enormous quantity of good iron ore, which was going to be developed in a few years hence, and there would be a demand for it. The great opportunity presented was to utilize it in this country, and not sell it to others. He came from the other side of the line, but he had tried to look at the matter from the standpoint of a Canadian, and it would certainly be a greater advantage to Canada and its people to rather hold back and not sell the iron ore to parties from outside, in the hope of immediate development. They all knew what great advances the Dominion Iron and Steel Company had made in the last two or three years, and he thought there was opportunity for an equally great development in the western part of the Dominion. The British Columbia mines, both on the coast and in some portions of the interior, could furnish an enormous amount of ore. British Columbia had the only good coking coal, the only good metallurgical fuel on the

Pacific Coast, and when the ironmakers of the province got to work, they could command the trade of the Pacific Coast, as they would be able to sell more cheaply than anyone else. They would also have the opportunity of entering the Eastern trade, which undoubtedly presented a great field for development. In the eastern portion of Canada the ironmakers had an especially favorable opportunity for building up a foreign trade, if they were ready to take advantage of the markets of the United States and Great Britain. Some authorities in the British iron trade were of opinion that Great Britain was going to be an increasingly good market for foreign iron. The cost of ores in that country was increasing very rapidly, and to such a large extent as to cause some far-sighted ironmasters there alarm. Canadian iron would very conveniently fill up the gap. People in the United States put themselves in a very dangerous economic position. The United States Steel Corporation now controlled 90 per cent., not of the present production, but of the ore reserves in the Lake Superior iron region. He knew, from information which had been received from reliable quarters, that the Steel Corporation was buying up iron ore deposits all over the United States. It had already secured options in Texas and had bought mines in Wyoming, and it was buying wherever it could get hold of them. It looked very much as if within a few years—a year or two—the Steel Corporation would practically control all the iron ores of the United States, with the possible exception of Alabama. The company which controlled the raw material controlled the trade, and the United States, with all its enterprise in manufacturing, and so forth, would be at the mercy of the Steel Corporation. The extent of the power thus given to a single set of men need not be enlarged upon. He was very much in hopes that when competition had been choked in the United States, the ironmakers there might be able to come into Canada and buy a little iron ore, if we had any to spare.

George E. Drummond presented a paper, comparing American and Canadian mineral statistics, which had been prepared by Mr. George Johnson, Ottawa. It showed that in the year 1901 the United States produced $524,873,284 of metallic substances, and Canada $42,309,202; of non-metallic substances, the United States produced $566,351,096, and Canada, $24,103,506, and of miscellaneous, the United States produced $1,000,000, and Canada $300,000. This gave a total for the United States of $1,092,224,380, and for Canada, $66,712,708; or $14.12 per capita for the former country and $12.42 for the latter, a difference of $1.70 per head. Canada, however, wsa creeping up and should overtake the United States in 1908.

An interesting paper on The Modern Blast Furnace Laboratory and Its Work was submitted by W. Dixon Craig, of Midland, Ont.

Dr. Eugene Haanel, Dominion Superintendent of Mines, read a paper on the examination of magnetic ore deposits by means of magnetic measurements. He described the different instruments used for this purpose in Sweden, where the method has been carried further than in any other country. The paper was illustrated on the blackboard in a lucid way. At its conclusion, Prof. Adams, of McGill University, stated that the Mines' Department of the University had recently procured a full set of instruments from Sweden, and hoped soon to give some practical demonstration of their use.

Among the other papers read was one by Major R. G. Leckie, on The Nickel Mines of New Ontario, which he had visited last year. He thought New Caledonia had advantages in cheap ocean freights, and said that the principal impurity found in the New Caledonia nickel was iron, which lent itself readily to treatment, and especially to the manufacture of ferro-nickel, which in many cases was preferred in the manufacture of nickel-steel to the pure metallic nickel. He pointed out that these nickel silicate ores, and also cobalt and chrome ore, were found in a serpentine formation, which was identical with the serpentine of the Eastern Townships of Quebec, in which chrome ores are found, and suggested that some prospecting for nickel and cobalt be done in that section.

A feature of the meeting was the students' competition for prizes, which was reported on as follows: Seven papers, four from McGill, and three from Queen's, were contributed by student members in competition for the president's gold medal, and the prizes annually offered by the Institute. Every one of these welcome contributions to our transactions possessed merit, but they covered subjects so widely diverse in character that the sub-committee appointed by the council to make the award had the greatest difficulty in arriving at a decision. C. V. Corless, who sent in a highly meritorious review of the geology and ore deposits of Southeastern British Columbia, withdrew his paper from the competition, and the awards were finally made as follows: President's medal to O. N. Scott, Listowel, Ont., for his paper describing The Ore Deposits of Copper Mountain, Similkameen District, B.C. Cash prizes of $25 each to H. W. DePencier, McGill, for his paper describing Mine Timbering in the Old Ironsides and Knob Hill Mines, and L. P. Silver, Queen's, for his review of The Sulphide Ore Bodies of the Sudbury Region.

The election of officers resulted as follows: President, Eugene Coste, Toronto; vice-presidents, John B. Hobson, Bullion, B.C.; R. E. Chambers, Bell Island, Nfd.; George R. Smith, Thetford Mines, Quebec; treasurer, John Stevenson Brown, Montreal; secretary, B. T. A. Bell, Ottawa. Members of Council—British Columbia, E. B. Kirby, Rossland; J. H. Tonkin, Fernie; S. F. Parrish, Eholt. For Ontario—David H. Kerr, Cordova; Dr. W. L. Goodwin, Kingston; A. P. Turner, Sudbury; E. A. Sjostedt, Sault Ste. Marie. For Quebec—Fritz Cirkel, Montreal; Harry J. Williams, Thetford Mines; B. Bennet, Quebec; Dr. J. B. Porter, Montreal. For Nova Scotia—Thomas Cantley, New Glasgow; Dr. E. Gilpin, Jr., Halifax; G. H. Duggan, Sydney; Cornelius Shields, Sydney. It was decided to hold the next annual meeting in Toronto.

ROADS IN EUROPE.

Two hundred years ago, England had the worst roads in the world, because the peasantry living on the roads alone were required to work them. In speaking of them, Macauley says that a route connecting two great towns, which have a large and flourishing trade with each other, should be maintained at the cost of the rural population scattered between them is manifestly unjust. It was not until many toll bars had been pulled down, until the troops had in many instances been forced to act against the people, and until much blood had been shed that a good system was introd

Every class now contributes to the maintenance of the road system in England. The French have probably the most efficient laws and regulations in the world for the building and repairing of highways. The Minister of Public Works has the general superintendence of all roads and ways by land and by water. There are four classes of road recognized by law, namely: (1) national; (2) departmental; (3) military; (4) cross roads. National roads are built and kept up by national treasury. Departmental roads are a charge upon the departments through which they pass, and part of the military roads are kept up by the Government and a part by the departments through which the roads pass. The cross-roads are kept up by the communes, though sometimes in thinly populated regions these communes receive assistance from the Government, especially when these roads become of importance. The national roads are paved like a street, having an average width of 52½ feet. The departmental roads are 39 feet wide, and the military and cross roads are of variable width. Piles of broken stone are placed at convenient distances, and a man is constantly employed in repairing each section.—American Asphalt Journal.

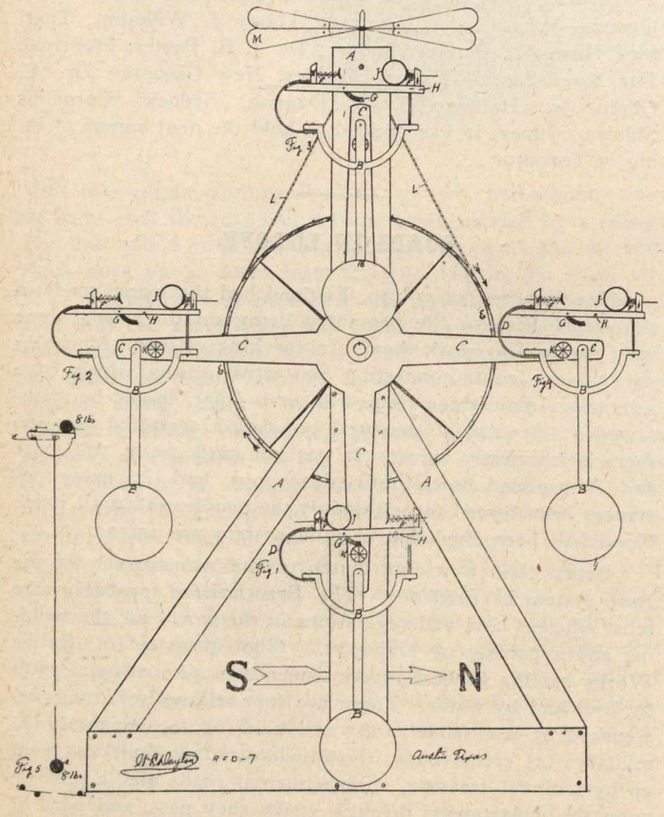
The Great West Saddlery Company will erect a large factory in Winnipeg to cost $25,000.

A new flour mill, projected at Keewatin by Eastern capitalists, will have a capacity of 4,000 barrels a day. The Ogilvie mill, now running there, is a 3,500-barrel mill.

A NEW GRAVITY MOTOR.

William L. Dayton, of Austin, Texas, claims to have discovered a self-generator of power, i.e,. a perpetual motion machine, or, as he styles it, a gravity motor, and has favored the Canadian Engineer with a drawing of his working model. The drawing is the actual size of the model, and is 20 inches high by 17 inches wide. We have had, of course, to reduce it in the cut. Mr. Dayton describes it thus:

The secret of this invention is the shifting of the balls, that changes the centre of gravity on the spoke wheel. The question of perpetual motion is reduced to the finding of a weight that is heavier than itself. (See sketch, Figs. 2 and 4.) A shows the frame in which the machine is built. B iron-balance weights to make a level track for the balls, J, to run on. C spokes of power wheel. D spring to lift the balls J. E driving sprocket wheel. F delicate spring to start ball J on a dead level. (See sketch.) G blade to lift the track or trough. H track for ball J to roll in. I post that controls delicate spring F. J ball. K little wheel on spoke of power wheel. L sprocket chain. M fan to govern the speed of the machine. Figs. 1, 2, 3, and 4 are all equal weight, which just makes a balance around the power wheel. This being so when G, the blade, comes in contact with the little wheel, K, which raises the track H, then the spring F starts the ball J from post I to post N. The ball J in this move passes over the centre (see sketch, fig. 1), and there remains until the blade G leaves the wheel K. At that instant the spring F

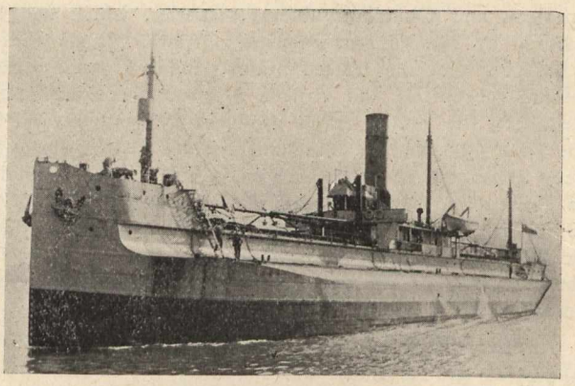


at post N starts the ball J back to post I, then the ball is carried up next to the centre of power wheel (See sketch, fig. 2). The spring D plays its part in this act. Say that the ball J and the track H all weigh twenty-five pounds, the spring D will raise twenty-four of it, so K just raises one pound of actual weight, so it does not take any power generated by the ball J, at Fig. 4, to pass ball J over the centre Fig. 1. It must be remembered that 98 per cent. of the actual weight of ball J and track H is raised by the spring D; so G and K just raise 2 per cent. Now we will say the ball J weighs one pound, then the weight B must weigh eight pounds on a 20-inch wheel, but on a 20-foot wheel this would be altogether different, for on a 20-foot wheel you would have 9 ft. leverage, and an 8-pound weight would govern an 8-pound ball. (See Fig. 5.) Fig. 5 would be very easily affected at ball 2, but it will take a great deal to affect ball 2 at 1. If there is any one that doubts this machine, let him take his dividers and measure, we will say the north and south side of wheel, and he will see how much further the balls are from the centre on the north side of wheel coming down than they are on the south side going up.

Mr. Dayton says he believes this motor will take the place of all the small engines up to say fifty horse-power. It might take a 30-ft. wheel to make a two horse-power. He would take twenty-five wheels and put them on one shaft; this, then, would give 50 horse-power. He appears to have every faith in the machine, which he believes will be a practical engine for the machine shop. If he has solved what has been so long sought after, he will rank as one of the great discoverers of the age.

THE TURRET SHIP.

There appeared on the Great Lakes, towards the close of last season a new type of carrier, known as the turret ship. It is a modification of the whaleback, being of much the same build, as to hull, but having the turret addition. They have been very successful in the ocean trade, but this was their first appearance on the lakes. Water does not come on the main decks in the heaviest weather. They have crossed the Atlantic in the middle of winter without difficulty, when the decks of other vessels were flooded. Our illustration gives a good idea of the general appearance of this type of vessel. The continuous hatch, which the turret renders possible, gives a great advantage in carrying grain, as it enables the elevator leg, or any appliance for unloading coarse freight, to be used the whole length of the boat. No trimming is required, and very little shovelling, thus doing away with the expense of one class of labor. The turret protects the crew while working the ship in heavy weather, and provides quarters, leaving the lower part of the vessel clear for cargo.



The first of these vessels was built in 1892, and there are now nearly one hundred in use. They are employed on the Peninsular and Oriental and other well known lines.

Four of these vessels came from Great Britain, and were placed on the Upper Lakes about October 1st, by the Canadian Lake and Ocean Navigation Co. Between that date and the close of navigation they carried three million bushels of last season's grain crop without wetting a single bushel, and took back cargoes of coal. They have a capacity of 118,000 bushels. Three of them, the Turret Court, Turret Cape and Turret Crown, wintered at Owen Sound, and the Turret Chief at Midland. They are now being fitted out for the season, and by the removal of some heavy gear, which was necessary for ocean navigation, their capacity on the same draft has been considerably increased. A new wheel for the Turret Court is being made by the Wm. Kennedy & Sons Co. at Owen Sound.

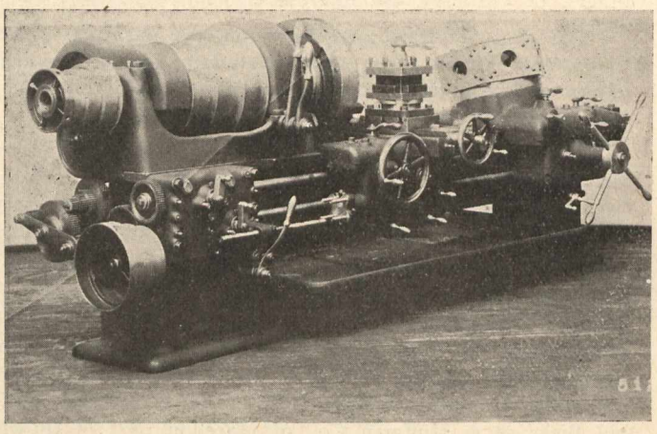
One advantage these vessels possess is the facility with which their boats can be launched. Instead of the swinging davits they are hinged close to the turret and turn down with the boat to a hrizontal position, when the tackling operates and lowers the boat. This plan is much easier and more rapid than on the ordinary vessel.

The crews who came out with the turret vessels were mostly Old Countrymen and salt water sailors, who did not

fancy the limitations of inland navigation, and besides, many of them had families on the other side. They, therefore, went back when navigation closed, and this season the vessels will be manned with Canadians. Wm. Byers, chief engineer of the line, is the only one of the Old Countrymen who remained. He is superintending the fitting out. It is probable more vessels of this class will be brought out.

HEXAGON TURRET LATHE WITH CHASING SADDLE.

Alfred Herbert Limited, machine tool makers, Coventry, Eng., who won the gold medal at the Paris Exhibition, are now producing a hexagon turret lathe with patent chasing saddle. The machine here illustrated is known as No. 6 and is specially designed for dealing with chucking work of all descriptions, though it can also be used on bar work if desired. The headstock is provided with duplex back gearing, which can be thrown in or out while the lathe is running, and which is so arranged in conjunction with two speeds on the countershaft, as to give six properly graduated speeds for



each step of the cone pulley. All of these speeds are obtainable by means of friction clutches without stopping the lathe, and without changing the belt on the cone pulley. By changing the belt eighteen speeds are available. The main turret is hexagonal. Each face has a tool hole for holding shank tools, boring bars, etc., large tools for repetition work being bolted directly to the faces of the turret. The turret is set on an angle to allow long tools to clear the pilot wheel, and is provided with a clamping handle. The turret slide has eighteen feeds in either direction. Six independent adjustable stops are fitted, one for each face of the turret. These trip the feed automatically, and also act as dead stops. The saddle carries a square turret suitable for four tools, and is provided with our patented chasing motion, by which external and internal threads can be accurately and rapidly cut without the possibility of cross-threading. The chasing motion is entirely independent of the feed motions, and these motions are so interlocked that no two conflicting feeds can be put into gear at the same time. The saddle has nine rates of feed in either direction, both longitudinally and transversely, and each motion has four independent automatic and dead stops. A special saddle can be fitted for taper turning or chasing, either internally or externally.

La Compagnie McLaughlan, lumberers, the Imperial Coal Co, the Edmonton Water and Light Co., and the E. De Wolfe Hardware Co. are applying for incorporation in New Brunswick. The Yarmouth Marine Railway Co. is making a similar application in Nova Scotia.

J. R. Booth is bringing lumber direct from the forest to his mills, at Ottawa, over the Canada-Atlantic Railway. By this means timber can be landed at the mills in twenty-four hours. It formerly took six months, and in dry seasons did not reach the mills until the following year.

Industrial Notes.

The Canadian Skewer Co., Hespeler, is installing a number of new machines.

The ratepayers of Moosomin, Assiniboia, have voted a $5,000 bonus to Sutcliffe & Muir for a flour mill.

M. J. Clarke, of Grand Rapids, Mich., offers to assist in starting a large furniture factory at Sault Ste. Marie.

Beet sugar factories are projected at Peterboro, Dunnville, Newmarket, Guelph, Whitby and Port Hope.

The Deseronto Car Works has received an order for standard flat cars from the Lotbiniere & Atlantic Railway.

The Imperial Tobacco Works, J. D. Goodwin, manager, St. John's, Nfld., is installing a large plant in that city.

An effort is being made in Toronto to abate the smoke nuisance. It is proposed to give manufacturers and others the alternative to instal a smoke consumer or burn hard coal.

Gloucester Co., N.B., now feels reasonably sure of securing the big pulp and paper mills, which the Harmsworths, a great English firm of publishers, propose to establish in Canada. A line of railway to a shipping point, probably Bathurst, would be built.

The Dominion Chemical Co., at Sydney, N.S., has purchased twenty-five thousand dollars' worth of machinery for their plant, which, when completed, will be the largest on the continent. They will distill the by-products of tar made in the Steel Company's works.

The Dominion Packing Co. has been organized at Montreal with a capital of $1,000,000, to carry on a pork and beef packing industry in the Maritime Provinces. Large plants, equal to the famous Armour plant at Chicago, will be erected immediately. C. Shields, of Sydney, is president, and J. M. Wiley, of Chicago, is vice-president and general manager.

The Victoria Chemical Works, Victoria, B.C., have awarded the contract for a new building, 90 by 35 ft., to Moore & Whittington. It will be used for the manufacture of sulphuric acid and will be lined with heavy lead sheeting, about 50 tons of which has arrived from Chester, Eng., for this purpose. This lining will reduce the escape of noxious fumes to a minimum, it is hoped.

The Hamilton Tool and Optical Co., Limited, of Hamilton, Ont., report success with their sensitive column drills and sensitive bench drills. These machines are designed to meet the requirements of machinists and manufacturers, who want a thoroughly well made tool at a moderate price. They are carefully made in large lots with special tools and fixtures for their manufacture. Each machine is carefully inspected before leaving the works, and is guaranteed as represented.

The reduction of alumina to metal is now progressing on what would have been regarded ten years ago as a stupendous scale. There are 11,000-h.p. operating at Niagara Falls, N.Y., and 5,000-h.p., at Shawinigan Falls, Que., devoted to producing this metal. They will produce aluminum at the rate of 4,500 tons yearly, or a production twice as large as that of the rest of the world put together. The same company have in contemplation the utilization of 12,000-h.p. at Massena, N.Y.

The Fairbanks Company, Montreal, have recently furnished various machine tools, such as lathes, planers, drills, slotters, cranes, etc., to the Montreal Heat, Light and Power Co., to the James Cooper Manufacturing Co., Montreal; the Canada Switch and Spring Co., Montreal; the Canadian Pacific Railway, J. Inglis & Sons, Toronto, and Carriere, Laine & Co., Quebec, and others. The Fairbanks Company is to be congratulated on the success of its machine tool department, which has only recently been established. The company forward catalogues to anyone who is in the market.

Pleffer Bros., Milverton, Ont., will erect a 3,000-bushel elevator at that place.

The Dickson Co., Peterboro, will erect a new sawmill on Burnham's Point.

Another starch factory is projected at Prescott, Ont., of which Dr. Archbold is the promoter.

The City of Toronto is considering the installation of a cold storage plant in the St. Lawrence market.

The Manitoba Pump Co., Brandon, is putting up a large building and will equip it with modern machinery.

The Flewelling Mfg. Co., Hampton, N.B., will rebuild their saw and grist mills at that place, recently burned.

A 500,000-bushel elevator is to be built at Point Edward, Ont., with tank storage capacity for an extra 250,000 bushels.

The Dowd Milling Co. will build a 30,000-bushel elevator at Eardly, Que., also one of 50,000 bushels' capacity in Manitoba.

A strike at the Collingwood steel shipbuilding yard, which lasted two weeks, has delayed operations on vessels building there.

Mr. Fader, of Toronto, is trying to form a joint stock company, in Orillia, to manufacture a patent door lock, which he has invented.

A new foundry building is to be added to the plant of the Niagara Falls, Ont., Machine and Foundry Co. The building will be 55 by 95 ft.

The Hamilton Steel and Iron Company's blast furnace is in operation again, after being closed down for two months for repairs and improvements.

The Steel Corporation of Canada is seeking incorporation, with a capital of $20,000,000, and will erect a very large plant beside the Welland Canal.

It is stated that the manufacturers of the Nernst incandescent lamp have secured patents and selling rights in Canada, and will establish a factory at Hamilton.

Work has been begun in the grey iron foundry of the Deering works, at Hamilton. The Hamilton Bridge Co. has commenced erecting the malleable iron foundry.

A by-law has been passed by Sherbrooke, under which the Jenckes Machine Co. is enabled to fulfil its obligations tc the city at an earlier date than provided in the original by-law. This is owing to the fact that the company has far exceeded expectations in growth, volume of business and amount of wages paid.

R. O. King, junior member of the firm of R. W. King & Co., civil and mechanical engineers, of Toronto, is opening a branch in Lockport, representing this firm, and an associated company, the King Construction Co., which will make water tube boilers, automatic stokers, florists' ventilating and heating plant, etc., for both the United States and Canadian market.

The Montreal Locomotive and Machine Co. has been working quietly on their buildings at Longue Pointe, and expect to turn out their first locomotive in August. The capacity of the works is to be 100 locomotives a year, with provision for increase to double that number. The company will also manufacture structural steel. The contract for the electric motors—eighty in number and varying from 5 horse-power to 50 horse-power—has been awarded to the Westinghouse Electric & Manufacturing Company, Limited. These machines will be direct-connected on three wires. About half the motors will be run at variable speed for direct application to machine tools. The Western Electric Company has the contract for a 400-K.W. generator. The contracts for the machine tools, aggregating about $300,000, have been about equally divided between Canadian and American builders. John Bertram & Sons, Dundas, Ont., the largest machine tool builders in Canada, secured the contract for tools to the value of $130,000. Of the remainder of the machine tool outfit, the principal contract allotted was awarded to the Niles-Bement-Pond Company, New York, for heavy locomotive building tools. The value of the contract is nearly the same as the Canadian one.

The Vulcan Iron Co., Winnipeg, will erect a new moulding shop.

The Crown Grain Co., of Chicago, will erect ten elevators in Western Canada.

A lockout of 106 moulders and 15 chippers has occurred at the Oshawa malleable iron works.

High water has washed away a large portion of the permanent dyke of the Montreal Water Power Co.

A sawmill will be erected on Quatsino Sound, B.C., by the Yreka Company for the purpose of supplying its mine with timber.

Preston, Ont., has passed a by-law to assist the Canadian Office and School Furniture Company with a $20,000 loan. A large new modern factory will be built.

The Dominion Fence Co. will be reorganized and the creditors will be paid in full. An electrical wire welding machine has been perfected, and will be used by the company.

The Lake Manitoba Quarry and Transportation Co., Limited, is being formed to develop extensive stone quarries at the Narrows of Lake Manitoba. John D. Hunt and others, of Carberry, are interested.

The peat beds and machinery on the farm of James Clapp, near Picton, Ont., which have lain idle for a couple of years, have been leased by Mr. Dickson, of Toronto, who will put in machinery for drying the peat.

A wall 60 feet high of the mill belonging to the Ferguson Estate, operated by T. A. Sloan, at Elora, fell into the river a few days ago, having been undermined by the water. A carload of oats and the electric light dynamo were lost.

The American Seeding Co., recently incorporated with a capital of $15,000,000, is looking for a suitable locality to establish a branch in Canada. It was formed by the amalgamation of the Superior Drill Co., of Springfield, Ohio; Hoosier Drill Co., of Richmond, Ind.; Brennan & Co., of Louisville, Kentucky; Empire Drill Co., of Shortsville, N.Y., and Bickford & Huffman Co., of Macedon, N.Y. It will manufacture seeders. Toronto or Hamilton will probably be chosen, preferably Toronto.

The following fires have occurred in industrial works: Hon. E. J. Davis' tannery, in King Township, burned; loss, $100,000; insurance, $60,000.——Ganong Bros'. candy factory, at St. Stephen, N.B., partly burned; loss, $75,000.——National Box Co.'s factory, Toronto, damaged for the third time.——W. J. Muirhead's hardware store, Carleton Place, damaged.——McClary stove works, London, damaged for the second time within a few weeks.——G. A. McGowan's cigar factory, Kingston, badly damaged; 375,00 cigars destroyed.——Cornell's brewery, Lindsay, burned.——Cross & Co.'s, formerly Scott & Cross, planing mill, Toronto, burned.——Excelsior Vinegar Works, St. John, N.B., damaged.

It is stated that J. Pierrepont Morgan is trying to buy up the entire tin-mining industry of Siamese Malaya.

A new electric light engine is being installed at Brockville, 225-h.p., direct connected, from the E. Leonard & Sons works, London.

The injunction obtained by the town of Fort William against the Bell Telephone Co., prevents their planting any more poles, but allows them to string wires on existing poles until the case comes to trial.

Lord Rayleigh, professor of natural philosophy at the Royal Institution, announces that M. Blondelot, a French experimenter, has adduced evidence going far to prove that Roentgen rays are susceptible of polarization, if they have not been polarized already, and can therefore be traced to the spectrum. If this is true and the rays are transversal, as M. Blondelot thinks, it follows that they are a species of ordinary light, but of extremely short wave lengths, perhaps a hundred times shorter than the waves of the light that one can see. Lord Rayleigh says he sees no reason to question the discovery.

Light, Heat, Power, Etc.

Peterboro is experiencing difficulty from anchor ice.

The mills of the Dowd Milling Co., at Quyon, will shortly be lighted by electricity.

Electric lighting is to be introduced in the factory of the Imperial Underwear Co., Peterboro.

The Merchants' Telephone Co., established in Montreal in 1892 by Mr. Moisan, has passed into the hands of a New York syndicate.

An auxiliary steam plant is proposed at Ottawa, to prevent stoppages of water and electric light supply by low water and anchor ice.

An automobile service is to be established between Peterboro and Chemong Lake. The first car will carry 20 persons, and has been ordered.

Wm. Kennedy, of Owen Sound, has gone to Italy in connection with the installation of some turbine wheels for electric power development in that country.

The judgment in the case of the city of Toronto against the Gas Co. was in favor of the latter. There is an impression that the city's case was not well prepared or the verdict might have been otherwise.

W. W. Ashald has been appointed superintendent of telegraph and telephone service on the Grand Trunk. He was formerly train despatcher at Bonaventure Station, Montreal. This is a new office.

The dam and works at Trenton, which supply Belleville with light and power, were damaged by high water and ice. Steam power was brought into requisition, but the engine broke down and gas had to be used.

Havelock, Ont., is to have electric light. Power will probably be derived from Burnt Dam, on the Crowe river, six miles distant. The Havelock Electric Light and Power Co. is being formed. It is thought that Norwood will unite in carrying out the plan.

The Montreal Light, Heat and Power Company and the Lachine Hydraulic Company have amalgamated. By this deal the first-named company acquires the Lachine Hydraulic Company, the Citizens' Power Company, the Standard Light Company, and a lease of the Shawinigan Power Company's power into Montreal.

The Nernst Lamp Company, of Pittsburg, Pa., having secured patent rights in Canada, is now making arrangements for establishing a factory in the Dominion for the manufacture of their product. This move is not only necessary in order to conform with the Canadian patent laws, but is also advisable in order to meet the rapidly increasing demands for this lamp.

A motor car, with a load of freight attached, jumped the track on the Galt, Preston and Hespeler Electric Railway, and fell off the bridge, at Preston, into the Speed recently, carrying the motorman, conductor, and brakeman, and Mr. Kirkwood, electrician of the road, who escaped with a wetting and a few bruises. The accident was caused by the air brakes on the freight car refusing to work. The latter ran on some distance, and left the track. The accident occurred on a steep grade.

Settlers around Sparrow Lake ask damages from the Orillia town council, because of their land being flooded by a temporary dam, which was erected while the Ragged Rapids power plant was being installed. Nearly twenty years ago, under the drainage act, $2,600 was spent blasting out obstructions at the outlet of Sparrow Lake. Later further blasting was done, and the Dominion Government granted $1,700 to complete the work, but the town had put in the dam at the head of the rapids, and the Ottawa engineers found the water too deep for operations. The settlers now want the dam removed.

A proposal is made to pipe natural gas from Attercliffe to Hamilton to be used for lighting, cooking and heating.

A transformer outside a machine shop at Hamilton was burned out in a recent storm, and the explosion was heard several blocks away.

Marconi has at last induced the British Government to allow his wireless telegraph station at Poldhu to be connected with the system of the country.

Mr. Hamelin, president of the Merchants' Telephone Company in Montreal, says there will be shortly something done toward making the company a live organization.

The central station at Fort William of the Fort William and Port Arthur municipal telephone system, recently described and illustrated in the Canadian Engineer, was burned March 10.

The Montreal Light, Heat and Power Company has acquired the water power on the Soulanges canal. This will supply 40,000-h.p., which can be generated cheaper, it is claimed, than at any other place in America.

The New Westminster and Burrard Inlet Telephone Company are going to lay a cable connecting the Lower Mainland with Vancouver Island, the cost being estimated at nearly $175,000. It will be about twenty miles in length.

The Bell Telephone Company will build two long-service systems in the west this year, one from Lethbridge to Cardston, via Raymond and Stirling, the other from Calgary to Edmonton, via Olds, Ponoka, Lacombe and Wetaskiwin.

Herr Ernst Ruhmer, a German, has invented a new system of ethergraphy to prevent messages reaching persons for whom they are not intended, by means of a parabolic mirror. Only those stations in the direction of the mirror rays are able to receive the messages.

Notwithstanding the advance of electricity, the consumption of gas goes on increasing, thanks to cooking stoves and penny-in-the-slot machines. Statistics show that in the United Kingdom there is manufactured yearly 165,563,885,000 cubic feet of gas, an increase of 6,000,000,000 cubic feet in a single year. The gas cooking stoves in use increased 17 per cent., and penny-in-the-slot consumers increased 18 per cent.

Mayor Urquhart, speaking of electric power for Toronto, recently said that an able electrical engineer had informed him that a duplicate line could be built from Niagara Falls to Toronto for $600,000—$7,000 a mile. This would be for transmission of 20,000-h.p., the amount now used by Buffalo. In that city 350 miles of street car lines, the city lighting and many manufactories were run by this amount of power.

The result of the completion of the line to transmit 8,000 electric horse-power from Shawinigan Falls to Montreal is to bring electricity to a price to make its use for heating purposes commercially practicable. Manufacturers have been notified that from now until first October power will be supplied at one-half the usual rate. A canvass will be made among those using gas for lighting, and electricity will be supplied at the rate now paid for gas. For cooking purposes electricity will be introduced for those using gas ranges at one-half the price being paid for gas. This is for the summer only. On 1st October new rates will go into effect, but they are not expected to be much in excess of summer rates.

The new buildings, which the Canadian General Electric Co. are about to add to their works at Peterboro, will include one 450 by 80 ft., two stories high, with a large crane 25 ft. wide for shipping purposes, that work now done by each department being centralized in the new building; one, 235 by 80 ft., with a new 40-foot gallery and a 40-foot crane, for the manufacture of heavy machinery; one, 140 by 40 feet, being an addition to the new building erected last fall. The company, it is said, has under consideration the advisability of moving some of the departments, where the smaller articles are manufactured, to Montreal or Toronto, in order that more room may be available at Peterboro Should they not do this they will erect an extra building, 200 by 50 ft. The extensions will necessitate the employment of about twice as many hands as at present.

There is a legal fight over the by-law at Guelph to purchase the electric light plant by the city.

The Bell Telephone Co. has recently completed a copper line between Montreal and Quebec, the weight of which is 260 lbs. a mile.

Gonch & Seeley, of Boston, have been given the contract for the new outfit of the People's Telephone Co. The plant will provide for 500 phones.

A professor in Finland is trying a method of using electricity in agriculture. A seed field is covered by a network of wire, and a strong current is turned on nights and chilly days.

It is proposed to establish a large electrical power at the chute on Egan creek, near Bancroft, Ont., to be utilized by the Armstrong and Craig Corundum Mines and the iron mines of Mayo.

The Cumberland Railway and Coal Co. has installed a telephone system connecting Springhill with all the stations on the line to Parrsboro', N.S., and to the different offices about the works.

Sutcliffe & Muir, who intend erecting a flour mill at Moosomin, have in contemplation the installation of an electric lighting system for the town in connection with their other enterprise.

Experience has shown that nothing is gained, in ordinary conditions, by placing electrical power plants at the coal mines, it being cheaper to haul the coal by rail than to transmit its power by wire.

The Westport and Digby Telephone line is reported to have been sold to S. Gidney, of Mink Cove, N.S., who will put it in thorough repair. The Dominion Government will be asked to lay new cables between Petite and Grand Passages.

A wireless press bureau is to be established at Table Head for receiving and transmitting news by the Marconi system. There will be correspondents all over Canada. Canadian news will be transmitted to the Poldhu station for the British journals.

Through Caron & Sinclair, their solicitors at Ottawa, a company has applied to the Dominion Government for the privilege to construct a dam across the southern outlet of Lake Temiskaming. They propose to develop water power, and to install electric plants, reduction works, blast furnaces and other industries.

A half dozen men worked all one day in a mill at Greenwood, Me., recently, trying to get it started, and two of them continued the next day. In despair they took the engine to pieces. Inside the cylinder were several quarts of nuts, bits of bark, and other fine stuff. A squirrel had converted the cylinder into a storehouse.

The earliest telephone line was erected on the outskirts of Brantford, Ont., by Prof. A. G. Bell, the inventor; the first commercial line was established at Hamilton, Ont., in October, 1877, by the Direct Telephone Co., and subsequently a number of private lines were constructed in Toronto and Montreal, which were the foundations of the exchanges in the different cities.

In certain conditions the messages of the De Forest system of wireless telegraphy can be intercepted by the Braun-Siemens receiver. If the suspended wire of the latter is short it cannot be intercepted, but if approximately the same length it can. If, however, the De Forest despatcher sends rapidly, the Braun-Siemens, which receives on a ticker and tape, will not work fast enough, and instead of dots and dashes there is only a blur.

The council of Fort William, Ont., has closed a contract with the Anglo-American Power Co., of Chicago, to develop the water power of the Kaministiqua, at least 5,000-h.p. to be developed in two and one-half years. The town is to be supplied with 1,000-h.p. to commence with, at $15 per horsepower, and to have the right to take up to 10,000-h.p., as it may require, and to sell it in quantities of 5-h.p. or less. The company is to deposit $100,000 in the Bank of Montreal, as security.

The meter system of electric lighting is being introduced at Prescott.

Toronto Junction is seriously considering an independent telephone system.

The Humber Power and Light Co. proposes to instal a substitutional gas or steam plant.

The Dominion estimates provide for an electric lighting plant for the Welland Canal.

A passenger elevator will be built at Quebec from the foot of Mountain Hill to the ramparts, at a cost of about $20,000. The electric railway will be extended along the ramparts to the elevator.

Application is made for the incorporation of the Dominion Oxygen Light Co., the object being to supply lighting by means of a new invention in carbureters. A number of Winnipeg people are interested.

Mayor Urquhart, of Toronto, wants the city to buy the Gas works. He would offer 214 for every share of gas stock, and provide $10,170 to reimburse those who bought at a higher figure than 214. The cost would be $3,755,170.

The electrical equipment of the Cornwall Canal has just been completed, where thirty-three of the Ampere Electric Mfg. Co.'s induction motors were installed, most of which were in operation before closing of navigation last season.

The West India Electric Co., a Canadian company, of which F. L. Wanklyn, of Montreal, is president, and which owns the street railway in Kingston, Jamaica, is about to add to its equipment, and will establish a system of electric lighting in Kingston.

The Dominion Government has placed the order for electrical equipment of the Lachine Canal with the R. E. T. Pringle Co., sales agents for the Ampere Electric Mfg. Co., Montreal. Forty-nine motors are to be used in operating the lock gates and swing bridges.

The Ampere Electric Mfg. Co. are building two induction motors, each of 200-h.p. capacity, for operating the new linoleum mills of the Dominion Oil Cloth Co., Montreal; a 75-h.p. induction motor for the Locomotive and Machine Co., of Montreal, and two 50-h.p. motors for the Canada Axe and Harvest Tool Mfg. Co., besides the usual drift of smaller size.

The development of 3,000-h.p. on the Kettle river, at Cascade, B.C., about fifteen miles east of Grand Forks, which has been in progress nearly two years, will soon be completed. Power will be conveyed by wire to the various mining camps. A dam 400-ft. long and 50-ft. high has been constructed, which raises the water 36-ft. above the natural level, thus giving a working head of 156-ft. at low water.

A strike took place at the King Edward Hotel, Toronto, caused by the transfer of electrical conduit work, which had hitherto been done by plumbers, to electrical workers. The local plumbers declined to relinquish this work, although the order for its transfer to the electrical workers is said to have been authorized by the A. F. of L., and other international bodies, who fixed March 16th as the day for the transfer. This order applies to the whole country, and has been obeyed it is stated, everywhere except in Toronto. Twenty electrical workers were called off by the union, as a result of the difficulty.

Speaking of wireless telgraphy, in an address on "Future Possibilities of Electricity," C. P. Steinmetz, the expert electrician, said that the success of wireless telegraphy would in the future prevent anyone from being completely isolated, and that by its means arctic explorers would be able to communicate with civilization, and thus prevent any more expeditions being lost and perishing. He said that it would also be generally used in war, so that an opposing force could not cut wires and thus cut off communication. He added that the telephone is yet in its infancy, and that within half a generation it will be possible for Americans to talk with friends in Europe, as a trans-atlantic telephone is a question of only a few years. With reference to electricity as a motive power, he said that it will never supersede steam for long distances, as each locomotive generates its own power, and that in direct proportion to its size.

The London Times had, in its issue of March 30th, about 200 words of foreign news received "by Marconigraph."

It is proposed to establish an independent telephone system at Welland, Ont., to connect with the small rural independent systems around that town.

Successful tests in communicating between stations and moving trains have been made in Germany by the Braun-Siemens system of wireless telegraphy.

Wireless telegraphy has been established between Toronto and Hamilton, the De Forest system being used, a description of which will be found elsewhere in this issue.

The large buildings of the Bell Telephone Co., in Montreal, which were finished about three years ago, are to be extended by another large building adjoining on Hospital street. The new structure will have a frontage of 143 ft., and will be several stories high.

It looks as if the Bell Telephone Co. is to have a rival. Notice is given of application for a charter for a company to operate telephone and telegraph lines throughout Canada. Kidd & Thompson, of Ottawa, are solicitors for the applicants, whose names are not given.

F. J. Orr, of Buffalo, and Col. Gaskill, of Niagara Falls, N.Y., have been in Hamilton investigating the field for an independent telephone system. Col. Gaskill said the company that was being organized would undertake to make a residential rate of $12 to $20 a year, and a business rate of $18 to $30.

The Winchester Repeating Arms Company have put in two 165-h.p., Westinghouse, 3-cylinder producer gas engines at their gas power plant in New Haven. The plant is the first American installation of gas power apparatus for industrial work. The present equipment comprises gas engine, generator units, and Loomis-Pettibone Producers. It supplies electric power and light for operating the entire manufacturing establishment.

The newly formed Independent Telephone Company, of Newtonville, Ont., held a meeting a few days ago, at which it was decided to build lines from Newcastle to Kendal, via Newtonville. Poles and 'phones are ordered and work will commence at once. Since the meeting the general agent of the Bell Telephone Company interviewed Mr. Bryans, manager of Traders' Bank, Newcastle, offering to build and equip the lines in addition to connecting with Newtonville Station, for $15 a phone. Finally, he offered to do it for $10 a phone yearly for a term of three years. All offers were refused.

A meeting of the ratepayers of Toronto Junction was held last month to consider the telephone situation. The Bell Company charges Toronto Junction citizens $35, with a toll of 10 cents, for connection with Toronto, an average of three to five miles distant. Where through connection is made free to subscribers the charge is $110. F. Dagger, a telephone engineer of Toronto, told the meeting that the Junction citizens could get 'phones for residences at $9 a year, or for business places at $12, or by a central energy system at $10 and $15 respectively. After discussing the exactions of the Bell Company, a resolution was passed asking the council to proceed with the establishment of a municipal system. The resolution also affirmed the principle of Government ownership of all trunk lines of telephone and telegraph, with permission for all municipal systems to connect with the said trunk lines. The local member, Archibald Campbell, was to be waited on requesting him to bring the subject before Parliament.

—F. H. Clergue has retired from the management of the Consolidated Lake Superior Co.'s interests at Sault Ste. Marie, but remains on the board of directors. Cornelius Shields, general manager of the Dominion Coal Company and second vice-president of the Dominion Iron & Steel Company, becomes president and manager. T. C. Search retires from the vice-presidency and E. H. Sanborn becomes vice-president.

THE BRAUN-SIEMENS AND HALSKE SYSTEM OF WIRELESS TELEGRAPHY.

INTRODUCTION.

The system of Prof. Braun-Siemens & Halske wireless telegraphy consists essentially in the use of a closed circuit of oscillations, which may, by a proper choice of self-induction and capacity, be adjusted to a strictly determined period of oscillations in either direct or indirect connection with an open resonator. In this way one obtains a transmitter that only sends out waves of an exact and known length, and a receiver that responds far better to this particular length of wave than to any other. In order to make the intensity of the waves as great as possible, one strives to obtain exact symmetry between the circuits on either side of the resonator. This symmetry is observed in the transmitting as well as in the receiving apparatus; so that in this system there is no need for a ground connection, as required in all other systems. The abolishing of the ground connection is of great importance, as in this way one avoids practically all atmospheric disturbances. This fact has been confirmed by experiment.

THEORY.

To explain the principles of the system in general in Fig. 1, S is the circuit of oscillation, which is connected to the secondary terminals of an inductor, J, and excited by it.

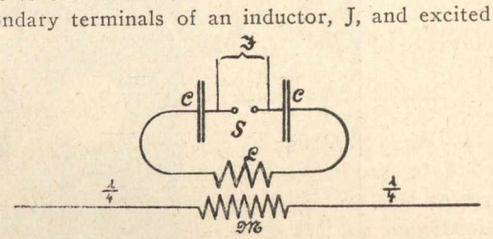


Fig. 1.

It consists of the capacities C, self-induction L, and the spark gap. If E is the potential difference between the armatures of the condensers, the intensity of current, which is produced by their discharge is:

$$J = \frac{E - L\frac{dJ}{dt}}{R}$$

where R signifies the resistance of the circuit, and L the self-induction.

The oscillations of this closed circuit are forced upon the secondary coil M (Fig. 1), and in order to obtain in this secondary coil a maximum of intensity, it is necessary to add to each end of the coil a length sufficiently great to put this circuit in resonance with the closed circuit. Then, if the damping in the closed circuit is sufficiently small the effect of this resonance is to raise the intensity in the secondary circuit enormously. Experiments have proved that the length of this secondary circuit on either side of the centre of the coil M should be ¼ wave-length. Thus one length becomes the aerial wire, the other may be conveniently wound into a coil, shortened to suit the increased self-induction or replaced by suitable capacity.

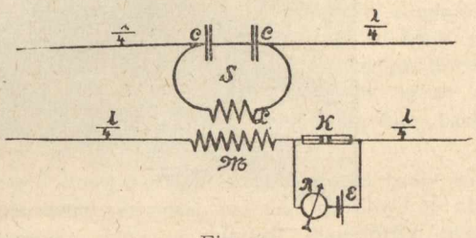
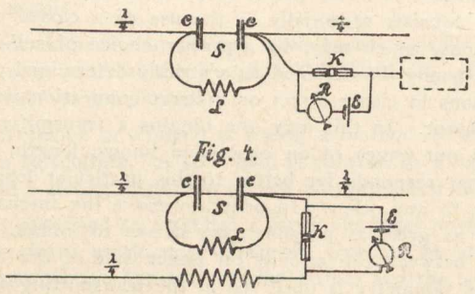


Fig. 2.

The receiver is constructed quite similarly to the transmitter, except that in a sense the connections are reversed, since in this case it is the open circuit in which the oscillations are set up and which forces its oscillations on the closed circuit of the secondary.

Fig. 2 shows the connections, which need hardly any further explanations.

Experiments have proved that this receiving system can be simplified with or without the transformer, as is shown in the diagrams, Fig. 3 and Fig. 4. In these arrangements two electric lengths opposed to the aerial wire are used. In one of these the coherer is placed. It seems that the

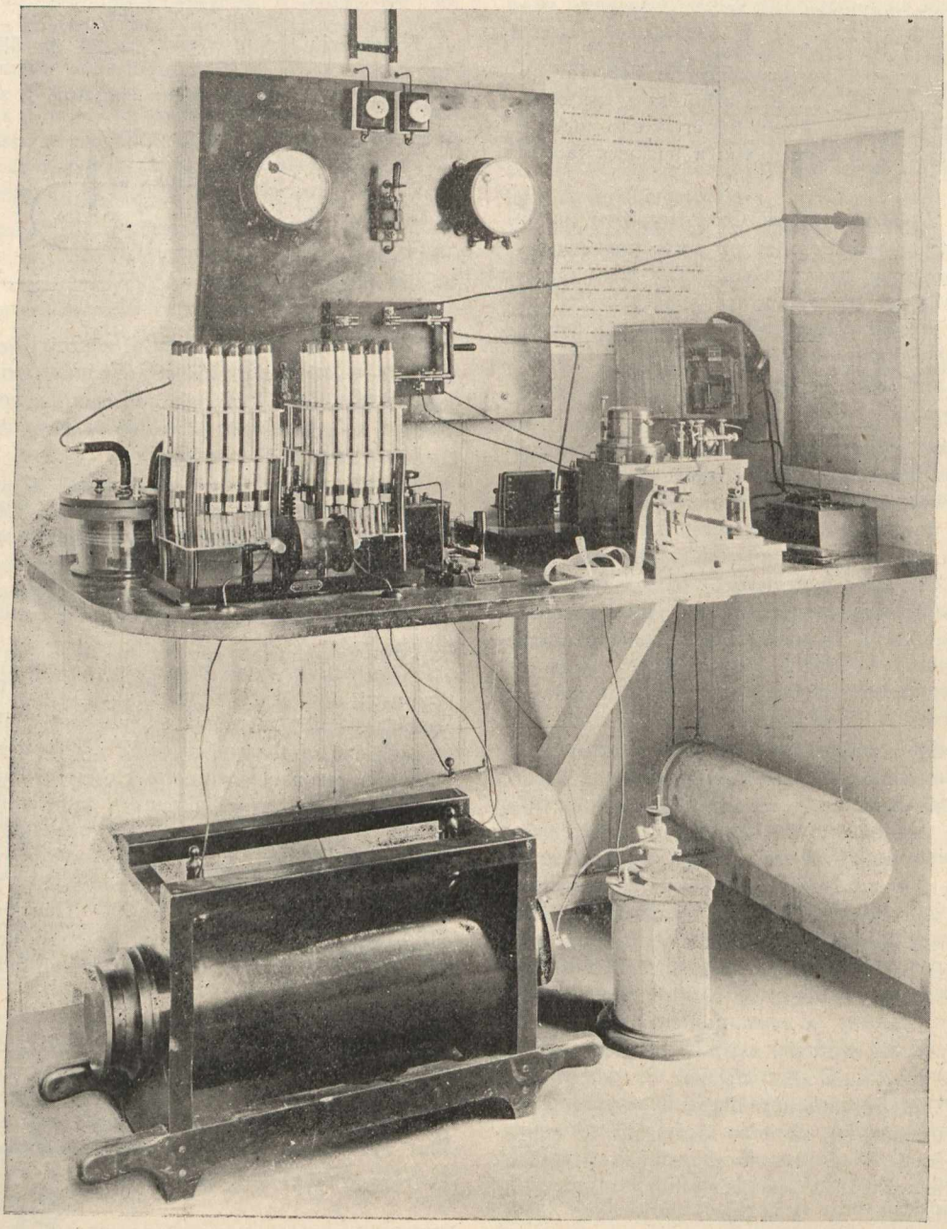


Figs. 3 and 4.

coherer disturbs the resonance; therefore, the second wire A = ¼ wave-length is employed by which the resonance is restored and the working of the coherer is assured.

construction, its aim being to produce not so much the high tension of the ordinary spark inductor as a large current output. With this special inductor we are able to charge much larger capacities in a shorter time interval than was possible with the ordinary form. The practical difference in construction consists in employing a special iron core, a considerably larger primary and a much shorter and heavier wire for secondary than in the ordinary type. In order to obtain a large charging power on the smallest time interval (resistance and capacity), the ohmic resistance of the secondary must be kept low. Further, in this construction, in which the C^2 R losses are not prejudicial, we obtain an insulation more than double that of the ordinary type, so that the coil will work even in very damp places. The primary is interchangeable and is fitted with three terminals giving different lengths of primary for different interruptors.

The accompanying photograph shows the special form of a Wehnelt electrolytic interruptor. The upper part of the platinum pole above the surface of the liquid is protected from acid vapors by enclosing it in a porcelain tube. This prevents the explosions due to spark in acid gas formerly



General View of System.

THE APPARATUS.

Transmitting. — The transmitting apparatus consists essentially of two groups, the inductor, with its auxiliaries, and the circuits of oscillation.

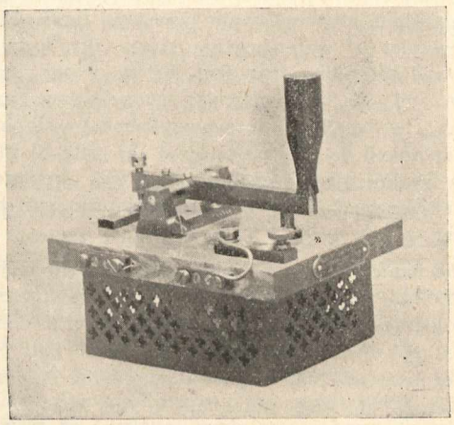
THE INDUCTOR.

This differs considerably from the ordinary inductor in common. For larger distances, it is intended to employ the Grisson direct-current-alternating-current transformer, which may be easily employed as the primary coil is interchangeable.

THE MORSE-KEY.

Owing to the strength of current employed, the Morse

key has had to be considerably modified. The accompanying photograph shows a morse-key so modified and capable of interrupting a current of 50 amperes without damage to itself. The platinum contacts are much larger in size and the key is fitted with a magnetic blow-out, which quickly extinguishes the spark and so prevents damage to the key.



The Modified Morse Key.

THE LEYDEN JAR CAPACITIES.

To obtain at the same time the highest resistance and the maximum capacity in the lowest possible space, the tube form of jar has been chosen. The tubes are made of the best glass about 25 mm. in diameter and 2½ to 3 mm. thick, and their capacities vary from 0,0004 to 0,0005 M.F. each. Spare tubes are furnished with each set of apparatus, if for any cause one or more of the tubes have to be replaced.

TRANSFORMER-SENDING-STATION

The primary of the transformer consists of a few turns of thick, insulated copper wire and possesses such a self-induction that, together with the capacity described above, the desired period of oscillation $T = 2 P \sqrt{LC}$ is obtained. The secondary coil is of such a length, size and inductance that together with the aerial wire to be employed we obtain the highest possible resonance. As very high tensions are used (although quite harmless on account of the high frequency),

Wehnelt Electrolytic Interrupter.

the transformers are enclosed in a glass cylinder containing insulating oil. When the maximum resonance is obtained, this transformer is a powerful multiplier (Tesla effect), and produces a high tension which gradually increases to the extremity of the aerial wire where it is a maximum (Ferranti effect). The opening wire, which is necessary in order to restore symmetry, is conveniently replaced by a capacity which usually takes the form of concentric cylinders.

A switch is arranged to connect alternatively the aerial wire with the transmitting or the receiving system.

THE RECEIVING SYSTEM.

As such high tensions do not occur in the receiver, the condenser can have much smaller dimensions than those of the sending system. The coherer consists essentially of an ebonite tube containing hardened steel particles of a uniform size, in the adjustable space between two polished steel electrodes. It is not known whether a vacuum adds to the reliability of a coherer or not. At any rate it is certain that once an evacuated coherer loses its sensitiveness, it is of no further value. Our coherer can be restored to its original condition at any time by the renewal of the steel particles.

The magnetic adjustment.—It is well known that the coherer becomes magnetic in use, and that, while a small amount of magnetism increases its sensitiveness, too much renders it over-sensitive, and hence unreliable. To obtain the advantage of a small amount of magnetism and obviate the disadvantage of too much, a permanent ring magnet is employed.

The Microphone.—The foregoing apparatus is employed exclusively with the Morse register. In cases where a record is not wanted, where syntonizing is not essential, and for extreme distances, a microphone with telephonic reception is employed. The microphone consists of a steel disc pressed against a carbon or steel point. By means of a screw, the pressure of the disc on the point and hence the sensitiveness of the microphone-hearer can be varied at will.

From the accompanying photograph, the connections of microphone telephone and the dry cell, can be readily followed.

Science and Invention.

Two balloonists recently covered 807 miles in thirty hours, starting from Paris and landing beyond Budapest.

Six employees of a Barrow, Eng., engineering firm have received prizes, ranging from $5 to $50, for suggestions tending to the more economical production of work.

France has a standing offer of $12,500 for the invention of a satisfactory substitute for phosphorus. The German Government is stated to have such a substitute, and to have offered it to match factories which now use phosphorus.

To keep machinery from rusting dissolve one ounce camphor in one pound melted lard; remove the scum; mix as much black lead with the lard and camphor as will give it an iron color; clean the machinery well; smear with the mixture; after twenty-four hours rub off; clean and polish with soft cloth.

In putting on belting, it should be stretched as tightly as possible, and with wide belts this can be done by the use of clamps secured firmly to each end of the belt, and drawn together by clamp rods running parallel. There is no danger of breaking, as a belt six inches wide and three-ply thick will stand a direct strain of 5,000 pounds.

In Germany, electricity, among other curious results, has rehabilitated the discarded windmill. At Nersham, a windmill supplies power for thirty-six incandescent lamps, that light a large paint factory. Another keeps up a steady current of thirty volts. At Dusseldorf a windmill winds up a heavy weight, the descent of which works a powerful dynamo.

The heating of buildings by exhaust steam does not appear to be so economical as is generally supposed. Its economical use is limited by the amount of back pressure put upon the engine. An engine developed 300 horse-power from 80-lb. boiler pressure, or about 35-lb. mean effective pressure at one-fourth cut-off, there being 8-lb. back pressure caused by the heating system.

It is well known that aluminum works badly with certain cutting tools and files, and that an alloy of aluminum and magnesium have a marked superiority over pure aluminum, but less malleable and ductile. It has been observed that if aluminum is allied to 2 to 10 per cent. of magnesium, the metal obtained is hardly to be distinguished from aluminum, but when passed several times through a flatting mill, heated each time towards 400—500 degrees C., its principles are modified. The alloy cuts and files well, as though it was charged with magnesium. It has preserved, also, the ductility and malleability of pure aluminum.

Perhaps the most remarkable instance of the nicety of calculation employed in modern manufacturing is that of the Cambria Steel Company, of Johnstown, Pa., which recently completed 800 steel cars for the West Virginia Central Railway without having a single piece of material left over.

The Geschaftsstelle Vereinigter Carbidfabriken, of Nuremberg, Germany, has opened a competition for the best method of packing calcium carbide. Two prizes of £50 and £25, respectively, are being offered, and the competition will remain open until March 1st next. The packing method to be selected must comply with existing railway and shipping regulations, cheap, simple, water and air-tight, etc.

Muskrats burrowing beneath a dam in Connecticut caused a flood in the village of Shelton, and did damage to the extent of $50,000. The reservoir had been built over twenty years, and was believed to be as solid as rock. The heavy granite wall is still standing, and all the water passed beneath it.

An Italian invention is announced by Signor Turchi, an engineer, and Prof. Brune, by which telegraphic and telephonic mesages can be sent simultaneously on the same wire. Similar inventions in Belgium, Austria and Germany did not fulfil what was claimed for them, but the present one is so successful that Signor Galimberti, Minister of Posts and Telegraphs, is about to test it on the public wires. If the result is satisfactory, the invention will be adopted forthwith.

A new osmium lamp has been invented, which may have possibilities for carriage lighting. Osmium is a metal of the platinum tribe, and is one of the heaviest known. It is harder than glass and will not melt at a temperature under 2,500 deg. C. When used in incandescent lamps it affords a very strong, white, lasting and steady light. There are two types of this lamp—the 10 to 15 candle-power with a current of 20 volts, and the 16 candle-power with a current of 25 volts. Both stand vibration well.

Otto Klotz and F. W. O. Werry, Canadians, are to make scientific observations for the determination of longitudes along the line of the Pacific cable. In 1892 the work was continued from Greenwich to Montreal, and since then carried across the continent along the line of the C.P.R. to Vancouver, and now the observations are to be continued to Australia, where connection with the previously determined telegraph longitudes will make a circuit around the world, in addition to determining the longitudes of all the cable stations.

The metal radium is sold at a price equivalent to $900,000 a pound. Scientists are the only purchasers. Referring to its properties, Sir William Crookes says: "If half a kilogram (one and one-tenth pound), were in a bottle on that table it would probably kill us both. It would almost certainly blind us and burn our skin to such an extent that we would not survive. The smallest bit placed on one's skin will raise a blister that will take months to heal. Radium emits electrons at such enormous velocity that the energy of one gram (one-twentieth of an ounce), of electrons is sufficient to lift the whole of the British fleet on to the top of Ben Nevis and possibly the French fleet, too. The metal must always be a laboratory subject, but experiments with it may lead to important discoveries."

A new method of brazing cast iron has been found, which has changed the methods of European foundries. The patterns are now cut into two or more parts, so that each is a simple piece to mould, and the parts are brazed together, so that when the brazing operation is complete, the pieces are as one entire casting, and the cost of production is reduced. Flaws are eliminated by drilling them out if small, and brazing in a plug made to fit the hole. If large and in the nature of a crack, and if the crack is wide, a piece of iron is fitted into the space and brazed in. If narrow, the crack is cleaned out and brazed up. If necessary, the fracture may be extended by hammering, even if this involved breaking the piece entirely in two. The cost of the ferrofix involved is about half a cent per square inch of surface brazed.

Freezing the earth by artificial process, in order to cut tunnels through it, is a development of modern engineering. It is to be employed on the Pennsylvania tunnels into New York. It has been employed in various places, among others, in sinking a shaft at the Chapin mine, at Iron Mountain, where a cylinder of water-bearing strata, fifty-four feet in diameter, and extending 100 feet below water level, was first frozen and the perpendicular tunnel then excavated through it. The freezing was accomplished by sinking vertical pipes arranged in a circle around the site of the shaft. Through a smaller pipe in each of these was circulated brine, cooled in an ice machine to zero temperature until the mass was frozen.

The mechanical force of the sound emitted from 5,000,000 to 10,000,000 cornets, would equal but one horse-power.

A smokeless stack has been invented, with collars and drip plates, and having water forced about half way up. The smoke, in attempting to pass through the flowing water, sheets, is turned into soot, which falls to the bottom. Another device has been tried on the Michigan Central Railway. A smoke consumer is situated near the fire-box, and is so arranged that with proper firing no smoke issues from the stack, but is used again for fuel. This little concern has proved to be very economical, and if the results are satisfactory, after a thorough test, they will be used on all engines. Still another smoke preventive, which also acts as a fuel economizer, is made by inserting a pipe in the top of a stack, leaving an annular space of three inches between itself and the inside of the stack, extending eight feet down into the stack and projecting seven feet above it.

Marine News.

The steamer Hamilton has been rebuilt and lengthened 40 feet at Sorel.

It is alleged that the Gulf Stream has diverged two degrees further north than formerly.

Goderich is asking for the construction of a breakwater outside the harbor. It would cost about $100,000.

The Thunder Bay Harbor Improvement Co. has the contract for piling for the new dock at Port Arthur, which the C.N.R. will construct this summer.

The C.P.R. SS. Alberta will go on the dry dock at either Port Huron or Detroit for inspection this spring. The steamers of this line go on the dock once every three years, and it is the Alberta's turn.

S. Maximoff, engineer to the Russian Imperial Government, is on a tour of inspection of all the greatest engineering works of the world. He recently visited the Trent Valley Canal lift lock, near Peterboro.

A strange craft is being built at Davidson's shipyard, West Bay City. It is a huge fuel ship, having 16 compartments, capable of holding fifty tons of coal each. A trough runs through the centre of the craft and, by means of a new patent bucket process, 300 tons of coal per hour can be discharged from the collier to any other craft. It is owned by the Pittsburg Mining Co., and will cost $45,000.

F. S. Henning, president of the Marine Engineers' Association, has been in Ottawa urging the amendments to the Steamboat Inspection Act suggested by the engineers at the last meeting of that association. The engineers ask that every vessel coming under the Steamboat Inspection Act be compelled to carry a certificated engineer, that all temporary certificates be abolished, that candidates for fourth-class certificates must have 36 months' service in a machine shop on the making and repairing of steam engines, also 12 months' service in the engine room as an oiler or fireman, or in lieu of this service he must serve 48 months as fireman or oiler on the watch. The engineers also want the responsibility for the use and care of the deck hose transferred to the deck officer.

The lake divers at Cleveland are on strike.

An appropriation will be asked to light the ship channel between Montreal and Sorel.

The Welland canal will be open for navigation on April 10th, and the other canals on May 1st.

Tenders are again asked for a fast Atlantic service, offers being received for an 18 and 21-knot service.

The Canadian Northern Railway disavow any intention to place a fleet on the Atlantic at present.

The C.P.R. has abandoned any intention to establish a steamship service with Glasgow for the present.

The steamer Rideau Queen sank in the lock at Jones' Falls, where she was wintering. She was easily pumped out.

John A. McGowan has launched, at Shelburne, N.S., a new steamer to ply between St. John, N.B., and Westport.

Work for the season has commenced on the contract for deepening the channel of the St. Lawrence east of Prescott.

M. Connolly, of Montreal, has purchased a steel steamer for the Baie de Chaleurs trade, and is negotiating for another.

A shoal with only 12 feet of water has been formed about 500 feet south of the eastern entrance to Toronto harbor.

The Government steamer, Stanley, after two months' imprisonment in the ice in Northumberland Straits, got free without damage.

A wireless telegraph system is to be installed in the Lower St. Lawrence, if practicable, and of advantage to vessels navigating the river.

St. Andrew's, N.B., is spoken of as the winter port of the C.P.R. The ocean voyage is about 140 miles shorter than from St. John or Halifax.

The mast recently placed in the yacht Shamrock, built for Sir Thomas Lipton, is hollow steel of unbroken length, The topsail yard is of similar construction.

The steamer Della Ritchie sank at her wharf at Kingston. It is said the frost drew the oakum out of the seams, and the same cause is given for other similar disasters.

Work has been resumed on the Depot Harbor breakwater. The company has purchased two additional engines for the work, which is under the management of Fred. C. Miller.

The Muskoka and Georgian Bay Navigation Co. authorized the directors, at the annual meeting, to spend $40,000 for a new steamer. A. P. Cockburn was again elected manager.

The new twin screw SS. Columbus, of the Dominion line, lately launched at Harland & Wolff's Belfast shipyards, is nearing completion. She is of similar design to the Commonwealth, but larger—15,000 tons.

The British cable steamer Iris will be kept permanently on Pacific line repair work, after laying a 40-mile section up the Alberni canal to replace a bad section of the land line which had to be repaired frequently last winter.

Permanent steel sheds, with concrete floors, will probably take the place of the temporary wooden sheds on the Montreal wharves. The estimated cost of eight sheds, including elevated roadways, ramps, tracks, etc., is $2,368,000.

The steamer Rosemount will be electrically equipped with a direct connected unit system battery, and the wiring for sixty-five incandescent lights and a powerful searchlight. The new steel steamers, Fairmount and Westmount, will be similarly equipped.

If Parliament does not do something for Capt. Bernier this session, he will probably accept an offer from a wealthy New Yorker to take charge of an expedition to the North Pole. Anthony Fiala, a young artist and photographer, of Brooklyn, is to lead a Ziegler expedition to the Pole.

The Iroquois, built last summer by the Bertram Co., for the St. Lawrence Navigation Co., is being finished at Toronto for her place on the Fort William and Georgian Bay route. She is 260 ft. long, 43 ft. beam, and will have a speed of 13 knots. She has two separate holds capable of carrying 4,000 tons of grain or other freight. She will go light to Chicago for her first load. Capt. Thomas Ewart will command her, and Engineer O'Dell will be chief engineer.

J. F. Foote, son of the late Capt. Foote, of Owen Sound, has been appointed marine superintendent of the Canadian Ocean and Lake Navigation Co., in succession to Capt. Donnelly, who has returned to Kingston.

The ratepayers of the Township of Bertie have, by an almost unanimous vote, expressed themselves in favor of exemption to the Canadian Shipping Co. on their shipbuilding plant, about to be established at Bridgeburg.

Captain W. O. Zealand, of Hamilton, has been appointed to the command of the Government steamer, Lord Stanley, which is to be employed in hydrographic survey work on Lake Superior. The survey will again be in charge of Mr. Stewart.

The hull of the R. & O. steamer, Montreal, recently burned, was so badly damaged that she cannot be rebuilt. Two new boats will be built, and if at Toronto will probably be taken down the canals in sections, as the risk of running the rapids with such large boats is too great.

Napier & Miller, shipbuilders, of Glasgow, Scotland, are asking information relative to Sydney as a suitable place for steel shipbuilding purposes, and for maps, charts, plans of available lands, cost and quantity of labor, etc., in connection with the establishment of a yard capable of laying down a vessel of 600-ft. keel.

Wm. Peterson, of Newcastle-on-Tyne, will, it is said, run a line of steamers, under the name of the Canadian Ocean Inland Line, between Rotterdam and Canada. Two will go as far as Fort William. Thomas Harling, late of Leyland line, is Canadian manager. The traffic to Canada will be largely steel rails.

A 25-knot turbine steamer, 300 by 40 feet, has been ordered for the route between England and France, to cover the distance in 45 minutes. It will be possible, with the turbine vessel to devote much more space to passenger accommodation than in ordinary steamers. If successful, it is expected the turbine system will be extended to Atlantic traffic.

Wm. Mackenzie is having built at the Polson Iron Works, Toronto, a private yacht, length 70 feet, breadth 10 feet, with triple expansion engine of 110-h.p., boiler of the Yarrow type, to stand a working pressure of 250 pounds, and guaranteed speed of 14 miles per hour. The cost will be in the neighborhood of $12,000. She is to run on the upper Trent waters.

Alexander Graham Bell inventor of the Bell telephone, writes from Washington, D.C., to L. J. Lacoste, of Montreal, inventor of the ship brake, that the collision between the Sound steamers, Plymouth and City of Taunton, could possibly have been avoided had the steamers been provided with his appliance. Mr. Bell saw the brake in action on the Government ship Eureka.

Railway Matters.

The G.T.R. has added a powerful crane to its wrecking plant at Belleville.

There is a strike among the firemen on the C.P.R. steamers, between Vancouver and Victoria.

The last of an order for 800 flat cars has been completed at the London, G.T.R. shops.

The Winnipeg Street Railway Company plans to build several extensions within the city during the summer.

The Toronto & Mimico Electric Railway & Light Co. is applying to the Legislature for permission to change its name and to extend its line to Hamilton.

A. F. Gerald, of Fairfield, Maine, has been looking over the ground with a view to building an electric railway in the vicinity of Charlottetown, P.E.I.

The London, Aylmer and North Shore Electric Railway will construct a power house, machine shop, and car barns at a cost of about $200,000, at Aylmer, Ont.

The Sault Ste. Marie, Ont., electric railway was opened for traffic March 30th. A 15-minute service is given over the two and a half miles of road. The rolling stock consists of five motors and three trailers.

A deputation from Quebec, representing the Trans-Canada Railway, appeared before the Board of Trade, at Toronto, and presented the claims of that road.

Mackenzie & Mann have now obtained absolute control of the Great Northern Railway of Canada. Mr. Mackenzie has been elected a director of the Shawinigan Power Company.

The contract for 25,000 tons of steel rails has been awarded by the Government to A. G. Kitson & Co., Glasgow, Scotland. The rails must be delivered in Canada by July 1st. The price is withheld for the present.

The Hartman Machine Works, at Chemnitz, have received an order for twenty locomotives for the Canadian Pacific Railway. This is the first time a contract for locomotives has gone from North America to Germany.

The New York Sun says that J. B. McDonald, of New York, has been given a contract to build a railway from Port Valdez up the Copper river to Eagle City in the Yukon and thence to Dawson. The Port Valdez route is 175 miles shorter than that by way of Skaguay.

A bill is before the Nova Scotia Legislature to transfer the Nova Scotia Central Railway to the Halifax & Southwestern, or, in other words, to Mackenzie & Mann, who are building the latter from Halifax to Yarmouth, a distance of 74½ miles. This transfer will save 13 miles of building, and the Nova Scotia Government the subsidy for the same distance, as the Central will be used between Mahone Bay and Bridgewater.

It is announced that the construction of the electric railway between Toronto and Cornwall will be proceeded with at once, and that it will be in operation by January, 1904. The first section will be from Brockville to Prescott. An attempt was made to purchase the Kingston electric road, which runs to the suburbs of Portsmouth and Cataraqui, but the price asked, $200,000, was thought too high. Through cars will be run, leaving the terminals every hour. The cars will be 50 feet long and will have baggage cars attached.

Two record runs have been made over the C.P.R. between Toronto and Windsor. A special, bearing a party of teachers, ran from Windsor to Toronto, 228 miles, in four hours and nine minutes. On the return trip two days later the run was made in four hours three minutes, actual running time. This is an average of 56⅛ miles an hour. Part of the way 72 miles an hour was the rate of speed. The best time previously made over the same line was four hours and twenty-five minutes.

The Temiskaming Railway Commissioners have offered to purchase from the Clergue Company the 2,500 tons of rails purchased by the Intercolonial, and regarding which there was a disagreement as to price. The commissioners have offered the same price as they are paying the Cammell Company, of Sheffield, for rails already ordered. Track laying will begin in May. Forty miles will be ready for the track by June 1st. It is hoped to complete seventy-two miles instead of sixty-five this year. An order has been given to the Kingston works for four locomotives. Specifications for cars have been ordered.

At the session of the Manitoba Legislature, just closed, several railway enterprises were chartered, including the proposed extensive system, which it is alleged is being promoted by the Great Northern-Northern Pacific combination, and known as the Midland Railway Co., of Manitoba; also the act which provides for assisting the Canadian Northern Railway to extend its lines in Manitoba. The Portage and Southwestern Railway company was also incorporated. Acts were also passed relating to the Western Extension Railway Company; the Winnipeg and Fort Alexander Railway Company; the Midland Railway Co., of Manitoba, and the Avondale-Brandon Central Railway Co.

—Darling Bros., Montreal, manufacturers of pumps of all kinds, heaters, etc., have opened an office in Toronto in the Quebec Bank Building, Toronto street. They have also an office in Vancouver. The new sectional catalogue, issued by this firm, describes their various specialties.

Municipal Works, Etc.

Portage la Prairie, Man., is considering waterworks.

Glace Bay is considering an electric fire alarm system.

Brockville is asking for tenders for granolithic sidewalks.

Gananoque is discussing waterworks. The cost is put at $140,000.

E. G. Barrow, city engineer, Hamilton, has prepared a plan for a drive along the bay front.

Dickson Bros. have the contract for a ten span iron bridge over the Trent at Hieley Falls.

The iron bridge over the St. Francis river at Brompton Falls has been carried away by the ice.

Harry Evans has been appointed commissioner of civic work at Peterboro at a salary of $700.

Danville, Que., is advertising for road machinery, and the construction of four miles of permanent road.

Winnipeg has accepted the tender of the Allis-Chalmers Co., for crushers, boiler, engine, etc., at $9,900.

Stratford ratepayers have voted $98,000 to purchase the waterworks, and $8,000 for street improvements.

Brandon, Man., has been granted permission to raise $50,000 to improve the waterworks, and $40,000 for other improvements.

The ratepayers of Richmond, Que., have voted $24,000 for the purchase of the waterworks system from the company heretofore owning it.

The county of Peterboro has awarded a contract for a stone bridge over the Indian river in Dummer, to Richard Sheeley.

There is keen competition between the asphalt paving companies for the Montreal city contracts, and prices are likely to be extremely low.

Port Arthur will expend $91,000 on a waterworks system if the ratepayers consent. The water will be taken from the Current river, and will be pumped from a filtering basin.

Nineteen large buildings are to be erected in Montreal this year, aggregating $2,800,000. Among them are the C.P.R. shops, C.P.R. elevator, G.T.R. elevator and a clothing factory.

The township of Montague has purchased a stone crusher, two dump wagons and four moulds for making concrete culvert piping, at a cost of $1,300, for the roads. They already have a grader.

The ratepayers of Carleton Place have decided to obtain from a competent engineer an estimate of the cost of a system of waterworks and sewers. They will then determine whether to construct them or not.

Winnipeg has let tenders for cement and asphalt, the former to Jas. H. Ashdown for 8,000 barrels at 82.575 cents per hundredweight, the latter for Venezuela Lake, Acme and Angelus brands in 100 and 200 ton lots.

John Galt, C.E., Toronto, has been appointed consulting engineer for Regina, N.W.T., to report upon a system of sewage, waterworks and electric light, which that city proposes to carry on as municipal undertakings.

An inspection by Belleville Water Commissioners led to the discovery that a creek was being fed from the town mains. The leak was stopped, when the gauge disclosed that 80,000 gallons a day had been going to waste.

The floating bridge across Chemong Lake, near Peterboro, was badly wrecked by the wind and ice. It was built, to replace a similar bridge, about two years ago, costing some $30,000, and was thought to be proof against any storm.

During the winter of 1901-1902, it cost the corporation of Montreal and the Street Railway Co., $102,000 to remove the snow from the streets. But there were great and lasting snowstorms. Last winter it only cost from $85,000 to $90,000.

The bridge over the Kaministiquia river at Stanley is being rebuilt. It was built by the Ontario Government about twenty years ago, but was damaged by ice and allowed to fall out of repair. The revival of silver mining calls for its repair.

Work on new pavements commenced in Toronto on March 30th, being much earlier than usual.

The Violin Lake Power Company has been incorporated for irrigation and other purposes in West Kootenay.

The septic tank and bacteria bed system of sewage, recommended for the east end of Toronto by the city engineer, has been vetoed by the people, who were not willing to pay for it.

A concrete floor is to be laid on the Hartman bridge, the first of the kind in the county of Waterloo. The plan is to lay a plate of corrugated steel on metal joists, then a covering of concrete.

A new inter-municipal bridge across the St. Francis river between Richmond and Melbourne has been opened for traffic. It is a two-span structure, 750 feet in length, each span being 375 feet, the longest spans in any municipal bridge in Canada. It cost $51,000, and will be free after 25 years, by which times the tolls will, it is expected, pay off the debentures.

Personal.

W. E. H. Carter has been appointed provincial inspector for the Bureau of Mines.

Capt. J. F. Foote, one of the oldest of lake navigators, died recently at Owen Sound.

Kenneth McLennan, of Hamilton, for many years inspector of bridges on the Grand Trunk, is dead.

James Barge, at one time a prominent railway contractor, and manufacturer, died at Windsor, Ont., March 21st.

James Corbett, one of the founders of the Corbett Foundry and Machine Shops, at Owen Sound, is dead.

C. J. Higgins, manager of the Bell Telephone Company's business at Smith's Falls, has been transferred to Calgary.

S. C. Skinner, principal proprietor of Skinner & Co.'s hardware, woodware, and hame factory, at Gananoque, is dead from paralysis.

Thomas Merry, chief engineer of the Toronto Railway Co., has resigned to take an appointment with Mackenzie & Mann, in the Northwest.

J. H. Means finally decided to retire from the superintendency of the Dominion Iron & Steel Works, at Sydney, and has gone to Chicago.

W. H. Kelly, conductor on the first train into Toronto from Montreal, on the C.P.R., is dead. He had formerly been in the employ of the G.T.R.

Frank Priestland, formerly with the Niagara Falls Electric Power Co., has been appointed manager of the Smith's Falls Electric Power Co., in place of John Davidson, resigned.

F. E. Ward, who has been named by J. J. Hill as general manager of the Great Northern Railway of the United States, was a Montreal boy. He swept out offices in the Grand Trunk as a lad.

C. F. Hannington, C.E., who lately completed surveys for the Clergue Co., near White River, has entered the service of the Grand Trunk Pacific Co., and will have charge of the survey from North Bay west.

Calgary city council has decided to consider as candidates for city engineer, W. Thorold, St. Catharines; T. D. McNab, Chatham; J. S. Griffiths, Winnipeg, in the order named, pending further enquiry.

Edward Black, who died recently in Toronto, was one of the oldest of the Grand Trunk engineers, having been employed on the Great Western before its amalgamation with the G.T.R. In the early fifties he came to Canada from Leicestershire, England, where he had been employed as engineer on the Midland Railway. At first he took up his residence at London, and afterwards for thirty years ran an express between Toronto and Hamilton, retiring from active work about 1888.

The new company of Engineers at Montreal will be officered as follows: Major S. Howard, in command; Captain H. Harrison, and Lieut. D. O'Brien. The uniform will be scarlet tunics with royal blue facings.

James Woodman, divisional engineer of the western division of the C.P.R., has resigned, and will be succeeded by J. E. Schwitzer, with headquarters at Winnipeg, and A. S. Dawson, with headquarters at Calgary.

H. R. Mallison, for a number of years connected with the Montreal Street Railway, has been appointed comptroller of the Light, Heat and Power Company, of Mexico, in which Montreal and Toronto capitalists are interested.

A. M. Dowsley, who has been manager of the Dowsley Spring and Axle Works, at Chatham, Ont., since its establishment, has resigned. He will be succeeded by L. Kennedy, who has been with Warnock & Co., Galt.

A. P. Low, who left the Dominion Geological Survey two years ago to take a position with a Philadelphia syndicate, at a salary of $10,000 a year to exploit iron mines in Labrador, has been re-engaged on the Dominion staff.

Colin Kennedy, late of the Whitman-Barnes Mfg. Co., St. Catharines, has taken the mechanical superintendency of the Victoria Wheel Works, Galt, in the place of James Miller, who has resigned on account of ill-health, after seventeen years' service.

Thos. Monro, chief engineer of the Soulanges Canal, during construction, died at Coteau Landing, March 20th. He was considered one of Canada's best known and most capable engineers, and had been employed on most of the Government's important works for many years.

Erik. Nystrom, mechanical and mining engineer, from the Institute of Technology, Stockholm, Sweden, who is especially conversant with Swedish methods of examining magnetic ore deposits by magnetometric measurements, has been appointed assistant to Dr. Haanel, Superintendent of Mines, at Ottawa.

Ford Kumpf, superintendent of the Berlin-Waterloo Electric Railway, has resigned to go into manufacturing at Waterloo. W. H. Breithaupt, the president, will look after the operation of the road, with Victor McIntyre, who has had several years' experience in the company's office, as assistant superintendent.

John S. Plaskett, electrician and mechanical expert of the University of Toronto, has been appointed mechanical superintendent of the new Astronomical Observatory, now in course of erection at Ottawa. He will have charge of the apparatus in the observatory, and also undertake work in spectrum analysis and stellar spectroscopy.

R. L. Whyte, of Hamilton, claims to rank as one of the oldest locomotive engineers in Canada. He will be 83 years of age on May 30th. He states that at fourteen he entered the drawing office of Robert Stephenson & Co., Newcastle-on-Tyne, and worked on the drawings of the Rapid, one of the two engines which were used at the opening of the first section of the Newcastle and Carlisle Railway from Blaydon to Hexam, about sixteen miles, at which he was present.

Alfred J. Stevens, assistant engineer of the construction department of the Intercolonial Railway, has resigned and will open an office at Toronto in April doing a general engineering and contracting business. Mr. Stevens has been engaged on construction work connected with the Intercolonial Railway for the past fifteen years, during which time he has been identified with nearly all the important undertakings of the railway. He has had necessarily a wide experience and met with uniform success in his engineering undertakings. Mr. Stevens' voluntary resignation is but another indication that the standard of salaries in connection with the higher departments of service on the Intercolonial Railway will need to be advanced if it is to retain in its service men whom it has trained to a position of usefulness.—Moncton Transcript.

MINERAL PRODUCTION OF CANADA.

The following table, prepared by the Geological Survey, gives a summary of the total mineral production of the Dominion for 1902:

METALLIC.

Product.	Quantity.	Value.
Copper, lbs.	39,168,202	$ 4,553,695
Gold, Yukon	$14,500,000	
Gold, all other	6,241,245	
		$20,741,245
Iron ore (exports), tons	428,901	1,065,019
Pig iron from Canadian ore, tons.	71,065	1,043,011
Lead, lbs.	23,000,000	935,870
Nickel, lbs.	10,693,410	5,025,903
Silver, oz	4,373,000	2,280,957
Zinc, lbs.	166,700	8,068
Total metallic		$35,653,768

NON-METALLIC.

Actinolite, tons	550	4,400
Arsenic, tons	800	48,000
Asbestos, tons	31,779	1,191,338
Asbestic, tons	8,662	12,114
Chromite, tons	900	12,400
Coal, tons	7,639,255	15,538,611
Coke, tons	506,466	1,538,930
Corundum, tons	768	84,468
Felspar, tons	7,576	11,375
Fire clay, tons	2,741	4,283
Graphite, tons	1,095	28,300
Grindstones, tons	6,159	48,400
Gypsum, tons	332,045	356,317
Limestone for flux, tons	293,108	218,809
Manganese ore, tons	84	2,774
Mica, tons		400,000
Mineral pigments—		
Baryta, tons	1,096	3,957
Ochres, tons	4,955	30,495
Mineral water		100,000
Moulding sand, tons	13,352	27,651
Natural gas		195,992
Peat, tons	475	1,663
Petroleum, brls	521,485	934,740
Phosphate, tons	856	4,953
Pyrites, tons	35,616	138,939
Salt, tons	63,056	288,581
Talc, tons	689	1,804
Tripolite, tons	900	15,800

STRUCTURAL MATERIALS AND CLAY PRODUCTS

Cement, natural rock, brls	124,400	$ 91,870
Cement, Portland, brls	594,594	1,028,618
Granite		170,000
Pottery		200,000
Sands and gravels (exports), tons	159,793	119,120
Sewer pipe		294,465
Slate		19,200
Terra cotta, pressed brick, etc.		348,597
Building material, including bricks, building stone, lime, tiles, etc.		5,500,000
Total structural materials and clay products		7,771,870
Total all other non-metallic		21,245,094
Total non-metallic		29,016,964
Total metallic		35,653,768
Estimated value of mineral products not returned		300,000
Total, 1902		$64,970,732

The tug Balize, owned by J. & T. Charlton, of Tonawanda, N.Y., is being refitted at Detroit for service on the Canadian side of the lakes.

The Collingwood Shipbuilding Co. is building for the Montreal Transportation Co. a steel tug, 120 ft. long, 24 ft. beam, and 13 ft. depth. This tug will have 1,000-h.p., and is said to be the most powerful tug on the Great Lakes.

—The Hamilton Electric Light and Cataract Power Co. has awarded the contract for the additions to the power house at De Cew's Falls, which have been in contemplation for some time. An extension to the power house is being made, and in this two Westinghouse generators of 5,000-h.p. each will be installed with two water-wheels of 6,000-h.p. each, working under a head of 270 feet. These wheels are being built by the firm of Riva, Monerett & Co., of Milan, Italy. This machinery is to be in operation by July, 1904, and meanwhile the power company contemplates plans for the further enlargement of the canal. The present canal yields 25,000-h.p., and the enlarged canal would produce 50,000-h.p.