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We judge ourselves by what we feel capable of doing; but the world judges us by what we have already done.

Longfellow.

DR. J. F. DEMERS,

A Pioneer of Independent Telephony.

De Tocqueville has said, that—"The general hatred of an institution by persons living under it, is conclusive proof that the institution deserved hatred."

We were forcibly reminded of this dictum recently, as we stood in the City Hall, Toronto, listening to the fervid oratory of the champions of independent telephony, as with stern invective they exposed to view the alleged "grasping policy, masterly inactivity, and predatory tactics of the greatest of all monopolies in Canada"—The Bell Telephone Company: carrying on business (as their charter declares) "for the general advantage of Canada" At that memorable convention of earnest business men from all parts of Canada and the United States, one striking personality stood out in bold relief. Upon the invitation of the president, a short, stout, French-Canadian of Napoleonic build, stepped out on the floor with firm measured tread, and told in broken English, the story of how eight years ago, down in a small Quebec village, he had set the ball of opposition rolling, by laying down a private line between Metis and a neighboring parish, and how this small venture had grown into a private telephone company, with 3,000 miles of pole construction, a paid-up capital of $200,000; no debts, no bonds. and which, since last autumn had built 900 miles of pole line, and added 600 subscribers: the greatest increase made by any private concern in the Dominion. And this success had been achieved in spite of the tremendous opposition which a strongly entrenched monoply, of the Standard Oil type can exert. With commendable restraint of statement, begotten only of conscious power, the sturdy hero of a hundred fights in far Quebec, calmly told his interesting tale, which was received with the proverbial generosity that a true Canadian audience knows how to mete out to the man who does things.

One cannot travel east or west over this great land without finding footprints everywhere of men of French origin, who have "done things:" and it is a pleasure this month to have the privilege of incorporating in our gallery a French-Canadian of distinction in the domain of telephone engineering.

J. F. Demers was born at St. Henri, County of Levis, in the Province of Quebec, May 16th, 1872. He was educated for the medical profession, and received his diploma as doctor of medicine at Laval, Montreal, April 1st, 1896. In 1898, at Ste. Octave de Metis, finding the need of quick communication with a fellow practictioner in an adjoining parish, he built a private telephone line. The success of this little enterprise, led the same year, to the organization of a corporation known as The Metis Telephone Company, with a capital of $2,500, operating between Ste. Octave de Metis and Ste. Flavie in Mantane County, P.Q. Success crowning their efforts, the capital of the concern was increased, and within two years, the three counties of Mantane, Rimouski and Temiscouata were networked with telephone wires, the farmers paying an annual rental of $12. In 1900 the little company bought in Bellechasse County the charter of the Bellechasse Telephone Company, and straightway invaded the city of Levis, together with the towns and rural communities in the vicinage; extending the line even into Lotbiniere County, west of Levis. At this stage, Dr. Demers determined to abandon the active practice of medicine and devote his energies to telephone enginering. This enabled him to concentrate his well-trained intellect to the solution of telephonic engineering problems, and to undertake the management also of three other private companies, operating in the counties of Champlain, Portneuf, St. Maurice and Maskinonge. The last mentioned systems have built over 800 miles of pole construction, and the Bellechasse Company, some 3,000 miles; all accomplished in eight years. Lately he succeeded in securing a franchise in the city of Quebec, for the Bellechasse Telephone Company (capitalized at $1,000,000), and expects shortly to construct a modern telephonic service for 6,000 subscribers, connected to all his system on the other side of the St. Lawrence.

It may be all true that racial sentiment has contributed largely to Dr. Demers phenominal success, for all his work had been achieved in the part of Eastern Canada where the *Fleur de Lis* reigns supreme. Be that as it may, he has done wonders where others had practically failed, hence is entitled to well deserved honor. At 34 years of age, he has eight years of invaluable experience in practical telephony, a sound physical constitution, trained executive powers and indomitable courage, and is heart and soul in the rising movement against telephone monoply. Theoretically, he believes in Governmental and municipal ownership, but has publically declared that until the time is ripe for the realization of this ideal, he will rest not until the village communities, townships and cities, mining camps and prairie farmsteads of Canada, are connected with a cheap telephone service.

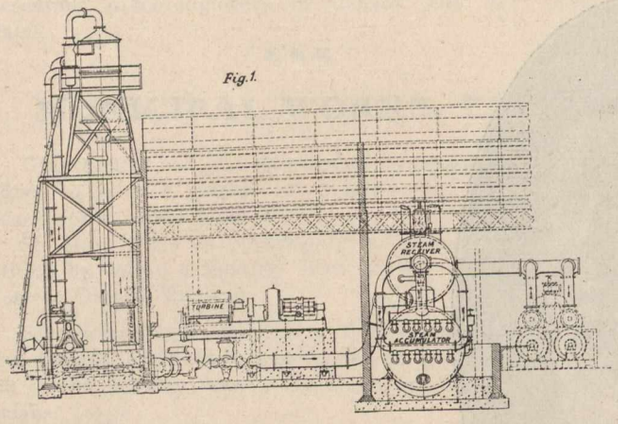
That he may continue to prosper in the good work is the sentiment of "The Canadian Engineer."

A RATEAU EXHAUST-STEAM REGENERATION AND UTILIZATION PLANT

[We are indebted to "Engineering," London, for the following description of a recent Low Pressure Steam Turbine Installation, at the works of the Steel Company of Scotland, which we conceive should be of special interest, as providing a means of increasing greatly the economy of existing reciprocating steam engine plants. Editor.]

The Rateau system of utilization of exhaust steam is now so well known that we need hardly enter into a full description of the principles on which it operates. We may say briefly, however, for the sake of those who have not yet become acquainted with its operation, that it consists of a method of storing and regenerating heat exhausted from any type of engine, especially of the intermittent

Fig.1.

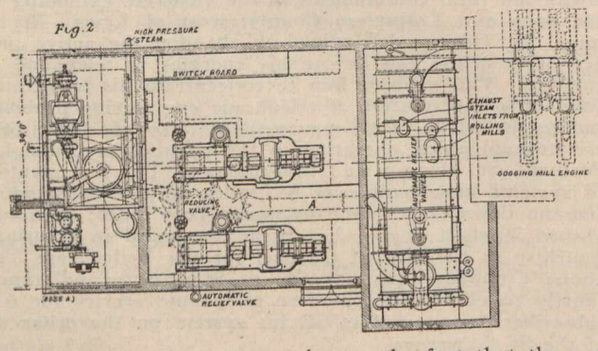


working type, such as rolling-mill engines, winding-engines, and steam-hammers.

The steam, coming from whatever source it may, is led into a steam-accumulator regenerator, which has for its object the storing of heat during the exhaust of the primary machines, and the giving off of heat during the periods of stop of the said machines, for the purpose of driving any other secondary prime mover, such as a turbine or other engine.

Use is made of the principle that water, even although at lower temperature than 212 deg. Fahr., will still evaporate, provided that a pressure proportionately less than atmospheric pressure is maintained in the vessel containing it; thus steam exhausted into the accumulator regenerator passes through a mass of water, which is, by special arrangements inside the accumulator, violently circulated, thus causing the whole of the water in the vessel to participate in the interchange of heat. This water absorbs the heat units in the steam during the periods of exhaust of the main engines, and the moment that the main engine

Fig.2



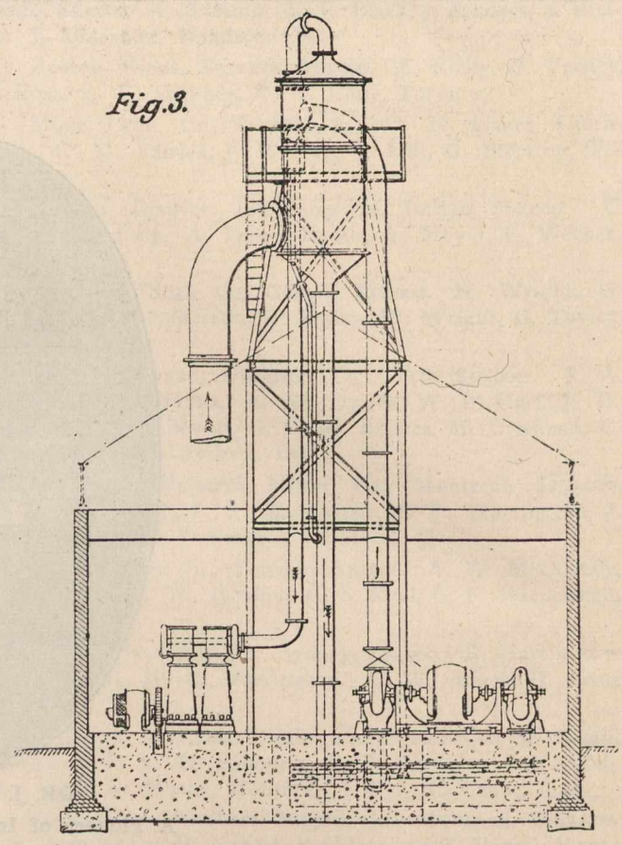
ceases running, the water, owing to the fact that the pressure is reduced in the vessel, commences to re-evaporate.

We will now pass on to a description of the plant installed at the Hallside Works of the Steel Company of Scotland.

This plant deals with the exhaust steam from the following engines: One high-pressure cogging-engine, with two cylinders, each 40" in diameter by 5'-0" stroke; one finishing train engine, with two cylinders, 42'-0" in diameter and 5'-0" stroke; two small mill engines, driving 14'-0" and 18'-0" mills; one 10-ton and three 4-ton steam-hammers.

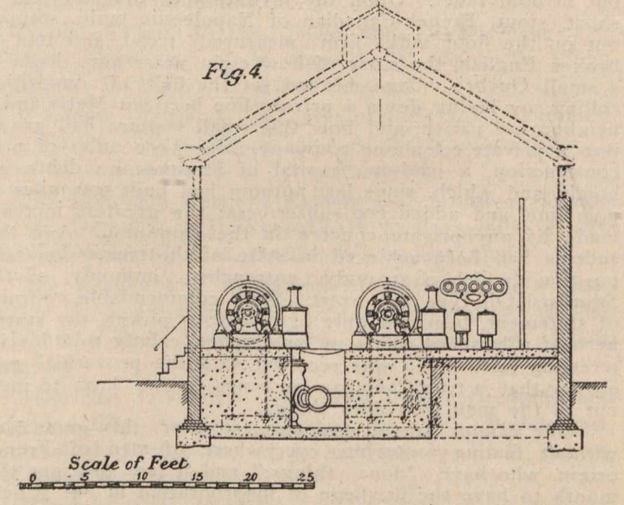
The total amount of steam from these engines was estimated at the time the plant was designed as 41,000 lbs. per hour, after making deductions for pipe condensation, etc. The power to be generated from the exhaust steam was required for lighting purposes, and for the driving of live rolls, cold saws, hot saws, sand-blast apparatus, straighteners, machine-tools, and the usual appliances in a steel works; also for overhead cranes, of which there are several installed in the steel foundry, melting-shops, and

Fig.3.



other departments. It was, therefore, decided to adhere to the electrical system then in operation at the works, namely, direct current at 230 volts. This naturally involved the design of a special type of turbo-generator, as hitherto no direct-current generators of the capacity and voltage chosen had been constructed with carbon brushes; the quantity of steam at that time available fixed the capacity of the plant, which was laid down for a total output of 900 kilowatts. Since the plant was designed, however, the output of the mills and the works generally has been considerably increased, making it possible to install at least one additional

Fig.4.



set. This would enable the power to be recovered from the above engines to be brought up to 1,350 kilowatts.

The plant is illustrated in plan, elevation, and two end-views in Figs. 1 to 4; whilst Fig. 5 shows a side view of the turbo-generator, which is fitted with the Dennis compensator. The steam-accumulator is shown in Fig 6.

The accumulator is of Professor Rateau's patent water type in two compartments. It is surmounted by a steam-receiver, which has for its object the separation of any oil and water that may be present in the steam, and the obviation of the sudden shock which would otherwise be caused by the sudden admission of steam to the water. The steam passes from the receiver to two ranges of branch pipes, and then enters special circulating tubes passing along the whole length of the vessel. The accumulator proper is 11'-6" in diameter by 34'-0" in length, and is firmly fixed on a solid concrete foundation. The accumulator was designed to deal with main-engine stops of 45 seconds when two turbines, working at full load, were being supplied. It has been proved by the tests that a main-engine stop of six minutes can be successfully dealt with when one turbine only is running at full load. Diagrams showing the variation of pressure in the accumulator are shown in Figs. 7, 8 and 9. On the receiver are provided two automatic relief-valves, which have for their object the prevention of any back pressure accumulating against the primary engines when the turbines, which are driven by the low-pressure steam, are working at less than full load. A 21" pipe from the steam-dome of the accumulator leads the steam to the stop-valve of the low-pressure turbines.

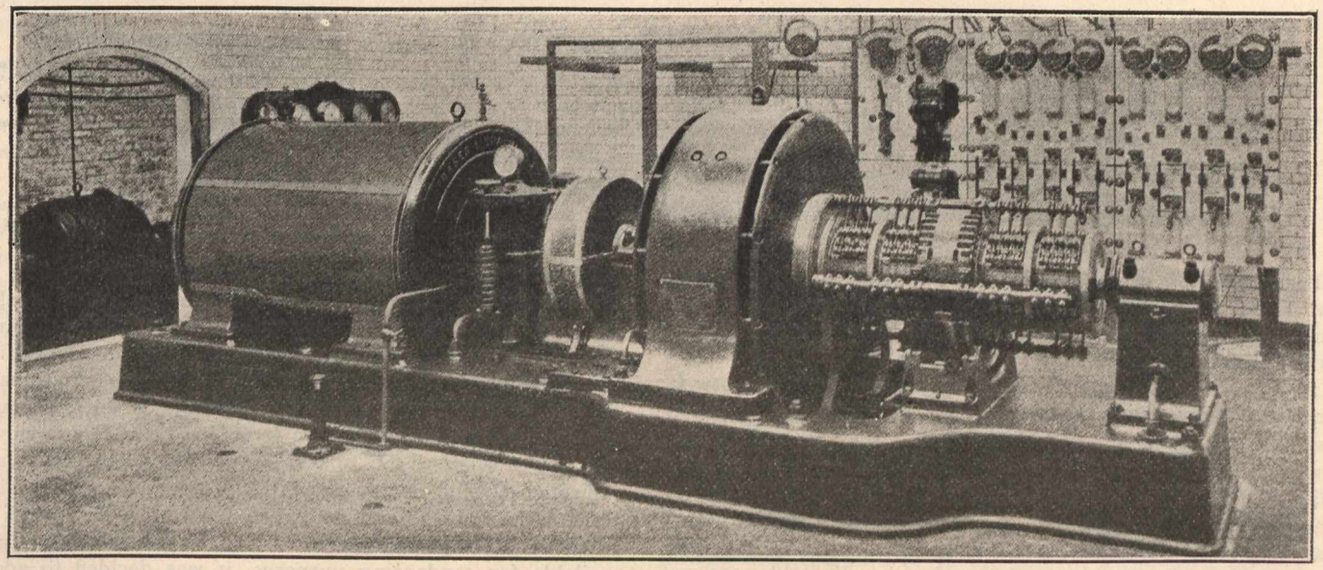


Fig. 5.

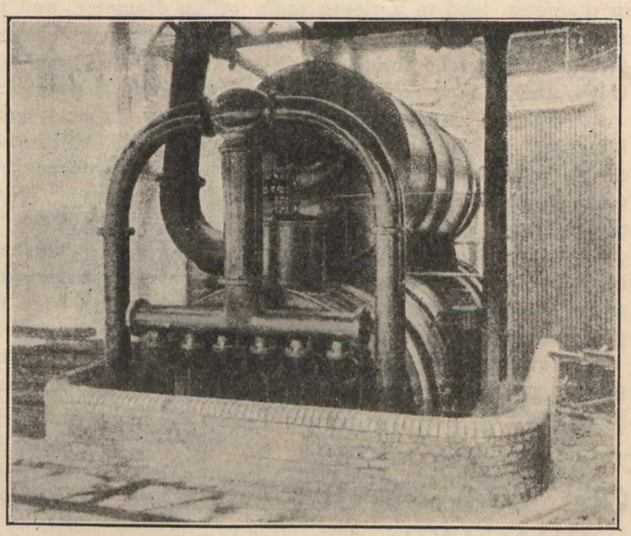


Fig. 6.

This turbine is of 700 brake Horse Power, and is of Professor Rateau's patent type, having eleven wheels, approximately 40" in diameter. The rotating part of this turbine, together with one of the fixed diaphrams and with the guide-blades, is shown in Fig. 10. The turbine develops full power at a speed of 1,500 revolutions per minute. When working on an overload of 10 per cent., the pressure at the inlet is never more than 12 lbs absolute, and the vacuum at present obtained at the outlet of the turbine is 27.9" with the barometer at 30".

A series of observations of pressure, vacuum, and consumptions are given in the annexed table. A curve showing the thermo-dynamic efficiency at varying loads, and also consumptions, is given in Fig. 11.

The turbo-generator is coupled to a special Siemens direct-current 230-volt generator by means of a Rateau flexible coupling, and special attention is drawn to the very long commutator. This was necessitated by the fact that carbon brushes were specified, and it is believed that this is the first machine of this size and output designed for such a low voltage, collecting over 2,000 amperes at 1,500 revolutions per minute, in which carbon brushes alone have been used. Ninety-six brushes in all are fitted, and "Morganite" has now been adopted as proving more satisfactory in practice than ordinary carbon.

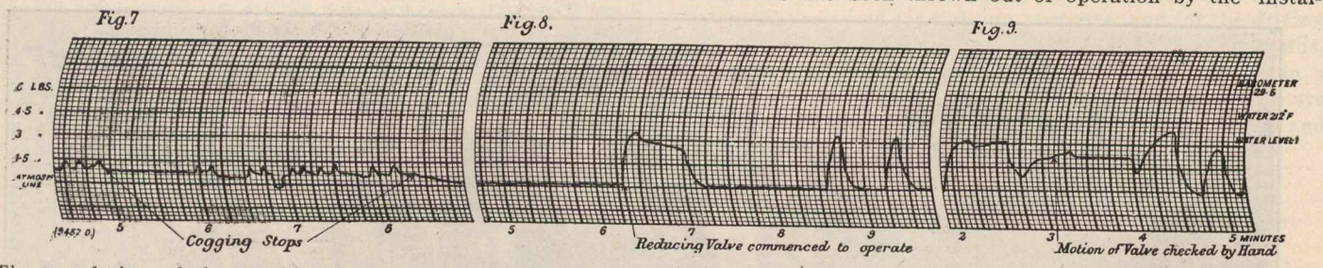
Tests on Steel Company of Scotland's Low Pressure Turbine, January, 1906.

Refer. Number.	Amperes	Kilowatts	Vacum at Turbine Exhaust	Absolute Pressure On entering Turbine	Absolute Pressure Exhaust	Steam Consumptions Total per hour	Steam Consumptions Per Kilowatt
1 ...	300	69	28.7	2.9	0.5830	4,590	66.4
2 ...	700	161	28.4	4.49	0.7394	7,170	44.5
3 ...	865	196.5	28.4	5.35	0.7394	8,290	42.1
4 ...	925	212.5	28.4	5.65	0.7394	8,750	41.1
5 ...	1,050	241	28.4	6.11	0.7394	9,480	39.3
6 ...	1,160	267	28.4	6.54	0.7394	9,920	37.1
7 ...	1,120	278	28.6	6.68	0.6399	10,250	36.8
8 ...	1,300	299	28.6	7.25	0.6399	11,130	37.2
9 ...	1,400	322	28.6	7.82	0.6399	12,080	37.5
10 ...	1,500	345	28.5	8.25	0.6825	12,790	37
11 ...	1,600	368	28.4	8.25	0.7394	12,800	34.8
12 ...	1,700	391	28.3	8.82	0.7821	13,600	34.8
13 ...	1,800	414	28.2	9.53	0.8247	14,500	35.1
14 ...	1,800	414	28.0	10. 1	0.9243	15,400	37.2
15 ...	1,900	437	27.9	10. 7	0.9811	16,300	37.3
16 ...	1,690	389	27.9	9.53	0.9811	14,500	37.4
17 ...	1,825	420	27.9	9.95	0.9811	15,300	36.4
18 ...	1,950	450	27.9	11. 4	0.9811	16,480	36.6

The commutator is in two lengths, and the bars have special ventilation ducts through them at the centre. Fan-blades are supplied on each bar, and flexible connections on the tips of the vanes to conduct the current from one part of the commutator to the other. A very powerful draught is induced by this fan through the commutator bars, and after 120 hours' full-load run the temperature rise of the commutator was only 50 deg. Fahr.

The test applied to this set was extremely severe, as it had to run for two consecutive weeks, day and night, without a stop, except for the Sunday, at absolutely full

load. This test was satisfactorily passed, although considerable difficulty was at first experienced with the commutator. These difficulties have now disappeared, and the surface of the commutator leaves nothing to be desired.



The regulation of the machine is excellent, and the speed variation of the turbine, when full load is thrown off, is not more than 5 per cent. momentarily, and the permanent variation, thanks to the Dennis compensator, is nil.

In order to render the turbine plant and the accumulator entirely independent of the working of the main engines, should the stops of the latter exceed the limit that the accumulator is designed to deal with, a special automatic live-steam reducing valve is provided. This reducing-valve has a piston, the upper side of which communicates with the accumulator, the under side being fitted with a dash-pot and spring; the tension on this spring is adjustable, and in

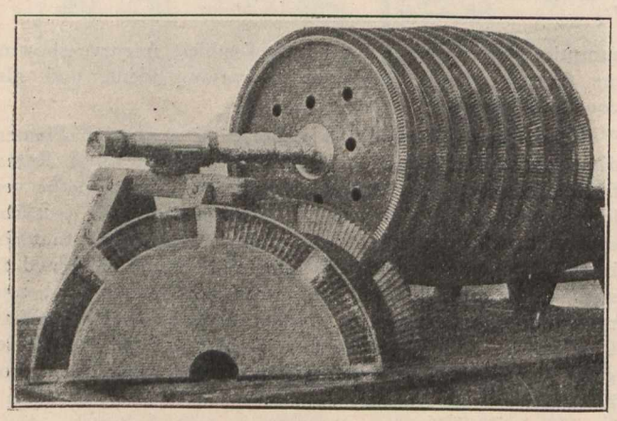
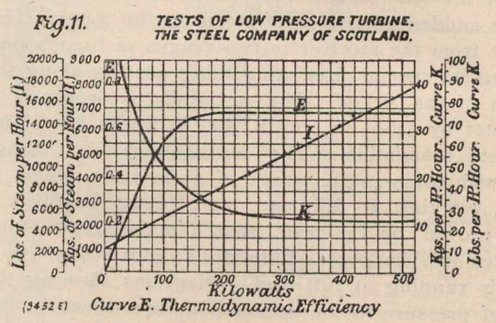


Fig. 10.

the event of the pressure in the accumulator falling below a predetermined limit, the pressure on the piston being also reduced, the spring overcomes the pressure on the piston and the latter rises, a collar on the piston-rod engages with a lever, which in turn positively opens the reducing-valve. When the pressure again comes on, the piston descends, and the live wire is shut off. As the steam is wire-drawn from boiler pressure down to atmospheric pressure in the reducing-valve without doing any work, a considerable degree of superheat is imparted to it, and actual measurements at the turbine inlet have shown that in expanding from 90 lbs. pressure down to atmosphere, 100 deg. to 110 deg. of superheat is imparted to the steam. This makes the turbine more efficient when working under live steam reduced in pressure than it is when working on exhaust steam, the difference being from 5 to 8½ per cent.

As the high-speed generating set supplying current to the works has been thrown out of operation by the installation of the turbine, no current is available for starting up the condensing plant; and as the reducing valve is shut positively in the manner described above, the turbines cannot be started without some special method of opening the reducing valve, and running the turbine to atmosphere. This is provided by a lever placed alongside the stop-valve hand-wheel, and operating the lever on the reducing-valve; this device enables the turbine to run to atmosphere until sufficient current is generated to start up the condensing plant. Then the lever is released, and the plant works at or below atmospheric pressure. As very little water was available for condensing purposes, it was decided to adopt the barometric jet type of condenser. This is shown in Fig. 1.



The exhaust-pipe from the two turbines, which are 24″ in diameter, lead to a rising main 33″ in diameter, and the steam leaving this pipe enters the condenser, where it passes through a series of fine sheets of water distributed by special trays, and flowing in the opposite direction to the steam.

Two centrifugal circulating-pumps, one for cold water injection, and the other for hot water, are provided, and are driven by a 100 Horse Power motor. A double-throw side-valve dry-air pump is provided, of the vertical type, driven through spur gear by a 35-brake Horse Power motor. To cool the condensing water a large cooling tower has been installed, with an hourly capacity of 200,000 gallons; the water is pumped by a hot-water circulating pump from the pump immediately below the condenser over this tower.

The running of the first turbo-generator installed having proved satisfactory, the Steel Company of Scotland have just placed the order for the second unit.

THE ELECTRIC FURNACE: ITS EVOLUTION THEORY AND PRACTICE

By Alfred Stansfield, D. Sc., A.R.S.M., Professor of Metallurgy in McGill University, Montreal.

Article IV.—Continued.

RESISTORS.

The materials employed as resistors determine very largely the voltage of electric furnaces, and have been referred to under that heading; but it will be convenient to consider them particularly at this point.

Three cases present themselves: (1) Arc furnaces—in which the resistor consists of the intensely heated gases and vapours in the arc. (2) Furnaces having a special resisting core, in which the heat is developed. (3) Furnaces in which the current passes through, and directly heats, the charge itself.

The arc furnaces need not be specially considered, as any gases or vapours that are ordinarily present in electric furnaces, will serve to carry the current. More furnaces belong to class (3) than to class (2); and it will obviously be more satisfactory, when possible, to pass the current through the material of the charge, instead of providing a special resistor for this purpose. The electrical conductivity of the charge will usually determine whether it can be used as a resistor of the ordinary materials found in nature, only

the metals and carbon are sufficiently conductive to carry large electrical currents; but, when heated to their melting temperature, most of the rock-forming minerals will carry an electric current; and when mixed in suitable proportions for a melting charge, and fused, they always form sufficiently good electrical conductors.

The conductivity of molten slags, enables continuous smelting furnaces to be operated electrically, although the ore fed into the furnace may be non-conducting. The furnace may be started in the first place by means of an arc between the electrodes: the heat of the arc melts some of the surrounding material, which ultimately fills the space between the electrodes with a molten conducting slag, in which heat continues to be generated by the passage of the current. More ore becomes heated and melted, and after a time the whole crucible of the furnace becomes thoroughly heated and filled with molten slag and metal. Another way of starting such a furnace is by placing some coke between the electrodes. This, being a moderately good conductor, soon becomes heated by the passage of the current, and melts the surrounding ore charge; after this, the electrodes are pulled further apart and the operation goes on as described above. A third method consists in pouring into the furnace a potful of molten slag, when the current may be at once switched on, and the furnace will soon be in regular operation.

Although the ordinary rocks and ore minerals are very poor electrical conductors, when cold, the coke, which is often added to the charge as a reducing reagent, is a fair conductor, and, if present in sufficient quantity, will render the charge somewhat conducting.

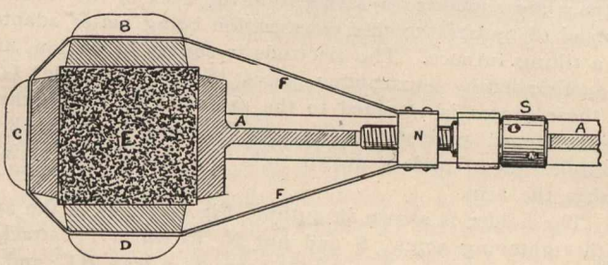


Fig. 26.—Electrode Holder of Heroult Steel Furnace.

Electrical Resistivity.—In order to design a furnace that will carry a certain electrical current at a given voltage, it is necessary to know the numerical value of the electrical resistivity of the materials through which the current will pass in the furnace. The Resistivity, or Specific Resistance of a substance, is the resistance, in ohms, between two opposite faces of a unit cube of the materials. A cube of one centimeter edge is usually referred to, but it is sometimes more convenient to know the resistance of an inch cube of the material. If the resistivity, or resistance of an inch cube of a substance, were **R** ohms, the resistance, between the ends of a cylinder of this material, **L** inches long and **C** square inches in cross section, would be $\mathbf{r\frac{l}{c}}$ The electrical resistance, in ohms, of any conductor, shows the voltage that would be needed to maintain a steady current of one ampere, through the conductor. Electrical conductivity is the inverse of resistivity, and shows the number of amperes that would be caused to flow through a unit cube if an electrical pressure, or electro-motive force of one volt, were maintained between two opposite faces of the cube. The unit of electrical conductance is the **Mho**; that is, **ohm** written the wrong way round.

Furnaces having Special Resisting Cores.—The cores or resistors in such furnaces are usually composed of carbon, which, in the form of coke powder, for example, is of moderate conductivity, thus allowing large currents to flow, and at the same time having a sufficient electrical resistivity to allow fairly high voltages to be employed—even when the cores are of considerable cross section and moderate length. The resistivity of powdered carbon depends upon the fineness of grain, as well as upon the resistivity of the solid material from which the powder was produced. In order to obtain uniform heating, it is advisable to sort powder, only using the particles that are of a uniform size; and under such conditions the resistivity increases with the fineness of the powder. The following resistivities for graphitized coke powder have been calculated from experiments by FitzGerald.* The resistivity of ordinary coke powder would probably be about four times as large.

Resistivity of Graphitized Coke Powder.

(Ohms for one cubic inch.)

Size of Grains.	Cold.	Red hot.	Red hot & weighed.
Between 5 meshes and 6 meshes to the inch.....	0.36	0.25	0.12
Between 3 meshes and 4 meshes to the inch.....	0.29	0.15	0.09

The first powder had been passed through a sieve having 5 meshes to the linear inch, and had been passed over a sieve of 6 meshes to the inch. The second powder had been passed through a 3 mesh sieve and over a 4 mesh sieve. The resistivities are given for the cold powder, and at a bright red heat. The third column shows the resistivity of the red hot powder when a weight was laid upon it, thus making a better electrical contact between the adjacent grains. The powder was placed in an open trough, and was only four inches in depth, and so would be more lightly packed than it would be in the core of a full-sized furnace. The figures in the list column would consequently more nearly represent regular furnace conditions. The figures are given for one cubic inch, as inches are still more frequently used, in this country, than centimeters; to convert to centimeter resistivities, multiply by 2.54—the number of centimeters in one inch.

For many purposes ordinary coke powder would form a better resistor than the graphitized material, on account of its higher resistivity; but it has this serious disadvantage, that if very strongly heated in the furnace the coke will become graphitized, and its resistivity will fall to about a quarter of its original value for corresponding temperatures. It will consequently be better, in high temperature furnaces, to use a core that has previously been graphitized, thus obtaining a more nearly constant material for the resistor.

Solid rods of carbon (amorphous or graphitized) are sometimes used as resistors, as in Borcher's resistance furnace (Fig. 14, page 214), or in Acheson's siloxicon furnace. The resistivity of rods of carbon, such as are used for electric lighting and furnace electrodes, and of the graphitized electrodes, is very much less than that of the same material in the form of a powder. The following are approximate values:

Resistivity of Solid Carbon.

(Ohms for one cubic inch.)

	Cold.	Hot.
Amorphous	0.0025	0.0012
Graphitic	0.0006	0.0003

In this table, "amorphous" refers to the ordinary carbon electrode, or arc light carbon; while "graphitic" refers to the graphitized electrodes. The word "hot" refers to electric furnace temperatures, such as 2,000 C. or 3,000 C., and it will be obvious that only approximate values can be given.

Furnaces in which the Current Passes through the Charge.

The writer has attempted to calculate the resistivity of the melting materials in the fusion zones of the Heroult and Keller ore-smelting furnaces, and also of molten slags themselves. The data available were very unsatisfactory, and the results obtained can only be taken as representing in the roughest way the resistivities of these materials. The Heroult and Keller smelting zones appear to have a resistivity of about 01. ohm for one cubic inch, varying perhaps from about 0.05 to 0.15 ohm. The resistivity of molten slag is less than this, being in the order of 0.01 to 0.05 ohm for one cubic inch. In the Gin and Kjellin steel furnaces, the

*Francis A. T. FitzGerald. Electro Chemical Industry, Vol. II. (1904), p. 490

resistivity of molten steel is an important factor; and this is very small, being about 0.00008 ohm for one cubic inch.

ELECTRODES.

With very few exceptions, the electrodes, which serve to lead the electric current into the furnace, are composed of carbon. They are made from retort carbon, petroleum coke and coal tar, the pulverized carbon being mixed with tar and pressed through a die of the required shape and size. The electrodes are then subjected to a baking process, which drives off the volatile part of the tar, and leaves them a hard, compact mass of carbon. Graphitized electrodes are made in like manner from petroleum, coke, and tar, with the addition of 1½% or 2% of hæmatite; being heated in an Acheson furnace to a very high temperature. The iron which is contained in the hæmatite, effects the conversion of the carbon into graphite, and is finally expelled, by volatilization, at the extremely high temperature of the furnace; leaving the electrodes composed of compact graphite. Molten iron has the property of dissolving carbon, which separates from the iron as graphite on cooling; but it is difficult to understand how so small a proportion of iron can change the whole electrode into graphite.

Graphitized electrodes have the advantage of purity, good conductivity, and great resistance to oxidation.

Their purity renders them very advantageous in operations like the production of aluminium, in which the electrode ash enters the electrolyte, and contaminates the resulting metal. The characteristic resistance of these electrodes to oxidation, reduces their consumption, and their good conductivity has a similar effect, since smaller electrodes can be employed. Graphitized electrodes are largely used for electrolysis, but, in electric smelting furnaces, cheaper ones made of coke and tar have usually been employed; while in some cases the coke forming part of the furnace charge has been utilized for leading in the current; electrical contact being made through the charging hoppers. The kind of electrode to be employed will depend largely upon the oxidizing or reducing character of the furnace. In the former case the graphitized electrodes would be preferable, while in the latter, the ordinary kind would serve the purpose.

Approximate figures, for the resistivity of carbon and graphite electrodes, have already been given. By means of these, it is easy to calculate the drop of voltage that would be produced in electrodes of a certain length and cross section, by any particular current. The cross section of an electrode is usually determined by the amount of current to be carried. The current density or the number of amperes per square inch of cross section of the electrode, differs considerably in different types of furnaces and for different kinds of electrodes, being much higher in graphitized electrodes than in the ordinary variety. The large electrodes used in the Héroult and Keller furnaces carry about 20 amperes per square inch, while small round electrodes and graphite electrodes carry more, up to about 100 amperes per square inch. Moissan used currents up to 200 or even 700 amperes per square inch, in small, ungraphitized electrodes, but this would be far too high for commercial work, as the carbons would become red hot and would rapidly waste away, and the consumption of electrical energy, in the electrode, would be too high to be tolerated. The loss, by oxidation, of the exposed part of an electrode, can sometimes be prevented by a system of water jackets, as in the Héroult steel furnace, Fig. 25.

The only furnaces in which some form of carbon electrode is not employed, are the electrodeless furnaces, such as the Kjellin steel furnace, and furnaces in which metallic electrodes, usually water cooled, are employed. Examples of these are the Gin steel furnace, the Laval ore-smelting furnace, and Borcher's aluminium furnace.

ELECTRODE HOLDERS.

Electrode holders are employed for making electrical connection between the electrode and the cable which supplies the electric current. They are also used for supporting and manipulating movable electrodes. The holders are made of copper or bronze, which are preferable on account of their good electrical conductivity, or of iron or steel, which are cheaper and do not melt so easily if over-heated. It is not easy to maintain a thoroughly good electrical contact between the holder and the carbon electrode, because the electrodes and their holders become heated, and the expansion of the metal loosens its hold on the carbon. The relatively poor conductivity of the carbon makes a large area of perfect contact desirable, while the small mechanical strength of carbon renders it difficult to clamp the holder sufficiently tightly without breaking the electrode. In addition to this, the heat of the furnace tends to render unworkable any bolts and nuts or similar mechanical devices.

Graphitized electrodes can be easily machined or threaded, and attached in this way to the holder; but for electric smelting furnaces, electrodes of rectangular cross section are more usually employed, and these are secured in their holders by bolting or clamping. The electrodes, in smelting furnaces, are usually vertical, in order to be more easily manipulated, and are suspended by a chain, so as to be easily raised or lowered; the electric cable being attached directly to the electrode holder. The holder shown in Fig. 22 may be taken as an example. The part A is made of steel, and the descending jaws JJ fit into the sides of the electrode, and are prevented from spreading by the two bolts. The electrode is driven downward by wedges, thus making good contact with the jaws. The upper part B is made of sheet copper, and enables the electric cable, and the pulley and chain by which the electrode is suspended, to be placed so far above the furnace, that they will not be overheated, while the lower part A can be cooled by air or water introduced from above. The electrodes of the Heroult steel furnace are supported by arms from the back of the furnace, instead of by chains; this construction being better adapted to a tilting furnace. The electrode is square in section, and is surrounded by four contact pieces, one for each side. One of these pieces is attached to the arm and the other three are tightened against the electrode by a steel strap, which encircles them, and is drawn tight by a screw contained within the arm.

The holder is shown in outline, Fig. 26. AA is the arm with tightening screw, S and nut N, to which is attached the strap F, which draws the contact pieces B C and D against the electrode E, and the latter against the arm A. A cable, not shown in the sketch, is bolted to A and to B C and D, thus distributing the current to the movable electrodes. A shield is provided to protect the holder from the heat and smoke of the furnace.

The iron and steel making furnaces, Figs. 22 to 25, will be further described in Article No. 5 together with some additional discussion of the construction and operation of such furnaces.

NIAGARA A GREAT WORKSHOP.

The Niagara Falls are rapidly assuming the nature of a huge chemical laboratory, and the employment of the electrical furnace for the production of various metallurgical and chemical products at these waterfalls appears to be extending almost day by day. It has been shown that a commercial efficiency of some 75 per cent. can be readily obtained from moderately-sized electric furnaces, and there is no reason to doubt that this efficiency can be enlarged. Aluminium, as is generally known, is one of the chief products of the electric furnace at Niagara; this is followed by calcium carbide, carborundum, and artificial graphite. Calcium peroxide is now being made, with the design of its employment as a sterilizing agent in the preservation of food. Magnesium peroxide is being produced for the same purpose. It is stated that an interesting use of caustic soda is being made at Niagara, where it is utilized for the production of sodium, which is converted in its turn into sodium peroxide. An American firm is now marketing tablets made from sodium peroxide, which are used for the production of oxygen, which gas is generated on the immersion of the cake of sodium peroxide in water in a way similar to the generation of acetylene from carbide of calcium. It is stated that one pound of the prepared material yields 59 litres, or 2.08 cubic feet of gas.

A FOUR-VALVE ENGINE OF HIGH ECONOMY

The question, "What class of apparatus will produce a Horse Power at the lowest ultimate cost per year, including coal, attendance, maintenance and interest?" confronts the man about to buy a steam engine. A throttling, single-cylinder engine exhausting to the atmosphere will probably be the lowest in first cost, but will require 40 to 65 lbs. of steam per Horse Power hour. An automatic engine will take 30 to 35 lbs. non-condensing, and 25 to 30 lbs. with a condenser, while a four-valve engine will require only 25 to 30 lbs. non-condensing, and as low as 19 lbs. condensing. If high-pressure steam is available, or the plant is of large size, or is to be operated twenty-four hours a day, it may pay to put in compound expansion engines, by which means the steam consumption may be reduced to 12 or 15 lbs. per Horse Power hour.

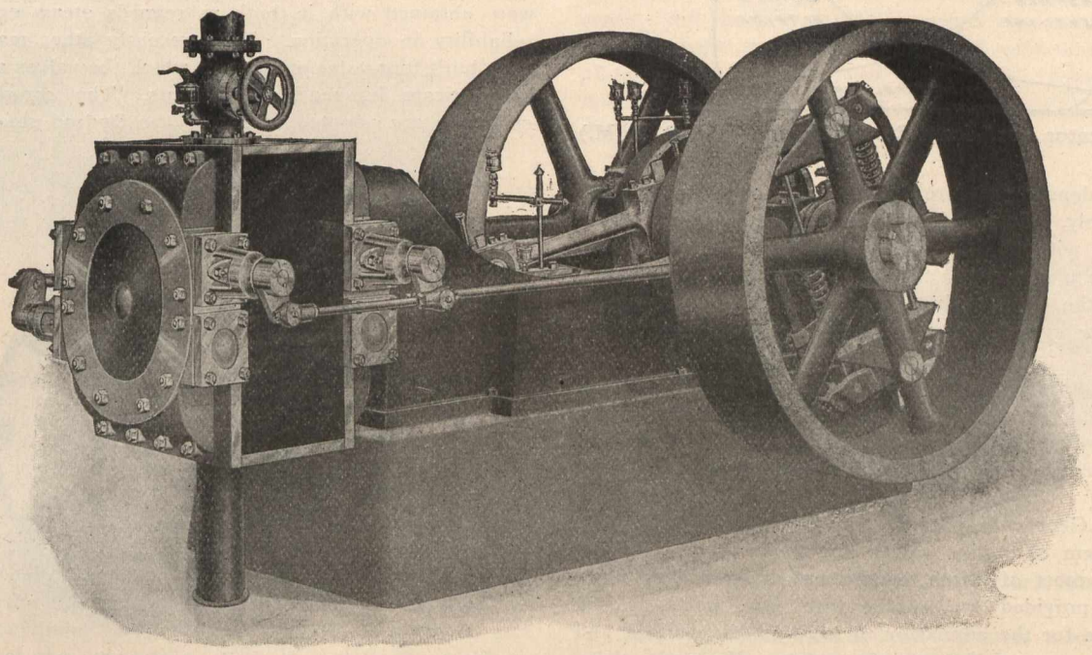


Fig. 1.—Atlas Four-Valve Automatic Self-contained Engine. (Oil Guard removed to show working parts).

Other things, such as steam pressure, vacuum, size of units, etc., being equal, the steam economy of an engine depends upon the manner in which the steam is admitted to and released from the cylinder and upon the proportions of the steam passages to the cylinder. The conditions favorable to the efficiency of the steam engine cylinder were understood by Watt, and may be enumerated briefly as follows:

1st. The steam should be admitted to the cylinder promptly at the beginning of the stroke and at full boiler pressure. This requires that all steam passages shall be short and of large area, and precludes the use of a throttling governor.

2nd. At an early point in the stroke (the point varying with the load) the supply of steam must be shut off suddenly without wire drawing and the steam within the cylinder allowed to work expansively until the end of the stroke.

3rd. At the completion of the stroke the exhaust valve should open promptly and completely in order that there may be no back pressure upon the piston during the return stroke.

4th. The exhaust valve should close before the completion of the return stroke, both to promote thermodynamic efficiency and to cushion the mass of the piston and piston rod when motion is reversed.

5th. The exhaust steam in going out should not pass through the same passages by which the high-pressure steam enters, as it would, by cooling the passages, cause loss of heat and condensation of the high-pressure steam.

6th. Clearance space, including not only the volume of the cylinder not swept by the piston, but also the volume

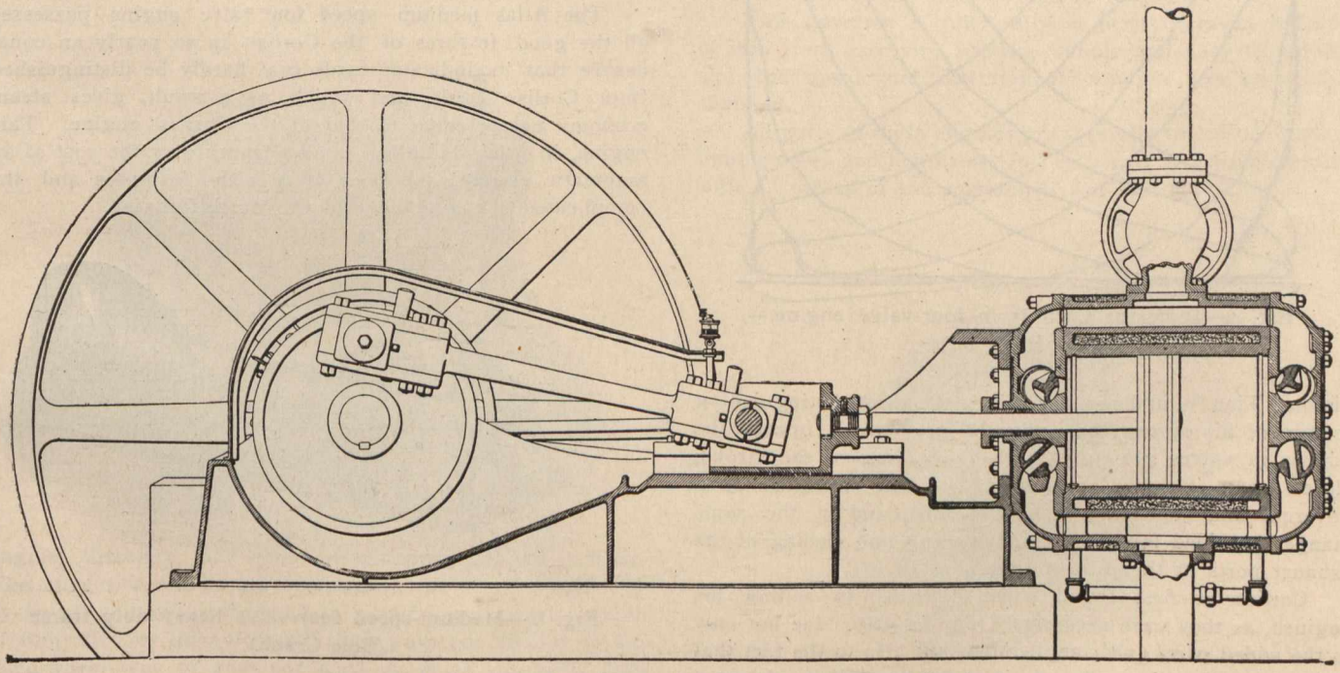


Fig. 2.—Automatic Four-Valve Engine.—Longitudinal Section.

of admission and exhaust ports and of passages in the valves themselves, should be as low as possible, although the passages should not be so constricted as to throttle the steam. This statement may be made obvious by comparing this space to a cylinder into which we should first admit

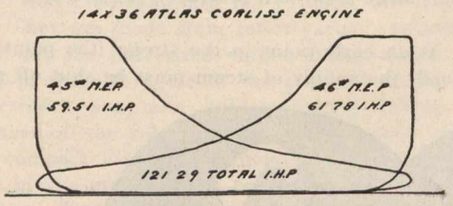


Fig. 3.—Indicator Card from Corliss Engine.—(96 R. P. M.)

steam at condenser pressure and then steam at boiler pressure alternately. Some of the high-pressure steam would be condensed without doing any useful work.

7th. The piston speed should be as high as practicable. The shorter the time during which a cylinderful of steam remains in the cylinder, the less heat it will transfer to the cylinder walls.

Although these conditions have long been understood, their realization in commercial engine practice, like many other things affecting the economy of the steam engine, has been dependent upon slow improvements in mechanical construction.

In 1849, George H. Corliss, of Providence, R.I., perfected a system of engine valves and gears which enabled him to meet most of these conditions more or less completely. He provided his engine with four ports, two in each end, one for the admission of high-pressure steam and one for the escape of the exhaust steam. He made these ports as short as possible by using a rotating form of valve, which could be placed very close to the cylinder bore, and further, in order to decrease the percentage of clearance and the frequency with which the valves would have to act, he made the stroke long in proportion to the diameter of the

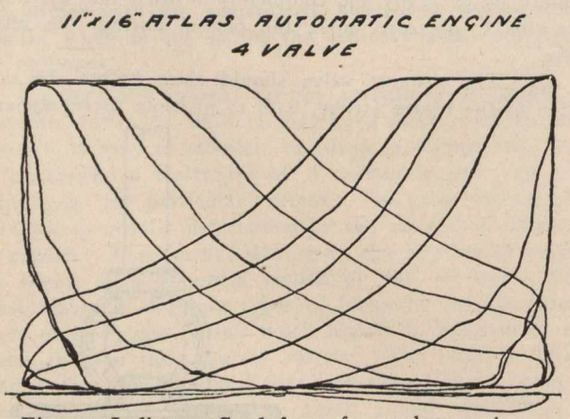


Fig. 4.—Indicator Card from four-valve engine.—(190 R. P. M.)

piston. Finally, and perhaps this is the most distinguishing feature of his system, he devised a gear which opened the admission valves promptly at the beginning of the stroke, closed them sharply at a variable point controlled by a governor and depending upon the load, and in the same manner provided for the prompt opening and closing of the exhaust ports at the proper times.

Corliss at first found great difficulty in selling his engines, as they were necessarily high in price, due not only to the added parts and complication, but also to the fact that the gear controlling the closing of the valves placed a definite limit upon the speed at which they could be run, at the same time limiting the power to be obtained from a given size of engine. However, they were so much more efficient than the throttling, slide-valve engine, then in general use, that he found it possible to sell them upon terms providing that the payment for the engine should equal the cost of the amount of coal saved during the first year's operation, a selling device similar to that used by Watt in introducing his first pumping engines.

The superiority of the Corliss engine, however, soon became so well recognized that until lately no other type of engine has been seriously considered for large power plants in which it is desired to obtain highest economy. As might be expected, however, many attempts were made to attain the advantages of a Corliss gear in high-speed engines which could be sold at lower prices. Ten or twelve years ago this company brought out such an engine in which the rotating valves were operated by cams, and good results were obtained with it, both as regards steam economy and reliability in operation. More recently other manufacturers have built four-valve engines in which the valves are operated by intricate kinematic movements. The complicated mechanisms are adopted to secure the desired steam distribu-

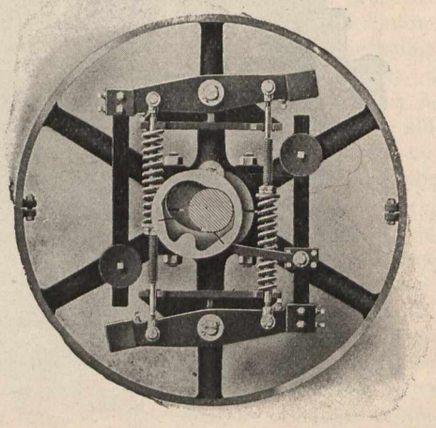


Fig. 5.—Atlas Automatic Shaft Governor four-valve centre crank type.

tion, and it is sometimes said that they secure "dwell" of the valves. This, however, is in itself detrimental, as it gives rise to uneven lubrication and consequent wear. Some of these engines are, it is true, more economical than the automatic slide-valve engine which they are designed to replace, but without exception they are complicated and expensive, both in first cost and cost of maintenance.

The Atlas medium speed four-valve engine possesses all the good features of the Corliss in so nearly an equal degree that its indicator cards can hardly be distinguished from Corliss cards, and which, as a result, gives steam economy nearly equal to that of the Corliss engine. This engine, in price, is only a small advance over the cost of an automatic engine, and does away with dash-pots and the complicated releasing gear of the Corliss engine.

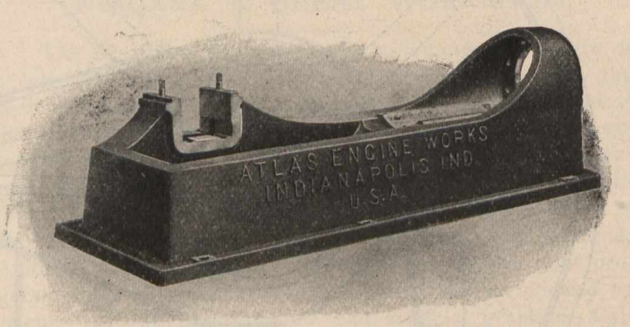


Fig. 6.—Medium-speed four-valve heavy duty frame (Side Crank).

In a test made at Purdue University, Lafayette, Indiana, last year upon a 13 x 12 engine of this type running non-condensing and with a boiler pressure of 121½ lbs., a consumption of 23.7 lbs. of steam per indicated Horse Power hour was obtained. The speed of the engine was 292 R.P.M. and the total indicated Horse Power 105.6, while the mechanical efficiency was 92 per cent.

In another test made upon a compound engine (8 and 14 x 18) running non-condensing, a steam consumption of

18 4-10 lbs. per indicated Horse Power hour was obtained when the engine was developing 122½ Horse Power and running at 202 R.P.M. The steam pressure was 155.4 lbs. This four-valve engine is not by any means an untried

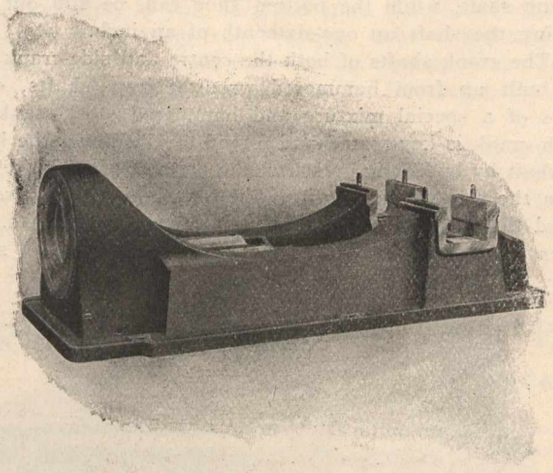


Fig. 7.—Medium-speed four-valve self-contained Frame. (Centre-crank).

machine, as a number have been in continual service since the spring of 1902.

Valves and Valve Gear.—These are the distinguishing features of this engine. The admission and exhaust valves at each end are placed in the cylinder heads, and lie across the ends of the cylinder. The valve casing is, therefore, as close to the cylinder cavity as it is possible to make it, and the volume of the connecting ports is practically nothing. The total clearance varies from 3 to 4 per cent. in different sizes as compared with 6 to 8 per cent. in other four-valve engines. The valves themselves are the most improved form of the rotating type. They are double ported and give free passage to the steam.

The exhaust valves are operated directly from a fixed eccentric through levers and rods, and open and close the ports quickly. These rods lie in a straight line, with no off-sets from the levers to the eccentrics. The points of opening and closing of exhaust valves are fixed, and the

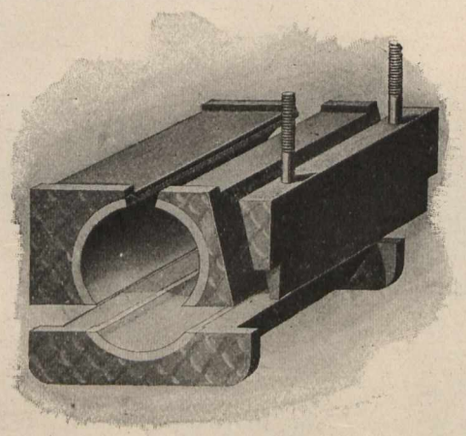


Fig. 8.—Main Bearing.

engine, therefore, has constant compression and release. The admission valves are operated in the same simple way by levers and rods connected to a shifting eccentric, which is controlled by an automatic shaft governor similar to the band-wheel type of governor used on Atlas automatic self-contained single-valve engines.

The travel and period of opening of the steam valves depend, therefore, upon the action of the governor, and the cut-off is varied from zero to three-quarter stroke.

Governor.—The automatic shaft governor regulates the supply of steam to the engine in proportion to the load, reducing the period of steam admission by shortening the valve travel as the load diminishes. The movements of the governor parts thus not only control the speed of the engine under changes of load, however wide, but also offer proper conditions for low steam consumption.

The same type of governor is used on medium-speed four-valve engines as is used on self-contained single-valve engines, this governor being particularly adapted to the four-valve movement because it maintains practically constant steam lead for all loads on the engine, while decreasing the lead to zero when the entire load is thrown off. The eccentric is pivoted on the same side of the shaft as the crank, and as the eccentric swings across the shaft, decreasing valve travel, the lead is well maintained throughout all working conditions of the engine, ensuring prompt opening of the steam ports, with consequent proper steam distribution.

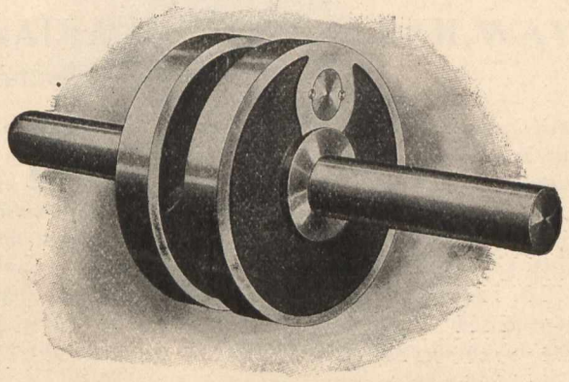


Fig. 9.—Four-valve Centre-crank Shaft.

The important principle of inertia is made effective in this governor by the manner of weight suspension. This is combined with a very strong centrifugal element, without which no governor is reliable. Thus this governor is powerful, positive and very sensitive, and not unstable, as are some governors in which the centrifugal element is almost entirely lacking.

The governor has spiral springs acting in compression, not in tension. Therefore, the springs retain their power, cannot be overstrained, and if they should break they are not free to fly about the engine-room or cause other damage, as is often the case with springs in tension.

This governor is practically in perfect gravity balance, is free from excessive friction, simple and easy to adjust, and the speed and direction of rotation can be readily changed.

All parts of these engines are carefully tooled to standard limit gauges and templates, and each part is interchangeable with all others of the same class and size.

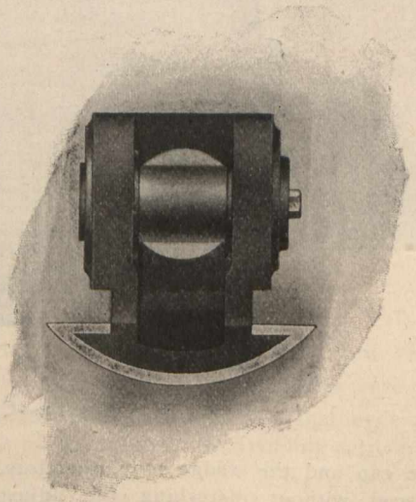


Fig. 10.—Cross-head of Medium-speed four-valve Engine. (End view).

In its **mechanical construction** the medium-speed four-valve engine embodies the improved details developed during thirty years of steam engine building. The engine is built in both self-contained or centre-crank and heavy duty or

side-crank types, built right or left-hand, and either set to run over or under.

The centre-crank engine possesses the advantage of requiring less space and having no outboard bearing for which a foundation must be provided. The side-crank bed-plate is a combination of the deep box pattern and the "tangye" frame. It is heavily built and has a broad footing upon the foundation. The main bearing housing is liberally proportioned, while the target end to which the cylinder is bolted is of great strength and stiffness. The finishing of all machined parts is done upon a special combination milling

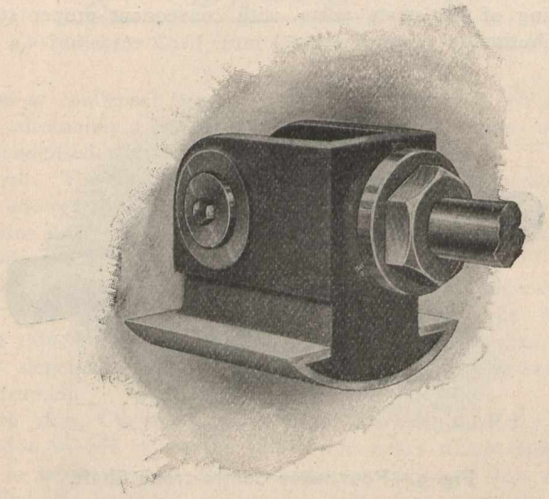


Fig. 11.—Cross-head of Medium-speed four-valve Engine. (three-quarter view).

and boring machine, and the finishing of the main bearing housing, the facing of the target end and the boring of the cross-head guide are all accomplished without resetting and in practically one operation.

The main bearings are made in three parts, two quarter-boxes and a bottom shoe, which completely surround the shaft with the exception of a small space at the top. The quarter-boxes are held in adjustment by a vertical wedge between one of the boxes and the housing of the bearing. This wedge is in contact with the box the entire length of the bearing, and is adjusted and held by set screws in the cap. The cap and the wedge may, therefore, be removed and replaced without disturbing the adjustment of the bearing, something that is impossible with most types of main bearings. The bottom shoe is free to move sidewise, and is, therefore, always centred under the shaft. This manner of arranging the main bearing was adopted by the Atlas Engine Works after an extensive study of the subject, and is based upon the fact that most of the wear of such a bearing is in a horizontal direction, the forces due to the push and pull of the piston being much greater than that due to the weight of the shaft and fly-wheel. These bearings are faced with anti-friction metal securely peaned into anchoring recesses and then bored and scraped to fit the shaft. The two quarter-boxes may be removed without disturbing the engine shaft, while the bottom shoe can be slid out after jacking the shaft up one-sixteenth of an inch.

The crank shafts of both the centre and side-crank types are built up from hammered wrought iron shafts, crank-disks of a special mixture and hammered steel crank-pins. Each crank is key-seated and forced to place over the key on its shaft by hydraulic pressure, the amount of which depends upon the size of the shaft. The crank-pin holes are then bored through the disks absolutely true to the shafts. The holes on a centre-crank shaft are both bored at one setting

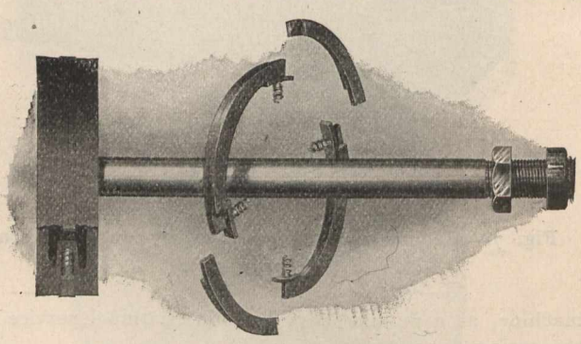


Fig. 12.—Piston and packing rings.

on a special machine, which assures absolute alignment. The crank-pin is forced into place, and one end of the shaft, which has previously been rough, is turned up, using the other finished end as a line of reference. The crank-disks are carefully counter-balanced and are turned up smooth and polished.

The cross-head is practically one solid piece. The pin is ground to fit tapered holes on both sides, and is firmly held by a bolt and washer. It can easily be removed or turned part way around to present new surfaces for wear. The shoe at the bottom is cylindrical in form to fit the bored guide in the bed, and is held down by heavy guide caps. The wearing surfaces are babbitted and scraped to a running fit. Oil is fed through the guide caps at the highest point of the wearing surface, and works downward through grooves toward the middle or lowest point. Lowering the guide caps afford ample means for the compensation of all wear.

The piston-rod passes through a large opening in the back of the cross-head in which it is centred by three set-screws, after which the jam-nuts are drawn up tightly to hold it in place.

The piston is provided with Babbitt & Harris' patent automatic spring packing, consisting of two rings, each of which is divided into four segments and occupies a separate channel. The segments lap over each other by fish joints,

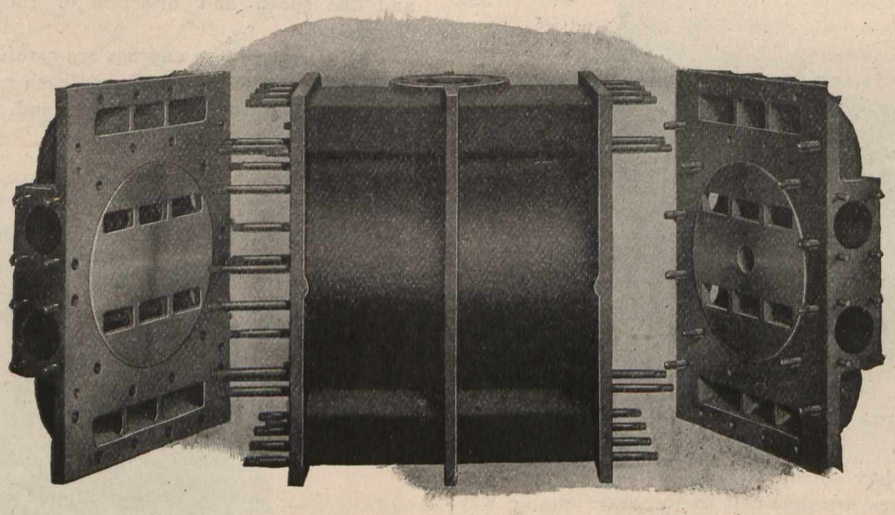


Fig. 13.—Cylinder and heads of four-valve Engine.

and under each joint is a small metal shoe held out by German silver springs placed in a socket in the bottom of the ring channel. This packing gives steam tightness with the least pressure and wear of the rings against the cylinder. The piston is hollow to reduce weight.

The cylinder, as will be noted from the illustrations, is overhung from the main frame casting. This is much better than supporting the cylinder by bolting directly to the foundation or by wings, since it provides for free expansion and contraction without strains and distortion.

Exact alignment is secured by the heads fitting counterbores in cylinder body, and the front head being also turned to fit a counterbore in the engine frame. The valve chambers are in the cylinder heads in order to get them as close to the cylinder cavity as possible, and thus reduce the length of the ports and clearance.

The steam and exhaust passages are separated from the main cylinder casting by cored spaces, which are packed with non-conducting material to prevent transmission of heat. Several sizes of cylinder may be fitted to one size of frame, so that is possible within limits to increase the power of the engine with the demand.

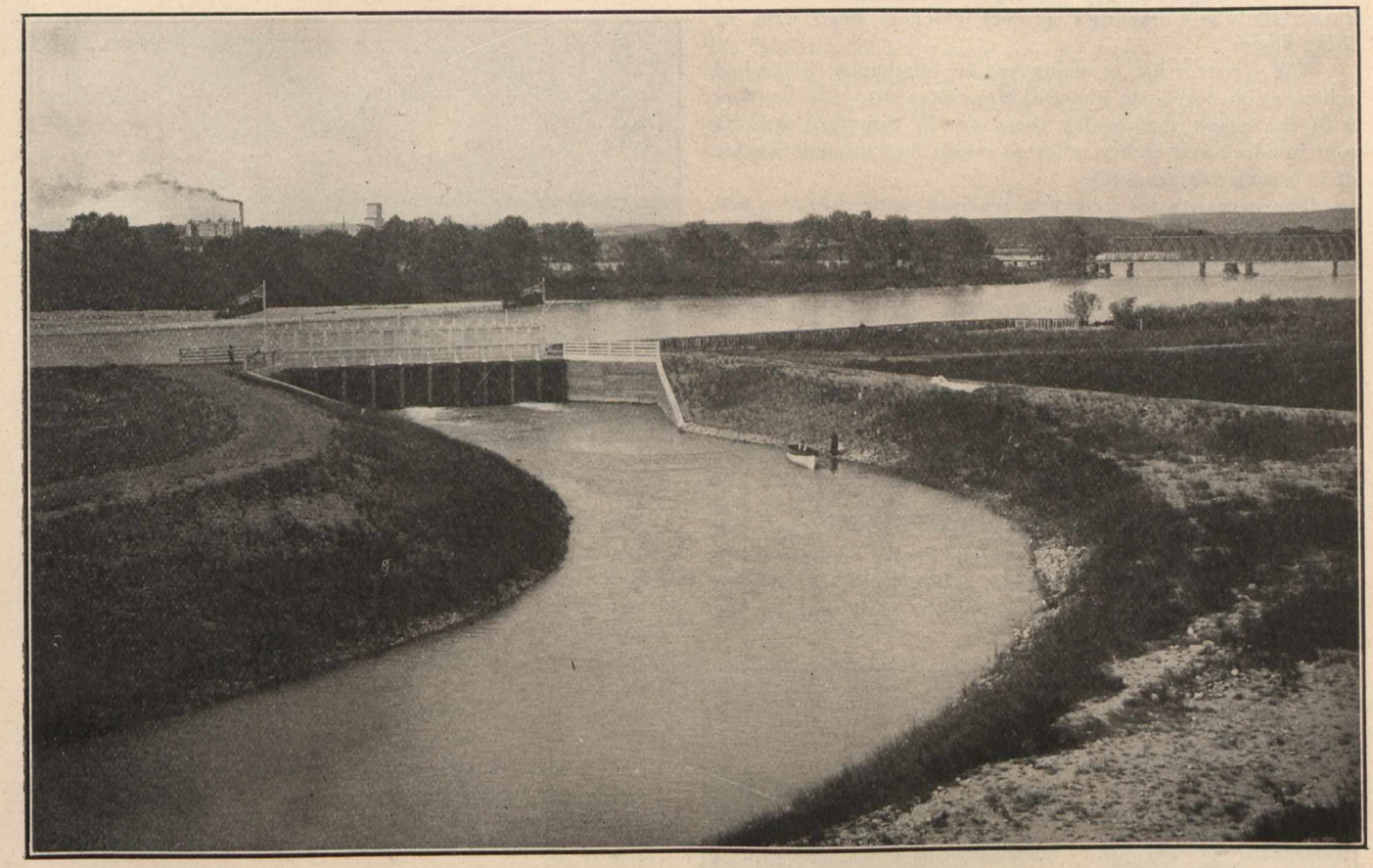
The joints between the cylinder and heads are provided with soft copper packing cylinders thirteen inches in diameter and less being cylindrical in form, while larger ones are rectangular.

For further particulars, apply to the Atlas Engine Works, Indianapolis, U.S.A.

IRRIGATION WORKS OF THE CANADIAN PACIFIC RAILWAY,

NEAR CALGARY, ALBERTA.

[On our recent 21 days' trip with the Canadian Society Civil Engineers, through Western Canada, we beheld many remarkable things; but we fully endorse the statement given to "The Montreal Daily Witness," October 1st, by Prof. C. H. McLeod, Secretary of the Society, that "from an engineering standpoint, by far the most interesting thing they saw, was the huge irrigation enterprise being constructed by the Canadian Pacific Railway in the neighborhood of Calgary." It is with pleasure therefore, that we here set forth a popular account of this unique piece of irrigation engineering. We are indebted to J. S. Dennis, Esq., Superintendent or Irrigation, C.P.R., Calgary, for the fine series of photographic views which we have reproduced, also, for the descriptive data. The map, and additional information, will appear in our account of the Engineers' Tour.—Editor.]



Headgates, Main Canal; Calgary in the Distance.

Historical.

Irrigation as a means of assisting agriculture by the artificial application of water to growing crops is as old as civilization, but the adoption of this principle in Southern Alberta is a matter of comparatively recent years.

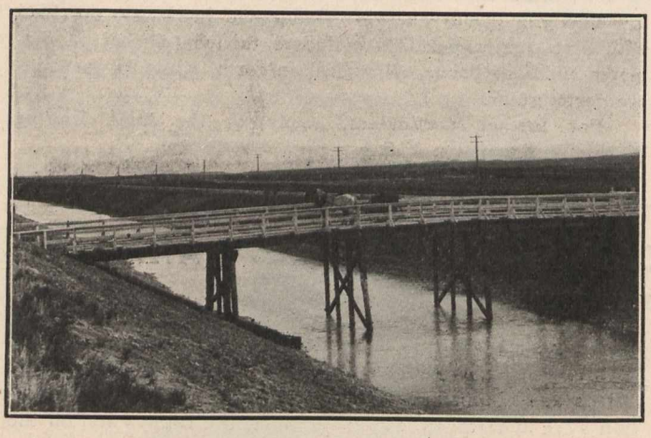
When the construction of the Canadian Pacific Railway was pushed across the great plains area of Canada in 1882-3, scattered settlement followed close upon its heels, and by the time the railway line had reached the Rocky Mountains, some of these settlements had been established in what is now the southern portion of the Province of Alberta.

For some years stock raising was the chief occupation of the residents of these settlements, the country having been found specially adapted to the outdoor grazing of cattle, horses and sheep, but by degrees small amounts of cultivation were undertaken, especially along the valleys and on the bottom lands, and the fact proved that the country, during seasons of sufficient rainfall, was well adapted to the growth of grain, fodder and root crops.

A series of dry years, commencing in 1893, however, turned the attention of settlers to the possibility of aiding the growth of their crops by irrigation, and such marked success followed their efforts where ditches were constructed to irrigate small areas in the valleys, that general attention was directed to this method of extending settlement and insuring crop production.

The matter was then taken up by the Government, a well-considered and comprehensive law relating to the use of water for irrigation was passed, and a system of general surveys was undertaken to determine the source and volume of the water supply available for irrigation, and the location of areas where such water could be used to the best advantage.

These surveys developed the fact that two extensive areas afforded special advantages for irrigation, one situated in the Lethbridge District which could be supplied with water from the St. Mary's River, and the second a large block of land lying East of Calgary which could be supplied with water from the Bow River. Preliminary surveys for the



Standard Bridge—Crossing Canal.

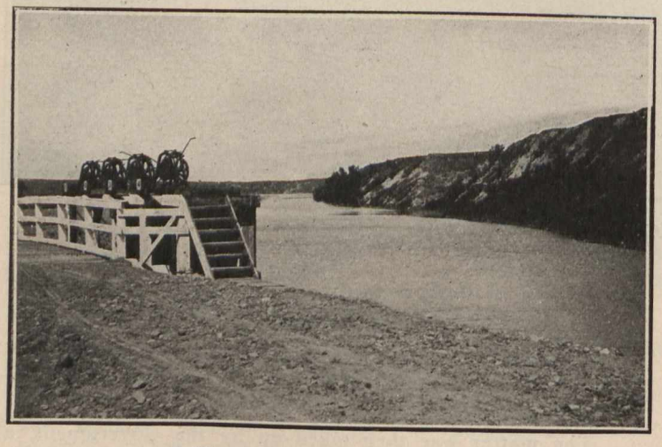
canals to supply water to these areas were completed and the first mentioned scheme was taken up and carried to completion by the Alberta Railway and Irrigation Company. The second scheme is that now embraced in the Canadian Pacific Railway Company's project which is dealt with in these pages.

The construction of many smaller ditches as individual schemes, or corporate undertakings, were also put in hand with the result that to-day there are in Southern Alberta four hundred and eighty miles of canals and ditches capable of irrigating 625,000 acres.

The necessity for irrigation received somewhat of a setback owing to the unusually wet seasons experienced during the years 1898-1902, but the fact that crop production could be increased and ensured during any year by irrigation in the larger part of the semi-arid region has been proved by those who have dealt with the matter intelligently, and it is now recognized that while irrigation is not a necessity in the same sense that it is in the arid States to the south of the International Boundary, it is an insurance on a crop in Southern Alberta justified by the cheap rate at which both land and water can be obtained.

Area Embraced in the Irrigation Project.

The area included in the Canadian Pacific Railway Company's irrigation project comprises a block of three million acres situated east of Calgary along the main line of the



Spillway Gates, Main Canal.

company's railway. The block is bounded on the west by the Fifth Meridian, on the south by the Bow River, on the east by the line between Ranges 10 and 11 west of the Fourth Meridian, and on the north by the Red Deer River and the north boundary of Township 28.

The block has an average length east and west of about 150 miles and an average width north and south of 40 miles.

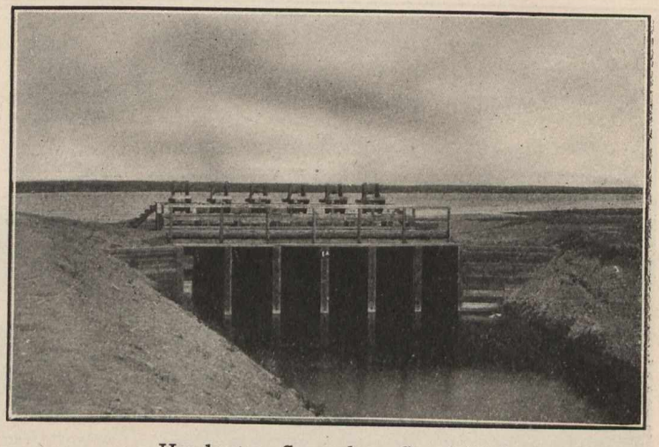
Within the block, the Company owns all the land except some areas which had been granted as homesteads prior to 1903. For convenience in dealing with it, the block has been divided into Eastern, Western and Central Sections, as indicated on the map referred to, each section containing about one million acres.

The block is an open prairie plateau with a general elevation near its western boundary of 3,400 feet above sea level, and slopes rapidly to the east until an elevation of 2,300 feet is reached at the eastern boundary. The surface throughout is more or less rolling until the Eastern Section is reached where large areas of almost level plains are found.

The soil throughout the whole block is first-class, with heavy black loam or a clay subsoil in the western portion and a lighter sandy loam with good subsoil in the more easterly parts. The whole block produces a most luxuriant growth of nutritious grasses, and the natural grazing is such as to provide pasture for horses, cattle and sheep throughout the whole year.

Climate.

What is the climate like? Is a question which intending settlers in the irrigation block are sure to ask, and his anxiety on this point is natural. First, because he should satisfy himself that the climate is one in which he and his family can live in health and comfort, and second, because the climate will have much to do with the success or failure of his agricultural operations.



Headgates, Secondary Canal "A."

In answering this question the statement can be safely made that Southern Alberta is favored with one of the most healthy and comfortable climates to live in on this continent. Its elevation varying from 1,400 to 3,400 feet above sea level, combined with its clear dry atmosphere, the almost continual sunshine, the total absence of malaria of any kind, its mild winters and cool nights during the summer all tend to produce a pleasant and healthy climate. The portion of the Province referred to has attained a continental reputation as a Sanatorium for pulmonary or bronchial troubles, and many persons can be referred to who moved to Alberta in weak health who are now strong and vigorous.

The winter in Southern Alberta is a season of bright sunny days broken by short intervals of cold weather and long spells when the western chinook winds bring almost summer temperatures. The snow fall is so light that as a rule wagons are used throughout the year and the snow disappears entirely as a rule two or three times during the winter under the influence of the warm chinook. During February and the early part of March brief periods of cold weather are usually experienced, but from one month to six weeks of winter is as a rule the limit.

Stock consisting of horses, cattle and sheep graze at large throughout the whole winter, and the fact that the beef which has attained such a high reputation as "Alberta Beef" has been and is killed directly from the range in winter is a proof of the mildness of the winter climate.

The summer season is characterized by hot days of almost continual sunshine with cool nights and a never failing

breeze, and the warm golden days of autumn, often lasting well into December, are the glory of the year.

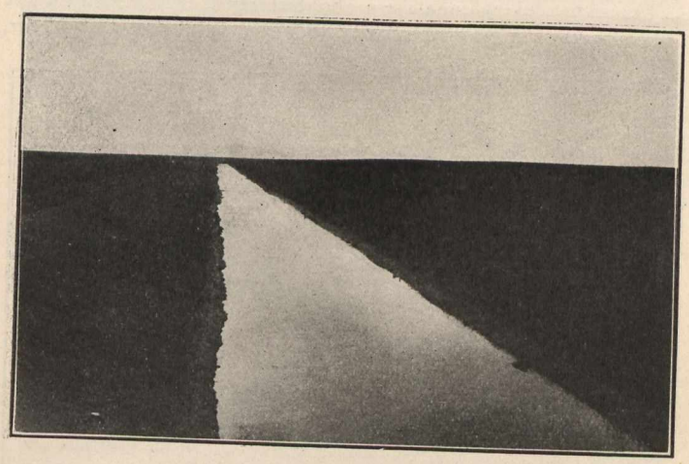
The marked characteristic of the climate of Southern Alberta is the "Chinook" wind, which is a warm, dry wind, blowing across the plains from the Rocky Mountains which bound the Province on the West. This wind has the power of melting and drying up the snow in winter seasons with amazing celerity, and to its influence may be ascribed the fact that Southern Alberta has many times celebrated mid-winter holidays with cricket, baseball and other outdoor sports, and that winter is one of the most enjoyable seasons of the year.

Statistics and figures do not always convey to the average reader a clear idea of what is represented but the two short subjoined tables, compiled from Government Meteorological records, illustrate in a graphic form the character of Southern Alberta climate.

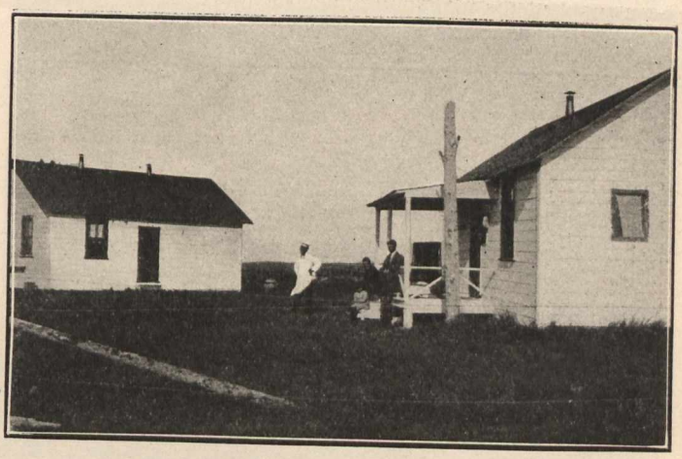
Mean Annual Rainfall in Certain States of the United States:

	Mean Annual Rainfall.
California	22.50 inches.
Montana	12.61 "
Nevada	10.64 "
Utah	10.32 "

The table of rainfall given above proves that Southern Alberta is only a semi-arid country and that during certain years there is sufficient moisture to mature crops without the aid of irrigation, but in every year the farmer who has water available to give his crop "a drink" when it needs it most, is the farmer who in the long run is going to be most successful, and to provide that "insurance" on crop production is why this irrigation undertaking has been put in hand to supply the insurance at a cost commensurate with existing climatic conditions.



Fine Stretch on Secondary Canal.



Maintenance Engineers' Headquarters.

Law.

The best proof of the fairness and stability of the Canadian law relating to irrigation is the statement that although irrigation has been practiced for ten years, and to-day in Southern Alberta there are, including the Canadian Pacific Railway's project, eight hundred miles of canals and ditches carrying water for irrigation, there has not during that time been one lawsuit about water rights.

The canal constructed by the Canadian Pacific Railway Company has an absolute title under the Canadian law to two thousand cubic feet of water per second from the Bow River, and that river at the point of intake for the canal has

STATEMENT OF MEAN MONTHLY AND ANNUAL TEMPERATURE AT CALGARY, ALBERTA.

Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Mean. Annual.
1898....	40.1	14.8	19.3	37.8	51.4	55.6	62.9	62.7	51.2	36.0	21.7	44.9	41.5
1899....	19.6	1.9	7.6	33.6	43.7	52.8	60.0	53.0	53.5	36.4	36.8	19.5	35.0
1900....	21.9	10.5	27.5	43.5	51.4	57.0	58.0	54.5	46.7	38.2	20.7	27.0	38.1
1901....	15.8	15.4	30.0	38.3	52.0	49.3	58.7	59.0	44.2	47.8	28.5	26.0	38.8
1902....	19.6	15.2	25.3	39.8	47.8	49.1	59.0	57.2	48.8	44.4	27.8	11.9	36.7
1903....	20.5	21.5	14.0	37.5	45.5	57.1	56.7	55.4	46.0	45.2	22.8	25.9	37.3
1904....	18.1	1.8	13.3	42.8	47.1	53.7	60.5	55.7	50.5	43.4	35.2	20.5	33.3
1905....	9.6	15.1	35.2	39.1	47.5	52.5	60.8	59.4	50.7	37.3	33.2	22.2	38.6
Mean...	20.7	11.6	21.5	39.1	48.3	53.4	59.6	57.1	50.0	41.1	27.6	25.1	37.4

STATEMENT OF MEAN AND TOTAL MONTHLY AND ANNUAL RAINFALL AT CALGARY, ALBERTA.

Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1898....	0.00	.90	1.57	.45	2.02	3.77	3.83	2.40	.74	.16	.30	.65	16.79
1899....	0.00	0.00	.97	.10	5.46	3.22	2.08	9.40	.99	.44	.26	.17	23.01
1900....	0.00	.02	.30	.47	1.32	3.56	2.00	1.29	4.50	.39	1.60	0.00	15.45
1901....	0.40	1.15	.05	.90	1.55	7.04	3.94	.51	3.15	.12	.40	1.20	21.31
1902....	0.40	.60	.62	.60	8.90	9.82	5.06	6.23	1.22	.61	1.00	.60	15.66
1903....	0.00	.50	.88	.29	3.97	2.07	4.09	7.62	1.80	0.00	.60	.16	21.98
1904....	.16	.10	.80	.14	1.56	1.86	1.74	2.75	.38	1.35	.12	.20	11.16
1905....	1.04	.30	.65	.60	1.68	8.51	.91	.56	.35	.31	1.20	0.00	16.11
Mean...	.25	.45	.84	.44	3.31	4.98	2.96	3.85	1.64	.43	.69	.37	20.21

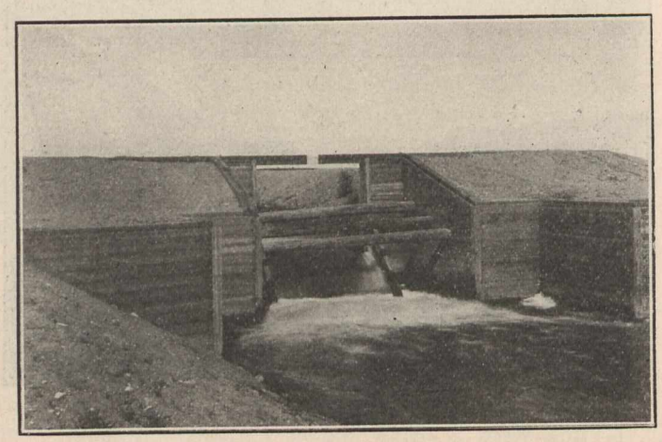
For the purpose of making a comparison with the climate of countries noted for their healthfulness and favorable conditions from an agricultural standpoint, the following tables, taken from United States Signal Service Reports, are given:

	Mean Annual Temperature.
Colorado	44.80
Montana	42.40
Nevada	50.32
Utah	50.10

never shown at its lowest stage, since Government gaugings were commenced some years ago, a smaller flow than three thousand cubic feet per second. During the irrigation season the flow usually averages about six thousand cubic feet per second.

The source and volume of the supply are therefore assured, the title to the water is as good as the title to the land, and in addition the purchaser of an irrigated farm gets the guarantee of the Canadian Pacific Railway Company to supply him with water for all time.

This is the first time on the continent that water has been supplied for irrigation under such an absolute title and with such a guarantee as to its supply by the Company sell-



Possible Water Power.

ing it, and purchasers of irrigated farms in this project need have no fear of encountering the disappointments as to water supply that have been experienced in many cases throughout the irrigated States.

Description of Irrigation Works.

It has been previously explained that the area of three million acres included in the irrigation block, which is shown on the official map, has been divided into three sections, Eastern, Central and Western, containing about one million acres each.

The preliminary surveys so far completed indicate that about one half the whole block or one million and a half

First Boat Here Since Noah's Flood.—Mr. J. S. Dennis, Irrigation Superintendent, in Prow of Launch.

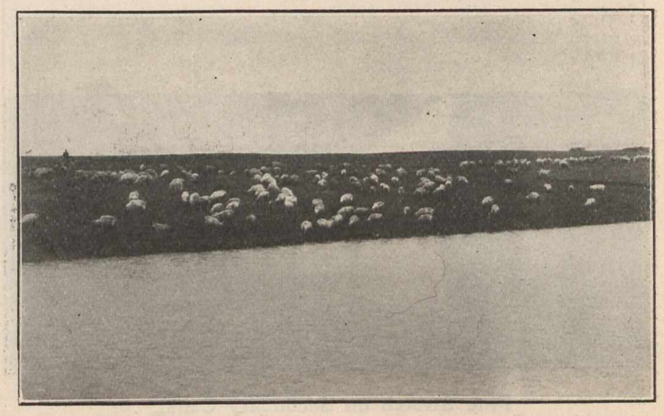
acres can ultimately be irrigated, but the actual work of locating and constructing irrigation works is being dealt with in sections, the works for the Western section having been first undertaken, the intention being to deal with and develop that section from the standpoint of colonization before proceeding with the work in the Central and Eastern sections.

The following brief description of the irrigation works completed or in course of completion in the Western section will indicate the character and magnitude of the work.

The water for irrigation in this section is diverted from the Bow River at a point about two miles below the City of Calgary, and from there is carried south and east through a main canal seventeen miles in length, which is sixty feet in width at the bottom, one hundred and twenty feet in width at the water line, and carries water to a depth of ten feet.

This main canal delivers water to Reservoir No. 1, for which a natural depression or lake bed has been utilized, and by the erection of a dam creating a lake some three miles long and a half a mile wide in width at that point.

From Reservoir No. 1, the water is taken out in three secondary canals, A, B and C, and carried to the different sections of the Western district which are to be irrigated. These secondary canals are about thirty feet in width on the bottom at the Western ends and carry eight feet of water,



What Canal Construction Does for Ranching.

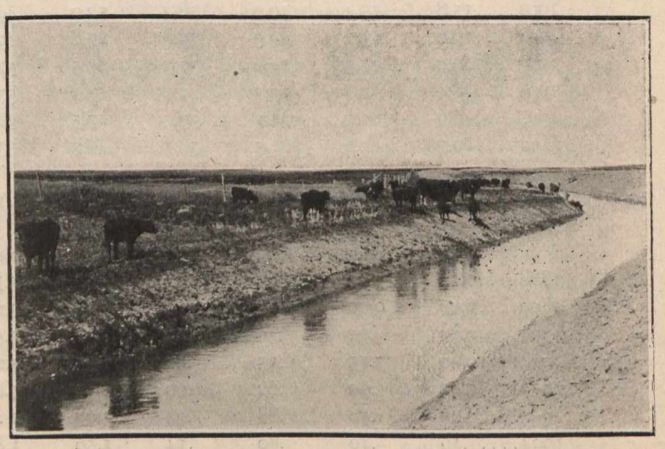
and their combined length is one hundred and fifty miles.

From these secondary canals the water is again taken out and transported and distributed in each irrigation district through distributing ditches, these comprising in the Western section a total mileage of about eight hundred miles.

In the Western section of the irrigation block, there will therefore be the following mileage of water ways:

Main Canal	17	miles.
Secondary Canals A, B and C.	150	"
Distributing Ditches	800	"
	967	"

In addition there will be several hundred miles of the small distributing laterals constructed by the farmer for the

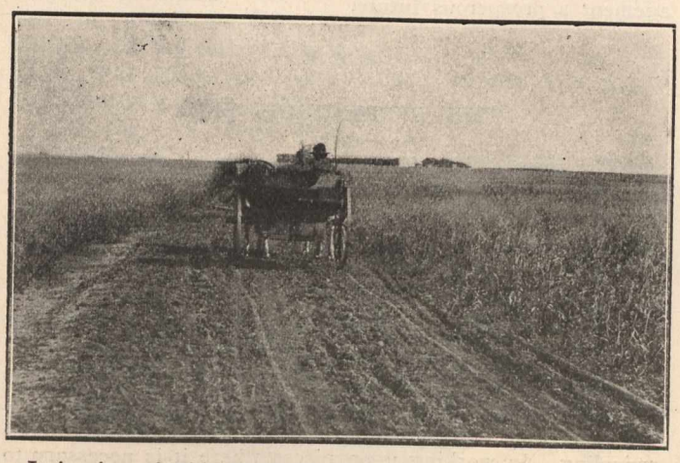


Why Should They Not Be Happy?

distributing of water over his land in the process of irrigating.

In carrying out the irrigation scheme in the Western section of the irrigation block, a departure has been made from the usual practice in large irrigation undertakings on this continent in the construction of the Company of the distributing ditches so as to deliver the water at each man s farm and only leave to him the construction of the small laterals to distribute the water over his irrigated land. The usual custom elsewhere is to bring the water in a secondary canal or ditch to a point near the area to be irrigated, and then leave it to the purchasers of the land to join together and build and maintain the distributing ditches.

The departure made in the Canadian Pacific Railway Company's project in building the distributing ditches as part of the canal undertaking will appeal to all intending purchasers of irrigated lands.



Irrigation of This Field Would Have Doubled the Crop.

In locating and constructing the main and secondary canals and the distributing ditches, an unusual amount of care has been exercised so as to reduce the chance of break in the banks or delay in delivery of water to a minimum and the manner in which the work has been performed led to the following statement by Dr. Mead, Chief of Drainage and Irrigation Investigations, Department of Agriculture, Washington, the leading irrigation engineer authority on this continent: "The chief problem of the main canal was to build a waterway which would be free from leaks and all danger of breaks. The precautions which have been taken to insure this are greater than those usually observed, the specifications for stripping the surface soil and packing of embankments are so rigorous and are being lived up to in all the work I inspected and I have never seen more compact or uniformly solid banks than those being built."

The same care has been followed in the design and construction of the main headgates and all the other structures on the main and secondary canals and possible delays and mishaps in the delivery of water from washouts and weak structures has been overcome as far as it is possible to do so in the works connected with the Western section of the irrigation undertaking.

His First Year.

In the Western section about 350,000 acres of land will be irrigated from the canals completed or under construction. After this section is developed and colonized the work will be extended to the Central and Eastern sections, within which it is expected that about eleven hundred thousand acres can ultimately be irrigated.

The water for the irrigation of land in the Central and Eastern sections will be taken through a second main canal heading in the Bow River at or near the Horse Shoe bend on the Blackfoot Indian Reserve, as shown on the accompanying map, and will then be distributed in the districts through a complete system of secondary canals.

The ultimate expenditure on this great undertaking is estimated at about $5,000,000, and this expenditure, taken in conjunction with the area of land in the block which it is proposed to irrigate, justifies the title given this scheme, "America's Greatest Irrigation Project."

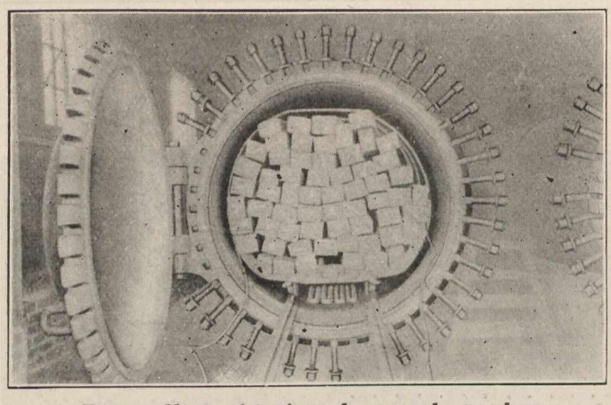
His Last Year of "Dry Farming."

A NEW CREOSOTING PLANT.

There has recently been installed at Shirley, Indiana, a new two-cylinder plant for impregnating railway ties, built for the Columbia Creosoting Company. It is probable that this plant has a greater capacity for the size and number of its retorts than any other in the country. The machinery, including retorts, tanks, pumps, piping, engine and generator, was all furnished by Allis-Chalmers Company, of Milwaukee. The plant consists of two retorts 7 feet in diameter by 130 feet long, each closed on either end with a heavy solid cast-steel door, bolted to a cast-steel flange. The retorts are capable of withstanding a pressure of 175 pounds to the square inch. Two over-head charging tanks, one large storage tank, one unloading tank for tank cars, one cylindrical underground tank for emptying retorts, one 40 kw. generator, steam-driven engine, switchboard, etc., two 100 H.P. boilers, electric locomotives, tie cars, etc., a complete equipment of pumps, piping, valves and fittings.

In the operation of this plant one of the features of great value, resulting in the saving of a great deal of time and enabling the operators to accurately keep track of oil used, etc., is the combination of an over-head charging tank and an underground receiving tank. When a retort is filled with ties and the doors closed and bolted, it is charged with creosote from one of the over-head charging tanks through two 8" pipes, the quantity of cresote already in this tank having been previously noted. The retort is filled almost in the fraction of a minute, the oil flowing in by gravity. The moment the oil comes to rest in the over-head tank the quantity remaining in it is noted and the pressure pump started, forcing in oil until the desired penetration into the tie or timber is effected. The quantity of oil being forced into the timber is carefully noted as the level drops into the over-head tank, there being no other outlet for the oil in the tank excepting into the retort. When proper penetration has been accomplished the pressure pump is stopped and the surplus oil permitted to flow from the retort into the underground tank through two 10" pipes. The time required to accomplish this operation is as short as the time required to fill the retort, it also being done by gravity. From the underground tank the oil is pumped back as desired into the charging tank during the subsequent part of the operation. The retort is now subjected to a vacuum, and the excess of oil which has been forced into the ties is withdrawn down to the proper quantity. The vacuum is then destroyed and the retort emptied. If it is desired to get an exceptionally deep and quick penetration, this process is reversed and the ties, immediately they are put into the retort, are subjected

to a vacuum, followed by the immersion in oil. Only seasoned ties are treated in this plant, and the retorts are not arranged for steaming timber, this being considered injurious to it. Each retort is supplied with heated coils in the bottom between the rails, which keep the oil heated to the proper temperature when in the retort. The charging



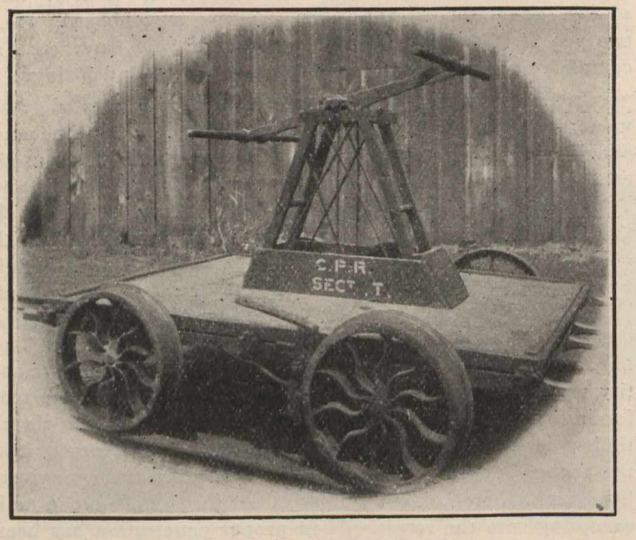
Retort filled with ties—door ready to close.

tanks and storage tank are all likewise provided with heating coils to prevent congealing of the creosote oil.

To illustrate the growth of the timber preserving industry it may be stated that the Allis-Chalmers Company has furnished nearly fifty of these retorts during the past few years, representing the most modern equipment in this line.

THE DOMINION ROLLER BEARING A SUCCESS.

The above illustration shows a C.P.R. hand-car, fitted with Dominion roller bearings, and now doing twelve miles service each day in section gang work from Toronto Junction eastwards. The bearings are 1⅜" dia. x 3⅛" long, and consist of 9 x 9 rollers, ½" diameter. A like set of bearings have been installed in a G.T.R. hand-car doing service between Toronto and Hamilton, and the general roadmaster (Mr. H. Ferguson) reports August 29th thus: "We have tested the hand-car that has been fitted up with roller bearings and find it works very satisfactorily, and is a



Hand-car with Roller Bearing.

great improvement to the old pattern." Since the reorganization of the company, which originally put the Henderson roller bearing on the market, an entirely new management, with a thoroughly competent engineer (Mr. Joseph Dove-Smith) in charge, have greatly improved the manufacture of these bearings, rendering it a still more effective friction-saving appliance. We recently visited the well-equipped plant of the Dominion Henderson Bearings, Limited, Toronto, and inspected all the varied operations of manufacturing and testing, beside witnessing experiments with the hand-car, now in active service on the Grand Trunk Railway. The impression made upon us was that the device is sound in principle and a manifest power-saver when properly constructed. The latest success of this roller bearing on the two principal railways of Canada is evidence of its utility, and we wish Dr. J. Frank Adams and the new management a prosperous future.

THE PITTSBURGH VISE.

The form of vise illustrated is made so as to combine convenience and adaptability with strength and durability. The slide-bar and front jaw is made of a round steel casting, and the screw is made from a solid steel forging. The vise may be revolved upon a vertical axis, and in addition, in the case of a double-swivel vise, the jaws may be revolved in a complete circle about a horizontal axis; notwithstanding these facilities, the vise is not encumbered with pins, levers, screws, or bolts for clamping it against swiveling, since the operation of tightening the jaws upon the piece of work at the same time automatically locks the vise and prevents its swiveling. In working upon pieces where it is necessary to change their position periodically, the changes can be made without removing the work from the vise. The swivels are

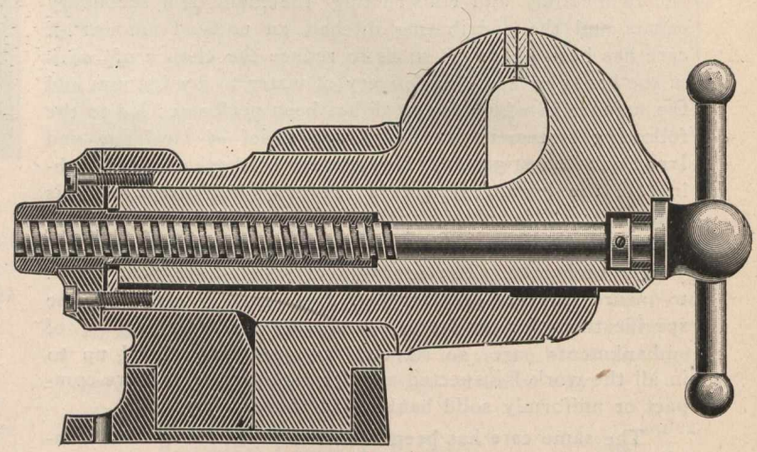


Fig. 1.—Double Swivel Vise.

graduated so that the amount of swivel movement can be closely determined. The vise may be converted to a stationary one if so desired by turning two screws, which lock both swivels, and by this means also, friction on the swivel may be varied. The sectional view, Fig. 1, shows the construction of the double swivel vise. The base is formed with an annular seat for the body, which latter is made in two halves or yokes. It will be seen from the cut that these two halves do not make contact with one another over the whole of their adjacent surfaces, but are so made that when their upper ends are placed towards one another as the result of

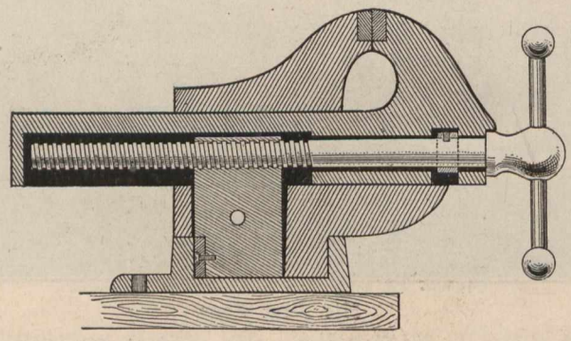


Fig. 2.—Single Swivel Vise.

screwing up the vise on the work, their lower ends are forced slightly apart, and thus press on the inner cylindrical circle of the base and lock the vise fast against swiveling.

Within the upper ends of the two yokes may be rotated the rear jaw-piece, Fig. 1, about a horizontal axis. The bearing in the front yoke is of a larger diameter than that in the rear yoke. The slide-bar of the front jaw is thus allowed to extend through the rear jaw. A sleeve or nut extends through the bore of the front jaw, and has at its

back end a head which bears against the outside of the friction plate or cap. The friction plate is fixed to the back end of the back jaw piece. A bearing sleeve is placed on the screw between its head and the collar so as to afford freedom of turning. This sleeve is driven or forced tightly into its seat in the front jaw so as to serve as a reliable backing for the collar when the screw is rotated to open the jaws. The screws are prevented from rotating with respect to one another with a spline.

In Fig. 2 a longitudinal section of the single swivel vise is shown which has merely the swivel about a vertical axis. This is constructed differently from that shown in

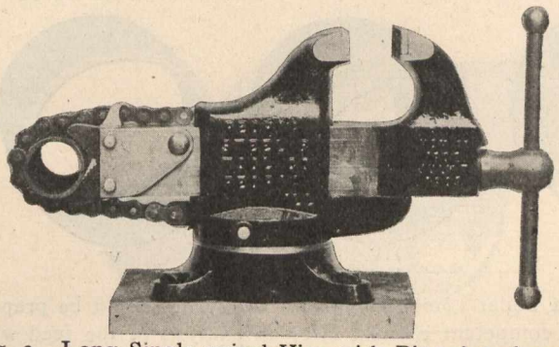


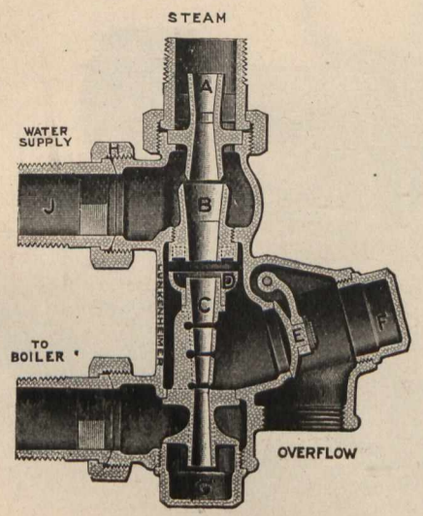
Fig. 3.—Long Single-swivel Vise with Pipe Attachment.

Fig. 1, but has also the feature that, by tightening the jaws on the work, the vise is automatically locked against swivelling. The action is shown very clearly from the cut. Tightening the vise draws the nut or upper end of the locking dog forward, thrusting the steel bar at its lower end backward against the inner cylindrical surface of the base and locking the whole against turning.

A pipe attachment for the swivel vise is also made which works on the rear end of the slide-bar without interfering with any work in the jaws proper. The Pittsburgh Automatic Vise and Tool Co., Pittsburgh, Pa., are the manufacturers.

AUTOMATIC INJECTOR IMPROVEMENT.

Demonstration has shown that a durable and efficient boiler feeder is manufactured by the Lunkenheimer Company, of Cincinnati, Ohio. In practice this injector has proved itself to be reliable under all ordinary conditions, and it has a full capacity when worked under high pressure. Variation in steam pressure does not affect its working to



An Improved Injector.

any extent, and the quantity of water delivered may be graded over 50 per cent. The durability of the injector is due to the fact that the parts are made of a hard bronze composition, and are well proportioned. The tubes are comparatively small for the amount of water delivered, which enables them to stand considerable wear, without impairing the efficiency of the injector. All the parts are interchangeable, and can be easily replaced. From an economical standpoint this injector is worthy of consideration, as the amount of water delivered per pound of steam is very large. The machine presents a nice appearance, the body being well proportioned and the trimmings polished.

AN AUTOMATIC SPRING FINDER.

One of the latest inventions of modern science, is an automatic spring finder. The discovery of a method to locate water beneath the earth's surface, is a problem that has occupied the minds of men of all ages. In olden times the Divining Rod was used, a mysterious instrument, which is still believed in by many, and which, in spite of attacks from a scientific point of view, cannot be denied some success, as experience has proved. It remained, however, for a

Automatic Spring-Finder.

Swiss Inventor, Adolph Schmid, to construct an apparatus that would indicate the presence of subterranean water, or, as it is usually designated, a spring, in a clearly visible and unmistakable manner. This new instrument has solved an old and difficult problem in a surprising way. It has been scientifically and technically examined upon physical principles, and is at present the only instrument by which subterraneous springs can be located. This is an invention of the utmost importance, and the inventor has already received numerous inquiries for the same from all parts of the world. The inventor is of the opinion that the instrument may be used to locate oil wells, as well as springs, and is about to make extensive experiments in this connection, which, if successful, will make the instrument invaluable in this country.

BOILER INCRUSTATION AND SCALE.

A chemical compound which it is claimed acts with great effectiveness directly on the scale of boilers, is being placed on the Canadian market by the Howard Chemical Company of New York. The compound consists of a fine, amorphous, brown powder, containing neither soda, potash, ammonia nor acid. It is neutral in reaction, and and contains no chemical element which will attack steel, iron or other metals. It has been demonstrated that 1-16" of scale increases the amount of coal required by 13 per cent. Any agent, therefore, which effectively removes old and prevents the formation of new scale, is a boon to the stationary engineer. The evidence produced by the Howard Chemical Company, emanating from expert engineers, after severe tests, especially that from the Superintendent Engineer of the Hamburg American Line, who has introduced it after trial on all that company's ocean-going steamers, goes to show that "scale off" is an effective remedy for incrustation trouble in boilers. It is claimed that one pound of "scale off" will save a ton of coal. The following illustration shows the startling action of the compound on a 3½" tube, taken from the boilers of the Wm. Peter Brewing Co., Union Hill, N. J.

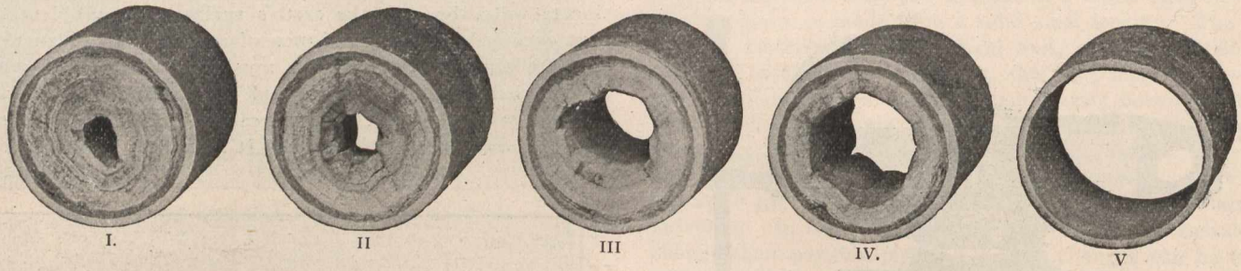


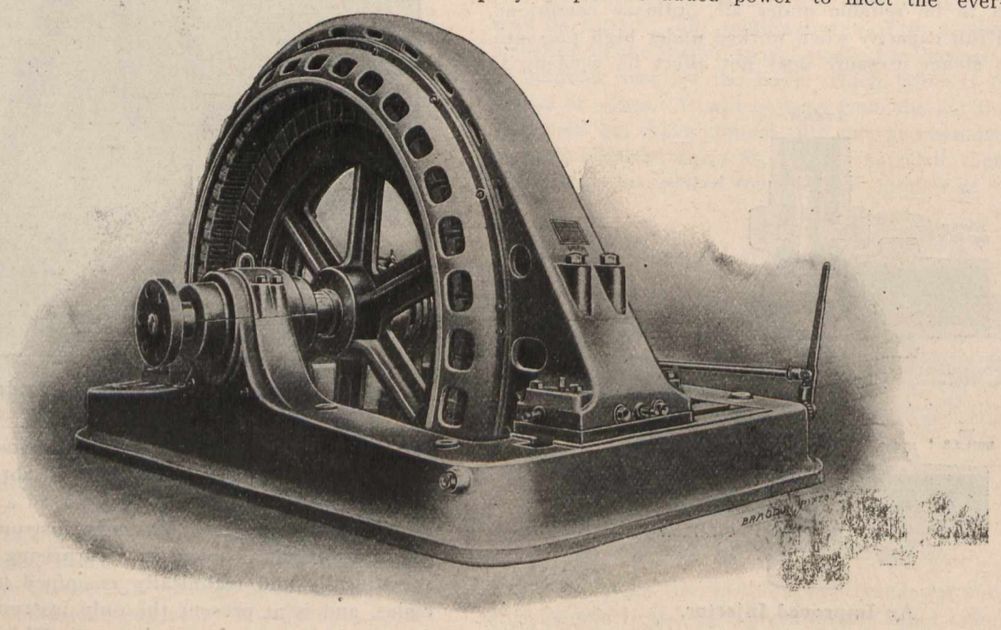
Fig. 1 represents the tube 3½" diameter as received; Fig. 2 after boiling two weeks in a solution of "Scale off"; Fig 3 after boiling four weeks; Fig 4, 6 weeks; Fig. 5, 8 weeks. These tubes were boiled in an open tank 12 hours per day, under atmospheric pressure. So many worthless boiler compounds have been floated on the Canadian market, that an agent with this class of goods is looked upon with as much suspicion as is a modern Insurance agent or western gold brick faker. Scale trouble in boilers, however, like the poor, is always with us, and a sure remedy is a desirable thing. In the standard work on "Steam," published by Babcock & Wilcox, occurs this passage: "To use a boiler composition with safety, it should be prepared by a competent chemist after an analysis of the feed water, as there are many compositions in use which may be absolutely useless." (page 115).

The Howard Chemical Co. say: "We are prepared to make an expert analysis of all samples of water sent us, and when necessary, will so alter the proportion of ingredients in our compound as to meet the special requirements of the case," thus freely complying with the important condition laid down by the greatest boiler manufacturers in the world. After careful scrutiny of the evidence set up by the manufacturers of "Scale-off" we hesitate not to advise owners of boiler plants to try it.

CANADA A RIVAL OF THE UNITED STATES IN ELECTRICAL MACHINERY.

The largest generator ever built in this country has just been shipped over the C. P. R. to British Columbia from the works of the Canadian Westinghouse Company, of Hamilton. The purchaser is the British Columbia Electric Railway Company, of Vancouver. The generator is 2,000 Horse Power, three-phase, 7,200 alternations, 200 revolutions per minute, engine type for direct connection with the water wheel. The order also includes one rotary converter of 1,350 Horse Power, 550 volts, three-phase, 7,200 alternations, 400 revolutions per minute, and eight air-blast transformers, each of 733 Horse Power, 2,200 volts to 24,200 volts, 7,200 alternations. The necessary switch boards and regulating and controlling devices were also manufactured in this plant, and will be shipped with the balance of the order in a short time.

The new machinery is required by the Vancouver company to provide added power to meet the ever-increasing demand of Vancouver and vicinity. It is the fourth generator of the size ordered by the Vancouver company, but the other three were supplied by the Westinghouse company from its Pittsburgh works previous to the building of the Hamilton works. The one just shipped is by long odds the largest ever manufactured in Canada.

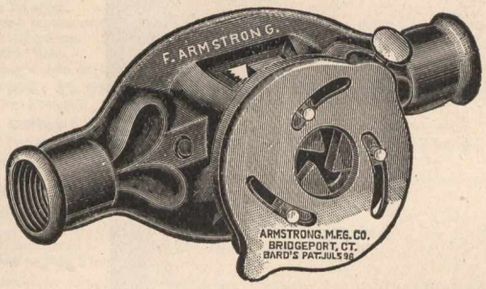


Generator for the British Columbia Electric Railway Company.

BARD ADJUSTABLE BUSHING.

This bushing is made in four sizes, each size taking the same range of pipe as the corresponding number of the stock. The bushing as shown in the illustration attached to the stock consists of a strong malleable iron body having a sleeve fitting into the barrel of the stock.

A simple twist of the cam plate brings a set of extra hardened jaws firmly against the pipe, centreing it at the same time. The cam plate is then secured by a thumb screw, insuring an absolutely accurate and straight thread. When a crooked, or drunken, thread is desired, however, it can be cut as easily as with the old style ring bushings.



The bother of lost or misplaced ring bushings, with the time lost in search and fitting to the stock, is saved by the use of this bushing. It is much more reliable and accurate than the makeshift of wrapping paper or tin around the pipe when the exact size bushing cannot be found. There is no necessity of carrying a set of bushings in the kit when one of these adjustable bushings has been fitted to the stock.

This is a thoroughly reliable tool, which need not be removed from the stock after fitting, and has nothing to get out of order. It will be of inestimable value to the pipe-fitters and mechanics who need a tool which is in the right place at the right time.

A NEW INDUSTRY FOR CANADA.

The importance of the independent telephone movement in Canada has been realized by the Century Telephone Construction Company, of Buffalo, N.Y., who have taken possession of a commodious building on Adelaide Street West, Toronto, where they will immediately commence to manufacture telephone equipment for every kind of service. The equipment manufactured here will be of the same superior quality as that turned out of their Buffalo factory. A complete line of construction material, tools and other supplies will also be kept in stock. Every effort will be made to give prompt shipment, and all enquiries received will be given immediate attention.

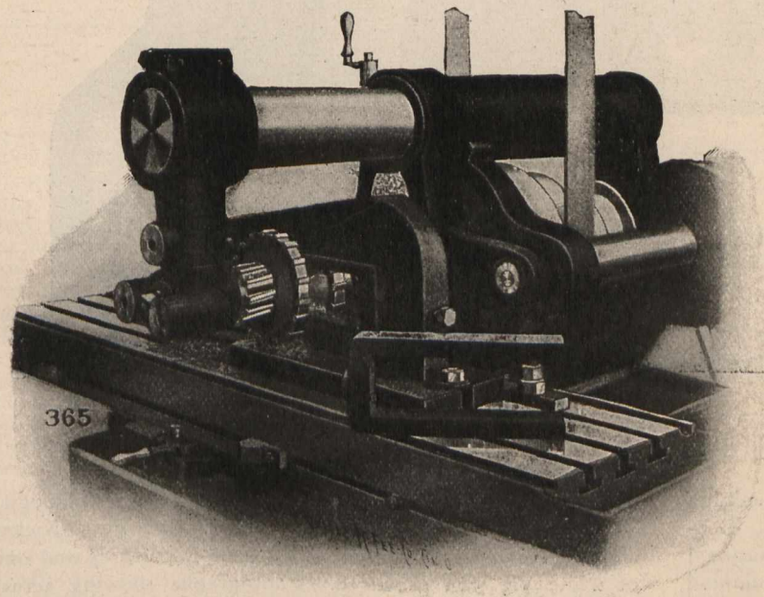
MACHINE SHOP NOTES FROM THE STATES.

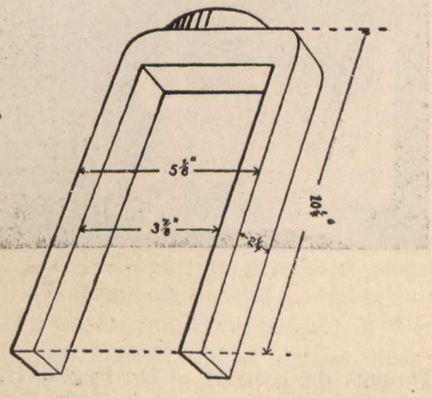
By Chas. S. Gingrich, M.E.

XXIX.

Steam Engine Work.

This illustration shows the third operation in finishing steam engine connecting rod straps on a No. 3 "Cincinnati" Miller, as it is done in the shops of the Frick Company, Waynesboro, Pa.

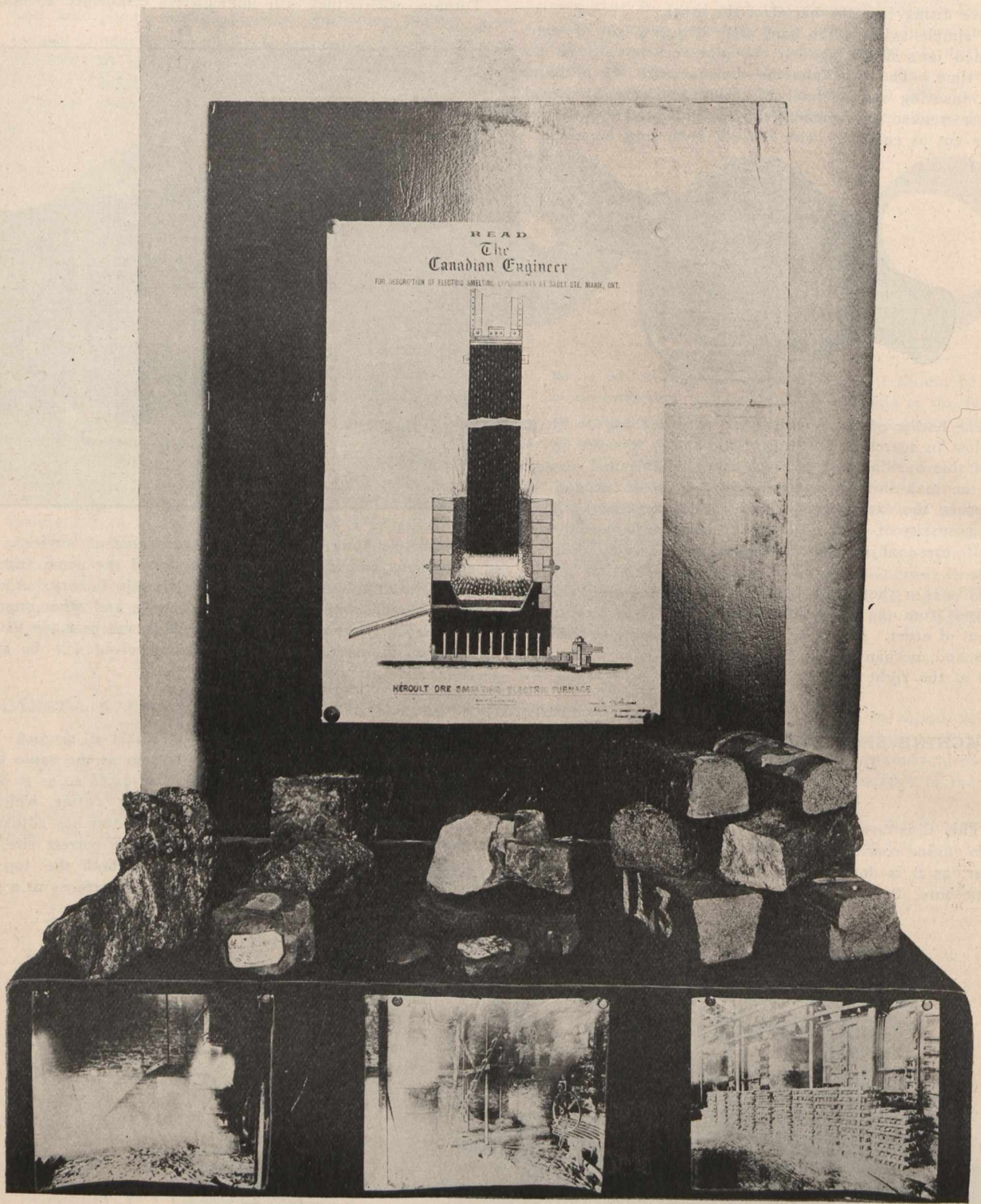




The first two operations shown in previous issues of "The Canadian Engineer," finished the ends and the sides of the straps. In this operation the two edges and the inside are finished. The piece is held in a convenient fixture, and the first cut taken is the one shown. In this the two side mills finish the edges of the piece, and a spiral mill between them roughs out the inside. The total width of the cut is 7", and removes about ⅛" metal all around. The inside cutter cuts at the top and bottom at the same time. After this has been done the table is adjusted so as to bring the work in position with the finishing cutter, which is shown next to the arbor support. This cutter has adjustable blades, and can always be kept up to the correct size. In this finishing cut the cutter again cuts both the top and bottom at the same time, and brings the surfaces to a good finish and exactly to gauge, so that the parts are interchangeable in all respects.

This is the most particular operation on these pieces, and it takes about half an hour to do this work on one piece. The line cut gives the actual dimensions of the finished strap. The final operation of finishing these straps complete will be shown in the next issue.

OUR EXHIBIT AT THE TORONTO FAIR



Through the courtesy of Dr. Eugene Haanel, Dominion Superintendent of Mines, and C. B. McNaught, Esq., General Superintendent of Manufactures, Canadian National Exhibition of Toronto—one representing the Dominion Government and the other the Exhibition Directors—we were enabled to show in a graphic manner to the 630,000 visitors to the fair the conditions attending the successful smelting of magnetite ores in the electric furnace at Sault Ste Marie. The exhibit, which attracted great attention, consisted of samples of the refractory ores used—Calabogie, Wilbur and Pierce Magnetites, L. S. P. Co.; Ferro-Nickel and red Hématites, together with 5 samples of grey and one of white pig iron produced. Photographs showing actual opeartions, and a large sectional drawing of the Héroult Electric Furnace, in water colors, done by the editor of "The Canadian Engineer" completed this unique representation of the new metallurgy which is destined to place Canada in the forefront of industrial nations.

The Canadian Engineer.

ESTABLISHED 1893.

With which is Incorporated

THE CANADIAN MACHINE SHOP

ISSUED MONTHLY IN THE INTERESTS OF THE

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

SUBSCRIPTION—Canada, Great Britain and the United States, $1.00 per year foreign, 7s., paid in advance.

Subscriptions—unless otherwise specified in contract—run until we receive a specific order to stop.

If you wish to discontinue at any time, notify us. and your instructions will receive prompt attention. As long as you **accept the paper,** you are **legally** liable as a subscriber.

Advertising rates on application.

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Montreal Office: 24 Fraser Building, St. Sacrament Street. General Agent for Quebec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland :—Hubert Groves.

Winnipeg Office: Free Press Building, corner Portage Avenue and Garry Street, Winnipeg. General Agent, G. W. Goodhall.

Vancouver Office: Northern Bank Building, Hastings Street. General Agent for British Columbia and Western Alberta (including Calgary and Edmonton) :—The British Columbia Agency Corporation, J. F. Maguire, Managing Director.

Address all business communications to the Company and not to individuals.

Everything affecting the editorial department should be directed to the Editor.

Editorial matter, cuts, electros, and drawings should be sent whenever possible, by mail, not by express. The publishers do not undertake to pay duty on cuts from abroad. Changes of advertisements should be in our hands not later than the 10th of the preceding month.

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TORONTO, CANADA, OCTOBER, 1906.

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ANNOUNCEMENTS.

With a view to keeping in close touch with engineering conditions in all parts of the Dominion, and, hence, making our journal of increasing value to enterprising engineers and advertisers, we have established offices in Montreal, Winnipeg and Vancouver, at the addresses indicated above. The interesting letters from the pen of our Montreal representative in this and the September number will show that the latest news of industrial conditions in the Province of Quebec is receiving special attention. Winnipeg, and the prospering provinces up to the Pacific Coast will receive like notice in the future.

In this issue begins our account of the 21 days' record trip of the Civil Engineers through the North-West. We had special opportunities of personally witnessing and investigating the engineering prospects and industrial conditions in nearly every section of the prairie, mining and Pacific Coast regions of Western Canada. The series will be profusely illustrated, and should be an interesting souvenir of the tour to those who participated in it, and at the same time a reliable guide to engineers, prospective investors, and supply companies. No wide-awake engineer can afford to be without the subsequent issues of "The Canadian Engineer."

Another departure contemplated, is the reservation of a page to be entitled "Draughtsman's Department." Everything pertaining to the drawing office—including current data for estimating—will receive careful treatment. This section will be edited by an engineer who has had wide draughting office experience in England, the United States and Canada, and who is interested in raising the status of the profession.

PUBLIC OWNERSHIP OF INDUSTRIAL UTILITIES.

The observant traveller passing through the great North-West of Canada in 1906, hears in every prairie village, mining community, lakeside town and Pacific Coast city, the fierce cry vibrating on the free air, that the immense natural resources of the country; fertile lands, mineral deposits, water-powers and industrial privileges, must not be swallowed up by private corporations and monopolies, but must be conserved and protected in the interests of the people. The pronouncements at the Canadian Labor Congress held in Victoria, B.C., (Sept. 17), culminating in the formation of a new political labor party; and earnest resolutions passed at the live Convention of the Canadian Independent Telephone Association, held at Toronto, (Sept. 6), are only the collective expression of widespread sentiments which the more intelligent artisans and active business men of limited means are determined to translate into action.

It is noteworthy, that three important centres, **Toronto,** Ontario; **Winnipeg,** Manitoba; and **Nelson,** British Columbia, are all in the throes of controversy at white heat, about the disposal of the electrical energy stored in the water-powers located in their vicinage. At the present stage of the struggle, the forces in favor of municipal ownership in the two western cities are in the ascendant. Nelson has built a fine inexpensive hydro-electric plant of 6,500-H.P., 65 ft. head, at Bonnington Falls—ten miles westward on the Kootenay River, which should before Christmas, be delivering cheap power into that prosperous and thriving horticultural and mining community. Winnipeg has just decided in council, to prepare plans for a $419,220 hydro-electric plant. This decision was made in the face of strenuous opposition by a powerful minority, who counselled a policy of "masterly inactivity." Behind this plea, was the fact, that a private corporation,—The Great Falls Power Co., consisting of Chicago capitalists, had bought up the best power sites on the local river, and undertook to put up a bond of $1,000,000, to build a modern 100,000-H.P. plant, $94,220, cheaper than the proposed municipal scheme. And would further guarantee, to transmit power 75 miles, in blocks of 12,000-H.P., at $20; next 100,000 at $17, and the rest at $15. Taking into consideration, the fact that this installation would only cost hundreds of thousands of dollars, where Niagara Falls plants due to special conditions, cost millions, we believe the American syndicate **could** deliver at the rates specified, and at a profit. Our aim, however, is not to discuss this tempting point, but to indicate, that even where the financial advantages seem to be in favor of private schemes, and against municipal ownership, the popular sentiment and temper is such that ownership of public utilities **by** the people, in the direct interests **of** the people, the people will have yea, though the heavens fall. In our innocence we imagined that feeling at high pressure on the complex power question was localized around Toronto; but in Winnipeg we found it even higher, and at Nelson, near the bursting point! It appears that for some time past the West Kootenay Power and Light Co., have been serving the mines at Rossland, and smelter at Trail, with "white coal" at $35, from their 4,000-H.P. plant at Lower Bonnington Falls, eleven miles below Nelson. Prior to this, these important industries had been using steam at $140 per H.P. But upon the power company commencing to build a new 38,000-H.P. plant at the Upper Falls—a mile further up the river—they came in conflict with the Nelson municipality.

who are building a plant on the opposite side of the Falls at this point. In the law courts the city won their case, but the trouble is now before the Privy Council. Although it is admitted that the private company have rendered valuable service to industry in the Kootenay district, yet, because their individual interest clashes with what the Nelsonians conceive to be the general good it is war to the knife, and the knife to the hilt.

A like sentiment, only in another direction, we found at Grand Forks, B.C. The man who ventures to criticize the Great Northern Railway, which rivals the C.P.R. at that strategic point, must be prepared to take chances of lynching. James Hill is looked upon almost as a benefactor of the race, because he builds his railways **without land grants.**

This laudation is only a back-handed slap at the Canadian Pacific Railway, whose magnificent pioneer railroading on the broken mountains, and through the tortuous valleys, and splendid steamboat service on the lakes and rivers of the Kootenays, have made the wilderness in these regions to blossom as the rose. But a new generation is on the spot—"a Pharoah who knew not Joseph." In 1906, to ask for land grants as a bonus for building a railway in the populated West, is as the holding up of a red rag before a bull. The astute Mr. Hill reads the "signs of the times," and sets his sails accordingly.

Such, are some particulars in proof of our opening statement, that a formidable movement against private monopoly is on foot throughout the country—especially in the North-West which is gathering force with increasing momentum every day.

There is some danger, that unless wisely guided, this movement may arrest industrial development, by deterring capital from investing in the private enterprizes needed to open out to commerce and civilization the resources of the country. Our statesmen and men of affairs can not afford to ignore this popular uprising.

Since "white coal" is not a product of civilization but a gift of Nature, water-powers should be controlled by the Dominion Government in the interest of the whole country. They should not be left for exploitation by private companies without regard to the interests of municipalities. By the adoption of a policy along these lines, the feuds between private and public interests, which are arising in all parts of the Dominion at the present time, would be avoided, and peace on earth, goodwill among men would more generally prevail.

TORONTO SEWAGE DISPOSAL.

The interdependence of the Sciences, was never more forcibly demonstrated than in the alarmist discussion by authorities on Biology and Hygiene, which took place at the Toronto meeting of the British Medical Association, (Aug. 21), relative to the official scheme for the disposal of Toronto sewage. The City Engineer, Mr. C. H. Rust, supported by the expert opinion of Mr. G. R. Strachan,—an eminent English Civil Engineer, with wide practical experience in sewage disposal—has advised that the screened crude sewage be discharged into Lake Ontario, at a point three miles east of the city limits—the romantic spot known as Scarborough Heights; thus rejecting the alternative **Filtration** and **Bacterial** schemes.

We are of opinion that the engineering features of Mr. Rust's scheme are admirable, and that it can be carried out with manifest economy. When, however, it comes to the question of getting pure water by the method proposed, we are doubtful; especially after reading carefully, the speeches referred to, notably those of Prof. Glaister, of Glasgow University, and Dr. T. A. Starkey, Professor of Hygiene, McGill University. These men have made a life study of biological science and hygienic conditions, hence, when they dissent emphatically from Mr. Strachan's affirmation; "that the screened crude sewage of Toronto may be discharged at the point selected, three miles east of the city limits, without nuisance or offence, (save very locally) and that **in (his) judgment the lake will digest the pollution with the aid of the bacterial life brought into being by the discharge,"** and declare that this theory is not in accordance with scientific fact, and experience, then, though inclined naturally to back the engineer, we feel bound to hearken seriously to the biologist's warning; for the issues are life and death. Here is what Professor Starkey said:—

> He disapproved of the popular idea that large rivers purified themselves of pollution by sewage completely. From a bacteriological point of view the so-called purification was merely dilution; the pollution was not got rid of. Speaking of observations of the St. Lawrence River, there had been, he said, a gradual increase from an average of 90 colonies of bacteria in 1903 to 168 so far this year. These figures were striking, showing that whether from sewage or surface drainage the waters of the river were becoming more polluted each year. The progress of pollution of the Ottawa River was more rapid still, the average number of colonies of bacteria having risen in the same period from 110 to 300, and on some special occasions in that portion of the Ottawa River back of Montreal from which Westmount obtains its water supply he had found from 1,000 to 1,500 colonies, and the average for the whole year was 600. **A peculiar feature of some of the conditions he had observed was that according to existing standards a chemist would have been forced to pass this water as first-class.**

Just as chemical analysis of iron and steel will not determine its magnetic properties, so chemical analysis of river water in a polluted area will fail to indicate the presence of those minute, deadly bacilli; which escape through even the most perfect filter beds, and are liable to spread enteric disease and death through entire communities. For unerring evidence of this latter kind, we have to rely upon Biological Science. It would be criminal on the part of the city corporation to countenance the adoption of the city engineer's scheme, without adequate provision for the destruction of the pathogenic germs contained in the city sewage, before being discharged into the Lake as proposed. This can be done effectively and economically, and we purpose setting forth the means by which this can be accomplished, in our next issue.

Canadian Pacific Railway and the Civil Engineers.

We understand that the day following the passing visit of the Civil Engineers' holiday party to Winnipeg, some mean fellow wrote a letter to the local press, denouncing the C.P.R. for not letting the Engineers have their westward trip *free.* We were witness, that when the fact of the letter became known to the excursionists, the deepest indignation was openly expressed. Everyone agreed that the Society was under deep obligation to Sir Thomas Shaughnessy, and the Directors of the Company, for generously placing at their disposal a special train with perfect appointments, and at a cost which was a mere acknowledgment.

BOOKS RECEIVED.

Technical Education in Evening Schools.—By Clarence H. Creasey. London: Swan Sonnenschein & Co., Limited, 25 High Street, Bloomsbury, W. C. Size, 5¼" x 7⅜", pp. 309. (Price, 3s. 6d. nett.)

Industrial Furnaces and Methods of Control.—By Emilio Damour; translated by A. L. J. Queneau, B.S. (Paris), E.M., A.M. (Columbia), Consulting Engineer, The New Jersey Zinc Co. New York: The Engineering and Mining Journal. Size 6½ x 9½, pp. 317. (Price $4.00)

Machine Drawing.—For students preparing for the science examinations in technical institutes and evening schools. By Alfred P. Hill. London: P. S. King & Son, Orchard House, Wesminster. Size 11 x 8½, pp. 83. (Price 2s. 6d. nett.)

Metallurgical Calculations.—Part 1, Introduction, Chemical and Thermal Principles, Problems in Combustion. By Joseph W. Richards, A. C., Ph. D. New York: McGraw Publishing Co., 1906. Size 9¼ x 6¼, pp. 201. (Price $2 nett.)

Steam Turbine Engineering.—By T. Stevens, C.E., and H. M. Hobart, B.Sc. Toronto: The Macmillan Co., of Canada, Limited, 27 Richmond St. West. Size 6½ x 9¼, pp. 814. (Price $6.50 nett.)

City Roads and Pavements.—By Wm. Pierson Johnson. New York: Engineering News Publishing Co. Size 6 x 9, pp. 197. (Price $2 nett.)

Unions for Steam Pipes.—An illustrated description of the several varieties, with valuable suggestions. By W. H. Wakeman, Jersey City, N.J. Joseph Dixon Crucible Co. Size, 5¼ x 7¼", pp. 19, illustrated. (Gratis).

Symmetrical Masonry Arches, including natural stone, plain, concrete and reinforced concrete arches. By Malverd A. Howe, M. Am. Soc. C.E., Professor of Civil Engineering, Rose Polytechnic Institute, New York. John Wiley & Sons, 1906. Size, 5⅝" x 9¼", pp. 170, illustrated. (Price $2.50 net).

"Wiring a House."—By Herbert Pratt, New York. The Derry-Collard Co. Size, 5⅝ x 7⅞, five illustrations, pp. 21. (Price 25 cents nett.)

Brazing and Soldering.—By James F. Hobart. New York: Derry-Collard Co. Size, 5½ x 8, 14 illustrations, pp. 33. (Price 25 cents nett.)

CATALOGUES AND CIRCULARS.

Gas Engines.—Gas-Driven Electric Power Systems, as exemplified in the Warren and Jamestown Street Railway, being a paper by J. R. Bibbins, presented before the Engineers' Society of Western Pennsylvania, and reprinted by the Westinghouse Electric and Manufacturing Co., Pittsburg, Pa. Size, 6 x 9, pp. 35.

Telephone Apparatus.—Swedish American Telephone Co., Chicago, Ill., are prepared to furnish information regarding Series Exchange, Bridging, Selective Signalling, and and Central Energy Telephones, also switchboards of any capacity. The circular we have just received, gives a brief outline of the work they are doing. Size, 4½ x 8¾, pp. 6.

Sterling Electric Co., Lafayette, Ind.—A telephone catalogue describing and illustrating telephone apparatus for all classes of service. A number of noteworthy letters of recommendation are included. Size, 9¾ x 6¾, pp. 64.

Reinforced Concrete.—Trussed Concrete Steel Co., Detroit, Mich. The Trussed Concrete Bulletin for September gives an illustrated example of reinforced concrete factory construction, as applied to the automobile industry. The extensive plant of the Packard Motor Car Co. is the one dealt with. Size, 8½ x 11, pp. 8.

Passenger Locomotives.—American Locomotive Co., New York, N.Y. A general description and dimensions of Atlantic type passenger locomotives built for various railway companies are given in this illustrated pamphlet. Size, 9 x 6, pp. 64.

Steam Pumps.—Canada Foundry Co., Limited, Toronto. Bulletin No. 34, issued by the Hydraulic Department, sets forth the various single and duplex steam pumps manufactured by this company. Size, 8 x 10½, pp. 12.

Incandescent Lamp Dictionary.—Sawyer-Mann Electric Co., New York. This is a neat booklet, giving the meanings of all the terms used in incandescent lamp practice. Size, 3 x 4½, pp. 16.

Lighting.—Canadian Westinghouse Co., Hamilton, Ont. "The Lighting of Public Buildings" is the title of a comprehensive treatise on this subject. It deals with lighting in railway depots, hotels, public office buildings, Government buildings, art galleries and museums, public libraries, schools and colleges, etc. Size, 6 x 9, pp. 31.

Nernst Electric Lamps.—Nernst Lamp Co., Pittsburg, Pa. Street Lighting by the "Nernst" series alternating Vertical Glower is graphically illustrated and described in a bulletin issued by this company. Size, 6 x 9, pp. 12.

Files and Rasps.—G. & H. Barnett Co., Philadelphia, Pa. A very clear and business-like enamelled tin sign has just been gotten up by the above Company, and they advise us that they will be pleased to send one to all dealers applying for same, mentioning "The Canadian Engineer." Size, 9¾" x 7".

Lubricators.—Michigan Lubricator Co., Detroit, Mich., have issued a catalogue illustrating and describing their line of lubricators, oil cups, oil pumps, grease cups, and other trimmings for steam, gas and gasoline engines, and air compressors, boilers, etc., pp. 108.

Steel Pressure Blowers.—The B. F. Sturtevant Co., Hyde Park, Mass. Bulletin No. 134 has just been issued by this company, relating to high pressure types of fan blowers for foundry and similar uses. It contains a valuable table of fan capacities for various size foundry cupolas.

Machinery and Supplies.—W. H. C. Mussen & Co., Montreal. As a guide to intending purchasers, this well-known firm has compiled a reference list of the machinery and supplies which they carry in stock, for railways, mines, contractors and municipalities. The list is in alphabetical order, and numerous illustrations are included in the pamphlet. Size, 3½" x 5¾", pp. 44.

Lighting of Industrial Plants.—Westinghouse Electric and Manufacturing Co., Pittsburg, Pa. "The Economical Lighting of Industrial Plants" is the title of a pamphlet, descriptive of the Cooper Hewitt Lamp, showing the advantages to be derived from its use in industrial establishments. Those interested in the lighting of large buildings would do well to secure a copy. Size, 5" x 7¾", pp. 29.

Pressure and Condensed Pipe.—The Pacific Coast Pipe Co., Vancouver, B.C., manufacture machine banded wooden stave and continuous stave pressure and conduit pipe for all pressure purposes. They also manufacture wooden tanks of every description. The descriptive catalogue we have just received is graphically illustrated, showing some uses to which the products of this company have been put Size, 4⅞ x 7¾, pp. 64.

CORRESPONDENCE.

Lachine Locks, P.Q., Sept. 11, 1906.
50 Notre Dame.

Editor of "The Canadian Engineer," Toronto, Ont.

Sir,—I was greatly pleased over Mr. Daru's "Impressions of Canada," as given in the September "Canadian Engineer." It was not alone his admiration for the progressiveness of our smaller cities and towns which pleased me, but his criticism of our desire for foreign capital. As he points out, our mines will be drained by foreigners, and Canada will have the few dollars left here in wages in return for this immense wealth.

I understand that a Canadian could not go to the United States and own a home in that country without first becoming naturalized, and yet Americans could own Canada without ever crossing its borders if we may judge from present indications.

Canada needs money in order to develop its unlimited resources, and no one could possibly be more anxious or more impatient to see it developed than myself, but if the capital must come from outside the Dominion, let it at least be restricted to the Empire.

You would oblige me greatly by having this letter printed, and asking for the opinions of other subscribers on this very weighty subject.

W. C. T.,
50 Notre Dame, Lachine Locks, P.Q.

SPECIAL MONTREAL NEWS.

Montreal Office,
24 Fraser Building,
Sept. 26, 1906.

Going through the many engine rooms in this city, it is pleasing to find that the majority of the boilers at these places are Canadian make. In the Northern Electrical Manufacturing Company's plant, are now in operation two Babcock & Wilcox boilers at 175 lb. pressure. Two is unusually high for this city, outside of locomotives. Two more 250 H.P. each are in course of erection, with B. & W. patent superheater attachments, and when finished

these boilers will run at a pressure of 200 lb. with absolute safety.

This same class of boiler is used at the power house of the Montreal Street Railway, although linked with a Manchester McDougall, and operating at 125 to 160 lb. pressure. These boilers have been in operation since September 1897.

By mutual consent McLean & Sophus, mechanical engineers, of this city, have dissolved partnership. The business henceforth will be conducted by Mr. McLean under the title of W. B. McLean & Company. With Mr. McLean is associated Mr. H. N. Brown, formerly general foreman of The Dominion Iron & Steel Works. This firm at present are designing vaults and adjusting elevators for the Bank of Montreal; also acting as consulting engineers, and have drawn up plans for laying out machinery for Henry Morgan's new furniture factory now in process of construction.

The delay for the past few months in general steel construction has been due to lack of raw material, but now a new trouble stares the manufacturer in the face, and that is the inability to get skilled labor for the shops, which is well nigh impossible.

The depth of water in the channel at Lake St. Peter during the past six years has not varied to any great extent, and as the table below shows, the water at present time is a medium depth of that duration. The vessels that carry heavy cargo are a source of much worry to large shipowners, since they must be careful as to their loading so that they may pass safely through the channel. Most of the vessels are drawing about 24'-0" or 25'-0" of water, and fotunately during the last few days a noticeably rise has come up, consequently the boats are loading to their utmost capacity.

Channel Depths.

	Ft.	In.
1901—September 27-28, lowest	26	7
September 1, highest	28	0
1902—September 27, lowest	27	3
September 2, highest	28	3
1903—September 17, lowest	27	11
September 3, highest	28	6
1904—September 24, lowest	28	5
September 6, highest	29	9
1905—September 16, lowest	27	10
September 7, highest	28	7
1906—September 17, lowest	26	3
September 4, highest	27	1

One of the latest and cleverest devices for protecting electric globes is the product of The Duncan Electric Company, of Montreal. The ribs and hinges are stamped from sheet steel, and strung on spring steel wire rings, thereby insuring maximum strength, without its skeleton structure causing any obstruction to the light. When the guard is once fastened to the lamp socket by the patent clasp the protector cannot be removed until the clasp is unloosened. This is undoubtedly the best article of its kind on the market to-day.

The business of the Nova Scotia Steel and Coal Company, from the coal standpoint, has been increased 50% during the past season. Last year late demands for coal had to be shipped to Montreal via Portland, Maine, but now the facilities for storing enough coal to meet winter demands are ample, as they have three yards in this city. One at Wellington Basin, another at Windmill Point, and a third at Beaudry Street wharf, which makes it possible for the company to bring at an early date their old Sydney coal up the St. Lawrence before the river closes for navigation.

It will be interesting to steam-power users in Montreal to know that some of the firms here have been successful in showing their neighbors across the border that they also have the goods wanted. A Brooklyn rubbish incineration plant finding that they had an excess of steam pressure in their plant recently made a contract with a nearby company to supply steam to them. The contract called for a continuous pressure of 110 pounds for 200 H. P. engine. In order to effect the supply a 1,400'-0" line of 5" steam pipe was laid, which stretched throughout the buildings, shops and grounds beyond, to make the proper connection to the plant from the steam source. Since most of this piping lies out of doors it was absolutely necessary that these pipes should be impervious to any weather conditions, so they were insulated with a specially prepared 1¼" mica covering made only by The Mica Boiler Covering Company, of Montreal, thus enabling the vendors of the steam to comply with conditions of their contract.

Port Colborne Elevator.

As briefly noted in our issue of last month, the contract for the Dominion Government Grain Elevator at Port Colborne, Ont., has been let by the Department of Railways and Canals. Work on the construction will be started as soon as the necessary steel can be got to the site, the contract calling for the elevator to be ready for handling of grain by September 1st, 1907. The intention in building the elevator is to equip the Welland Canal with modern facilities for transferring grain from the large lake vessels to those of a size that can pass through the canals to Montreal.

The elevator is to be located in Port Colborne harbour, inside the new break-water, and will have a minimum depth of water of 22'-0" on all sides, thus providing ample room and draft for the largest vessels likely to be built on the Great Lakes.

The elevator pier, which is 200'-0" by 800'-0", and the concrete foundation for the 2,000,000 bushel elevator, which covers an area of 200'-0" by 225'-0", has already been completed. This latter, which is considered one of the best sub-aqueous foundations that has ever been provided for any structure, consists of conical-shaped concrete pedestals and two-buttressed retaining walls, all carried down to solid rock bottom 17'-0" to 24'-0" below water level and 7'-0" above. Each pedestal and wall buttress will support one of the main columns of the elevator, while the sub-aqueous walls form the face of the piers or wharf and retain the stone filling. To carry the exterior walls of the elevator and the marine towers, heavy reinforced concrete girders built as monoliths with the outside rows of pedestals have been constructed. The foundation contains approximately 12,000 cubic yards of concrete. The wet caisson system on construction was used and the sub-aqueous concrete was deposited in the caissons through a special telescope tube-bucket, which entirely provided against the separation of the ingredients or washing out of the cement, and proved a great success, both as to the superior quality of the work and the much greater rapidity with which the concrete could be deposited than with the usual bottom dumping bucket.

The elevator super-structure is to be of a thoroughly modern fire-proof construction, built of steel and reinforced concrete throughout. The storage structure is to be the Jamieson system of rectangular bins construction, which was first proposed for the Montreal Harbor Commissioners Elevator and rejected by Mr. Tarte, then Minister of Public Works, but which has subsequently been investigated and selected by the Government as superior to all other known types of elevator construction.

It is understood that this system of bin construction, which is radically different from all others, is based entirely on the data obtained by Mr. Jamieson from his tests and investigation of the question of grain pressure as described in his paper, entitled "Grain Pressure in Deep Bins," which was published in our columns (page 345, November, 1905), and which is now recognized by the engineers throughout the world as the standard work on this subject.

The interior structure, consisting of columns, girders, bin walls, cupola frame and marine towers are to be of steel protected by concrete. The bin hopper bottoms and all exterior walls, including the bin and cupola walls, floors and roofs are to be built of reinforced concrete. A special system of concrete finish is to be used, over both the exterior and interior, which, combined with the general design, will insure a good architectural finish and appearance, in contrast to the usual tank or barn-like elevator structures.

The mechanical equipment of this elevator will be far in advance of any existing plant. All the machinery has been specially designed, and automatic weighing machines and appliances that will increase the handling capacity and reduce the cost of operation, will be installed. There will be four marine legs giving a total elevating capacity of 80,000 bushels per hour, each leg will have a double equipment of marine shovels, which will be operated by an electro-pneumatic control system. There will also be an equipment of automatic machines for cleaning up the vessel's floor. This will give an unloading capacity from vessels practically equal to any two existing elevators. There will be nine elevator legs having an elevating capacity of 22,000 bushels per hour each, to receive the grain from the marine legs, and also to concurrently load canal vessels at the rate of 100,000 bushels per hour through special loading spouts, which will distribute the grain in the vessel's hold without the aid of hand-trimmers, thus making a large saving both in time of loading and in the cost of labor.

All grain will be weighed both into store and for shipment, by automatic weighing machines, which will entirely eliminate weighmen, and at the same time insure greater accuracy than can ordinarily be obtained with the usual hopper scales operated by weighmen. This system of automatic weighing is an entirely new departure in public elevators on this continent, but these machines have been in most successful use publicly weighing grain in Great Britain and Europe for a number of years, and are accepted as the official weighing instrument by such public bodies as the Liverpool Corn Trade Association. The adoption of these machines was decided upon after full investigation by the engineer, and there is no doubt that automatic

weighing machines will soon become the standard grain weighing instrument on this continent. All parts of the machinery will be driven by individual A. C. induction type electric-motors, having a total of 1,800 H.P. The building will be lighted throughout with incandescent electric lights so that it may be operated both day and night, as may be required to give prompt dispatch in discharging or loading vessels.

In preparing the plans and specifications for the elevator full considerations have been given to the most prominent features which make for commercial success in in the age of close competition, in which the cost of handling and transportation of material is such an important factor. By having a strictly fireproof building of ample strength in which valuable goods are to be stored, the risk of failure and cost of insurance is reduced to a minimum. By having the very best mechanical equipment of large capacity, a large saving can be made in the cost of transportation by reducing the delay to vessels in port receiving or discharging their cargoes, and at the same time generally reduce the operating cost of the elevator. It is believed that the saving in operating expenses will be fully 35%, and that the saving in time to vessels will be fully 50% over any existing elevators.

The plans and specifications, including complete detail drawings of all the machinery, structural steel work, reinforced concrete, electric equipment, foundations, and including the caissons and telescope tube system of construction, embracing over 200 sheets of drawings 30" x 45", and the unusually complete and carefully drawn specifications have been prepared by Mr. J. A. Jamieson, the well-known Canadian grain elevator engineer and builder, who is also superintending the complete construction on behalf of the Government.

—Hubert Groves.

INDUSTRIAL AND LABOR CONDITIONS DURING THE MONTH OF JULY, 1906.

A comprehensive review of Industrial and Labor conditions throughout Canada is given in "The Labor Gazette" for August. It says that at no period in many years past has general employment been more active, or the industrial and commercial outlook more promising throughout the entire Dominion, than during the month of July. Unskilled labor was particularly in demand, owing to the unprecedented extent of railway construction, and manufacturing industries were exceptionally busy in nearly every part of the country. Railway and steamboat employees reported one of the most active seasons on record. An increasing scarcity of workmen, particularly unskilled laborers, was an important feature, and considerable embarrassment was felt in many lines of industry on this account. The securing of men for railway construction work has been particularly difficult, a dearth of men for this work having been experienced in many parts of the country.

Fires during the month totalled approximately $771,100.

Sawmills were working to full capacity in Ontario and the eastern provinces. Preparation for the season of 1906-07 were begun in Ontario, and men for the camps were reported very scarce, although wages offered were on an average $4 per month higher than last year. Many sawmills in British Columbia were running night and day, and new logging camps were established to meet the demand for logs. The Dominion Government recently passed an Order-in-Council, with the object of establishing sawmills in Manitoba, Saskatchewan, Alberta, and in the railway belt of British Columbia, in order that a cheap supply of lumber might be secured for settlers.

Mining conditions throughout the country showed considerable improvement over the corresponding period in 1905. The Dominion Coal Co.'s shipments increased 24% over last year, and the Nova Scotia Steel and Coal Co.'s 40%. In the case of the Drummond Mines a gain of 58% was shown. Laborers were greatly in demand at most of the important mining centres. In British Columbia the output from the Crow's Nest Pass colleries was heavy. The metalliferous mines were very active, properties in the Slocan and other districts being worked, which had been lying idle for some time.

Manufacturing establishments in all parts of the Dominion were very busy, the output being greater than at any previous period, iron and steel working establishments, and plants manufacturing building material were exceptionally busy.

Railway construction operations continue to increase; the demand for labor and material in this direction affected the labor market generally. Heavy orders for box cars were placed by the various railway companies, and extensive repairs were in progress, owing to the anticipated heavy demand for cars, in connection with the moving of the Western grain crop.

Railway earnings showed a considerable increase compared with last year. At the conclusion of the financial year of the Canadian Pacific Railway Company on June 30th, gross earnings of $61,612,410, compared with $50,481,882 in 1904-05, were reported. The net earnings were stated to be $23,362,410, compared with $15,475,088 in the previous year.

Iron moulders, iron workers, machinists and employees in metal working establishments generally, had a very busy month. Shipbuilders in some sections were less active than in the earlier months of the season, especially in connection with repair work. Electrical workers and linemen were very busy.

At the annual meeting of the Toronto branch of the Canadian Manufacturers' Association, which was held on July 10th, an important discussion took place with reference to technical education and workmen's dwellings. With reference to technical education, the following resolution was passed:—

"Be it resolved, by this, the annual meeting of the Toronto branch of the Canadian Manufacturers' Association in convention assembled, that recognizing the pressing importance for both workingmen and employers of adequate provision for industrial education, we again endorse the resolution of the association which has received the uniform support of the heads of all our leading universities of organized labor, and of the press of all political shades, respectfully asking for the early appointment by the Dominion Government of a commission on Technical Education; and that a copy of this resolution be forwarded to the Right Honorable Sir Wilfrid Laurier."

INDUSTRIAL BOUNTIES.

Canada's payment of industrial bounties during the fiscal year ending June 30, 1906, was $3,088,407, an increase of $229,056 over the year previous. The statement concisely is as follows:

	1904-5.	1905-6.
Iron and steel and steel products	$2,234,684	$2,400,773
Lead	330,645	90,197
Binder twine	13,789	15,079
Petroleum	350,407	291,157

The heaviest earner of bounty was the Dominion Steel Company, which was paid in the last fiscal year on iron, steel and articles made from steel the sum of $957,337. The Algoma Steel Co. came next with $535,190; Hamilton Steel, $200,965, and Nova Scotia Steel, $187,693.

The bounties for iron and steel earned by the several companies in 1905-6 were as follows:

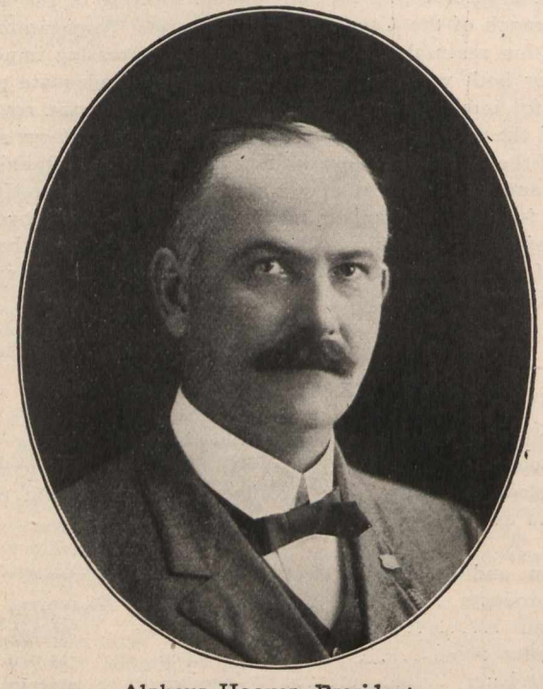
Pig iron—	
Canada Iron Furnace Co.	$ 40,256
Deseronto Iron Co.	13,664
Hamilton Steel and Iron Co.	98,897
Dominion Iron and Steel Co.	246,353
Nova Scotia Steel and Coal Co.	65,075
Londonderry Iron and Mining Co.	51,525
Algoma Steel Co.	167,420
Steel ingots—	
Hamilton Steel and Iron Co.	$ 67,578
Nova Scotia Iron and Coal Co.	96,803
Dominion Iron and Steel Co.	408,571
Algoma Steel Co.	367,770
Articles manufactured from steel—	
Dominion Iron and Steel Co.	$302,413
Nova Scotia Steel and Iron Co.	25,815
Montreal Rolling Mills Co.	7,386
Hamilton Steel and Iron Co.	34,217

THE CANADIAN INDEPENDENT TELEPHONE ASSOCIATION

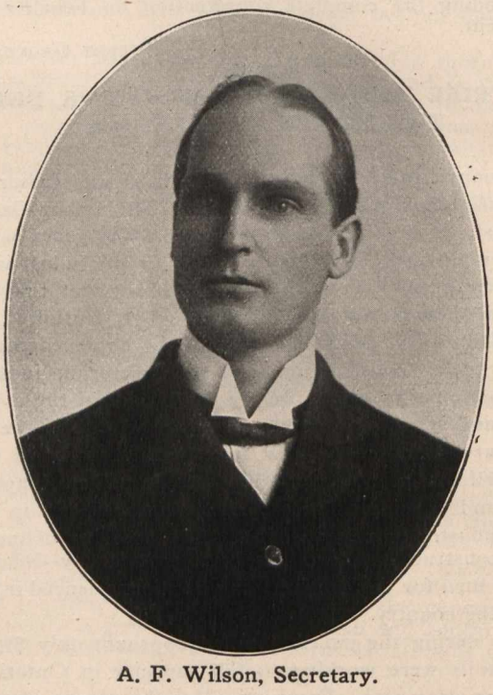
FIRST ANNUAL CONVENTION.

In the morning of September 5th, 1906, an enthusiastic body of business men, interested in the unfettered establishment of cheap telephone systems in all parts of the Dominion, assembled in Chamber No. 2, of the City Hall, Toronto, to hold the first Annual Convention of the Association formed in the Queen City, September 6th, 1905.

In the temporary absence of Mayor Coatsworth, Alderman J. J. Graham greeted the delegates on behalf of the city. He said: "We welcome you on account of the important work in which you are engaged. We believe you are on the eve of making rapid progress along the lines upon which you are working. No other work is of more public interest than the one in which you are engaged." Upon the conclusion of this official welcome, the President, Alpheus Hoover, invited the Hon. Colin Campbell, Attorney-General of the Province of Manitoba, to reply on behalf of the Association, which he did in an eloquent speech, complimenting Toronto on being "foremost in the fight for independent telephones;" emphasizing the fact that his Government of Manitoba had decided for Provincial control of long distance transmission lines and municipal ownership of local exchanges; declaring that Manitoba has the proud distinction of being the first Province to give to the people the right to say whether they desire telephones operated by themselves in their own interests. This, they had done irrespective of party politics.



Alpheus Hoover, President.



A. F. Wilson, Secretary.

The following is a list of delegates who responded to the roll call, together with a partial list of visitors:—

Manitoba.—Hon. Colin Campbell, Attorney-General. **Cleveland, Ohio, U. S.**—Hon. J. B. Hoge, president International Telephone Association; J. A. Harney, assistant secretary-treasurer. **Toronto.**—E. Coatsworth, mayor; Ald. J. J. Graham; A. F. Wilson, Provincial Long Distance Telephone Company; C. D. Scott, Provincial Long Distance Telephone Company; W. H. Lytle, Provincial Long Distance Telephone Company; R. Y. Ellis, Stark, T. L. & P. Company; F. D. McKay, Canadian Machine Tel. Company; L. Wilson; J. Elson, "The Globe;" K. J. G. McKay, "The Telegam;" W. A. Clarke, "The News;" H. D. Scully, "The Star;" A. L. F. Rubbra, "The World;" F. M. Chapman, "The Sun;" J. J. Salmond, "The Canadian Engineer;" P. W. Ball, "The Canadian Engineer;" S. Groves, editor, "The Canadian Engineer." **Levis, Que.**—J. F. Demers, Bellechasse Tel. Co. **Green River, Ont.**—W. A. Fuller. A. Hoover, Markham & Pickering Tel. Company. **Beauceville, Ont.**—S. LeMoine, Beauce Tel. Co. **Stouffville, Ont.**—F. A. Dales, M.D., Stouffville & Bethesda Tel. Company. **Clark, Ont.**—G. W. Jones, Clark-Hope 'Phone Line. **Demorestville, Ont.**—J. G. Spragge, J. A. Spragge, Spragge Tel. Company. **Port Hope, Ont.**—W. H. B. Dickinson, E. J. Dickinson, I. Barrowclough, Clark-Hope Tel. Company. **Binghampton, N. Y.**—G. B. Wright, York State Tel. Company. **Southampton, Ont.**—Lieut.-Col. A. E. Belcher, mayor. **Brantford, Ont.**—E. Hart, M.D., American Machine Tel. Co. **Mt. Albert, Ont.**—C. W. Davidson, J. Brodie, Mt. Albert Telephone Company. **Hespeler, Ont.** A. Ochs, M.D. **Kendall, Ont.**—T. Patterson, **North-East** Clark 'Phone Line. **Buffalo, N. Y.**—B. G. Hubbell, Consolidated Telephone Company. **Alexandria, Ont.**—J. Wilson. **Prince Edward, Ont.**—J. W. Hyatt. **Barrie, Ont.**—C. G. Strange. **Brown's Corners, Ont.**—A. Neilson, Scarborough Tel. Line. **Kirby, Ont.**—J. Burgess, Clark & Manvers Tel. Line. **Ingersoll, Ont.**—H. F. Boyce, Ingersoll Tel. Company. **Harrietsville, Ont.**—Dr. W. Doan, C. B. Adams, Harrietsville Tel. Company. **Maynooth, Ont.**—J. Haryett, Peoples' Tel. & Tel. Company. **Northport, Ont.**—P. H. Fox. **Belmont, Ont.**—A. W. Venning, J. Daws, Belmont Tel. Association. **Keswick, Ont.**—S. B. Purdy, N. Gwillimbury & Sutton Co-Op. Tel. Co. **Garden Hill, Ont.**—A. C. Beatty, M.D. **Orono, Ont.**—Dr. N. Colville, Durham Telephone Union. **Kirby, Ont.**—C. J. Thornton, Durham Tel. Union. **Ingersoll, Ont.**—A. J. Welsh, T. R. Mayberry, Ingersoll Tel. Company. **Dorchester, Ont.**—J. C. McIwain, Harrietsville Tel. Company; D. D. York. **Yorkton, Sask.**—T. Paul. **Locust Hill.**—C. Skinner, A. C. Reeser, Markham & Pickering Tel. Company. **Chicago.**—C. W. Weipert, Sound Waves; H. B. McMeal, Telephony. **Montreal.**—H. Bragg, "Canadian Municipal Journal." **Holbrook, Ont.**—M. Emigh.

After reading of minutes, and nomination of committees, Secretary Wilson read the following report of past years work:—

Secretary's Report 1906.

Mr. President and Gentlemen of the Convention,—Your secretary begs to submit his first annual report as follows:—

Statistical report of Independent Telephone Companies in Canada:—

Number of absolutely independent or non-Bell companies or private systems.....	73
Number of shareholders.....	3,248
Number of subscribers 15th August, 1905..	6,427
Number of subscribers 15th August, 1906..	12,073
Increase in one year.....	5,646
Capital invested	$850,000

The above does not include the Central Telephone Companies of New Brunswick.

The annual report of the Bell Company of Canada shows that on the 31st December, 1905, it had 78,195 subscribers, and an increase in 1905 of 12,035.

It has been a somewhat difficult matter to obtain full information and figures regarding independent telephone systems in Canada, covering as it does half a continent, and

it at first being very difficult to know with whom to enter into communication. By means of writing those known to be in sympathy with the movement, and who are refusing to affiliate with the monopolistic company, we have come into touch with about ninety independent telephone companies, privately owned lines and municipal systems. The figures given above are taken from the reports sent direct to the secretary by the officers of the different companies and municipalities and owners, and are thoroughly reliable. There are a large number of other independent systems, especially in the West and Nova Scotia, knowledge of whom was received so late that reports have not yet been returned, and the figures given are considerably below the actual number. If any person knows of any new company starting, or any independent person about to start an independent telephone system, however small, and will notify the secretary, he will be doing a great service to the Association and independent interests, as well as to those who are about to invest in an independent telephone system.

The statistics given above do not include any company or person having connection in any form with the Bell Telephone Co. of Canada or its subsidiary companies, with the exception of one private line in Quebec having one telephone, and another line of fifty telephones which connects with both Bell and independent lines. Reports have been received since the foregoing statistics were compiled, which will more than make up for the number of phones included in the statistics which have Bell connection.

To the Bellechase Co., of Quebec, of which Dr. Demers is the manager, belongs the credit of having made the greatest increase during the year. To the Province of Ontario belongs the credit of having made the most rapid advance of any Province, the increase in that Province for the year being nearly 3,700. The reports have been received from four municipal systems only.

In view of the facts that more than half of the Ontario companies are only a few months old; that there had been no telephones manufactured in Canada, and equipment had to pay a duty of 25 per cent. in addition to other burdens; that there has been little or no inter-communication except with local companies; that independents had to compete against the most strongly entrenched monopolies in Canada, and that development has been confined largely to the rural parts, the Bell Company, with few exceptions (among which are Sherbrooke, Levis, Brantford, Peterboro', Ingersoll and Toronto Junction), having the towns and the cities to itself, shows the force of the movement for competition in telephony just begun, and for the first time organized.

Following the Secretary's brief, but adequate report, came a paper on **The Canadian Telephone Situation from an Independent Standpoint**, by Francis Dagger, of Toronto, the recently appointed telephone expert to the Manitoba Government. This paper is the best presentation of the case for independent telephony ever made in Canada. It is comprehensive, wisely critical, bristles with important facts, and is a model of convincing logical statement. We regret our inability to reproduce it verbatim in this issue. The Association should publish it as a campaign pamphlet. Here is the admirable peroration:—

"There is a present demand in Canada for approximately half a million telephones, and I need hardly remind you of the rapidity with which the population is being augmented by new arrivals. Since the last census, 580,000 persons have landed upon our shores, and it is said that Sir Wilfrid Laurier claims 2,300,000 people will have settled in this country five years hence. Other estimates place the Western population of 1921 at ten millions, and prophesy that in 1931 this Dominion will have twenty-five million inhabitants.

A Long Pull Will Do It.

"It is true that the 'Bell' is first in the field, but its twenty-five years' record is such that you need have no doubts about passing them on the road. You cannot expect to do so in a day or a year; it took longer than that in the United States. Remember that unswerving allegiance to the cause you represent, and to each other, is absolutely essential to your success. Keep your ranks unbroken. Do not allow small differences, petty jealousies or rivalries to defeat the object you have in view."

At this stage Mayor Coatsworth entered the chamber and straightway delivered a stirring speech, which had in it the undoubted ring of true patriotism. He said:—

"I deem it a great honor to have the privilege of speaking to you this morning. We welcome you in the City Hall of Toronto. The reason we have not done all we ought to have done, has not been for lack of courage. Toronto fought single-handed when the discussion came up at Ottawa. Then again, the objection of having two telephones makes it an exceedingly difficult problem to deal with. We want good, cheap telephones. I understand that in Norway and Sweden there is a telephone in every house, the charge being about $12 per year. We cannot have them on account of the Trust that is carrying them on. Personally, I am prepared to stand right by the movement, and put telephones in my office. We must educate the people to the fact that they are being held down by a monopoly, and then the time will come when we can fight this monopoly more effectively than we can to-day. I believe the solution of the case is for the Government to control long distance lines, and municipalities to control the local telephones. I believe there are enough people here to take a chance; the only difficulty is the long distance, and once we establish the fact that we are entitled to long distance connections we will have them no matter what goes."

AFTERNOON SESSION.

The second half of the Convention began with oral reports of progress by the delegates. Dr. Demers, of Levis, P.Q., lead off earnestly, pleading with his auditors "to look after legislation at Ottawa." They in Quebec Province found themselves checkmated at every turn by monopolist legislation. C. Skinner, of Sherbrooke, P.Q., said:—

"We come 420 miles, because we are highly interested in legislation at Ottawa, which affects railway connections and crossings. If we can make connections with railway stations in our Province, we want nothing more; for we would not accept any connection with the telephone company. We are the oldest company in Canada,* and have been competing with the Bell Co. eighteen years."

Interesting reports were also rendered by Dr. McKay, R. Y. Ellis, C. J. Thornton, and the Secretary, who spoke highly of the service rendered their cause by W. F. Maclean, M.P., at Ottawa, closing by saying that the Government must be shown that the supporters of the independent movement were a bigger **voting body** than the Bell Company shareholders.

The following resolutions were carried unanimously:—

Resolution on the Railway Act.

Whereas, the amendments to the Railway Act, especially those relating to matters between telephone companies and railways, made at the last session of the Dominion Parliament, without hearing representatives from the independent companies, and in our opinion without a full or correct knowledge of existing conditions, are most unsatisfactory and inadequate;

And Whereas, the machinery provided by the Act for recourse to the Railway Board of Canada is unduly expensive to local companies, particularly farmer lines, and results in injurious delays which greatly interfere with the telephone company's business and prevents it from meeting the demands of the public;

And Whereas, it is desirable that relations between the independent telephone companies and municipalities and the railway companies should be amicable and conducive to the interests of all, especially that of the general public;

And Whereas, matters requiring adjustment between the railways and telephone interests are those which affect to a great extent the vast number of telephone subscribers;

And Whereas, the difficulties thrown in the way of independent companies and municipalities by the railways have been in the interests solely of a monopoly:

Resolved, that the officers and Executive Committee of this Association be requested to secure an interview with the chief authorities of the various railway companies and arrange, if possible, some fair and reasonable basis for terms in connection with access to and the placing of our instruments in railway and other depots, the crossing of telephone lines over railroads, and the use of railroad bridges and other communications, so that all telephone companies shall be placed on level and equitable footing;

And Further, that the Executive endeavor to obtain an interview with the Railway Board of Canada with the object of having it make such provision and regulations that applications in regard to telephone matters may be made simple, speedy and inexpensive, and that in regard to railway crossings compliance with standard regulations shall be sufficient without any order of the Board or other onerous conditions;

* An illustrated account of the People's Telephone Co.'s system at Sherbrooke, appeared in "T.C.E.", Feb., 1905.

And Further Resolved, that in the event of fair and reasonable arrangements not being obtainable from the transportation companies, the executive or officers be instructed to prepare and circulate for signature among the shareholders of the Independent Companies and their subscribers a petition to the Governor-General-in-Council and to Parliament, praying for the necessary redress.

Resolution on Municipal Franchises.

Dr. Ochs, Hespeler, had no trouble in getting passed the following resolution:—

That whereas the granting of exclusive franchises is detrimental to the progress of cheaper and better telephony by excluding towns from the benefit of telephone competition and outside connection; be it resolved, that no municipality should have the power to grant exclusive franchises to any company, and that this association petition the Legislature to rescind all legislation which makes this possible.

Resolution on Long Distance Connection.

Whereas, it is found that the use of a telephone by the ordinary subsciber is about 97% entirely local, and that the best, cheapest, most satisfactory, popular and the most generally used service is provided by local telephone systems managed, owned and controlled by local municipalities or by local private enterprises where the management is subject to immediate local pressure and adaptable to local requirements;

And Whereas, in order to maintain inter-communication between local systems, whether municipal or privately owned, long distance trunk lines are necessary, but are beyond the financial ability or operating machinery of local systems;

And Whereas, for the permanence of such local systems it is necessary and advisable that such trunk lines should not be controlled by a private monopoly, nor by a corporation, which, in addition to the trunk line, operates a local system in direct competition to the system which operates solely a local system, and thus the larger company uses undue pressure, the interests of each company directly antagonizing each other;

Resolved, that it is the opinion of the Independent Telephone Companies and municipalities here represented that inter-communication between local systems and long distance business should be secured exclusively over or by means of trunk lines operated by Independent Companies or owned by the Province, according to the respective degrees of development and the economic and political conditions prevailing in the various Provinces.

After a plea by G. W. Jones, of Port Hope, for help in their effort to get long distance lines a trenchant address was made by R. M. Eaton, Secretary of the New York Independent Telephone Association. He narrated the story of their struggle to get independent wires at Niagara Falls, which had ended triumphantly. Upon trying to make connections across the gorge, however, they found that the Bell Company had an exclusive franchise on the Canadian side of the Falls, hence they were blocked! He said: "We have the gateway of your toll lines into the United States. Meet us half way. If you will stand by us and help us we will stand by you." Then came a powerful indictment of monopolist methods, by the Hon. J. B. Hoge, of Cleveland, Ohio, President of the International Independent Telephone Association. He said that Canada had now great opportunities for going right into the telephone business. In the United States eleven years ago there were only 300,000 telephones, and that was after the Bell Company had had seventeen years of complete monopoly. To-day Ohio had close to 300,000 independent telephones. There are fully six million telephones in the United States, and of this number three and a quarter millions are independents. That shows what competition can do.

After consideration of a symbolic sign for display outside independent telephone places, consisting of a shield surrounding a maple leaf and the words "Independent Telephone" thereon; the disposal of some business matters, and listening to an excellent paper on "Our Duty to the Public and Ourselves," by Dr. Doan, of Harrietsville, the election of officers was proceeded with, and resulted as follows:—

Election of Officers: 1906-7.

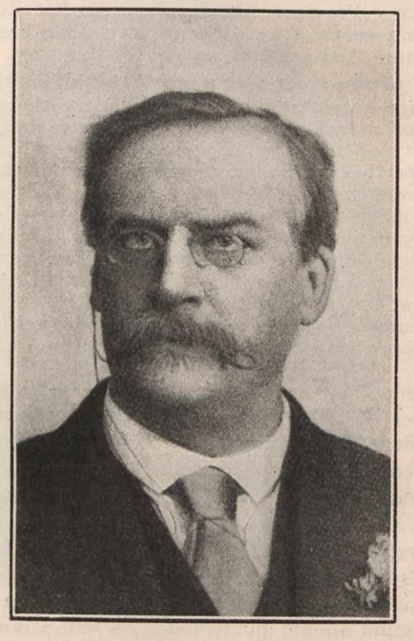
President, Alph. Hoover, Green River, Ont.; Vice-President, F. D. McKay, Toronto; Sceretary-Treasurer, A. F. Wilson, Markham, Ont.; Executive Committee, T. F. Demers, M. D., Levis, Que.; W. Doan, M.D., Harrietsville, Ont.; C. J. Thornton, Kirby, Ont.; Dr. Ochs, Hespeler, Ont.; Richard Vigars, Port Arthur, Ont.; E. Hart, M. D., Brantford, Ont.; Levi Moyer, Beamsville, Ont.; F. Dagger, Toronto; C. Skinner, Sherbrooke.

A gracious act on the part of the city then took place, for Alderman Graham, on behalf of the city corporation, extended an invitation to the delegates to become their guests at the Canadian National Exhibition—with free admission to the grounds and grandstand. This pleasing incident was followed by votes of thanks to the Hon. J. B. Hoge for his attendance, to Francis Dagger for his luminous and able paper, and to City Council for their generous hospitality. Thus ended at 5.55 p.m. this highly successful Convention. The business-like manner in which the proceedings were conducted and the fraternal spirit which dominated the entire gathering was largely due to the executive ability and wise generalship of the President, Mr. Alpheus Hoover.

THE LATE JAMES DREDGE

Obiit August 15, 1906.

When the announcement of the death of the late James Dredge, co-editor of "Engineering," came to hand we felt that the field of Technical Journalism had lost one of its brightest ornaments and most devoted workers. Since the commencement of "Engineering," over forty years ago, Mr. Dredge has taken a prominent place in its conduct, and



The Late James Dredge.

his energies have contributed not a little to the placing of that high-water mark British Journal in the commanding position it occupies to-day. Mr. Dredge was born at Bath, July 29, 1840. His father was a civil engineer of repute, hence his taste for engineering was a matter of heredity. With the able co-operation of William H. Maw, his spirit of fairness and good fellowship for all the world, willingness to accept and advise the acceptance of new ideas, freedom in pointing out improvements which might be made in the practice of his own countrymen, and general broadmindedness, has made "Engineering" the leading journal of its kind in the world. Mr. Dredge was a member of the Institution of Mechanical Engineers, and the Institution of Civil Engineers; also an honorary member of the American Society of Mechanical Engineers.

The tensile strength of catgut musical instrument strings is 60,000 pounds per square inch; the elongation at rupture, 15 to 19 per cent.

Stone-setters, if not prevented, frequently attach booms to the columns of a building to hoist their stone to position. Hoisting engines are often placed on the first floor, and cause a great deal of vibration. They should either be placed in the cellar or shored up so that they clear the ironwork entirely.

WITH THE CIVIL ENGINEERS IN THE WEST

By the Editor.

Objective.

Due to the laudable enterprise of Prof. C. H. McLeod and the Executive of the Canadian Society of Civil Engineers, generously aided by the liberality of the Canadian Pacific Railway Company, a special train left Montreal on Saturday morning, Sept. 8th, containing a representative party of Eastern Engineers, who were joined at North Bay in the evening by the members from Ontario. The entire excursion train consisted of three Pullmans—"Chantilly," "Trianon" and "Bathurst," to which were attached a commodious dining car with complete appointments, and baggage van. The objective of the trip was to familiarize the civil engineers of Eastern and Central Canada with the progress being made in the West; to enable them to estimate the industrial possibilities of the future. and at the same time to let them see the splendid pioneer engineering work which has been done by the C. P. R. in opening out the great North-West land to commerce and civilization.

Admirable C. P. R. Arrangements.

The train was placed in charge of an expert contingent of C. P. R. officials, for it was to be a record trip of 21 days—the longest previously being 16 days. The unavoidable congestion on the western line, due to lack of help and excessive traffic caused by the bountiful harvest, made the travel of a train stopping at every point of engineering interest a somewhat hazardous experiment. It was to the untiring vigilance and excellent judgment of Conductor A. C. Thompson, Inspector Charles A. Crozier, and T. L. Hancock, conductor of sleeping cars, all of Montreal, that the excursion was made on remarkable schedule time in well apprciated comfort, and without accident of any kind. We are expressing the unanimous sentiment of the entire party when we declare that they one and all are deeply grateful to Sir Thomas Shaughnessy and the Directors of the C.P.R. for the pleasurable part their executive care played in this memorable tour.

Personnel of the Party.

The following is a list of the civil engineers and their guests who comprised the party:

Montreal, P. Q.—C. H. McLeod, Professor of Applied Science, McGill University (Secretary C. S. C. E.); Dr. J. B. Porter, Professor of Mining, McGill University; A. Amos; J. Duchastel de Montrouge, Engineer Dominion Bridge Company; W. A. Murray; C. de B. Leprohon, Assistant City Engineer; R. B. Owens, Professor of Electrical Engineering, McGill; R. F. Ogilvie; L. G. Papineau, Engineer Public Works' Department; S. F. Rutherford; F. P. Shearwood, Structural Engineer Dominion Bridge Co.; W. J. Sproule, Assistant Chief Engineer Harbor Commission; Miss McLeod; Miss Bray; Mrs. R. F. Ogilvie; Miss Smith; Mrs. W. J. Sproule; Misses Wicksteed. **Toronto.**—W. A. Bucke, Canada General Electric; Edward L. Cousins, Assistant Resident Engineer G. T. R.; S. Groves, Editor "The Canadian Engineer;" J. G. Greey. of W. & J. G. Greey Co.: Lieut.-Col. Chas. S. Jones; F. S. Keith, Editor "Canadian Machinery;" Norman H. McLeod, Superintendent of Construction Canadian General Electric Co.; C. B. Smith. Hydro-Electric and Railroad Engineer, Chairman Temiskaming & Northern Ontario Railway Commission; Frank Simpson. Contractor: A. P. Walker. Assistant Divisional Engineer C. P. R.; Mrs. N. M. McLeod; Mrs. Frank Simpson; Mrs. Walker; Mrs. C. B. Smith; Mrs. Coon. **Ottawa, Ont.**—I. T. Bertrand, Outside Construction Engineer, Dominion Public Works' Department; Capt. R. DeCorriveau, District Engineer, Public Works' Department; F. A. Drought, Transcontinental Railway; Arthur Surveyor, Engineer Ship Canal, Georgian Bay; James White, Dominion Geographer; Mrs. Papineau; Mrs. White. **Quebec, P. Q.**—W. D. Baillairge, City Engineer; Mrs. Baillairge. **Winnipeg, Manitoba.**—Col. H. N. Ruttan, City Engineer; Mrs. Ruttan. **Chicago, Ill., U. S. A.**—Octave Chanute. past President American Society Civil Engineers; Miss Chanute; Mrs. Boyd. **Moncton, N. B.**—C. W. Archibald, Chief Engineer Intercolonial Railway. **Guelph, Ont.**—T. C. McConkey. **New York, U. S. A.**—Geo. H. Frost, President Engineering News Publishing Co.; Edward Van Winkle, Consulting Engineer, A. C. S, C. Engineers, and Patent Attorney. **Calgary, Alberta.**—H. J. Haffner, Irrigation Engineer. **Brantford, Ont.**—Major T. Harry Jones, City Engineer; Mr. Sweet, LL.B., barrister; Mrs. T. H. Jones; Mrs. Sweet. **Owen Sound, Ont.**—Wm. Kennedy, Jr., Hydraulic Engineer and Consulting Engineer, the Slave Lake Power Co., British Columbia. **Halifax, N. S.**—Capt. Bethune Lindsay, Royal Canadian Engineers. **St. Jerome, P. Q.**—S. G. Laviolette; Mrs. Laviolette. **Niagara Falls, Ont.**—Chas. H. Mitchell, Hydro-electric Engineer. **Frank, B. C.**—T. A. MacLean, Mining Engineer. **Napanee, Ont.**—F. F. Miller, Master Miller and Mrs. Miller. **Sherbrooke, P. Q.**—Geo. D. McKinnon, Assistant Manager Jenckes Machine Co. **Welland, Ont.**—Geo. Ross, Surveyor; Mrs. Ross; Miss Ross. **London, Ont.**—Dr. E. Seaborn. **Scarboro', England.**—Miss Paverley; Miss Edith Paverley. **Vancouver, B. C.**—James Kennedy, Resident Engineer, The Slave Lake Power Co.

Order of Description.

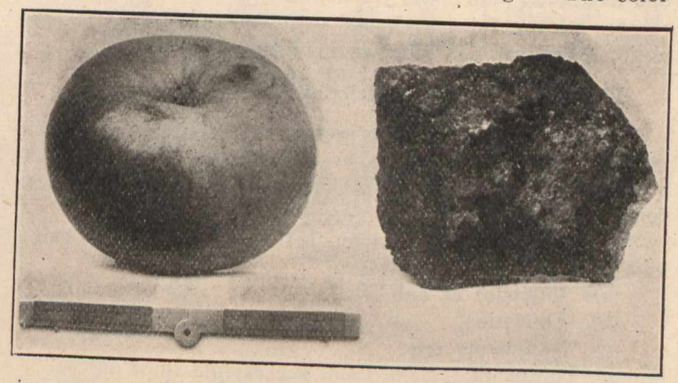
In order to set forth coherently the examples of modern irrigation work on the prairies; stupendous railroad engineering amid the mountains; economic water-power installations near Vancouver and Nelson; great copper, gold and silver mines on the banks of the Kootenays; immense smelting plants at the Boundary p;rosperous metallurgical industries, and unique electrolytic process for the extraction of the precious metals in Trail, B. C.; all of which we beheld on those twenty-one eventful days—we purpose narrating our experiences in diary form. By so doing, the story will flow lucidly and logically, for we shall travel within known bounds and landmarks.

(Continued.)

EXHIBITS AT THE FAIR, NELSON, B. C.

Sept. 19th to 22nd, 1906.

One of the astonishing revelations to the Civil Engineer excursionists out West, was the splendid display of fruit and vegetables which they beheld at the Nelson Fair. We never saw such apples, pears, plums, gooseberries, etc., in our lives. The apple "Non-such," pictured above, was 15¾" circumference and 23¼ ounces in weight. The color-



ing was superb. We saw gooseberries 1½" long by 1" diameter, the like of which we have never seen outside Old England. If the Nelson district were not famous for its mining it would be renowned for the fruit and garden produce grown in its peaceful valleys, watered by the lovely Kootenay River. The mineral shown is part of the gold exhibit from the "Strathmore" mine, Greenwood, which won the first prize. The gold therein would realize about $300 per ton.

TORONTO.—We have pleasure in welcoming to this country Mr. J. Robson, Mechanical Engineer, A.M.I.M.E., of Yorkshire, England, who is opening an office in Toronto as sole agent for two reputable British firms, viz., Messrs. Pollock, Whyte & Waddell, of Glasgow, manufacturers of the celebrated "Globe" gas and oil engines; and Messrs. Blackstone & Co., Limited, Stamford, England, makers of the well-known "Blackstone" oil engines, land rollers, spring-tooth cultivators, and "Stamford" stone mills and food preparing machinery. He has our hearty greeting and best wishes for a properous future.

APPRENTICESHIP COURSE AS A PREPARATION FOR ENGINEERING ACTIVITY.

The following is an outline of the address delivered before the engineering apprentices of the Allis-Chalmers Company at its Cincinnati works on August 30, 1906, by Prof. V. Karapetoff, Cornell University:

Introduction:—Three essential conditions for a successful engineer:

(a) Professional knowledge.
(b) Knowledge of business forms and of human relations.
(c) Strong character.

I.—Professional Knowledge.

1. While in the works you learn the construction of machinery, the manufacturing operations and testing without a particular effort. However, the question "why" is of decided importance; do not be satisfied with "how." Get into the habit of analyzing. To get full benefit from the factory work:

(a) Keep regular notes on your work.
(b) Make sketches.
(c) Keep on a separate sheet your doubts, to be straightened out at a future opportunity.
(d) Make rough check calculations on machines you are working with.

The above is not sufficient by any means; you must devote part of your evenings to systematic study, namely:

2. Read at least one electrical magazine regularly and keep some kind of an index of information on at least one subject in which you are particularly interested.

3. Go over your college books and notes and see that you are sure in fundamentals. A few things that you must be absolutely sure of are:

Ohm's law, general law of induction and its application to machinery, the law of electrical energy. Besides, you ought to know the general theory of D. C. and A. C. machinery and transformers.

4. Gradually get familiar with the standard electrical books; go from time to time to the Public Library and see if there is anything new in your specialty.

5. Select some one branch of electrical engineering and devote all your extra time to it.

6. Do not miss a chance to make an original investigation whenever you have an opportunity.

II.—Study of Human Relations and Business Forms.

You naturally expect to some day occupy responsible positions with this company or some other. This is impossible without a knowledge of human relations and business forms.

1. Observe the characters of men you are working with; in particular:

(a) Influence of age.
(b) Education.
(c) Nationality, etc.

2. Things that make them successful:
Things that are an impediment in their work.
Things that they would like to have.
Things that make them happy and unhappy.
Betterment work that they would appreciate.

3. Observe the foremen, and their ways of conducting their departments.
Make clear to yourself what you would consider an ideal foreman.
Do not judge the foremen by the way they treat you.

4. Observe the general factory system as far as you can. In particular, gradually find out:

(a) General subdivision of duties of the executive officers; the management, commercial, engineering, manufacturing, erecting, selling department, etc.
(b) Arrangement of factory buildings, and the general idea of this arrangement.
(c) Orders, cost, accounting, etc.
(d) Causes of waste of time and materials, and possible remedies.

5. Get a thorough understanding of the significance of co-operation in modern industry.

6. Do not get rusty in regard to general life questions; continue reading books on philosophy, economics, history, etc. This will make human relations clearer to you. Besides, a man in a responsible position must be a well-educated man; he should be posted on many general things, and ought to be able to speak about them.

III.—Training of the Character.

Engineering and business knowledge are the necessary conditions for usefulness ("success" and usefulness are not always the same), but the proper development of the character is the third necessary condition.

What is the use of having a profound engineering knowledge if you have not the necessary perseverance to achieve results; or to have a knowledge of business forms and relations, if your temper is such that nobody cares to be associated with you in business?

Practice daily the qualities of the character that you find essential for a good citizen and good business man.

1. Work patiently on any problem until a result is achieved. If it should be impossible to get satisfactory results, at least make clear to yourself the causes and limitations.

2. Be honest in all things; do not be afraid to confess your mistake or ignorance. Train your character by doing over your work cheerfully.

3. Keep down your selfish personality and ambition. Do not let them interfere with your business. The highest form of personality and ambition is to have your part of the work done in the most ideal way.

4. Be generous, polite and considerate to others; there are no circumstances where you would be justified in breaking this rule. Remain dignified even under unjust reproof.

5. Remember that you work for the future; shape it aright now, and it will come as you expect it to be.

Conclusion.—Your opportunity will be no chance if you are ready for it. A comparison to orchestra musicians. The story about Tom Potter.

SCHEDULE WEIGHTS OF STEEL AND IRON PLATES.

In purchasing iron or steel of any section by weight where the number of lineal feet or sizes are specified, it is frequently the case that sections and plates are rolled heavy. In order to make an allowance which shall be fair both to the mills and the purchaser, it is customary to allow a margin of 5 per cent. over the calculated or theoretical weights; this weight is then termed schedule weight. The actual weight is paid for if under this margin; any excess is to the gain of the purchasing party.

In the case of wrought iron plates this gives rise to a very simple formula, which is:

Weight in cwts. = area in sq. ft. × thickness in inches × 3⅛.

Stated as a formula $W = 3\frac{1}{8} \times A' \times T''$.

For steel a further 2 per cent. is added

Example W. I. plate 10′ × 8′ × ⅞″.

10	
8	
80	
⅞	
70	
3⅛	
26.25	
.02	
.5250	
26.25	
26.78	cwt.

The formula is easy to remember and can be applied in other ways.—"American Machinist."

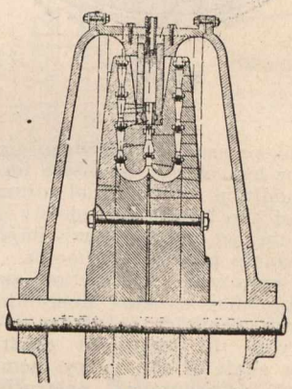
INTERNATIONAL PATENT RECORD

Dominion Houses of Parliament.

CANADIAN PATENTS.

Specially compiled by Messrs. Fetherstonhaugh, Dennison and Blackmore Patent Attorneys Star Bldg., 18 King St. W., Toronto; Montreal and Ottawa.

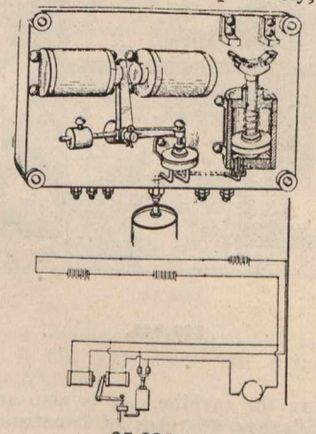
Turbine.—R. H. Goldsborough.—98,139.—This invention consists of forming the rotor portion of a plurality of connected annular portions having annular chambers arranged between them, and placing in said chambers several series of vanes spaced apart, leaving intervening annular chambers. A conduit, comprising a medial annular portion and two



98,139.

lateral annular portions connected thereto by deflecting passages is placed between the aforesaid annular portions of the rotor portion and an expansile fluid passed through said conduit and deflected radially outward to pass successively through the series of annular vanes.

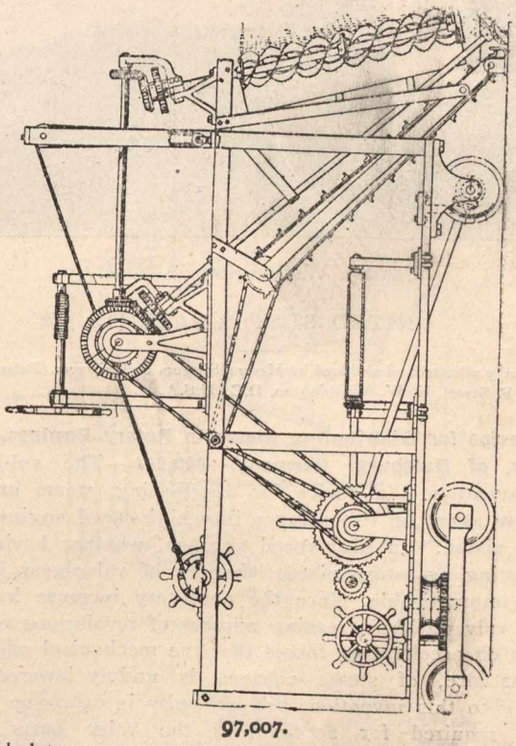
Electric Switch.—The Electric and Train Lighting Syndicate.—97,994.—The electric circuit controlling switch shown consists of a pair of contacts fixed on a base connected with a source of power and an independently energized circuit, a pair of electro-magnets connected to said source of power in said circuit respectively, a pivotal lever



97,994.

having one end thereof extending between the cores of said magnets, and operated thereby, and the other end operatively connected with a pneumatic valve which controls the position of a movable contact adapted to make contact between the said fixed contacts.

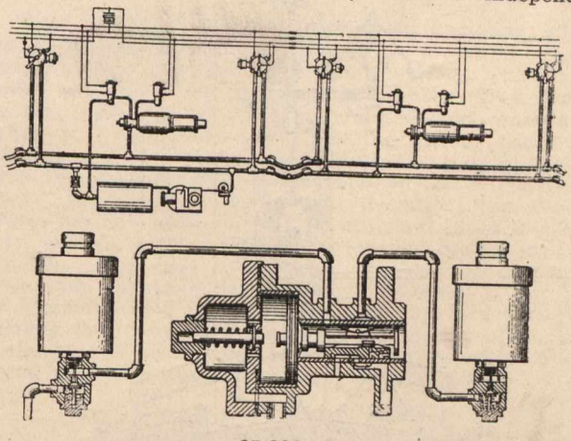
Excavator.—John O'Connor.—97,007.—A main frame having adjustable extensions therefrom which may be operated from the main frame, and upon said extensions are mounted a plurality of spiral cutters preferably having serrated edges. The cutters are driven through flexible connections by a suitable source of power mounted upon the main frame, and may be moved in any desired direction. An endless carrier



97,007.

is provided to operate in conjunction with the spiral cutters and carry away the material as it is separated or cut from the embankment against which the machine is working.

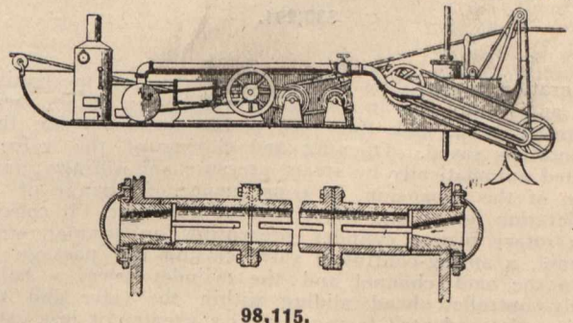
Fluid Pressure Brake.—The Canadian Westinghouse Company.—97,826.—The invention consists in placing an electrically operated supplemental controlling valve between the main reservoir and the auxiliary reservoir independent



97,826.

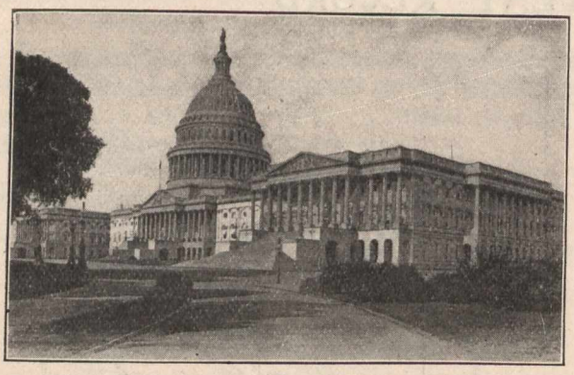
of the train pipe for supplying air of higher pressure to the said auxiliary reservoir, and an independent electrically operated release valve for controlling the exhaust from the brake cylinder, independent of the triple valve.

Gold Dredge.—H. J. Clarke et al.—98,115.—A dredge having swinging arms suitably controlled mounted thereon, an oscillating scoop mounted on said arms having a conducting space and a reticulated face and a hollow rotatable



98,115.

hub in communication with the space in said scoop. A suction is created in the hollow hub to elevate the material caught by the scoop and means provided for carrying said material to the body of the dredge.

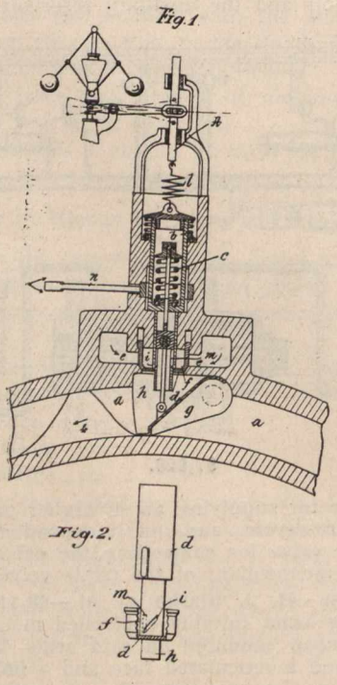


Capitol, Washington, U. S. A.

UNITED STATES PATENTS.

Specially selected and abridged by Messrs. Siggers and Siggers, Patent Attorneys, 918 F. Street, N. W., Washington, D.C., U.S.A.

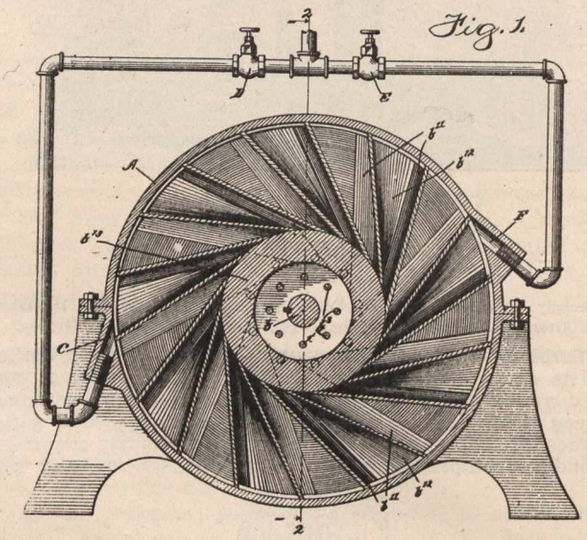
Device for Distributing Steam in Rotary Engines.—Paul Berger, of Duisburg, Germany.—830,291.—The subject of this invention is a device for distributing steam or other pressure agent on its entrance into high-speed engines with rotary piston. In high-speed engines, whether having reciprocating or rotary piston, the use of valve-gear is generally impracticable, since the necessary increase in speed of the valves with increasing number of revolutions requires such high accelerating forces that the mechanical efficiency, for instance, of steam engines, is unduly lowered. According to this invention, this difficulty is overcome by the forces required for accelerating the valve parts being diminished as far as possible and by suitable distribution of steam being brought about through the acceleration. The power is economized by the dimensions of all parts being kept as small as the conditions of strength and the required



830,291.

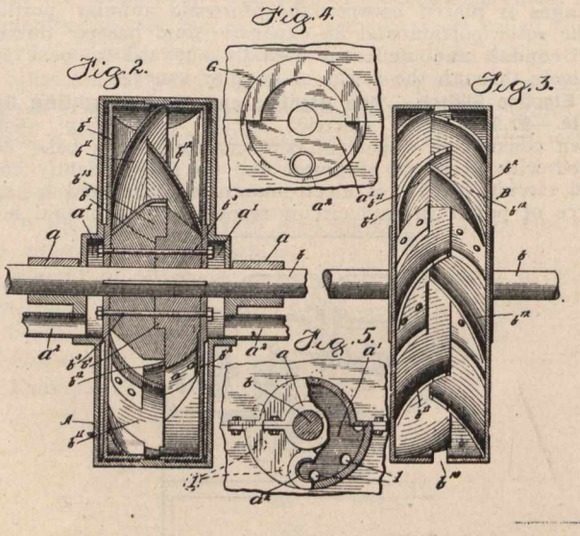
acceleration times allow, and by the actuating mechanism, such as is employed in nearly all well-known gears, being dispensed with, and thus the power necessary for their acceleration saved. Opening and closing of the valve is effected automatically by steam pressure and springs; regulation of the expansion, in consequence of change of the acceleration forces and times, by the governor. It consists of a rotary piston cylinder presenting an annular steam channel, a spring-controlled valve closing the passage between the said channel and the cylinder-space, a hollow spring-controlled head sliding within the valve and possessing slots adapted to register to a greater or less extent with slots in the said rotary valve-body a valve actuated by the said head and controlling the cylinder-space, and a governor controlling the said springs.

Turbine.—Eric Blucker, of Chicago, Ill.—829,942.—This invention relates to turbines in general, and more particularly to turbines adapted to be driven by gas under pressure, and especially to turbines adapted to be driven by steam pressure. Generally stated, the object of the invention is to provide an improved, simplified, and highly efficient turbine adapted to be driven by any suitable fluid-pressure, but especially adapted to be driven by compressed air, steam, or other gas under pressure. A special object is to provide an improved construction and arrangement by which a turbine when operated may advantageously and



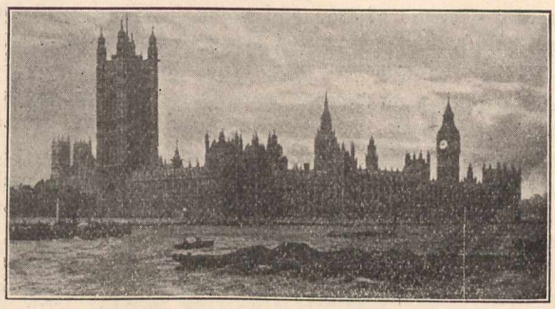
829,942.

efficiently utilize the pressure of the steam or other gas, and may utilize more or less of the expansive force of the steam or other gas, in addition to the usual utilization in motors of this character of the impact or velocity of the steam as it escapes from the jet-opening and impinges upon the surface of the movable part of the motor. Another object is to provide an improved construction and arrangement whereby the turbine may exhaust freely through the hub portion of the rotary member, the tendency of the steam or other gas being with the improved construction to flow toward the axis or shaft of the rotary member. A further object is to provide an improved construction or arrange-



829,942.

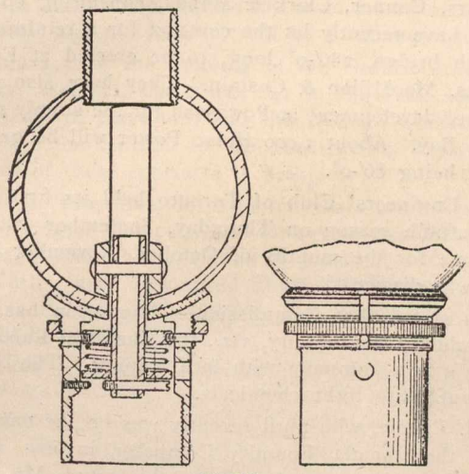
ment for reversing the turbine. It is also an object to provide certain details and features of construction tending to increase the general efficiency and serviceability of a turbine of this particular character. It consists of a turbine provided with a hollow rotary member, said rotary member having internally-arranged blades, said blades being set both obliquely to the circular line of travel and tangentially to the central portion of said rotary member, and the said blades being also arranged in two sets, with the members of the two sets slanting or converging forward relatively to their circular path of travel, and means for delivering a jet of steam or other gas under pressure against the faces of said blades.



British Houses of Parliament.

GREAT BRITAIN.

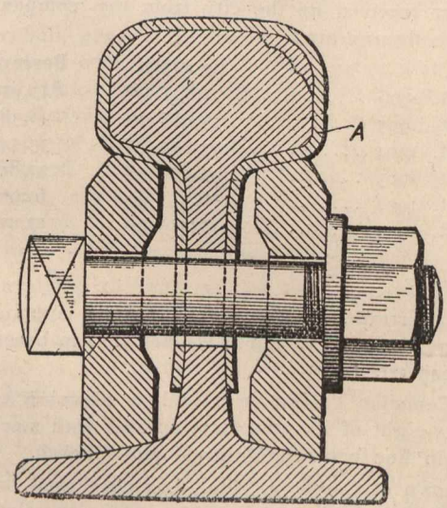
Universal Ball Joint or Socket suitable for supporting Electric Light Fittings and for other purposes.—Hirst and Collings.—18,646.—The joint consists essentially of a



18,646.

hollow ball fitting into a corresponding cup, the means of joining these two members being well understood from the illustration.

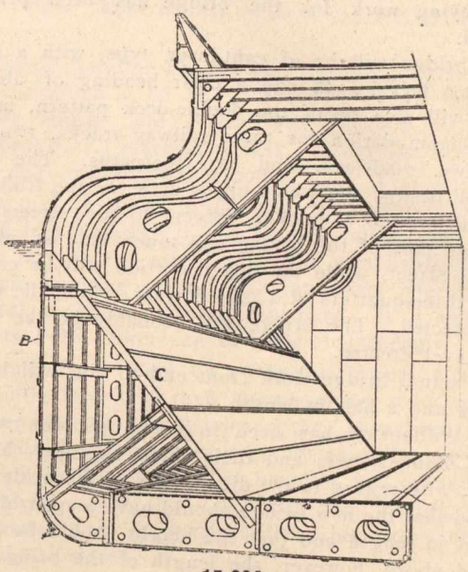
Railway and Like Rails.—Fenwick.—14,981.—A shield, consisting of a thin metallic strip A, is shaped to embrace the tread portion and head of the rail, with its edges in con-



14,981.

tact with the web portion of the rail. It is secured by bolts and fish plates to the commercial rail in the usual holes and fastening arrangements.

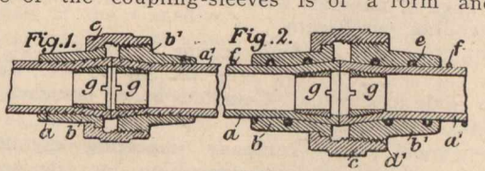
Turret Vessels.—C. D. Doxford, Sunderland.—17,224.—This invention relates to improvements in vessels of the well-known turret type, in which the upper portion of the vessel is in the form of a continuous girder, somewhat narrower than the breadth of the vessel, and providing a longitudinal strengthening frame or girder at the upper part of the vessel. The objects of such improvements are to reduce the cargo space to a desired amount per ton dead weight, to reduce the tonnage measurement, and to increase the water ballast space; also by this invention the discharging of the cargo is facilitated by causing it to slide towards the centre of the vessel, so as to be directly under the cargo gear. In carrying out the present invention there is employed, in conjunction with a turret vessel of the type above described, a side or inner wall or plating C connected with the double bottom D at a distance considerably away from the side wall, and sloping outwards and upwards, so as to join the walls B of the vessel at a height considerably above the bilge; this, as will be appreciated, has the effect of reducing the cargo space and tonnage measurement, and at the same time providing large water-ballast tanks which may communicate with the hollow space of the double



17,224.

bottom, while at the same time the angles or corners in which the bulk cargo might lodge, and could then only be displaced by manual labor, are removed from the cargo space, and the cargo can be easily collected and removed by mechanical means direct from the hatches without further handling. This invention may be applied to turret vessels having the usual stanchions and beams, though it is preferred to use it in conjunction with vessels in which beams and stanchions are dispensed with, and the side walls of the vessel are strengthened in any desired manner.

Pipe-Couplings.—United Engineering Company, Limited, and J. McRae, London.—12,599.—This invention relates to pipe-couplings, and particularly to couplings which are intended to connect the ends of india-rubber tubes, hose, or the like, whether armored or unarmored, and consists principally in a construction whereby the various parts of the coupling members remain secured on the ends of the pipes when the coupling-nut is slackened off to disconnect the pipes. According to the present invention, the coupling-sleeves are outwardly flared, and are screwed on to the pipe ends, and are further secured by internal conical expanding thimbles. The ends a, a1 of the hose to be coupled are fitted with outwardly-flaring coupling-sleeves b, b1, which are screw-threaded internally, and are provided with means whereby they may be drawn together by a coupling-nut c. In the case of an armored hose (Fig. 2) the internal screw-thread e of the coupling-sleeves is of a form and pitch



12,599.

adapted to screw on to the armoring-wire or band f. The coupling-sleeves are secured on the pipe-ends by means of conical thimbles, which may be either screwed into the pipe-ends, as shown, or may be otherwise forced into them so as to expand the said pipe-ends and clamp them tightly against the coupling-sleeves. The screw-threaded form g of the expanding thimble may consist of a tube split longitudinally for part of its length, and splayed outwardly to form a more or less conical taper or of a conically coiled wire. The latter form has the advantage of being self-adjusting within limits, so as to be applicable to hose of different diameters or thicknesses of wall.

—The voids in concrete will be larger if the broken stone is screened of its small sized fragments, and the proportions of sand should be increased correspondingly. Should the stone be the "run of crusher" the proportions may be determined by experiment to be those most economical of cement and sand.

THE NEW MONTREAL BRIDGE ACROSS THE ST. LAWRENCE.

It is stated that the new bridge across the St. Lawrence in front of Montreal will be well under way by Christmas time, and will be finished in a couple of years.

Mr. F. S. Williamson, who is associated with Sir Douglas Fox, of London, in the work, states that already the surveying work for the bridge has been practically completed.

The bridge will be of cantilever type, with a span of about 1,500 feet length and a clear heading of about 150 feet. It will also be of the double-deck pattern, and will afford accommodation for three railway tracks, two trolley tracks, two roadways, and two footpaths. The railway tracks will occupy the whole upper deck, as the trolleys and vehicles will need a quicker descent to the streets of the city. This part of the bridge will touch land at about St. Catherine Street, while the upper portion will be continued for fully three-quarters of a mile further, where the terminal will be erected. The bridge will probably be the heaviest per foot ever erected.

The actual bridge work from end to end will be about two miles and a half in length.

Mr. Williamson has been in communication with the Harbor Commissioners and their chief engineer, Mr. John Kennedy, with regard to the dimensions of the bridge. They demanded that the new bridge should have a span of at least 1,200 feet in length and that the height should be 150 feet. As stated above, however, the length of the bridge's main span will be about 300 feet more than the minimum they have fixed.

It is the plan of the Montreal Bridge and Terminal Company, as the promoters of the enterprise are known, to erect a union railway station at the Montreal end of the bridge for the use of the roads using it to get into the city. Mr. Williamson stated that in connection with the terminal the company had also decided on the construction of a large hotel, equipped with every modern convenience. He also said that he had recommended its construction even before the building of the bridge, as there was a demand for such an establishment in Montreal, and there was no reason for waiting till the bridge had been built.

INDUSTRIAL NOTES.

The following were among the enquiries relating to Canadian trade received at the Canadian Government Office, 17 Victoria Street, London, S.W., during the week ending 7th September, 1906:

A Toronto company holding interests in mines and in a wide range of minerals wishes to enter into correspondence with intending purchasers.

A London firm building marine motor sets of fittings, such as engines, reversing sets, propellers, etc., desires to open up trade in Canada. Complete motor launches, yachts, boats, etc., can be supplied.

A chemical supply company importing cryolite, flake graphite, tungsten, uranium, vanadium, etc., desires to get into touch with actual mine owners of such minerals in Canada.

From the City Trade Branch, 73 Basinghall Street, London, E.C.:

An enquiry has been received from a Canadian correspondent for the addresses of United Kingdom manufacturers of machines for making chains.

A company in Montreal would like to get into touch with manufacturers of builders' and contractors' supplies; also railway supplies and specialties.

A Manchester firm interested in the importation of high-grade graphite, nickel and copper matte and other minerals desires to correspond with Canadian producers and exporters.

An important firm manufacturing forgings, stampings, etc., is desirous of extending their connection with Canada, especially for such goods as turnbuckles, tie rods for roofing, bridges, waggon work, etc.

A firm of metal merchants in London make enquiry respecting deposits of iron and manganese ore available in Canada for work, the intention being to utilize them, if possible, for the manufacture of ferro-manganese.

An English firm holding patents for jointed pipes for municipal purposes desires to correspond with Canadian makers of iron pipes.

A Yorkshire firm of crane and lifting tackle makers desire to be placed in communication with Canadian houses requiring such goods from time to time.

A firm manufacturing patent jointed pipes for gas and water mains, sewers, drains, etc., desires to get into touch with earthenware pipe manufacturers in Canada.

Toronto.

A notable exhibit at the Canadian National Exhibition was that of the Ideal Concrete Co., South Bend, Indiana. The Ideal is the original face-down concrete block machine, and is well worthy of investigation by anyone interested.

Messrs. Connor, Clark & Monds, consulting engineers, Toronto, have recently let the contract for a reinforced concrete arch bridge, 286'-0" long, to be erected at Edenvale, to Messrs. MacMillan & Costain. They have also reported on a power development at Powassan for the supply of power to North Bay. About 1,000 Horse Power will be generated, the head being 86'-0".

The Engineers' Club of Toronto held its first meeting of the autumn season on Thursday, September 27th. The programme for the months of October, November and December was discussed.

It is stated that Commissioner Thompson has secured a new industry for the city, viz., the Chemical Laboratories, Limited, a new company with local capital. The company will manufacture light chemicals.

A. J. Lavoie, who until recently was on the engineering staff of the Canada Foundry Company, is now with the Gendron Manufacturing Company, this city. Mr. Lavoie's System for Industrial Establishments was installed in the Gendron Company's plant over a year ago, and up to date has given most satisfactory results.

The Toronto Railway Co. has forwarded to City Treasurer Coady the cheque for the percentage of the gross receipts for August, and the amount, $43,770.53, is the largest ever received by the city from the company. The comparative figures are:

	Receipts.	Percentage.
August, 1906	$291,803 58	$43,770 53
August, 1905	255,888 90	38,383 33
August, 1904	223,611 65	33,541 74
August, 1903	193,669 50	24,835 26
August, 1902	166,355 59	19,962 67
August, 1901	156,518 92	17,417 56

Montreal.

W. T. Bertram, of Montreal, has been appointed purchasing agent of the T. and N.O. Railway, to become effective October 1st.

The Canadian Pacific, it is said, is planning to replace about forty-eight of its present structures with steel bridges on its main line between Montreal and Quebec.

The town of Cardston, Alta., has purchased from Allis-Chalmers-Bullock, Limited, of Montreal, an electric and waterworks plant, including generator, switchboard, transformers, lights, and a special compound duplex pump.

Under the direction of the Department of Marine and Fisheries hydraulic engineers are at present engaged in taking bearings at St. Joseph de Levis for the construction of a new graving dock to meet the changed conditions of ocean shipping.

C. Brandeis, consulting engineer, of Montreal, has been appointed chief engineer of the St. Césaire Hydraulic Power Co., of St. Johns, Que. He has been retained as consulting engineer by the town of St. Laurent, Que., also as chief engineer of the Saraguay Electric Light and Power Company.

General.

The Locomotive and Machine Co., Montreal, have ordered three belt-driven vacuum pumps from the Smart-Turner Machine Co., Limited, Hamilton, Ont.

The Yukon Consolidated Goldfields Company, Limited, have contracted with the Canadian Westinghouse Company for the complete electrical apparatus to be used in gold dredging in the Yukon Territory.

Among numerous clubs and similar buildings to be equipped with ventilating apparatus, furnished by the B. F. Sturtevant Co., of Boston, Mass., is the following: Convocation Hall, Toronto University, Toronto, Ont.

The Rust Boiler Co., of Pittsburgh, has secured the order for the boilers for the United States Steel Corporation's new plant at Gary, Indiana. The order being for 16 400-H.P. Rust Water-tube Boilers.

The Peterborough Hot Water Boiler and Radiator Company, with a capital of $50,000, will erect a plant in Peterborough if favorable terms are granted by the city. The class of work done would require the employment of highly-paid workmen, and the industry will be a valuable asset.

The contract for the building of the Ontario Iron and Steel Works, Welland, Ont., was let to the Wm. Irvin & Sons Company, of Hamilton, and the Welland Construction Company have the contract for the construction work. The total amount of these contracts is $265,000.

Howard E. Troutman, for over ten years connected with the Buckeye Engine Company and for several years manager of its Chicago office, has resigned to accept the sales management, Corliss and High-speed Engine Department of the Atlas Engine Works, Indianapolis. Mr. Troutman's headquarters will be at the home office.

Mrs. Frances A. W. McIntosh, formerly advertising manager of the Standard Tool Company, Cleveland, Ohio, and more recently connected with the advertising department of "Power," New York, now has charge of the publicity department of the Norton Company, Worcester, Mass., the appointment taking effect August 1st.

The sixth annual convention of the National Electrical Contractors' Association, in session at Cleveland, Ohio, endorsed trade schools for the education of boys in the mechanical arts. The convention adopted a set of uniform symbols to be used in marking electrical wiring plans. Mr. James H. Strong, New York, was elected president.

R. Turnbull, general agent for Canada of the Héroult process of electric-smelting, Sault Ste. Marie, Ont., reports having secured two orders for electric-smelting plants; one in California, having a capacity of 25 tons per day, to be increased to several hundred tons when the electric power plant is enlarged. The other in Mexico, also for a plant of 25 tons daily capacity. If this plant proves successful it will be increased to 250 tons daily output. The reducing material will be charcoal and coke, respectively.

A deal involving the sale of the immense limestone deposit at George's River has been consummated whereby the transfer of an area two miles long and half a mile wide, and estimated to contain two hundred million tons of limestone, has been made by Rev. M. A. McPherson, of Little Bras d'Or, to the Dominion Iron and Steel Co. The purchase price has not yet been disclosed, but it is said to be in excess of a quarter of a million dollars. The steel company had the areas bonded for some time past, and last winter used about two thousand tons of the limestone at the Sydney plant.

Sealed tenders, marked "Tender for Hawkshaw Bridge Metal Superstructure," will be received at the Department of Public Works, Fredericton, until Monday, 15th day of October, 1906, at noon, for constructing one through-pin connected or riveted highway steel truss span of 100 feet c. to c. of end bearings; for constructing one through-pin connected highway steel truss span of 285 feet c. to c. of end pins; for constructing two through-pin connected highway steel truss spans of 188 feet 10 inches c. to c. of end pins over the St. John River at Hawkshaw, Parish of Dumfries, York Co., N.B., according to plans and specifications to be seen at the Public Works Department, Fredericton, N.B.

James A. Moore, a Seattle promoter, has purchased the plant of the defunct Pacific Steel Company, located at Irondale, B.C. The price paid was $40,000. It is understood that about $100,000 will be spent in rehabilitating the plant to a capacity of sixty tons of pig per day.

A despatch from Dauphin states that coal oil in free quantities was struck at the foot of Riding Mountain, south of that town recently. A company will be organized for exploration work. Experienced oil men say this is the real thing.

The Cooper Gasoline Engine Co., Limited, of Winnipeg, Man., are installing a 60 H.P. "Weber" double cylinder vertical gas engine and suction gas producer plant for Messrs. Horn Bros., Markinch, Sask., to operate their new roller mill and elevator at that point.

An enquiry is being made into the available water-powers and iron deposits in the Ottawa valley, and if the reports are favorable it may lead to the establishment of a large electric smelting plant. The capitalists interested in this proposal are most of them Canadians. It is said that at the Chats Falls power can be generated cheaply.

Armstrong Bros. Tool Co., Chicago, report that the summer months have kept their plant working at its extreme limit to keep abreast of orders, and they have been forced to install additional machinery in an effort to get some finished stock ahead. September business has opened with a rush, dealers' orders, both domestic and foreign, being especially heavy, they evidently anticipating heavy demand and delayed shipments.

Sealed tenders, marked "Tender for Hawkshaw Bridge," will be received at the Department of Public Works, Fredericton, until Monday, 15th day of October, 1906, at noon, for building the masonry substructure and approaches for Hawkshaw bridge, over the St. John River, Parish of Dumfries, York Co., N.B., according to plans and specifications to be seen at the Public Works Department, Fredericton, N.B., at office of Hon. L. J. Tweedie, Premier, Chatham, and at the office of Hon. Wm. Pugsley, Attorney-General, St. John, N.B.

G. M. Davis Regulator Company report increasing sales from all their branches and a factory running overtime. One interesting repeat order calls for 3—6" x 12" pressure reducing valves to be installed in the largest central heating plant in this country, the Murphy Heating Company, of Detroit. This plant already has an 8" x 14" Davis reducing valve installed, supplying 50,000 pounds of steam per hour at 1½ pounds pressure, reducing from 175 pounds boiler pressure. Each additional 6" x 12" regulator of the above order mentioned is required to supply 40,000 pounds steam per hour at 1½ pounds, reducing from 175 pounds.

It is announced that John E. Botterell, manager of the Vancouver branch, has been appointed manager of the Winnipeg branch of the Canadian Fairbanks Company. Mr. Botterell succeeds F. R. Newman, who has been given charge of Caverhill, Learmont & Company's Western business. The retiring manager, Mr. Newman, was the recipient of a token of regard at the hands of the staff, who presented him with an address and a diamond ring, and the president, H. J. Fuller, gave a private dinner at the Royal Alexandra, Winnipeg, to Messrs. Newman & Botterell, at which a number of the staff were present. W. A. Akhurst has been appointed as manager of their Vancouver house.

The United States Circuit Court of Appeals has handed down a decision in the case of the General Electric Company against the Kuhlman Electric Company. The suit refers to the infringement of the Dobrowolsky patent, No. 422,746, owned by the General Electric Company. The Kuhlman Company was manufacturing polyphase transformers in which the cores of the different elements are combined in an integral structure. The patent was sustained by the United States Circuit Court and the Kuhlman structure held to be an infringement thereof. The practical result of this last decision is to secure to the General Electric and Westinghouse Companies the exclusive right to manufacture polyphase transformers having their cores combined in an integral structure as distinguished from a plurality of single-phase transformers.

The Smart-Turner Machine Co., Limited, Hamilton, have supplied the Shawinigan Water and Power Co., Limited, with one of their side-suction centrifugal pumps.

LIGHT, HEAT, POWER, ETC.

The contract has been let to Ald. McDonald to put in the electric light and power plant for the town of Ladner in connection with the British Columbia Electric Railway Company.

The Ottawa and Hull Company has made an offer to the Provincial Hydro-Electric Commission to supply power to it for re-sale to the city on terms and conditions in its existing arrangement with civic corporations.

Stratford has decided to request the Hydro-Electric Power Commission to give an estimate of the price to be charged the city for from 2,000 to 5,000 Horse Power from Niagara Falls.

The Ontario Railway and Municipal Board is going to Ottawa to hear the application of the city for approval of its by-law to expend $50,000 on extensions of the city's electric lighting system.

MARINE NEWS.

It is stated that the work on the Huron-Erie Canal will be commenced shortly. It is proposed to make the canal about 42 miles long, and the cost will be in the neighborhood of $60,000,000.

Signor Marconi is at present engaged on the invention and perfection of a device for the exact location of ships. By means of this device the location of any ship can be accurately determined in the thickest weather. The apparatus will be first experimented with on the Mersey during the coming winter. Signor Marconi regards this invention as of inestimable value in the navigation of the St. Lawrence River.

The report of the surveyors upon the feasibility and probable cost of the proposed ship canal by the Ottawa Valley route to Georgian Bay will be presented to Parliament next session, when the Cabinet will also make known whether it intends undertaking the enterprise. It has been ascertained that water powers along the route capable of development would supply in the aggregate about 1,250,000 H.P.

The Trent Valley Canal, it is understood, will be rushed to completion as soon as possible. This work has been going on for a number of years, and a good deal of work has been done. Now it is estimated that two years will enable the work to be finished from Georgian Bay to Peterboro' at a cost of a half million; and another year will complete the canal from Georgian Bay through to Trenton on Lake Ontario.

RAILWAY NOTES.

It is understood that the project of the British Columbia Electric Railway Company to build an electric railway from New Westminster, B.C., to Chiliwack has been postponed until next year.

Mr. Collingwood Schreiber, Chief Consulting Engineer to the Canadian Government, states that the Grand Trunk Pacific Railway, when completed, will be the cheapest transcontinental line in existence.

Plans and specifications are ready for the new union passenger station to be built by the Midland and Manitoba (Great Northern) and the Grand Trunk Pacific Railroads at Portage la Prairie, Man. Mayor E. Brown can give information.

H. A. Drury, of the Railway Commission staff, has been appointed engineer for Western Canada, with headquarters at Winnipeg. He will have charge of railway matters coming before the Commission for the West, and will also investigate any railway accidents.

The Grand Trunk Railway is understood to have acquired the charter of the Kingston, Smith's Falls and Ottawa Railway, with the object of establishing a more direct line between Ottawa and Toronto.

Over 2,000 men are now employed on the Grand Trunk Pacific section under construction from Quebec to La Tuque. As soon as the harvest season is over the contractors expect to obtain the services of 1,000 more men.

The Canadian Pacific, it is reported, has awarded to Deeks & Deeks, of St. Paul, Minn., the contract for the construction of about 100 miles of road from Peterboro', Ont., to Penetang; contract price reported to be $3,000,000.

Work on the Mackenzie & Mann Railway from Nepigon to Lake Nepigon is to be commenced at once. The contract for the road has been let to the Central Contracting Company, and one of the conditions of the contract is that the railway shall be completed within a year.

The Winnipeg Electric Street Railway is about to erect new car shops in Fort Rouge, near Portage Junction. The present shops of the company are said to be inadequate for the requirements, and it is the intention of the company so to equip the plant at Fort Rouge that it will be possible to build car bodies.

The twenty-fifth annual report of the Canadian Pacific shows gross earnings of $61,669,758, with working expenses of $38,696,445, leaving net earnings of $22,973,312. Working expenses for the year amounted to 62.75 per cent. of the gross earnings, and net earnings of 37.25 per cent., as compared with 69.35 and 30.65 per cent., respectively, in 1905.

General Manager Hays, of the Grand Trunk Railway, says that in a year or two it will be necessary for the company to construct another tunnel under the St. Clair River on the south side of the present one. The approaches were built with this in view, and with the introduction of electricity the Grand Trunk expects that a single tunnel will not accommodate the traffic.

It is stated that the Canadian Northern Railway and the Grand Trunk Pacific have made arrangements for the construction of a line to Hudson Bay. The starting point of the new line is in Saskatchewan, Regina being spoken of as its Western terminus. This has not been positively decided as yet, however. It is understood that the C.N.R. and the G.T.P. have got together, owing to the fact that Jas. J. Hill has his eye on the Hudson Bay outlet.

Five of the largest and most attractive street cars ever made in Canada have just been built in Ottawa for the Windsor, Essex and Lake Shore Rapid Railway Company The cars are 55 feet long. The motive equipment will also be an innovation in street car construction in Canada. The cars will run on single-phase alternating current. The cars are built on the Pullman style, and have observation ends and all other modern conveniences. The line on which they will operate is not yet complete.

It is reported that the Canadian Pacific Company has decided to await the outcome of experiments by the New York Central and New York, New Haven and Hartford Railway Companies before taking steps for the electrification of any part of its system. Both the latter railways are spending enormous sums upon experiments, the former with a direct and the latter with a single-phase alternating current. The line from Montreal to Quebec will in all probability witness the first installation. All the electric power necessary can be obtained from the Shawinigan Falls.

The plans of the Detroit River Tunnel Co. have been approved by the Canadian Railway Commission. The project, which is to cost between seven and ten millions of dollars, provides for the construction of two parallel tubes of iron to rest 65 feet below the surface of the water on beds of concrete and to be flanked by concrete walls. These will give double tracks to enable the Michigan Central and Canada Southern trains to cross beneath the Detroit River. The plans are said to be the most detailed and finished ever seen in Canada, and were prepared by W. J. Wilges, chief engineer of the New York Central; W. J. Keenean, chief engineer of the Michigan Central, and H. A. Casson. The work will be commenced right away.

The C.P.R. has placed an order for fifty locomotives with the American Locomotive and Machine Works at Longue Pointe, to cost $19,000 each.

The work on the construction of the Quebec and Saguenay Electric Railway, from St. Joachim to Malbaie, a distance of 58 miles, will be commenced shortly, and pushed to completion with all possible speed. The new road is being promoted by a syndicate of twenty-six Quebec, Montreal and Toronto capitalists, who have assumed the full responsibility for the cost, $1,500,000, which will include the electrical equipment and rolling stock of the road.

MINING MATTERS.

Rich silver deposits have been discovered in Haliburton county, Ont.

The last clean-up of the St. Anthony Reef gold mine amounted to $8,000.

A discovery of copper, mixed with gold, has been made near Cardston, Alta.

It is reported that the silver mines in Port Arthur are to be reopened shortly, when Port Arthur will again become the centre of one of the richest mining camps in America.

The discovery of cobalt in large quantities in Northern Ontario, and the limited market for that metal, have had a disastrous effect upon its price, which has fallen from $3 a pound to 37 cents a pound.

The Macdonnell Dominion Government Survey have made a discovery of gold in the Peace River country, which, judging by surface indications, promises to be the richest find yet made in this country.

The output of the Dominion Coal Company for the first seven months of the present year was 2,032,018 tons, as compared with 1,696,439 tons and 1,765,136 tons in the corresponding periods of 1905 and 1904 respectively.

A vein of nickel ore has been discovered in the southwest part of the city of Ottawa, between Rochester and Division Streets. Much excitement prevails in the locality, and real estate there has gone up with a bound.

C. V. Haines, a well-known mining engineer of India, was in Ottawa recently. He says that there is an increasing interest on the part of the better class of natives in the rapidly developing mining industry of that country.

While engaged in digging a sewer in Port Arthur recently a laborer named McPherson struck a vein of quartz, highly mineralized with silver and sulphide of copper, and has staked a claim on the street in partnership with Capt. Hogan.

A new vein has been located on the Nipissing property, near working vein No. 25. It was about 13 inches wide where first discovered. It has been uncovered and followed for a distance of over fifty feet, and by careful and accurate measurement it was found to be five feet wide, with a surface out-cropping of practically native silver.

The purchase of the Iron Mask property by the Canadian Consolidated Smelting Company is along the lines of the announced policy of the Consolidated Company at its last general meeting in Montreal, and it is just one more step in the direction indicated by James Cronin when he announced his resignation. "I think, in time," he said, "that the Consolidated Company will become one of the greatest mining corporations of the West, of the American continent, and one of the world's greatest mining concerns."

The winze in the Le Roi has reached the 1,750 foot level, which makes the Le Roi the deepest mine in British Columbia. Drifting from the bottom winze is in progress for the purpose of intersecting the ledge on this level. The slump has been made at the bottom of the shaft on the 1,350 foot level. After some further preliminaries, which are being done, the work of deepening the shaft, which has five compartments, and the dimensions of which are 25 by 5½ feet, will be commenced. It is the intention to deepen the shaft to the 2,000 foot level and perhaps further. The work will cost between $125 and $150 a foot.

PERSONAL

David D. Elder, jr., has resigned from the management of the M. W. Kellogg Co. in order to build tile-lined concrete chimneys. Mr. Elder's address is now 42 Broadway, New York City.

J. M. Broucher, of the Brownell Company, Dayton, Ohio, has resigned his connection with that company to accept the position of assistant general manager of sales for the Atlas Engine Works, of Indianapolis.

Prof. Willet G. Miller, who has charge of development of veins on the Gillies timber limit, Ontario, will attend the International Geological Congress at the city of Mexico, leaving his Government work in charge of Mining Inspector E. T. Corkill.

Attorney-General Campbell, of Manitoba, announces the appointment of F. Dagger, of Toronto, as one of the Manitoba Government's telephone experts. His duties will be to advise with the municipalities and give information regarding the proposed Government system.

J. G. Macklin, who has been divisional engineer of construction for the eastern forty miles of the Guelph and Goderich Railway from Guelph west, has received the appointment of chief engineer of construction of the St. Mary's and Western Railway from Woodstock to St. Mary's. Mr. Macklin's headquarters will be at Guelph.

Anthony C. Douglass, who was connected with the wheel-pit work of the Niagara Falls Power Company, and who built the tunnels of the Canadian Niagara Power Company and of the Electrical Development Company of Ontario, Limited, has returned to his home in Niagara Falls after a trip to the Pacific Coast to investigate the proposed power work on the Feather River in California.

William Perry, who for the past thirty years has been connected with the firm of R. H. Buchanan & Co., has severed his connection with them to take charge of the general steam pump trade of the International Pump Company in Canada with the John McDougall Caledonian Iron Works Company, Limited, Montreal. Mr. Perry is practically the oldest pump expert in the Dominion, having been connected with that class of work since 1851.

The press of Ottawa and Montreal have conveyed an impression that Mr. W. R. Brock, of Kingston, had been promoted to the position of Director of Geological Survey of Canada; other notices conveyed the impression that he had been appointed Chief Geologist, implying that Dr. Robt. Bell had resigned. Neither statement is accurate. Mr. Brock has merely received well-earned recognition in the shape of an increase in salary, and the offices of Director and Chief Geologist remain exactly as before.

W. H. Whiteside, president of the Allis-Chalmers Company, Milwaukee, returned on August 22nd from a two months' combined business and pleasure tour of England, France, Germany and Switzerland. Mr. Whiteside inspected various large manufacturing industries in England and on the Continent. Among them he visited the plants of the leading English steam turbine builders, whose American rights for building Parsons steam turbines for marine and land use are enjoyed by the Allis-Chalmers Company.

MUNICIPAL WORKS, ETC.

Waterloo is to have a third storage tank added to its water-works, together with other improvements. Five thousand dollars is to be expended.

A by-law has been introduced into the city council of London giving notice of the city's intention to buy the London Street Railway and run it as a municipal concern.

Preston, Ont., recently carried two by-laws for the installation of a water-works and a sewage system. The sum voted for the water-works system is $57,000, and for the sewerage $16,000.

Plans and specifications for the waterworks of the village of Cartierville, Que., are now being prepared by Charles Brandeis, consulting engineer, of Montreal. About 3½ miles of streets will be provided.

The Canadian Westinghouse Company are supplying two 1,100 Horse Power Westinghouse-Parsons steam turbines and two McDougal two-stage turbine type pumps to the city of Toronto for fire purposes.

The city council of Woodstock have submitted to the ratepayers a by-law providing for a loan of $25,000 to the Canadian Bearings Company, of Hamilton. The company agree to erect three buildings at an expenditure of $10,000, and to install machinery worth $30,000.

At the convention of the Municipal Association of Ontario, held in Toronto, August 30th, the question of standardizing hydrant nozzles and couplings throughout the Province came up, and it was unanimously concluded that the adoption of a standard, as well as a standard gong, would be a great benefit, as all cities and towns throughout the Province would be enabled to go to each other's aid in case of fire, no difficulty being encountered in making hose connections.

In order to get rid of the sewage east of Woodbine Avenue the city of Toronto has purchased from Allis-Chalmers-Bullock, Limited, of Montreal, a set of two 4" vertical submerged centrifugal pumps to be driven by two of their induction motors for Station No. 1 at south end of Kenilworth Avenue, and another similar set to be driven by two of their induction motors for Station No. 2 on the lake front. Each pump will be capable of lifting 550,000 gallons in twenty-four hours.

The contract for supplying and erecting the steel superstructure of the traffic bridge over the Saskatchewan River at Saskatoon has been awarded by the Provincial Department of Public Works to the Canadian Bridge Company, of Walkerville, Ont. The contract price is slightly in excess of $64,000. The bridge provides for a 20-foot roadway, with provision for street car tracks and a water pipe line to connect Nutana with Saskatoon, and a bracket for a sidewalk when it is required. The concrete substructure is to be completed by December 1st next.

TELEGRAPH AND TELEPHONE

An International Wireless Telegraph Congress will be held in October at Berlin, with delegates representing all the European nations, the United States and Japan in attendance. Questions regarding the international regulation of wireless traffic, its control in time of war and peace, etc., will be discussed.

The Swedish-American Telephone Co., whose advertisement appears on page 17 of this issue, were represented at the recent Canadian Independent Telephone Convention by E. B. Overshiner and C. H. Macklin, of Chicago. They also had an exhibit at the Toronto Fair, which was in charge of J. A. Russell. They have established many customers in Canada, and predict that the Independent Telephone movement in this country will equal the growth of this enterprise in the United States, within a reasonably short time.

NEW INCORPORATIONS.

Dominion.—Iroquois Motor Car Co., Welland, $96,000. J. H. Mills, Buffalo, N.Y.; D. Scott, Ottawa; A. Griffiths, G. W. Sutherland, J. H. Crow, W. H. Crowther, R. Cooper, G. G. Brown, E. A. G. Pew, Welland, Ont.

North American Wrecking Co., Montreal, Que., $60,000. D. Armour, E. F. Surveyor, E. M. McDougall, A. H. Brock, Montreal; H. W. Norton, St. Louis, Que.

The Ground Anchor Co., Montreal, $25,000. H. E. Lovell, Coaticook, Que.; R. A. Stinson, F. J. Bell, E. Sissons, Montreal; F. W. Hibbard, Westmount, Que.

P. J. Powers Co., Ottawa, $45,000. P. J. Powers, M. Lannon, Ottawa; T. McBrearty, Montreal; M. Viau, L. Dalpé, Ottawa.

E. K. Watson Co., Montreal, $20,000. J. H. Parkes, Warwickshire, England; E. K. Watson, G. A. Savage, Montreal, Que.; A. R. Picard, Montreal.

The Porto Rica Railway Co., Halifax, N.S., $3,000,000. W. N. Tilley, R. H. Parmenter, A. J. Thomson, G. F. Ronald, L. Huffman, E. W. H. Holme, F. J. Coombs, C. E. Abbs, G. C. Williams, Toronto.

The Quebec, Ontario and Cobalt Silver Mining Co., Montreal, $1,000,000. L. J. Labrosse, St. Eugene, Ont.; F. X. Dupuis, Valleyfield, Que.; G. Langlois, J. A. Tanguay, R. Houle, Montreal.

Canada Quarry and Transportation Co., Montreal, $20,000. T. Gauthier, S. Raoul, Quebec; L. Leger, Lachine; V. Lamarche, E. A. D. Morgan, Montreal.

International Marine Signal Co., Ottawa, $1,200,000. T. L. Willson, Ottawa; H. A. Little, Woodstock; A. M. Scott, Ottawa.

British America Elevator Co., Winnipeg, $500,000. J. S. Lovell, R. Gowans, E. W. McNeill, C. H. Black, W. F. Ralph, J. C. Sherry, W. Gow, Toronto.

Dominion Portland Cement Co., Montreal, $1,000,000. H. Domville, J. H. Redpath, H. E. Borradaille, H. N. Chauvin, Montreal; C. A. Duclos, Westmount, Que.

Ontario.—The Century Telephone Construction Co., Toronto, $40,000; to manufacture telephone equipment.

Canada Stove Co., Ottawa, $150,000. F. J. Travers, F. R. Yule, Montreal; G. Tomlinson, G. A. Mothersill, J. I. MacCracken, Ottawa.

Peterborough Steel Rolling Mills Co., Peterborough, $200,000. A. Dunn, M. Connors, R. J. Munro, R. H. Jackson, W. Rudkins, M. A. McNamara, R. H. Fortye, D. O'Connell, F. J. Jameson, W. Ferguson, R. Stuart, W. H. Hill, F. L. Robinson, A. Elliott, Peterborough.

Ontario Oil and Refining Co., Chatham, $100,000. C. T. Hobart, New York; G. W. Harrison, Lima, Ohio; J. M. Pike, T. C. Holmes, J. Simon, Chatham.

The Interprovincial Mining Co., Haileybury, $1,500,000. W. A. Weir, J. A. Ewing, Montreal; A. Lay, T. H. Steele, Haileybury; L. J. Labrosse, Hawkesbury East, Ont.

The Huronian Cobalt Silver Mining Co., Cobalt, $500,000. J. R. Gamble, W. A. J. Bell, T. Langton, G. Clark, Cobalt; M. Mayor, Toronto.

Winona Steamship Co., Hamilton, $100,000. R. O. Mackay, A. B. Mackay, J. A. Milne, D. Brown, E. J. Jordan, Hamilton.

British American Silver Co., Toronto, $50,000. J. E. Elliott, W. H. Wallbridge, F. Smith, J. E. Davies, H. N. Baker, Toronto.

Wright Silver Mining Co., Toronto, $200,000. E. Horder, F. C. Elks, A. E. Lloyd, E. B. Ryckman, C. C. Robinson, Toronto.

The Bailey Mining Co., Windsor, $500,000. E. A. Benson, Chicago; H. B. Wright, R. A. Bailey, L. S. Trowbridge, J. H. Harris, J. P. Glendon, Detroit; A. R. Bartlett, Windsor, Ont.

The National Mining and Developing Co., New Liskeard, $40,000. K. Farah, J. J. Grills, J. W. Bolger, New Liskeard; J. P. Gibbons, R. Gibbons, W. Reid, Casey, Ont.; W A. Reid, London.

The Golden Reed Mining Co., Sault Ste Marie, $1,200,000. R. J. Miller, St. Thomas; G. Reed, Michipicoten River; M. Gates, A. E. Sharpe, Sault Ste. Marie, Mich.; F. M. Dole, Sault Ste. Marie, Ont.

The Twin Lake Mining Co., New Liskeard, $500,000. T. Passmore, W. J. Spencer, G. A. McGaughey, North Bay; J. Juby, H. Dorrow, New Liskeard.

Canada Mines, Toronto, $100,000. H. C. Barber, M. Cairncross, J. A. Gormaly, R. T. Shiell, H. L. Dunn, Toronto.

The Williams Copper Mining Co., Toronto, $100,000. J. F. Lennox, D. A. Rose, F. W. Rose, M. W. Mayer, G. T. Veale, Toronto.

Manitoba.—Union Farmers' Telephone Co., Langford, Man., $2,000. W. G. Pollock, J. C. Drysdale, R. Hunter, W. Brydon, J. Dark, D. McLaren, J. McLaren, Langford, Man.

The Ajax Manufacturing Co., Winnipeg, $100,000. G. F. Stephens, C. W. Clark, C. D. Stovel, I. E. Fairchild, A. G. Akin, W. Findlay, Winnipeg.