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Established 1882

Vol. XXIII—No. 12.

MONTREAL, DECEMBER 31st, 1904.

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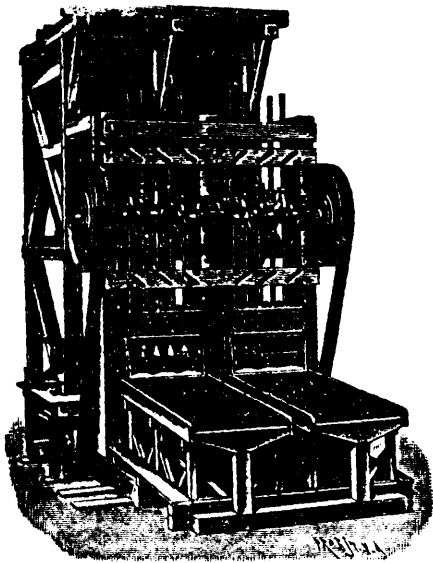
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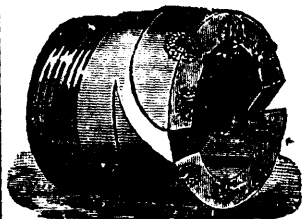
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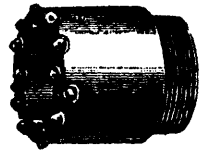
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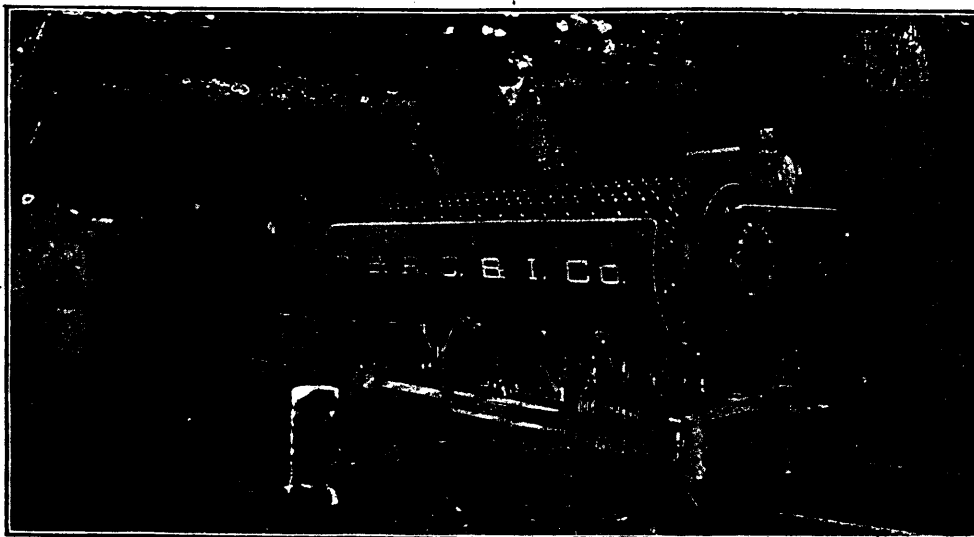
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Dear Sirs,—I have much pleasure in stating that the air compressing machinery, supplied by you in 1891 and 1897, to Pease and Partners, Ltd., Loftus Ironstone Mines, has given every satisfaction.

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The compressed air is used for rock drilling, hauling, and pumping underground.—Yours faithfully,
For Pease and Partners, Ltd.,
W. MOORE, Manager.

[NOTE.—These engines have four steam cylinders and two air cylinders.—WALKER BROS.]

The United Alkali Co., Ltd., Chief Engineer's Office,
Widnes, 23rd December, 1901.

Messrs. WALKER BROS., Pagefield Ironworks, Wigan.

Dear Sirs,—In reply to your enquiry of the 29th November, we have pleasure in being able to state that your blowing engines have given us great service and satisfaction.

We have had for several years quite a number of your large blowing engines in operation, driven direct by both single and cross compound arrangement of steam cylinders.

We consider that the arrangement of the "Walker" valves on the compressor cylinders is a valuable one, possessing the merit of simplicity and efficiency, while giving a large throughway with a small clearance space.—Yours faithfully,

For the United Alkali Co.,
EDWARD J. DUFF, Chief Engineer.

[NOTE.—See the number and dimensions of the compressors referred to in the list of users in our catalogue. The steam and air cylinders are nearly 70 in. number, from 20 in. to 50 in. diameter.—WALKER BROS.]

Barrow Hæmatite Steel Company, Limited,
Barrow-in-Furness, 7th Oct. 1901.

Messrs. WALKER BROS., Pagefield Ironworks, Wigan.

Dear Sirs,—I have much pleasure in stating that after a long experience of your Besselner blowing cylinders, extending over 15 years, we find the valves perform their work most satisfactorily, and they are most enduring; indeed, we cannot speak too highly of their performance or life.—Yours faithfully,

For Barrow Hæmatite Steel Company, Limited,
J. M. WHILE, General Manager.

[NOTE.—The various blowing engines (air compressing engines) referred to above include several air cylinders 48 in. diameter.—WALKER BROS.]

Messrs. The GLENGARNOCK STEEL AND IRON COMPANY write, in November, 1901, after 15 years' experience of Walker Bros.' blowing engines, having air compressing cylinders 54 in. diameter by 6 ft. stroke:—"These engines have given us every satisfaction."

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Blackwall Tunnel Works, East Greenwich, S.E.,
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Messrs. WALKER BROS., Pagefield Ironworks, Wigan.

Dear Sirs,—We are pleased to confirm what we told you verbally the other day, viz., that we consider the Air Cylinders and Valves of your compressors to be the best for such work as we have been carrying out on the above contract.

One of your engines ran for almost a year without stopping, and it gives us great pleasure to thus testify to the good qualities of the plant which we purchased from you.—We are, Dear Sirs, yours faithfully,

(Signed) pro S. Pearson and Son, E. W. MOIR.

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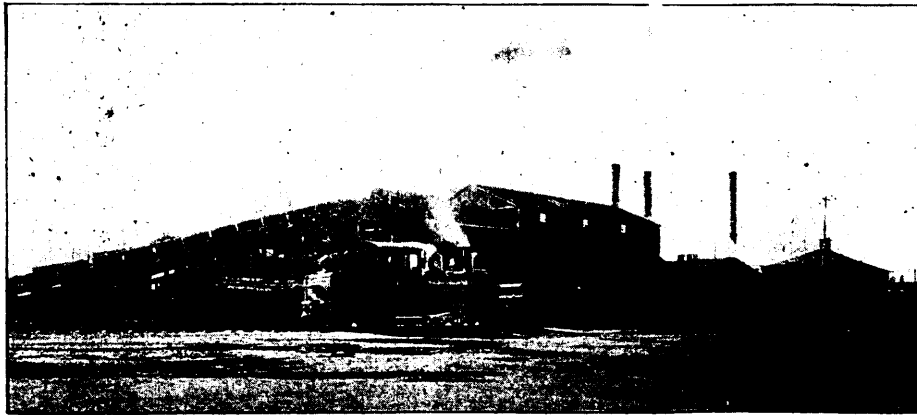
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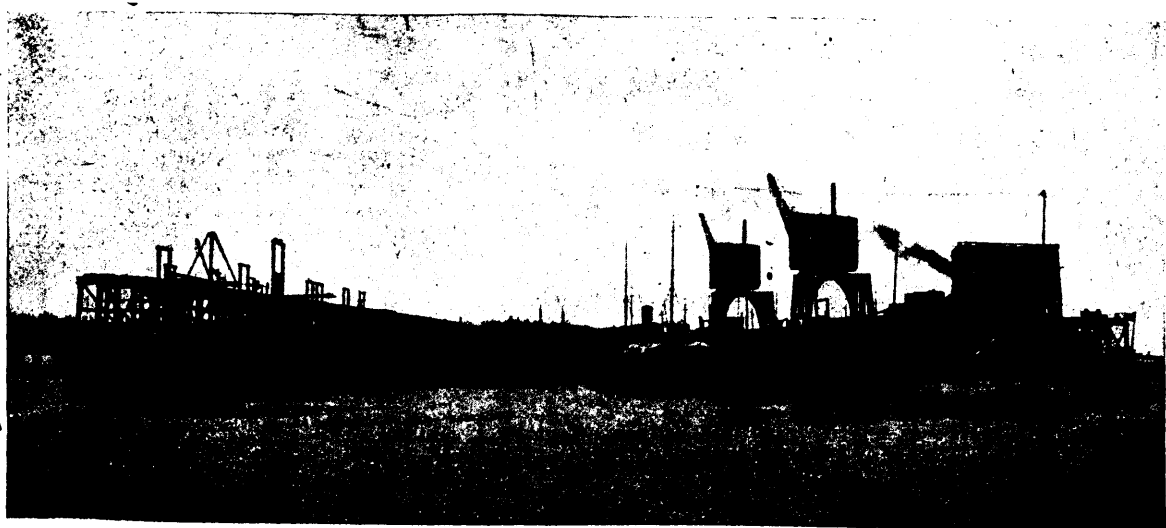
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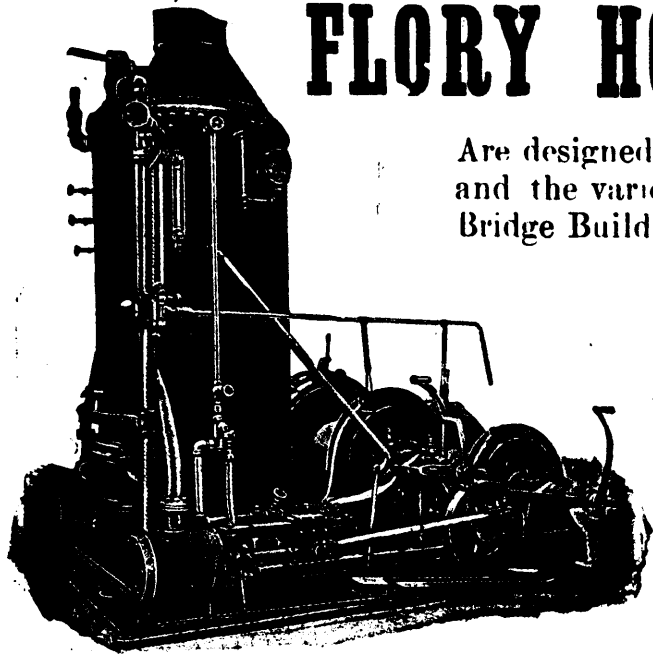
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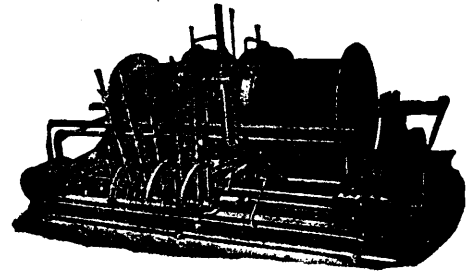
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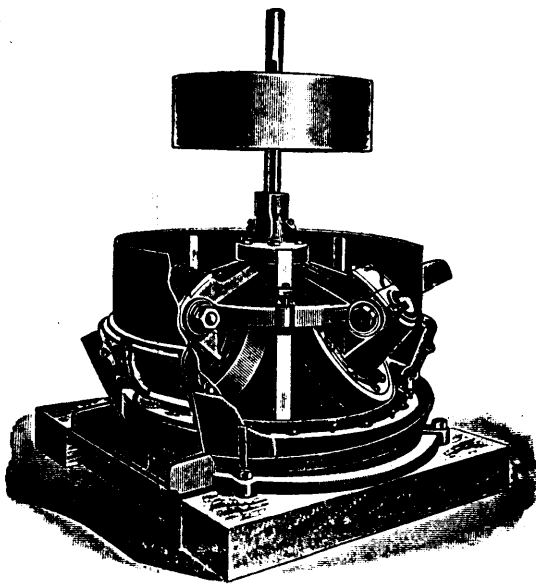
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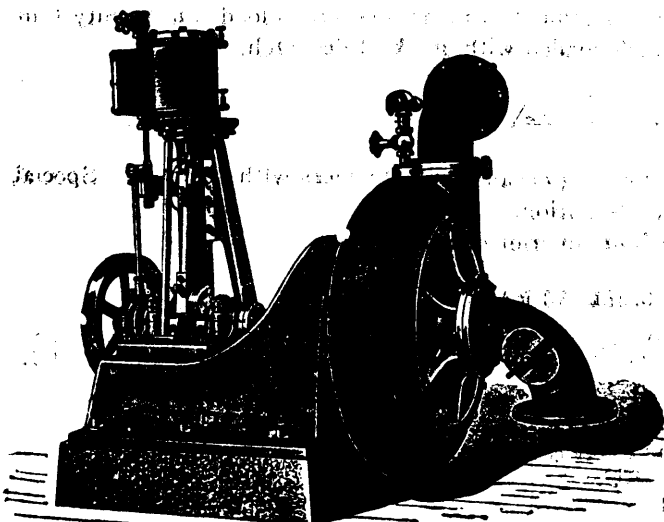
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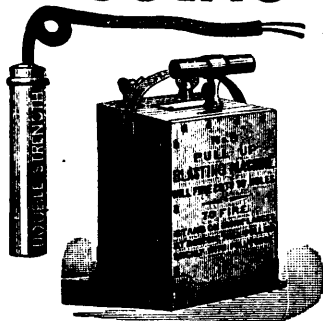
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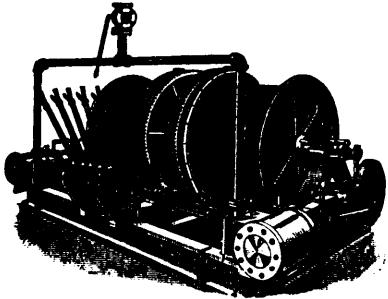
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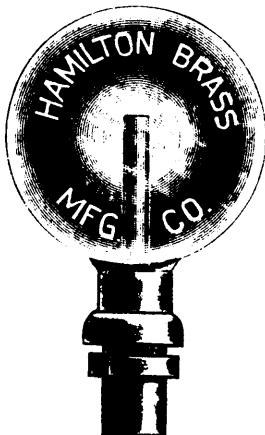
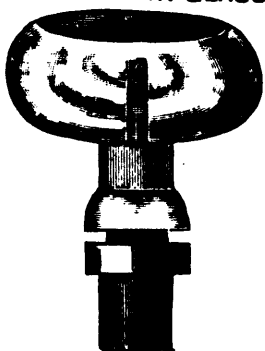
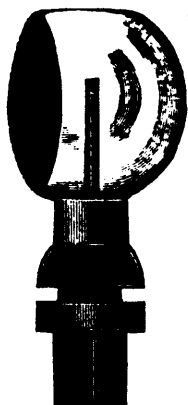
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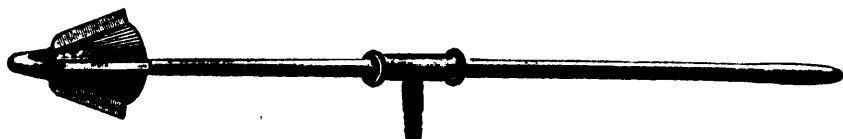
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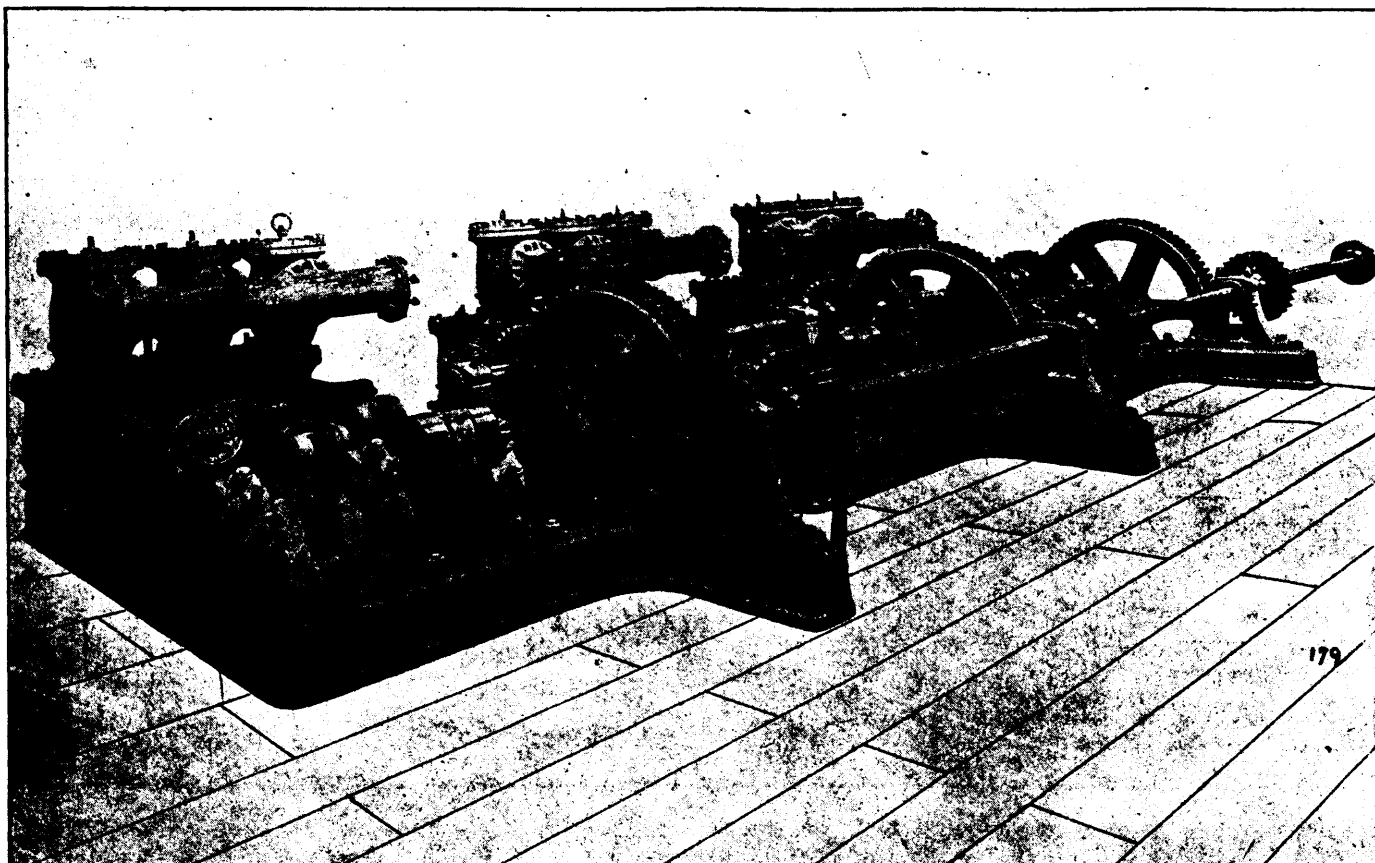
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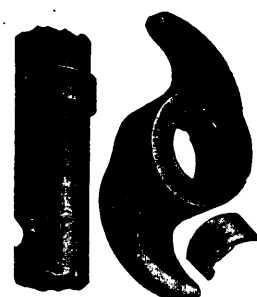


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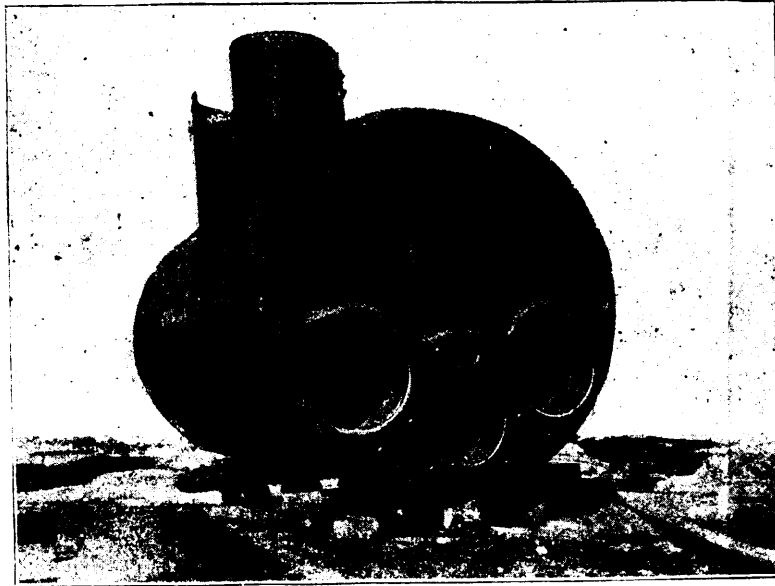
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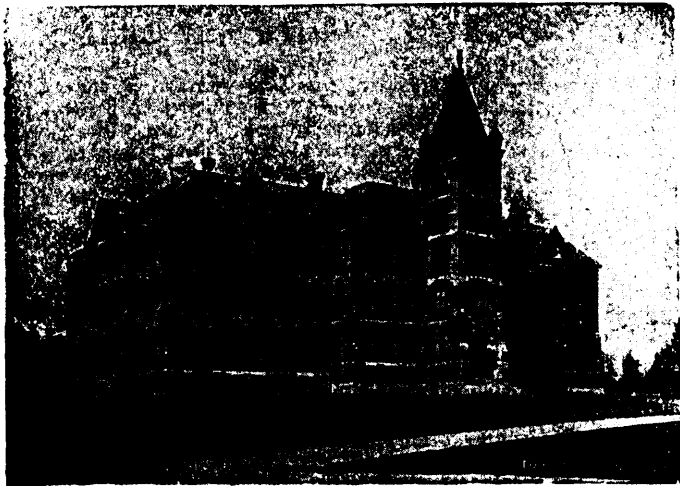
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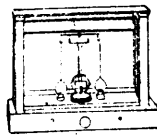
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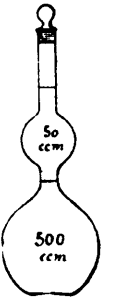
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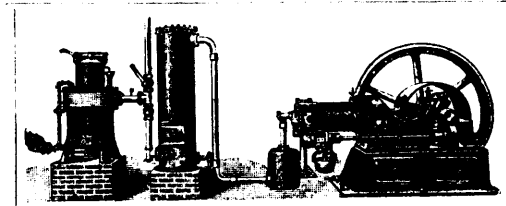
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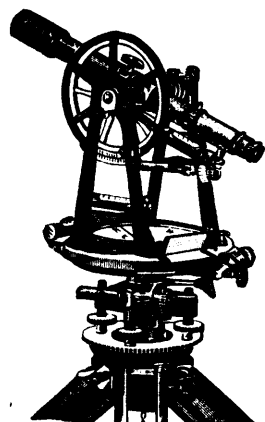
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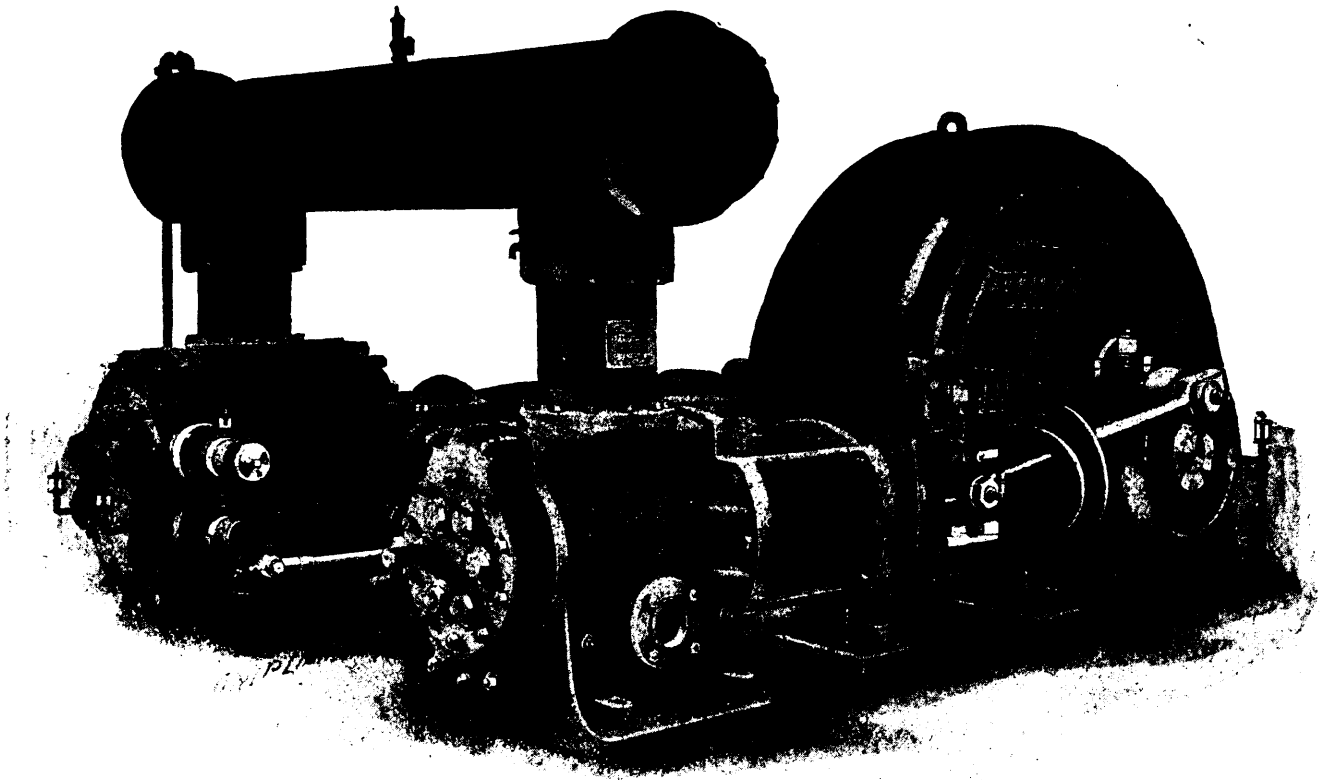
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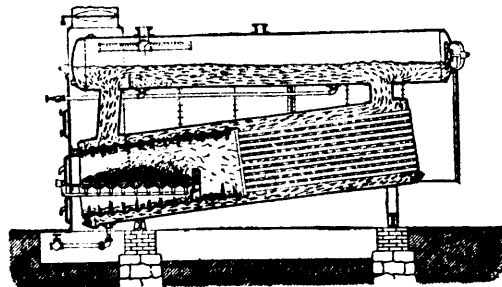
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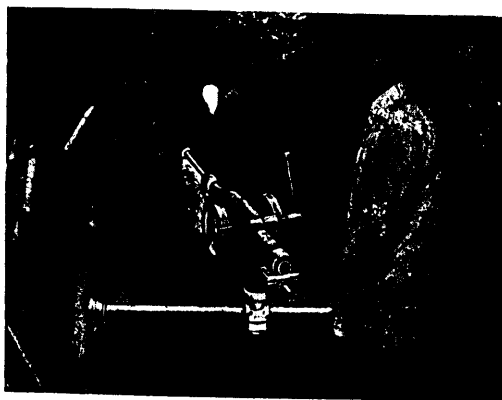
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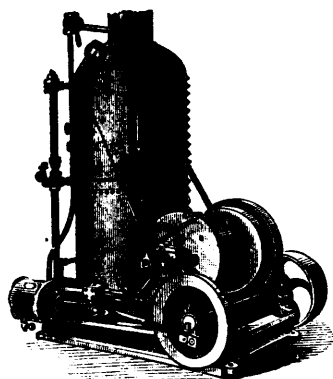
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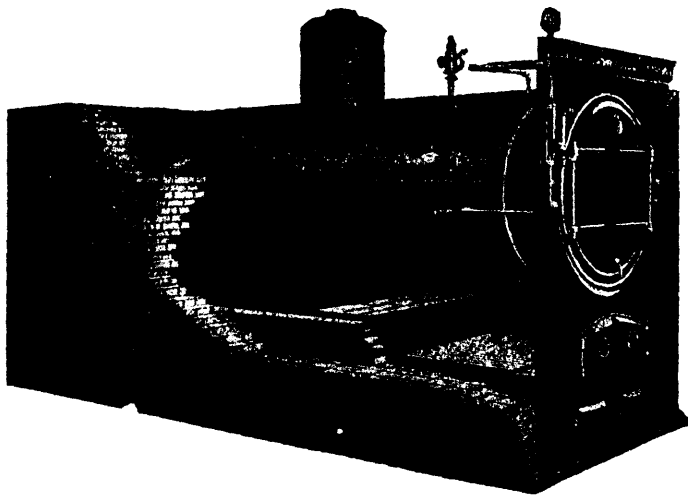
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A despatch from the Canadian Associated Press in London, reports a returned member of the Iron and Steel Institute to have expressed himself regarding the Lake Superior Corporation as follows:—"It is a concern which has leaned on the politician and has had more direct and indirect help from him than any industrial enterprise that was ever put on foot anywhere in the Anglo-Saxon world." Vulgarly but truly—Them's our sentiments.

The same Englishman remarks that even in the days of free trade with Canada, no English rail mill could have successfully competed with the Edgar Thompson rail mills in the manufacture of the rails which he saw making for the specifications of the Canadian Pacific Railway. He says "It would need an export bounty from the British Government and an import bounty from the Canadian Government to make trade follow the flag" in such a case.

The New York "Evening Post" has some caustic comment in its paragraphs on Montreal and Boston consolidated stock. Referring to the market on December 8th when the stock tumbled from $3\frac{5}{8}$ to $\frac{1}{2}$, it says that the collapse excited a great deal of interest "because of the notorious advertising

this stock has had. There had been flaring advertisements, sometimes amounting to more than half a page a day, with alleged guarantees in some of them that those buying at a certain price would have the privilege, at any time within thirty days of returning their shares to certain brokers at a price slightly below the figure paid. On some days more than 50,000 shares were reported dealt in, and in a single week the total ran above 200,000 shares—very heavy operations for a curb stock. The collapse to $\frac{1}{2}$ or 50 cents (par value \$5.00), really amounted to a drop from $72\frac{1}{2}$ per cent. to 10 per cent. of the par value, all within 48 hours." If the "Post" desires fuller information about this stock we fancy several Montreal people can give it; if not, then, there are many British Columbians who can supply it without charge.

A despatch from Rossländ, under date of Dec. 10th, reports that the mill of the Rossländ Power Company has closed down temporarily. It will be remembered that this company is a subsidiary corporation, owned and controlled by the Centre Star and War Eagle mining companies, organized to deal with the concentration by water of the pyrrhotite ores of the Rossländ district. The process used depended upon the feasibility of concentration of coarse ($\frac{1}{4}$ inch) particles of the ore by jigging, and of extraction of the gold values from the fines which passed a one-quarter inch mesh by a cyanide treatment. Results have shown that, the coarse particles do not concentrate satisfactorily by water, the grade remaining low as before concentration; and that the finer particles (which remained with the tails) were of too high a value in gold, from \$100 to \$200 per ton, to give a satisfactory extraction by cyaniding. It is proposed, we are informed, to attempt a recovery of the high values by tables and also to experiment as to the possible recovery of gold values that may be made by fine grinding and amalgamation. The non-success of the plant and the consequent delay and further experimentation are much to be regretted.

The Seventh Annual meeting of the Canadian Mining Institute will be held at the Windsor Hotel in Montreal on the 1st, 2nd and 3rd days of March, 1905. An interesting syllabus of papers is being arranged for, covering practice and progress in mining from Nova Scotia to British Columbia. The business to be transacted is also important, and a full meeting is anticipated.

Canadian Coal and the Coal Duty.

The large increase in the production of coal in Nova Scotia and Cape Breton, and the search for profitable markets which the Dominion Coal Co. has been (and is yet) making, has again aroused in some quarters the question of coal duties, and discussion of the possibility of extending the domestic market to include Ontario.

Probably the passage of resolutions by some local boards of trade to the effect that the duty on American soft coal should be taken off has been the inciting cause of the discussion referred to. The contention is made that geography, and hence freight rates, determines Montreal to be the extreme western market for Nova Scotia coal, whereas from Montreal westward to Winnipeg geographical conditions point to a southern source of supply—which means Pennsylvania, West Virginia and perhaps Ohio.

It is known in Montreal that Dominion coal influence has been exerted towards the deepening and widening of the canals so as to permit coal boats to reach Toronto, without having to barge their cargoes; it is also known that the energetic president of that corporation is by no means willing to have the Cape Breton mines go into a state of hibernation, as previously they have done, every winter. In fact, the shipments of coal to Mexico and South Africa are experiments in the line of finding profitable winter markets.

But although various and repeated attempts have been made to find European and foreign markets for Cape Breton coal, the results have never been successful, or, at any rate, only moderately successful. The nearest and best foreign market is Boston, but the quality of the Cape Breton coals is not good enough to compete with the coal from Pocahontas and other West Virginian mines, it is too friable to stand much handling and it gives too dense a smoke to be acceptable in that market as a fuel. Moreover, the cost of cutting Cape Breton coals and putting them on board is in excess of similar costs in West Virginia. That these costs are higher *necessarily* is not admitted by many competent managers, but that they are so under existing conditions is a fact.

Freights to Boston from Sydney are lower than from Montreal to Sydney; rates to Boston are 60 cents per ton, and have been lower, while the rate to Montreal was 90 cents, and has been much higher. Moreover, the New England market, if it could be obtained, would take three or four times the tonnage which Ontario is likely to take.

When the coal duty was imposed at the time the great so-called "National Policy" was proclaimed (1879), the output of the Nova Scotian coal mines was in the neighbourhood of 700,000 tons, to-day the output is seven times that amount. There seems, therefore, to be sound argument available on the part of those gentlemen who are seeking for abrogation of the coal duties. That the United States will follow suit and permit Canadian bituminous coal to enter free of duty does not at first seem so certain, but it must not be forgotten that the northwestern states, Montana, Washington and Oregon, together with California, would gladly welcome the chance to get our British Columbia coals free of duty. Conditions as to

coal have changed enormously in the West in the last ten years; the opening of the mines in the Crow's Nest region, in both Alberta and B. C., and the building of branch lines by both the Great Northern Railway and the C. P. R. have provided the Pacific slope with a fuel it has never had before as to quality. So, that the coal duty problem is no longer an eastern question for Nova Scotia and Massachusetts to settle, it is a national problem on which British Columbia and the northwestern states will insist on being heard, and their views will certainly be of value and, in all probability, will incline to the abolition of the duty.

Mexico, for Mining Engineers and Investors.

The old country of the Spaniards, the Republic of Mexico, has been attracting a good deal of capital and a not inconsiderable number of professional mining men during the last two or three years. Thanks to Porfirio Diaz, President of the Republic, Mexico now has a stable government and security for property and life throughout the greater portion of its domain. It has, in addition, a climate which is both most agreeable and healthful, and in most of the mineral regions the temperature has no such extremes as one would imagine from the tropical situation of the country. So far as outdoor operations are concerned the climate is more favorable than that of either Australia or South Africa and is even better than that of California when the whole 365 days of the year are considered.

The mining engineer, however, must not be misled by the irresponsible items he reads in the current press respecting the great opportunities presented by that country for "modern methods and greater savings." The engineer who goes to Mexico with the idea that he can improve everything that he may see in the methods employed there, and who swaggers in a domineering manner over the native foreman and superintendent, and assumes a conscious air of superiority, will find himself in very bad odour with the Mexicans and will probably regret his advent into that country. The importation of American labor has shown rather conclusively that costs are increased by the use of such labor as against the employment of native miners: this is particularly true of lode mining. The few large mining and metallurgical enterprises which have been operating in Mexico during the last half dozen years have been backed by financially powerful people who have only undertaken going concerns or proved propositions, and who have worked their property on the large scale which large financial resources permit.

From information personally received it appears that Mexico offers greater inducement at the present time to the small capitalist than to the large one. The individual, if he be an engineer, who goes into that country with a modest capital at his back and who will use common sense, much courtesy and sound business principles, will have little difficulty in buying, or optioning, small properties which, by the exercise of the qualities just mentioned, will return very handsome dividends upon the investment. Like other mining countries there are large numbers of small mines which can produce handsome profits for a limited time, and permanent

propositions are, perhaps, no more abundant than in other mining countries. Many of these smaller properties that are now working by native Mexicans are passed by, without consideration, by the professional man who is looking for a *large* mine. When investigated many of these little properties are found to be working on a hand-to-mouth principle, which is occasioned by the necessities of the owner, but which reveal to the practised eye of the engineer possibilities of a greatly enlarged output if operations could be increased through the aid of a little capital. One of our correspondents tells the story of a 12-inch free gold vein, the ore from which was packed on burros nine miles or more for treatment, although a good water power was within half a mile of the property. This mine was purchased by a young American who invested \$5,000.00 in a five-stamp mill which he erected within 3,000 feet of the property, and which, once it was in operation, returned to the owner a net profit of \$1,500.00 a month. Our correspondent informs us that there are many sections throughout Mexico in which similar conditions exist, and in which a young, energetic and practical man with a few thousands can do as well, if not better, than in the case just cited. But for professional men to go there without capital for investment, and to depend upon the earnings of professional fees, is to court serious disappointment.

For the investor the opportunities are similar to those of the professional man—small capital can find many opportunities for profitable investment, not alone in mines but in small metallurgical enterprises such as furnaces for custom smelting of ores.

We are led to these remarks because of the increasing number of Canadian engineers who are tending towards the Mexican republic. It is the wish of the REVIEW to safeguard these men against probable disappointment and also to keep as many of them as possible in Canada where the lack of really competent mining engineers is most obvious. We cannot blame our older men for seeking a more congenial climate, nor the capitalist for desiring returns continuously for twelve months instead of having his profitable season limited to from four months in the Yukon to, say, six or seven months in Quebec or Ontario, but we clearly point out that the field for the capitalist in Mexico is rather one for small amounts than one for the investment of large sums.

An Installation of Electric Power for a Quebec Mine.

The old and important Eustis Mine at Capelton, P.Q., which has been a steady producer for over thirty years of sulphur, copper and the precious metals, has recently had important alterations made in the motive power by which its mining operations are conducted. Electricity generated by water power has been substituted for steam power, and the installation has been so arranged that in case of deficiency in, or stoppage of, the electric power a delay of only a few hours will substitute steam, so that operations under ground need not be suspended.

The ore bed of this mine, which belongs to a private corporation known as the Eustis Mining Company, is an im-

mense pyritiferous deposit yielding on an average three per cent to four per cent. of copper and varying small amounts of silver and gold, i.e., from two ounces to six ounces of silver to the ton, and fractional parts of an ounce of gold.

The deposit has been opened by two incline shafts of which No. 1 is 2,600 feet long, and No. 2 is 2,350 feet from the surface. The mine was originally opened on the top of a hill, but some years ago a tunnel was driven, some one thousand feet, to cut the deposit at a depth of five hundred feet below the old shaft mouth. All ore extracted is now delivered through this tunnel.

The annual output of the property is from 25,000 to 30,000 tons, and about 150 persons are employed.

The electricity for the plant is generated by a water power situated on the Coaticook River, about one mile above its junction with the Massawippi. At this point a wooden dam, about fifteen feet high, has been built. At one end of this dam are placed the head-gates from which a wooden pipe, seven feet in diameter, carries the water to the power house situated 340 feet farther down the river. Just outside of the power house this wooden pipe is led into a twelve-foot stand pipe or penstock, thirty feet in height, to which is connected, directly opposite the wooden pipe, a steel tube, also seven feet in diameter, which takes the water from this stand-pipe directly to the turbine case. The stand-pipe is provided with an overflow, six feet above the normal water level, designed to take care of the back rush of water when the wheel gates are suddenly closed, but in practice it has been found to be seldom necessary. The water wheels are of the Crocker pattern and were built by the Jenckes Machine Company, Ltd., of Sherbrooke, P.Q.; they consist of two pairs of eighteen inch wheels mounted on one shaft. The wheels are set in one steel case, the setting being of the type known as "central discharge," that is each pair of wheels discharges into a central draught compartment which is provided with a single draft tube or discharge pipe. The turbines were designed to furnish 450 h.p. at a speed of five hundred revolutions per minute under a head of thirty-two feet, but the plant is now running under a head of thirty-six feet. In the design of the power house provision has been made for a third pair of water wheels, and these will be placed in an extension of the present sheet steel casing; the inlet tube is large enough to supply the three pairs of wheels without making any deficiency of water for anyone of the three pairs.

The turbine shaft is directly connected to a 200 K.W. Westinghouse three phase 2,200 volt, 25 cycle, rotary field generator. The exciter has 7½ K.W. capacity and is operated at 875 revolutions per minute by a separate 9-inch Crocker turbine, which also is directly connected. The electrical controlling and connection apparatus is mounted on a single panel switchboard. The leads from the machine are brought to the board through a tile pipe laid under the floor. The power line from the switchboard is taken through the end wall of the building across the river to the mines (a distance of about two miles), and consists of three No. 1 hard drawn copper wires, spaced eighteen inches apart, in the form of a triangle on the poles.

At the receiving end of the power circuit there are three stations, one for the air compressor, one for the hoist, and one for the crushing machinery. The air compressor house is placed just outside the entrance to the mine tunnel. The compressor is of the two stage type and is a Canadian Rand Drill Company's class D-2, belt driven, cross compound machine, fitted with a Rand water tube intercooler. The cylinders are 13 inches by 18 inches and 20 inches by 18 inches, with Corliss inlet valves on the low pressure cylinder. The compressor is driven by a 100 H.P. Westinghouse, 2,000 volt, constant speed, induction motor controlled by a switchboard on which are mounted the starting switch, fuses, etc.

The hoist is situated at the inner end of an adit tunnel, 1,000 feet long, through which the power is carried by three No. 4 weather proof wires, which are further protected by being placed in a heavy wooden box bolted to the rock wall of the tunnel. This hoist, which was designed and built by the Jenckes Machine Company, Limited, of Sherbrooke, Que., is placed about twenty-five feet above the tunnel level in a chamber cut out of the solid rock. It has two cast iron drums, 72 inches diameter by 48 inches face, mounted on separate shafts which are 6 5-16 inches in diameter; both drums are driven by one motor through a double set of gears. The drums are connected to the motor by friction clutches of the Lane type, and are provided with band brakes and indicators, which show the position of the skips in the shaft at all times. The clutches and brakes were designed to be controlled by levers operated either by air, or by hand; in practice, so far, only the hand levers are used. The motor for the hoist is a Westinghouse 150 H.P. three-phase, 2,000 volt, type F, variable speed induction motor, with a normal speed of 480 revolutions a minute. The controller is mounted on the engineer's platform and has seven steps; it acts by connecting different resistances, in series, with the rotating part of the motor. These resistances are entirely separate from the machine, being connected with it by means of three slip rings.

The mine incline varies from forty-five degrees to twenty degrees as depth is obtained. At present it has a depth of over 2,000 feet, and is equipped with double tracks of four feet gauge laid with 56 pound steel rails. The skips are self dumping and are not run in balance. These skips discharge into bins, the bottoms of which are about five feet above the tunnel track, which allows the cars running on the latter to be loaded through hoppers. The nominal speed of the hoist is five hundred feet a minute, but it has been found in actual practice that it only takes from five to six minutes for the skip to come from the bottom of the mine, discharge its load, and return again to the bottom. The total load hoisted (rope, skip and ore), is from 7½ to 8 tons.

The crushing plant is situated by the side of the railroad track, about three-quarters of a mile from the mouth of the tunnel. This plant is supplied with power by a branch from the main line, and the machinery at present consists of a 20 inches by 6 inches Farrel crusher with a set of geared rolls used for reducing the hard ore to fines. This hard ore occurs in parts of the mine but not in all. The two machines (crusher and rolls), are driven by a 50-horse power, 200 volt, slow

speed, type C, Westinghouse induction motor, supplied through two 25 K.W. transformers. Electrical measurements indicate that these machines take about 40 H.P. when crushing eight tons per hour. This plant is only a temporary one, to be used until the new mill, now under construction, is completed. This new mill will be driven throughout by 2,000 volt motors. It is designed to handle all the ore from the mine, and will both dress the rich ore for shipping and crush and concentrate those ores which are too lean to ship.

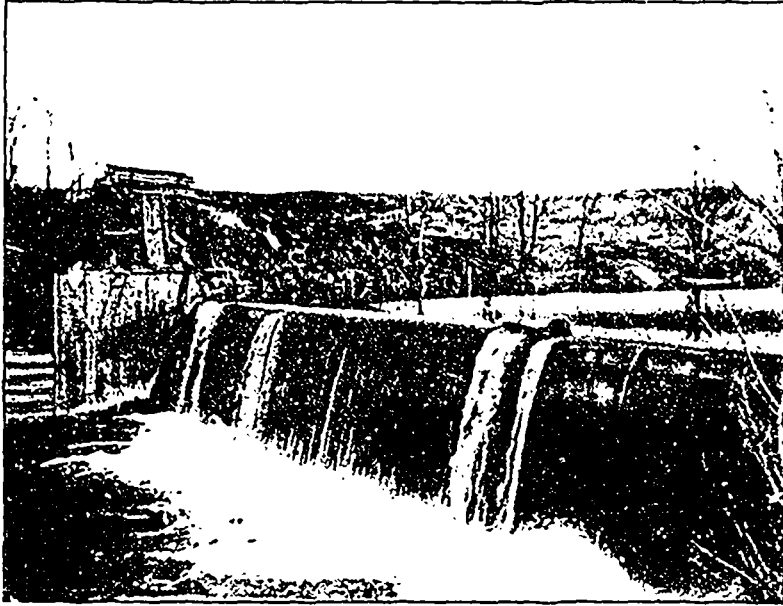
The hoist is so designed that, in case of accident, it may be operated by steam power by simply coupling an engine to each end of the countershaft of the new hoist, an operation which will require very little time. Steam will be supplied to the engines by old boilers, located about fifty feet away, the stacks from which consist of two tile pipes laid up the old shaft to the surface above.

The old compound steam, single stage air compressor, built by the Canadian Rand Drill Company, which is located just over the mouth of the adit tunnel, can be used in the case of low water, or, of accident to the electrically driven compressor. Steam is supplied to this old compressor by the two 125 H. P. boilers which formerly ran it.

In a recent test of the new plant it was found that, when double the full load was on the generators (a 100 per cent overload test) the level of the water in the stand pipe was below its normal point, and that the water in the tail race was above the normal point; these water levels, both above and below, fluctuated rapidly and it was difficult to gauge them accurately with the means which were on hand at the time of the test. The actual head of water on the turbines is supposed to have been thirty-three feet, and if this assumption is correct the water wheels would have used, theoretically, 706 horse power of water, of which amount about 18 H. P. was consumed in the exciting generator. Allowing the main generator to have used 688 H. P. and on the assumption that it developed one hundred amperes per phase at a voltage of 2,160, and on the further assumption that the efficiency of the generator at this overload was 92 per cent., and that the power factor of the circuit (water rheostat) was unity, the brake horse power developed would have been about 543 H. P., which would give an efficiency of 78.9 per cent. for the water wheels. As the electrical measurements were not accurately taken, and as the head of water (as already mentioned), fluctuated, the results are doubtful, but the probability is that the efficiency was less, rather than greater, than the above figures. Similar tests made with the wheels operating at partial load, and, therefore, partial gates, showed that the efficiencies at 271 and 390 E. H. P. were respectively 51 per cent. and 65 per cent. approximately. The 271 E. H. P. would represent the conditions under which the plant operates while the hoist and the compressor are in use.

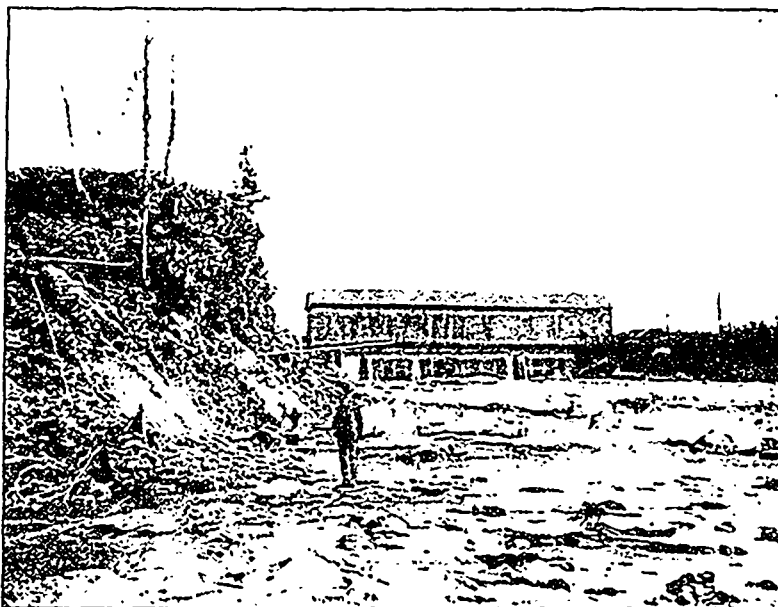
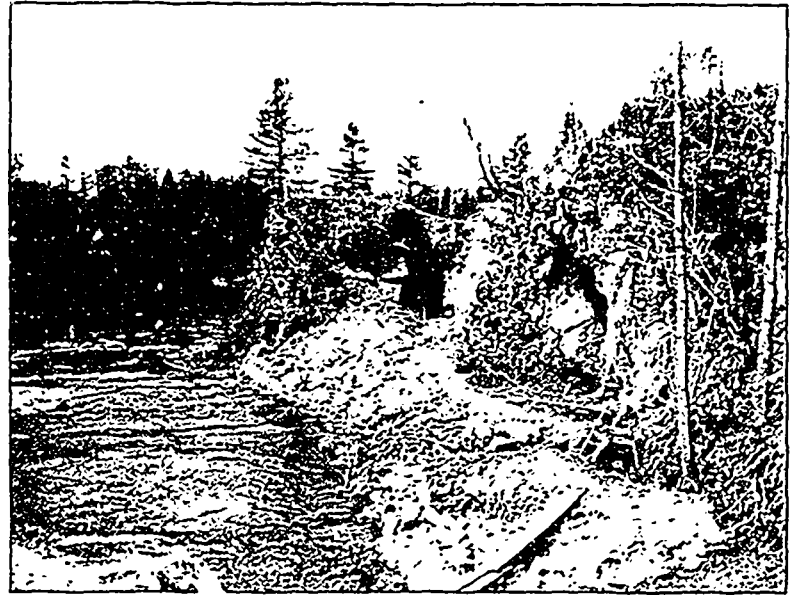
As the hoisting plant is quite unusual in its use of induction motors the following consumption of a power for the various stages of the hoist is given. These figures were taken by Mr. Davis (the electrician in charge), and are readings from his electrical instruments.

The method adopted in hoisting is, on receipt of the mine

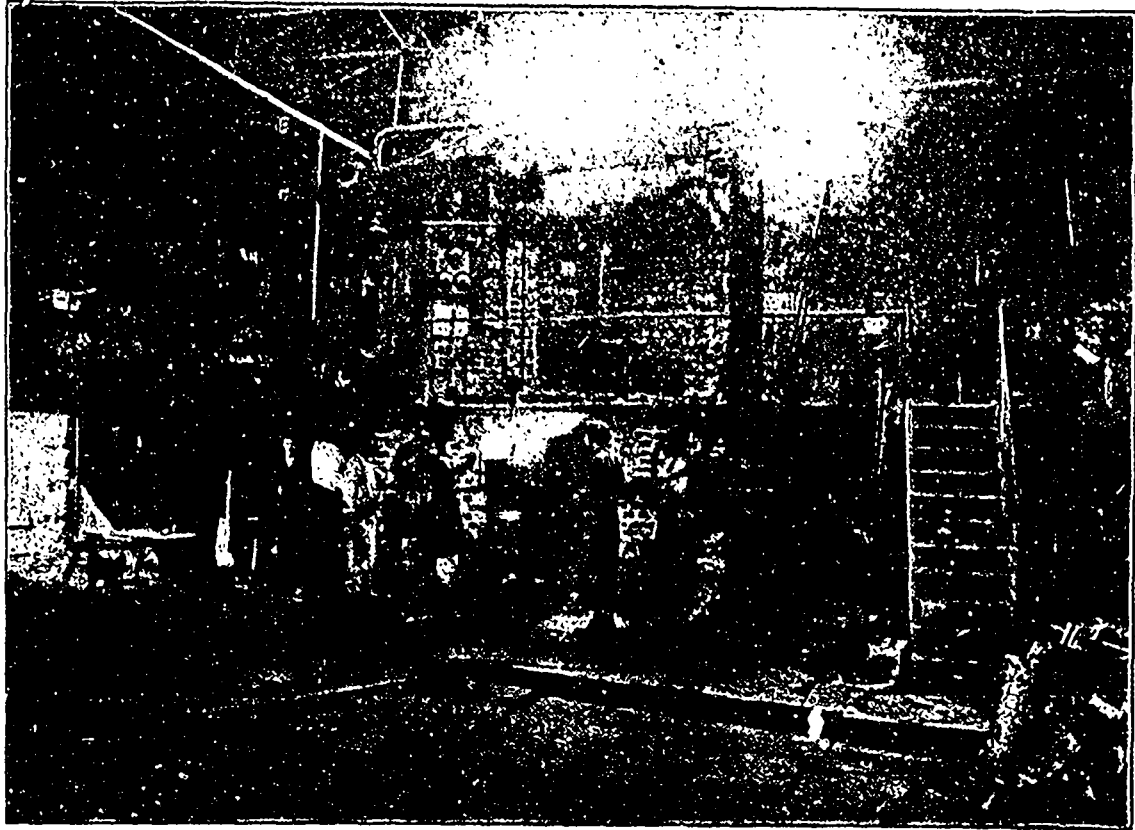


VIEW OF THE DAM ON COATICOOK RIVER,
EUSTIS MINING CO

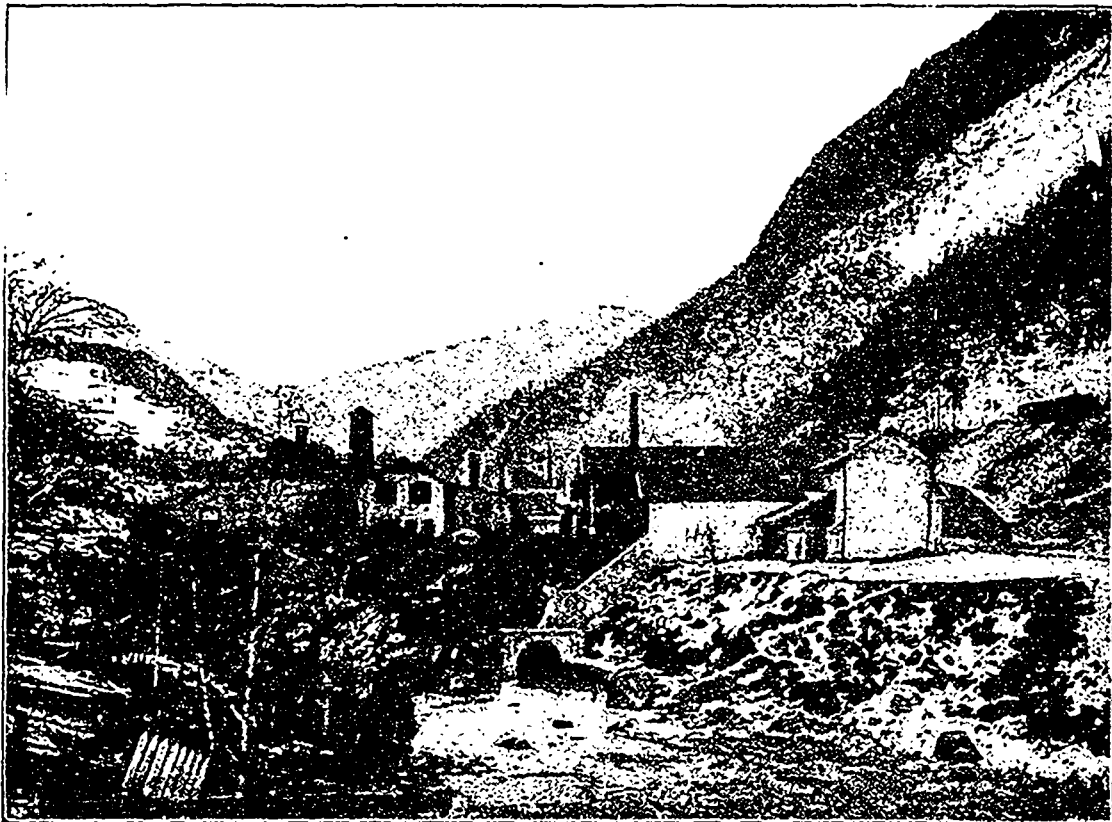
SIDE HILL EXCAVATION FOR CIRCULAR WOODEN FLUME,
7 FEET IN DIAMETER



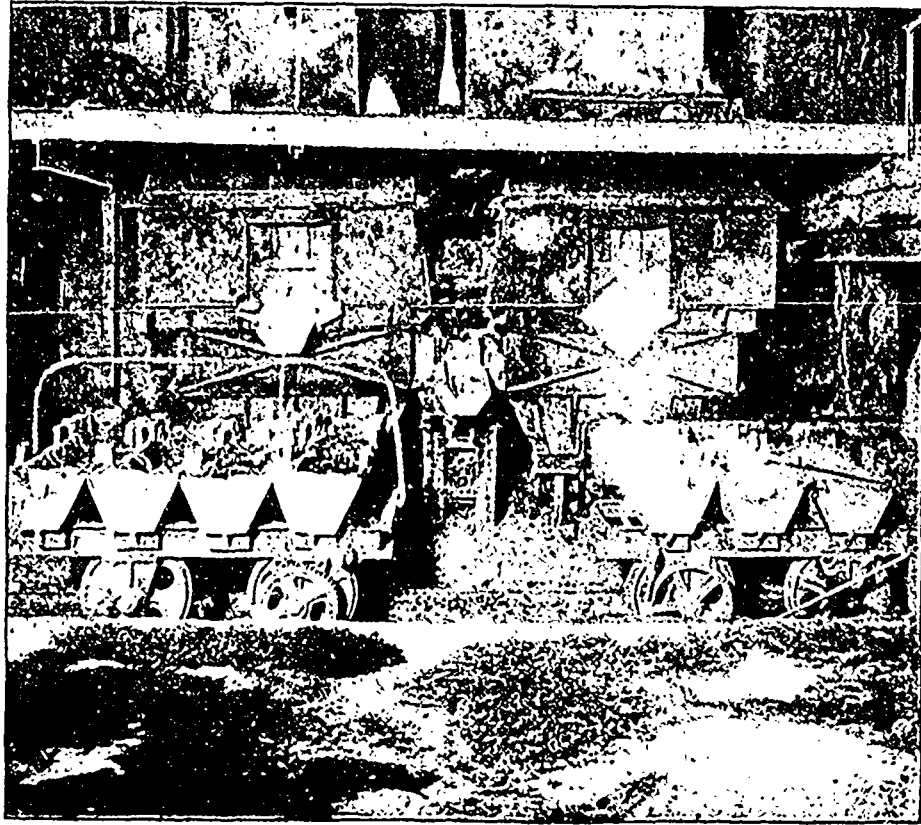
COATICOOK RIVER BELOW THE POWER DAM,
SHOWING FALL OF 15 FEET



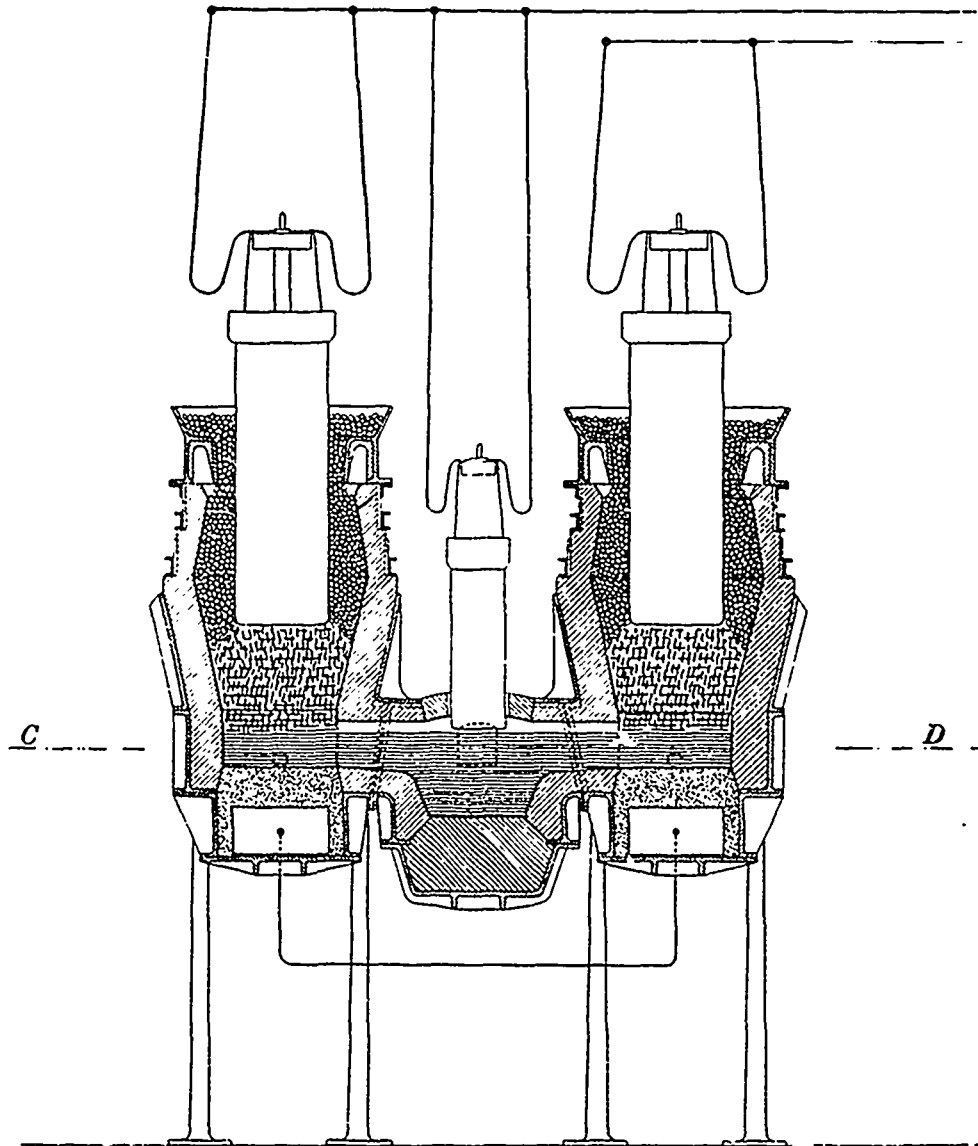
GENERAL VIEW OF KJELLIN ELECTRIC FURNACE AT GYSINGE, SWEDEN.



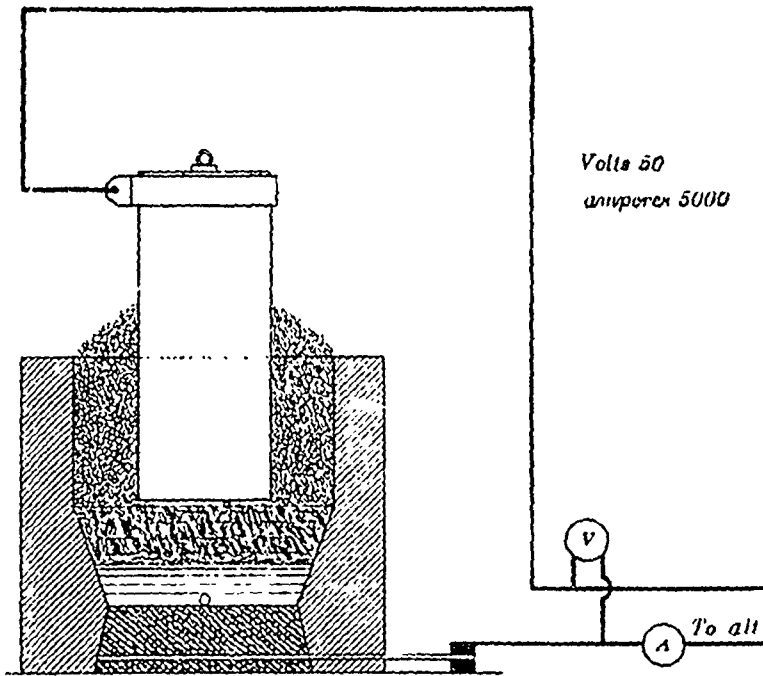
THE ELECTRIC SMELTING PLANT AT LA PRAZ, FRANCE.



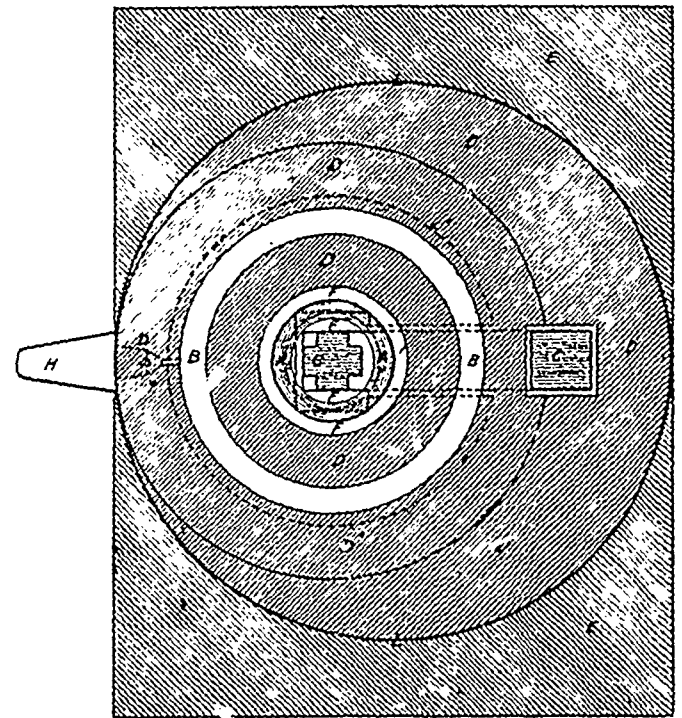
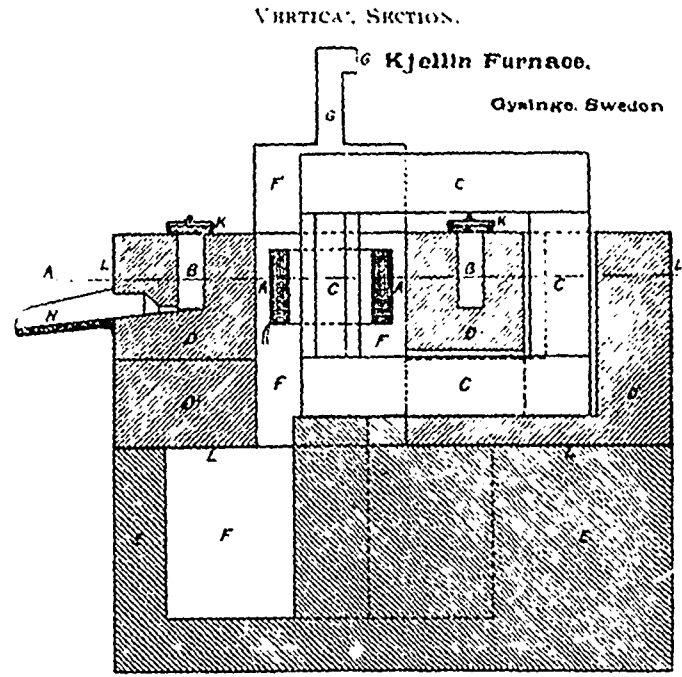
THE KELLER FURNACE AT LIVET, ISERE, FRANCE.



VERTICAL SECTION THROUGH A FOUR HEARTH KELLER FURNACE.



SECTION OF FURNACE AT LA PRAZ, FRANCE, SHOWING ELECTRICAL CONNECTIONS.



Section A B
HORIZONTAL SECTION, KJELLIN FURNACE.

signal to start the motor light, and, after it has gotten up to a fair speed to pick up the load with the friction and then throw the controller over to full speed. It will be noticed that this method of starting saved nearly 100 E.H.P. over the method of starting the load when the motor was at rest.

Starting Motor Light.

Instantaneous starting current.	96 H.P. for 5 seconds.
After starting with load on.	126 " " 10 "
Full load full speed.	107 " "

Starting Motor with Load On.

Starting current.	194 H.P. for 20 seconds.
---------------------------	--------------------------

This adoption of electricity for motive power in mining is the first we have knowledge of in Quebec; in British Columbia the Granby Consolidated Co. have made an electric installation for tramming, crusher and other purposes. There are many places in the Dominion where a substitution of electricity for steam would be most advantageous and economical. Had the original Montreal and London Company, operating the Dufferin Mine in Nova Scotia, utilized the water power of the Salmon River, that famous and still valuable gold property would not have cost its shareholders so much money. Electricity and good management will provide many dividends yet from this Nova Scotia mine, which has gotten a bad name through unscrupulous financiering and incompetent management.

Excerpts From the Report of the Electric Smelting Commission.

The following excerpts from the official report of the Commission appointed to investigate the Electro-Thermic processes are given to our readers as presenting, briefly, the salient points of the three furnaces which have actually done commercial work.

Kjellin Process.

At the Gysinge works, steel of superior quality is made by the smelting together of charcoal-pig and scrap in electric furnaces of the Induction type, i.e., furnaces without electrodes. The process does not permit the purification of the materials entering into the composition of the steel produced, the quality of the steel depending entirely upon the purity of the component materials employed. The process, therefore, corresponds to the crucible steel process, but has certain advantages over the latter, in that the melted material is at no time during the operation exposed to gases, which absorbed, deleteriously affect the quality of the product; moreover, the absence of electrodes, employed in all other classes of electric furnaces, avoids contamination of the molten material with the impurities which may be contained in the electrodes.

The Furnace.

Description:—

The furnace, of 225 H.P. capacity, is the invention of Mr. Kjellin, and is of the induction type, corresponding to a step-down transformer. Fig. 1 represents a vertical section through the tap-spout, and Fig. 2 a horizontal section through A B. The primary A A fig. 1 consists of a coil of insulated copper wire wound about one leg of the magnetic circuit C C C C. The secondary is formed by the charge contained in

the annular groove B B. To the primary an alternating current of 90 amperes and 3,000 volts is delivered. This current induces in the charge forming the single turn of the secondary, according to Mr. Kjellin, a current of 3,000 amperes at 7 volts. The conversion of electric energy due to the resistance of the charge takes place, therefore, in the substance of the charge.

The furnace consists of a cylindrical iron casing L L, partly closed at the base, resting upon the brick foundation E E. The casing is lined with fire brick D' D', and the portion D D (as shown in figs. 1 and 2) is filled in with the exception of the annular groove B B, and the space F with magnesite or silica brick, according as a basic or acid lining is required for the groove, which forms the melting space or crucible.

The space F F, surmounted by the iron cylinder F', to which the pipe G is attached, serves the purpose of cooling the primary by the draft of air passing through it. In addition to the air draft, water circulation is employed to keep down the temperature in the space occupied by the primary. K K are covers for the annular crucible, and H the tapping spout.

The upper part of the furnace is at the same level as the working floor and the charging is effected by simply removing the covers K K, and putting in the material. Since the heat is produced in the metal contained in the annular crucible, the slag which has formed is at a much lower temperature than in other steel furnaces, and as a consequence the workmen suffer little from the heat.

The following figures, which could not be determined by the Commission relating to the efficiency of the furnace, are given by Mr. Kjellin:

From a series of trial runs, the production with this furnace averaged 4,100 kgs. in 24 hours, with a power of 165 kilowatts, or 225 electric horse-power. The loss of heat by radiation, transformation, etc., at a temperature of 1,400 degrees C, amounted to 80 kilowatts, this amount of energy being required to keep the temperature constant at 1,400 degrees C.

The temperature of the fluid metal at tapping is from 1,600 degrees to 1,700 degrees C.

The total efficiency of the furnace is 45½ per cent.

Plate I is a general view of the furnace in the act of being tapped.

The cost of a furnace of this type of 600 H.P. is, according to Mr. Kjellin, about \$4,000.

Mr. Brown reports for charges Nos. 546 and 547 an absorption of electric energy per ton of product of 0.116 and 0.145 electric horse-power years respectively.

Mr. Harbord reports the estimated cost of steel by the Kjellin process to be \$34.00 per ton of 2,000 lbs.

The capacity of the furnace is comparatively small, but for a larger plant Mr. Kjellin states that three furnaces of the pattern now used might be joined into a compound furnace, and supplied with a 3-phase alternating current. This would treble the capacity and reduce the wages, since the number of workmen now employed in operating the one furnace could attend to all three.

The La Praz Process.

Steel at the works of the Société Electro-Metallurgique Française at La Praz is made from scrap melted down, purified by the making of a number of slags, and carbonized in the furnace by carburité. This process, unlike that adopted at Gysinge, permits of the purification of the materials employed, and different grades of steel are made without difficulty.

The furnace is of the tilting pattern. It consists of an iron casing lined with dolomite brick, and magnesite brick around the openings. The hearth is formed of crushed dolomite,

rammed on top of the dolomite brick lining of the bottom of the iron casing. Two electrodes pass through the roof of the furnace, which, in the Kortfors furnace, were water jacketed for a short distance above and below their passage through the iron casing of the roof. The current passes from one electrode through the narrow air gap left between the electrodes and the slag line, into and through the slag to the molten metal, along it, through the slag and second air gap, to the other electrode. An alternating current of 4,000 amperes and 110 volts was delivered to the electrodes. The intensity of the current passing through the bath is regulated by adjusting the width of the air gap between the electrodes and the slag line. This adjustment is effected either by hand or automatically by a specially constructed regulator.

Mr. Héroult states that the cost of the furnace (charge 2,500 kgs.), building and necessary equipment, such as ladles, moulds, crane, etc., is about 50,000 francs, or \$10,000. This does not include the turbines and electrical machinery.

Electrodes.

The electrodes are square prisms 360^{mm} on the side and 170^{mm} long. They are made from retort coke which contains from one per cent. to two per cent. of sulphur. The binding material is tar.

The coke delivered at La Praz costs 50 francs per metric ton, and the finished electrode 10 centimes per Kg.

The electrodes are not entirely consumed, and the short ends remaining are worked over into new electrodes, at a cost of two centimes per Kg.

The plant for making electrodes for one furnace is estimated by Mr. Héroult to cost \$5,000.

In a memorandum furnished me by Mr. Harbord, at La Praz, the estimated cost of converting scrap into steel by the Héroult process, exclusive of cost of scrap and metal, amounted to \$14.00 per ton of product.

Keller Process.

The furnaces employed for these experiments were the furnaces used in the regular work of making, by the electric process, the various ferros such as ferro-silicon, ferro-chrome, etc. The company, at the time of our visit, was engaged in filling a rush order for ferro-silicon, but generously interrupted their pressing regular work to undertake the making of the experiments for the Commission.

Furnace.

Description:—

The furnace is of the resistance type, and consists, see Plate X, of two iron casings A and B of square cross-section, forming two shafts communicating with each other at their lower ends by means of a lateral canal. The casings are lined with refractory material. Two different classes of furnaces were used for the experiments. In the case of the first furnace employed, the lateral canal was widened out at its centre to form a reservoir for the accumulating melted metal, from which it could be tapped after the slag had been withdrawn from tap-holes, one for each shaft, situated at the lower end of the shaft, at a higher level than the tap-hole of the reservoir.

The base of each shaft is provided with a carbon block. These blocks are in electric communication on the exterior of the furnace by means of copper bars. The carbon electrodes to which the electric current is distributed pass two-thirds of their length into the shaft.

Method of Charging.

In starting the furnace the charge is introduced between the carbon blocks of the base and the ends of the electrodes,

which latter are then in their lowest position. The current passes from one electrode through the material to be reduced to the carbon block, from thence outside of the furnace by means of the copper conductor to the other carbon block, through the charge in the second shaft, and to the other electrode. The current meeting in the two shafts with the resistance of the charge, the latter is heated, the reduced metal flowing along the canal conducts the electric current from one electrode internally to the other electrode. The exterior current diminishes as the amount of reduced metal increases. The electrodes are now raised, the charging continues, until finally the electrodes occupy their normal positions, and the shafts below the electrodes, and between the electrodes and the sides of the shafts, are completely occupied by the charge. Under these conditions but a small current flows through the external conductor, the main current passing within the furnace from electrode to electrode. This ingenious arrangement of providing a shunt for the current enables the furnaces to be worked continuously, without at any time varying excessively the load on the alternator.

Electrodes.

The electrodes are formed by an assemblage of four electrodes of square cross-section, 280 millimeter on the side, into a single mass of square cross-section, 850 millimeter on the side, and 1.4 meters long.

The dimensions, measured after forty-eight hours of working, showed that the decrease of the electrodes in length was very slight. This can be understood when it is considered that the electrodes are but little affected by the passage of a current of relatively low density; the parts of the electrodes not in contact with the charge do not become heated, and the heated ends are completely submerged in a reducing medium.

Two electrodes, which had already been in operation for forty-eight hours at the beginning of the test, were still in operation thirteen days later. On the date of our departure these electrodes were still one meter long, their original length having been 1.4 meters.

Experiments.

Three sets of experiments were made for the Commission:

- 1st.—Electric reduction of iron ore and obtaining different classes of pig: grey, white and mottled.
- 2nd.—Electric reduction of iron ore containing a definite amount of carbon in the charge, with a view of ascertaining the amount of electric energy absorbed in the production of one ton of pig iron.
- 3rd.—The manufacture of ordinary steel of good quality from the pig manufactured in the preceding experiments.

The different classes of pig iron, grey, white and mottled, were obtained without difficulty.

Throughout the experiments the furnaces worked quietly, and without the slightest accident; the gases discharging on top in flickering flames, showing that the gas resulting from the reduction of the ore escaped at low pressure. The workmen were ordinary Italian laborers, without any special training.

The energy absorbed per ton of pig produced is reported by Mr. Brown to be 0.475 E.H.P. years for the run, with furnace of 1,000 H.P. capacity, with an average current of 11,000 amperes at 60 volts, and 0.226 E.H.P. years for the run with furnace of 308 H.P. capacity, with an average current of 7,000 amperes at 55 volts.

Cost of Production of Pig by the Keller Process.

Mr. Keller's estimate of cost per ton of product, based on the energy consumed in the second experiment, and found to be 0.226 E.H.P. years, is as follows:—

1. Ore (Hematite, 55 per cent. iron), 1.842 tons at \$1.50 per ton	\$ 2.76
2. Coke, 0.34 tons, at \$7.00 per ton	2.38
3. Consumption of electrodes \$45.00 per ton, 34 lbs per ton of iron	0.77
4. Lime, 300 lbs., at \$2.00 per ton	0.30
5. Labor, at \$1.50 per day	0.94
6. Electric energy, 0.226 H.P. years, at \$10 per H.P. year	2.26
7. Miscellaneous materials	0.40
8. Repairs and maintenance	0.20
9. General expenses	0.20
10 Amortization (machinery and buildings)	0.50
Total, exclusive of Royalty	\$10.71

Mr. Harbord has furnished reasons for assuming the mean of the determinations of the two sets of experiments made, i.e., 0.350 E.H.P. years, to be a safer figure on which to base the calculation of cost per ton of pig produce^d. With this change in the amount of E.H.P., and 100 lbs. additional of lime, the cost per ton of pig is \$12.05.

Machine Coal Cutting.

The following resumé of the advantages and disadvantages of using coal cutting machinery where circumstances warrant it is excerpted from a paper by Mr. Charles Bell, which was printed in a recent issue of "The Science and Art of Mining." That so small a percentage of coal in Great Britain is won by machines has been noted by coal men and machinery supply houses, and has been a matter of surprise. The use of such machinery obviates any difficulties due to idiosyncrasies of miners, and secures a regular output, and an approximately fixed standard of cost.

The advantages claimed by machine coal cutting are as follows:—

1.—A reduction in the cost of getting the coal. The amount of reduction varies owing to the local conditions of the mine. There are some cases where a saving of 1s. per ton has been effected, while in others the difference runs from 3d. to 9d. per ton less than by hand labour.

2.—An increased production per man. The increase of coal got per man employed, by machine coal cutting, is exceedingly great, varying from fifty to seventy-five per cent. more. The greater output from a given length of face implies that less pit room will be required, concentration of the workings, and consequently an indirect saving of production. A less number of men will be required for the same output, which means a saving in houses and rent.

3.—An increased percentage of round coal. Where the selling price depends upon the size of the coal, it is evident that any increase in the percentage of round coal is a matter of great importance. In hand labour a large percentage of the seam is cut to waste by the hewer in kirving. In coal cutting by machines only a few inches is cut out, and sometimes the cutting is performed in the under-clay. The increase, however, is not so great in a seam where the hand cutting is performed in the under-clay and not in the coal itself. The average amount of increase varies from seven to twenty per cent.

4.—Thin seams can be worked to advantage. Coal-cutting

machines compete more successfully in thin seams than in thick ones, as it replaces more costly labour, and, therefore, raises the value of the thin seams to a nearer comparison with the thick seams. Seams only fourteen inches in thickness have been worked to advantage by machinery, which could not be said of hand labour.

5.—The rate of accidents is considerably reduced. The position of the miner is greatly improved by machine cutting, due to the quick advancement of the working face and the abolition of the peculiar attitude in kirving. In America, where coal cutters are extensively used, we find that the death-rate by accidents is considerably reduced where machines are working, and that mines where the largest percentage of the coal was produced by machines had the lowest death-rate. In our own country, in the district of Yorkshire, we are told that 1,270,000 tons had been produced in the Silkstone seam by machines for the same number of reported accidents as 360,000 tons by hand labour.

6.—The cost of timber and explosives is reduced. By the rapid advancement of the face the timber drawn from the goaf is in a fairly good state, and can be used again. The long line of face, together with the deep undercut, had, in some cases, rendered the use of explosives unnecessary; in others, the number of shots had been considerably reduced.

The chief disadvantages to the use of these cutters are:—

1.—The enormous first cost. A very large sum of money has to be expended in the purchase of boilers, air compressors or electric generators, and foundations for the surface machinery; then there is the long length of pipes or cable, the wear and tear of the machinery, the cost of maintenance, and the interest on capital.

2.—Favourable terms for hand labour. In some coal-fields we find special favourable terms for hand labour arranged, and coal-cutting machines are never likely to be introduced.

3.—Difficulty encountered with bad roofs. A great amount of difficulty is sometimes encountered in a seam with a bad roof. The roof may be so tender as to require very careful timbering, which prevents the rapid movement of the machines along the face, and, therefore, the amount of work got out of the machine is very small.

4.—Seams not adapted to coal-cutting by machinery. We are told that, owing to the makers not readily adapting their machines to the varying difficulties of different seams, there was a considerable amount of difficulty to be overcome to enable these particular seams to be worked advantageously. A faulty seam presents a great disadvantage to the use of the machines.

The Huntington-Herberlein Process.

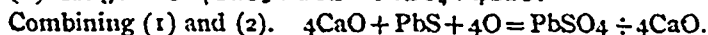
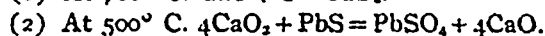
(From the "Lead and Zinc News.")

An interesting description of the Huntington-Herberlein process has been contributed by Donald Clark to the "Mexican Investor." This process is being installed by the Penoles Mining Company at Mapimi, Mexico, and is the first plant of its character installed on this continent.

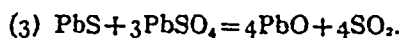
The Huntington-Herberlein process was patented in 1897 and is based upon the fact that galena can be desulphurized by mixing it with lime and blowing a current of air through the mixture.

If the temperature is dull red at the start, no additional source of heat is necessary because the reaction causes a great rise in temperature. The chemistry of the process cannot be said at present to have been worked out in detail. The patentees found that by mixing lime and galena together and heat-

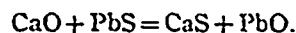
ing the mixture in air to seven hundred degrees C. and then allowing to cool to a dull red heat, that oxygen was given off, sulphur dioxide being simultaneously evolved. At this point, if air is forced through the mixture, the temperature rises and the operation becomes continuous, the oxygen acting on the galena as long as any sulphur dioxide remains in the mixture. Concentrated fumes of sulphur dioxide are given off and the mixture gradually fuses to a mass of lead oxide in conjunction with the gangue of the ore treated. The reactions provisionally given by patentees are :—



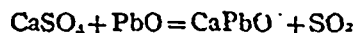
In other words, lime heated to 700 degrees C. absorbs oxygen and becomes dioxide, which reverts to lime again on cooling, but if lead sulphide is present this is attacked and converted into sulphate. After the change, at the temperature due to these reactions, lead sulphide reacts with lead sulphate, giving lead oxide and sulphur dioxide.



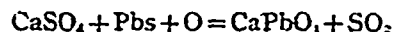
These reactions, given by the patentee, are not satisfactory, since calcium dioxide is only formed at low temperatures and is readily decomposed on gently warming it; lead oxide, however, combining with oxygen under suitable conditions at a temperature not exceeding 450 degrees C. forms a higher oxide, and it is probable that this unites with the lime to form calcium plumbate. The reaction between sulphides and lime, when intimately mixed and heated, may be put down as



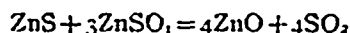
In contact with the air the calcium sulphide oxidizes rapidly to sulphite, then to sulphate, then reacts with lead oxide giving calcium plumbate and sulphur dioxide.



Further, calcium sulphate will also react with galena, giving calcium sulphide and lead sulphate; the calcium sulphide is oxidized (by air blown through) to calcium sulphate again, the ultimate reaction being



In all cases the action is oxidizing and desulphurizing. It was found that oxides of iron and manganese will, to a certain extent, serve the same purpose as lime. In the case of zinc sulphide the decomposition is probably due to the interaction of sulphide and sulphate.



The process has now been adopted by the Broken Hill Proprietary Company at their works at Port Pirie, Australia; the Tasmanian Smelting Company, West Australia, and the Sulphide Corporation's works at Cockle Creek, New South Wales. The operations carried on at the Tasmania Smelting Works comprise mixing pulverized limestone, galena and slag-making materials and introducing the mixture either into hand-rabbed reverberatories or mechanical furnaces with rotating hearths. After a roast, during which the materials have become well mixed and most of the limestone converted into sulphate and about half of the sulphur expelled, the granular product is run, while still hot, into the Huntington-Herberlein converters. These consist of inverted sheet-iron cones, hung on trunnions, the diameter being 5 feet 6 inches and the depth 5 feet. A perforated plate or colander is placed as a diaphragm

across the apex of the cone, the small conical space below serving as a wind box into which compressed air is forced, a hood above the converter serves to carry away waste gases. As soon as the vessel is filled, air under a pressure of 17 oz., is forced through the mass, which rapidly warms up, giving off sulphur dioxide abundantly. The temperature rises and the mixture fuses, and in from two to four hours the action is complete. The sulphur is reduced from ten to one per cent., and the whole mass is fritted and fused together. The converter is emptied by inverting it, when the sintered mass falls out and is broken up and sent to the smelters. There are 12 converters, of the size indicated, for the two mechanical furnaces, of 15 feet diameter. Larger converters of the same type were erected to deal with the product from the hand-rabbed roasters.

At Cockle Creek, New South Wales, the galena concentrate is reduced to 1.6 mm., the limestone is crushed down to from 10 to 16 mesh, silica is also added, if it does not exist in the ore, so that, excluding the lead, the rest of the bases will be in such proportion as to form a slag running about 20 per cent. silica. The mixture may contain from 25 to 50 per cent. lead, and from 6 to 9 per cent. lime; if too much lime is added the final product is powdery, instead of being in a fused condition. This is given a preliminary roast in a Godfrey calciner. This furnace has a rotating bed and a low dome-shaped roof. Ore is fed through a hopper at the center, and deflected outward by blades attached to a fixed radial arm. At each revolution the ore is turned over and moved outward, the amount of deflection of the blades, which are adjustable, and rate of rotation of the bed, determining the output. The furnace for supplying the hot air is placed at one side, and the gases are made to travel over the ore before leaving by a flue. A constant stream of hot semi-roasted ore is discharged through a slot at the circumference of the roaster. This may contain from 12 to 6.5 per cent. of sulphur, but from 6.5 to 8 per cent. is held to be the most suitable quantity for the subsequent operations. Thorough mixing is of the utmost importance, for if this is not done the mass will "volcano" in the converter, that is, channels will form in the mass through which the gases will escape, leaving lumps of untouched material alongside. The action can be started if a little red-hot ore is run into the converter and cold ore placed above it; the whole mass will become heated up, and the products will fuse, and sinter into a homogeneous mass showing none of the original ingredients. At Cockle Creek the time taken is stated to be five hours; a small air pressure is turned on at first, and ultimately it is increased up to 20 ounces.

Operations at Port Pirie are conducted on a much larger scale. A mixture of pulverized galena, powdery limestones, ironstone and sand is fed into Ropp furnaces, of which there are five, by means of a fluted roll placed at the base of a hopper. Each roaster deals with 100 tons of the mixture in 24 hours. About 50 per cent. of the sulphur is eliminated from the ore by the Ropp (the galena in this case being mixed with a large amount of blende, there being only 55 per cent. of lead and 10 per cent. of zinc in the concentrate produced at the Proprietary mine). The hot sand from the roasters is trucked to the converters, there being 17 of these ranged in line. The converters here are large segmental cast-iron pots hung on trunnions; each is about 8 feet diameter and 6 feet deep, and holes an 8-ton charge. At about two feet from the bottom an annular perforated plate fits horizontally; a shallow frustrum of a cone, also perforated, rests on this; while a plate with a few perforations closes the top of the frustrum. The whole serves as a wind box. A conical hood with flanged edges rests on the flanged edges of the converter, giving a close joint. This

hood is provided with doors which allow the charge to be barred if necessary. A pipe about 1 foot 9 inches in diameter, fitted with a telescopic sliding arrangement, allows for the raising or lowering of the hood by block and tackle, and thus enables the converter to be tilted up and its products emptied. The cast-iron pots stand very well; they crack sometimes but only two pots have been lost in 18 months.

Air enters at a pressure of about 24 ounces and the time taken for conversion is about four hours. The sulphur contents are reduced to about three per cent. It is found that the top of the charge is not so well converted as the interior. There is practically no loss of lead or silver due to volatilization and very little due to escape of zinc. It has also been found that practically all the limestone fed into the Ropp is converted into calcium sulphate; also that a considerable portion of lead becomes sulphate, and it is considered that lead sulphate is as necessary for the process as galena. The value of the process may be judged from the fact that better work is now done with 8.5 foot furnaces than was done with 13-foot before the process was adopted.

In addition to the sintered product from the Huntington-Herberlein pots, sintered slime, obtained by heap roasting, and flux consisting of limestone and ironstone are fed into the furnaces, which take 2,000 long tons per day of ore, fluxes, and fuel. The slags now being produced average: SiO₂, 25 to 26 per cent.; FeO, 1 to 3 per cent.; MnO, 5 to 55; CaO, 15.5 to 17; ZnO, 13; Al₂O₃, 6.5; S, 3 to 5; Pb, by wet assay, 1.2 to 1.5 per cent; and Ag. 0.7 oz. per ton. Although this comparatively large quantity of sulphur remains, yet no matte is formed.

In their strenuous efforts to obtain a higher tariff the manufacturers sometimes say, or are reported to have said, some very silly things. In a recent speech by Sir Howard Vincent on Canadian trade, he made allusion to the new regulations against "dumping" foreign rails into Canada, and quoted tables shown to him by a Canadian manufacturer (erroneously dubbed the largest iron master in the Dominion) whereby it was shown that steel rails imported from Sheffield into Canada would, under the new regulations, "pay only \$5.23 a ton against \$14.37 on German rails and \$11.76 on American rails."

All this on one side, and on the other side assurances are given that Canada will supply itself with steel rails, that the Sault Ste. Marie works and the Sydney works can more than supply the domestic demand. Where, we ask, is the comfort to the Sheffield manufacturer? If he could get what he wants he will pay \$5.23 a ton for doing so, but the "Canadian Iron-master" has so many rails to sell that "no rails need be imported."

Copper producers, and the copper market generally, has witnessed a steady increase in the price of copper during the last three or four months, and the price for metallic copper in December is one of the highest of recent years. The markets for the last thirty days have shown a range from twelve and a half cents to fifteen cents per pound, with the demand steadily increasing. The well-known English house of Merton & Co. have provided the following figures of production, from which the enormous increase of consumption is easily gathered:—

	World's Production.	United States.	Spain and Portugal.	Other Countries.
	Tons.	Tons.	Tons.	Tons.
1880	154,000	27,000	36,000	91,000
1885	225,000	74,000	48,000	103,000
1890	269,000	116,000	52,000	101,000
1895	334,000	170,000	55,000	109,000
1900	485,000	269,000	53,000	164,000
1901	519,000	267,000	54,000	197,000
1902	542,000	295,000	50,000	198,000
1903	566,000	299,000	50,000	217,000

Pumping Plant for Comstock Mines.

One of the most important deals in mining machinery ever made on the Pacific coast was closed in San Francisco recently. This was the awarding of the contract for the permanent pumping plant which is to drain the middle group of mines upon the Comstock lode to the vertical depth of 3,000 feet through the Ward shaft. The successful bidders were the International Steam Pump Company, of New York, whose works are in Harrison, New Jersey, and the Westinghouse Electric and Manufacturing Company, of Pittsburg, Pennsylvania. The contract price is about \$80,000.

The Ward Shaft Association, which authorized the awarding of the contract, is composed of the Comstock mining companies: Gould and Curry, Savage, Chollar, Potosi, Bullion, Alpha Consolidated, Exchequer and Julia Consolidated. These companies own and operate ground nearly a mile in length in the middle part of the Comstock lode. The northern half of this ground has yielded considerable pay ore from the deepest points of nearly 3,000 feet, while large and well mineralized quartz bodies have been discovered in the southern half down to the 2,500-foot level, which could not be explored owing to a great inburst of water some twenty years ago, which has since flooded all the middle mines nearly up to the 1,600 or the Sutro tunnel level.

The contract calls for two first-motion, electrically-driven Express pumps, each of the units to have a capacity for lifting 1,600 gallons of water per minute, against a pressure equivalent to a height of 1,500 feet, or from the 3,000-foot level up to the level of the south lateral branch of the Sutro tunnel. Each pump to be driven by an 800 horse-power, slow-speed induction motor. The \$80,000 contract just awarded includes, besides 600 feet of 16-inch pump column pipe (the Ward Shaft Association already having 900 feet on hand), a travelling crane for the pump station, an automatic oiling system, a small air compressor for filling the air chambers, a small vacuum pump for discharging the vapor from the suction chamber, all the piping and valves of every description for completing the installation, and a complete set of duplicate parts of the pumps. The contract price also includes all freight and insurance charges to Virginia City.

Magnetic separating plants for low grade zinc ores have been extensively introduced into the Wisconsin field, with the effect of raising market prices for such ores to a considerable extent. The result of the introduction of these plants is that both the lead and zinc interests in Wisconsin are in a more favorable condition than they have been for many years past. The increase of new concentrating plants and the total production of the district have both been the heaviest in the history of the section.

The Centre Star Annual Meeting.

The sixth annual meeting of the Centre Star Mining Company was held in Toronto on Tuesday, the 29th of November, when the following profit and loss account for the year was submitted:—

Dr.		Cr.	
To Cost of mining and development	\$227,507.20	By Balance brought forward	\$150,789.36
Diamond drilling	7,110.39	Net proceeds of ore sales	279,252.63
Legal expenses	11,200.12	Interest	6,447.84
Managing Director's salary	2,500.00	Transfer fees	43.25
Mine accounts	189.16		
Travelling expenses	450.00		
Auditors' fees	160.00		
Head Office expenses	781.74		
Investigation of ore processes	993.64		
Sundry expenses	1,023.79		
Depreciation	19,442.29		
	\$271,358.38		
Balance (net profit)	165,183.70		
	\$436,542.08		\$436,542.08

It will be noted that the balance to debit of Profit and Loss is only \$14,394.34 in excess of the balance brought forward from last year.

Speaking to the shareholders, the president wandered a little afield in talking about the total production of the two mines (War Eagle and Centre Star) since discovery, and in dwelling on the fact that sixty per cent. of the value produced had been spent in freights, smelting, refining and marketing, and the remaining forty per cent. in labor and

supplies; he was, in fact, courageous enough to state that so far as the War Eagle Company was concerned, it had borrowed a large amount in addition. What Mr. Gooderham did not do, was to tell his shareholders what reasonable grounds the directorate had for believing that this discouraging state of affairs would soon be remedied. The full report has not yet been printed and issued to the shareholders, and comment must be deferred until its receipt. Mr. Gooderham's address was as follows:—

"As you are aware, it has been apparent for some years past that the chances for large dividends from Rossland mines were doubtful unless a much cheaper method of treatment could be devised than that which has hitherto obtained. Our manager has reported from time to time during the past four years that such methods of treatment were possible; but for one reason or another it seems impossible for him to secure the facilities necessary for such a plant, such as a suitable site, abundance of water, and cheap freight rates. However, a year ago last August, these difficulties were overcome, and the Rossland Power Company was shortly afterwards organized for the purpose of building and equipping a concentrating and cyaniding mill near the smelter at Trail, but owing to many unforeseen difficulties, Mr. Kirby appears to have been unable to get the mill into running order until within the last few weeks, and up to the present time we have not been advised that it is running smoothly. The usual difficulties which naturally arise in starting a large plant such as this have been met with, but are being gradually overcome.

"Everything to-day is turning upon the success of this and other mills which are being installed in Rossland. This will be apparent when I tell you that the Centre Star and its sister mine, the War Eagle, which have been operated under the same management, have so far produced 553,932 tons of ore, which has averaged about \$14.40 per ton, or a total value of \$8,076,661. Of this, more than \$4,872,834 has gone to pay railways and smelters for freight, treatment, refining, and marketing charges. The balance, amounting to about \$3,200,000, has been received by these mines, and the whole of this has been by them disbursed for labor and supplies in connection with the mining of the ore and the development and equipment of the mines; and I may say that, so far as the War Eagle is concerned, a large amount has been borrowed in addition.

"It will be seen from this that we have been producing from these mines, during the past seven years, about \$4,000 in market values of gold, silver and copper for every working day; and undoubtedly everybody, miners, merchants, railways, smelters, refineries, and indeed the whole country, has been making a good thing out of the wealth thus produced, except those whose capital produced it. The fact of the matter is, that the cost of mining at Rossland is probably higher than at any of the other points in the world at which these metals are being produced in like quantities. The object of the mill is, in a measure, to meet this difficulty by affording some cheaper method of treatment of low grade ores than by smelting, and the plan has been hit upon of concentrating out the copper sulphides for the smelter and extracting the gold from the balance by the cyaniding process."

The Mining Section of the Canadian Society of Civil Engineers.

The first meeting for this season of the mining section of the Canadian Society of Civil Engineers was held at the headquarters of the Society, on Dorchester Street, Montreal, on Thursday evening, December 8th. Dr. J. B. Porter, chairman of the section, presided. The papers of the evening were: one by Mr. C. H. MacDougall, on "The Flue-dust Problem at Anaconda, Montana," and one on "The Centre Star Mine, at Rossland, B.C.," by Mr. L. H. Cote. Both papers were illustrated by lantern slides, those of the latter being made from some unusually fine underground photographs. There were present at this meeting Prof. C. H. McLeod, Mr. Phelps Johnson, Mr. James A. Jamieson, Mr. W. J. Sproule, Mr. E. A. Rhys Roberts, Dr. Alfred Stansfield, Mr. F. Cirkel, Mr. J. Burley Smith, Mr. John F. Robertson, Jr., Mr. James M. McPhee, Mr. H. Wilson, Mr. J. G. Kerry and many others.

It was announced that, at the meeting of the section to be held on February 9th, a paper would be read by Dr. Stansfield, and that later a paper prepared jointly by Messrs. Davidson and McKenzie, of the Dominion Coal Company, on "The Cause and Effects of the Fire in Dominion, No. 1," would be presented.

The Review announces that it will publish these papers in subsequent issues for the benefit of its readers, and it hopes to be able to make such arrangements as will permit of the publication of all of the Mining Section papers immediately after they have been read before the Society. The admirable Journal of the Canadian Society of Civil Engineers is a yearly publication, and many papers of great interest are thereby delayed in their introduction to public notice: their prompt publication will be of great benefit to our readers and to the mining public generally.

Kryptol.

In our October issue we printed a notice of a new German invention known as "Thermit," by which intense heat is generated for special uses in a very short time, and by chemical action, entirely without electricity or any other outside aid. Another German invention to be used for heating in connection with electricity has been announced this month, and the name by which it is to be known to the trade is Kryptol.

Kryptol is a heat-resisting material made by mixing (in correct proportions) graphite, carborundum and clay, so combined as to form a granular mass. This substance offers to the passage of an electric current a sufficient amount of resistance to generate a high degree of heat without being itself destroyed. It avoids the use of platinum, nickel or any metals which have been heretofore used in resistance furnaces, thereby securing economy and avoiding danger from short circuiting.

The form in which Kryptol is applied (so far) is as follows: An earthenware plate, usually about two feet square, is enclosed in a wooden frame from which, at two opposite sides, project two carbon electrodes which rest upon the plates and which are connected by insulated wires with the current supply. Upon this earthenware plate the granulated kryptol is loosely strewn to the depth of about one inch. When the kryptol powder connects with both electrodes, a circuit is closed, and the kryptol becomes heated if the thickness is diminished. Or, by brushing the powder away from one electrode, the circuit is broken. If only a thin layer is used, the kryptol becomes heated and will sparkle and glow when the current is on, generating heat so quickly as to raise water to the boiling point within four minutes.

The finer the grains the less active the resistance, and the less heat is obtained; for regulating purposes, therefore, the kryptol is at present manufactured in grains of four sizes. The extreme tractability by which the temperature can be regulated by increasing or decreasing the thickness of the layer on the plate renders this substance applicable to a great variety of practical purposes. It has been used for heating railway and street cars, houses, rooms, etc., etc.

The new material has been adopted by the laboratories of the University of Berlin, the Technical College at Aix la Chappelle, the Imperial Health Office, and other state institutions in Germany.

OBITUARY NOTICES.

Col. John Leahy, formerly a brewer in Vancouver, but more recently prominent in mining affairs, died on Thanksgiving Day, at the age of sixty. Col. Leahy came to Canada in 1878, and followed gold mining a short time, after which he engaged in the brewing business. At one time, recently, the deceased owned large areas of coal lands in Grahame Island.

Mr. John Bertram, president of the Bertram Engine Works, Toronto, died at his home on November 18th, after an illness of nearly six months. Mr. Bertram was of Scotch descent, and came to Canada at the age of twenty-three. He first engaged in the hardware business in Peterboro', Ont., and subsequently went into the wholesale hardware trade in Toronto, from which the organization of the engine works was the final product. Mr. Bertram, though not in active politics, was a staunch Liberal. He was an M.P. from Ontario some thirty years ago, and at the time of his death was chairman of the Transportation Commission.

Captain John R. Gifford died on Tuesday evening, the 23rd of November, at the Hayward Hotel, Hayward, California, at the age of fifty-five.

Capt. Gifford was born in Cornwall, and for a long time was in the service of the celebrated firm of John Taylor & Sons, as mine manager, in various districts in Australia and Mexico. His first acquaintance with Canada was in the capacity of manager for an Ontario mine, known as the "Boulder," in the Lake of the Woods district, where he established a record for economy and speed of development which that district has never seen either before or since. He left Ontario to take charge of the mines of the Hall Mining & Smelting Co., in 1899, and remained with that company until 1902, when he removed to San Francisco and opened an office as consulting engineer. Last year Capt. Gifford spent in Mexico, and this fall, about the end of September, went to Goldfields and Tonapah, Nevada, where he acquired several claims for himself, and was engaged in development work upon them when he contracted a severe cold which sent him back to his wife at Hayward to die.

Capt. Gifford had been for some years a sufferer with catarrh of the stomach, which was the immediate cause of his death. He was one of the best known mining men on the Pacific coast, and his friendship was prized by all who were fortunate enough to know him.

For ability to size up a mine, to develop it, and to conduct operations economically he had few equals. The mining fraternity loses a good member in his death.

GEOLOGICAL SURVEY NOTES.

With one or two exceptions, all the field geologists have returned to Ottawa and are now busy on the work of plotting their surveys and digesting their field notes. Owing to the small appropriation, the members of the Survey have still to act in the dual capacity of topographers and geologists.

During the year 1904 the large annual volume of the summary reports and special publications to the number of about twenty, in the shape of bulletins on economic minerals, have been prepared, but the King's Printer has not kept pace with the manuscript. Some of these have been printed and issued, but many have not.

A bulletin on the peat areas of the Dominion, by Dr. Robert Chalmers, has been recently issued. It gives the total area of the fields, as known at present, as 37,000 square miles, but assurance is made that further explorations will greatly increase this area. The bulletin also describes the various processes for manufacturing peat which are now being used in Canada.

About thirty parties have been in the field this season, and each year witnesses an increase in the operations of the Survey; this year the usual fields have been covered, and a party sent as far north as Lancaster Sound in the Arctic regions. The gold and coal areas of Nova Scotia and British Columbia, the possible copper areas in Quebec, Ontario and British Columbia, the iron resources of divers localities, and the minor minerals in various portions of the Dominion have all received attention.

As in the past, too much immediate attention has perhaps been given to the exploring of unknown sections, which (though valuable ultimately) will not attract population or exploitation for years to come. With the advent of the Grand Trunk Pacific, however, no one can tell in what unexpected or, at present, improbable directions development may occur, and the Survey is covering the whole area of the Dominion reconnaissance work very rapidly.

Dr. Robert Bell remains Acting Director of the Survey, no Director having been appointed since the death of Dr. Dawson. Dr. Bell has had the experience of forty-seven years in the department, and has been Acting Director for four years. It would seem that either his appointment as director should be made, or a new Director appointed, as at present Dr. Bell has all the work and responsibility of both offices, viz., the Director and the Deputy Director—a double load and burden to which no man should be subjected, and under which no one man can be expected to do the best that is in him.

BOOK NOTICES.

The Review has received from John Wiley & Sons, publishers, New York City, a copy of Notes on Assaying, by Prof. R. W. Lodge, of the Massachusetts Institute of Technology. In addition to the book being a most excellent compendium for the assayer, Professor Lodge has included in it some sixty pages of notes on metallurgical methods and experiments which have been made and used at Technology in connection with the larger laboratory tests which are required at that institution for fourth year students when working on their theses for degrees.

The book was specially written for the use of students at Technology, but has a large value to all practical assayers, and is a welcome addition to all assaying literature.

The chapter on the Assay of Ores for Gold is the best we have yet seen in any text book. Professor Lodge lays stress at the very beginning upon the difficulties attending the assay of material which carries a very low percentage of the metal sought, instancing the fact that an ore worth ten dollars in gold to the ton carries only .0005 of a gramme to the assay ton. In speaking of ores carrying tellurium, he mentions one fact which we have not noticed in previous works—that the main point in the assay of tellurium ores is that they shall be ground to pass at least a 150 mesh screen if satisfactory results are desired, or, the richer the ore the finer should be the mesh through which the ore is passed.

The pages on the assay of zinc box residues from the cyanide process have been published in the Transactions of the American Institute of Mining Engineers, but their incorporation in these notes is most desirable. To the young or just graduating engineer we can heartily commend the pages of Metallurgical Laboratory Experiments, which point to such neophytes many ways of doing things correctly in practice which are not usually taught to students in the university. We note particularly, the apparatus for chlorination tests, some valuable remarks on the barrel process of chlorination, a page of chemical reactions which occur in the cyanide process and which are here grouped succinctly together. Also valuable are the remarks on the experimental treatment of gold-

bearing ores and on making silver amalgam for accurate plate work in mill tests.

The book is one that can be cordially and heartily recommended to be placed upon the shelves of every practising engineer and metallurgist.

Mining Share Market.

The market for mining shares has been neglected, and transactions extremely light. During the early part of the month there was some demand for War Eagle and Centre Star, consequent on the annual report of the latter company; but the apparent failure of the new reduction process has given these securities a set-back. Granby Consolidated has declined a little in common with other copper shares, but there is still a fairly active business doing in the shares.

In the industrial list there has been a fair amount of trading, and prices are firm, the most active being Dominion Iron & Steel, preferred and bonds, both of which have scored a considerable advance. There is no particular reason to account for this, beyond the general satisfactory condition of trade and the bullish character of the speculative market.

The sensational movement in Montreal and Boston, which carried the stock up to \$3.50 and ended in the collapse of the syndicate, and the sharp decline to 50 cents, has had no effect here, as the boom was engineered on the curb market in New York, and did not extend to this one.

The following list shows the quotations for the month ending Saturday, December 17th, as supplied to the Review by Robert Meredith & Co., 57 St. Francois Xavier Street, Montreal:—

Par value of shares.		Asked.	Bid.
.10	Canadian Gold Fields Syndicate.....	.07	.06
5.00	Cariboo Hydraulic .....	.75	—
1.00	Centre Star .....	.23½	.20
1.00	Deer Trill Consolidated .....	.02	—
1.00	Giant .....	.03½	.01
10.00	Granby Consolidated	5.25	5.12
10.00	Montreal and Boston	1.25	1.12
1.00	North Star .....	.02	—
1.00	Payne .....	.04	.02
1.00	Rambler Cariboo .....	.17	.16
1.00	Republic .....	.03½	—
1.00	St. Eugene .....	.47½	.45
1.00	War Eagle .....	.10½	.09
1.00	White Bear .....	.04½	.04½
100.00	Nova Scotia Steel (common).....	.68½	.68½
100.00	Ditto ditto (preferred).....	—	1.05
100.00	Dominion Coal (common).....	.64	.63
100.00	Ditto ditto (preferred).....	1.18%	1.17
100.00	Dominion Iron and Steel (common)...	.18%	.18½
100.00	Ditto ditto ditto (preferred)...	.59	.58%
—	Ditto ditto ditto (bonds).....	.84½	.84%

PERSONALS.

Mr. R. C. Barkley, who has been for many years associated with the Massey Mining Co., at Massey, Ont., has gone to Florida for the winter.

Mr. Paradi, of the Public Works Department, Ottawa, was in Alberta last month, where he investigated the possibility and cost of constructing a waggon road over the rock slide at Frank. The Government have been asked to make a public road there.

Mr. Harvey Graham, a director of the Nova Scotia Steel and Coal Co., was in Montreal recently, and expressed the opinion that the present year's output of 400,000 tons of coal by this company will be exceeded in 1905. Mr. Graham is of the opinion that industrial matters will suffer no check during 1905.

Mr. Jacob Langloth, president of the American Metal Co., of New York City, has been chosen president of the Granby Consolidated Mining and Smelting Co., Ltd., in succession to Mr. S. H. C. Miner, of Montreal, resigned. Mr. Langloth is a copper magnate of long standing and immense resources in capital.

Mr. E. B. Kirby, general manager of the Centre Star and War Eagle mines at Rossland, has resigned, to take effect on the 15th of January. It is understood that Mr Kirby will resume the private practice in the United States, from which he came in 1899 to the management of the above companies. Mr. Kirby's departure will be felt, as he has distinctly advanced the practice since he has been in Rossland.

INDUSTRIAL NOTES.

The Canadian Westinghouse Co., Ltd., are issuing in individual pamphlet form concise descriptions of the various machines which they manufacture, amongst these, the latest one is devoted to Voltmeters and Ammeters.

The Westinghouse Electric & Manufacturing Company has been awarded the contract for all the electric apparatus to be installed at the El Oro Mining and Railway Company, El Oro, Mexico. This contract amounts to nearly \$100,000.00.

The Jeffrey Manufacturing Company is to be congratulated upon the typography, paper and illustrations of the new series of catalogues which it is now issuing. Especially is this the case with the catalogue of pulverizing machinery, in which is shown in numerous illustrations the Schoellhorn-Albrecht Pulverizer noted in our last issue. As a pulverizer for fluxes, coal and clay rocks it has no equal.

Messrs. McAvity & Sons are filling an order from the Dominion Government for fifty metal posts, of a certain composition, to be used as boundary monuments on the line between the United States and Canada. The posts are of brass, five feet in length, and of rectangular section; on one side the word "Canada," and on the opposite side the words, "United States," are cast in the metal. The posts are hollow, with sides one inch in thickness.

The A. Leschen & Sons Rope Co., of St. Louis, Mo., have made a new form of yoke rope clip, which is superior in its holding powers to other forms now on the market. Corrugations are cast on the hand piece which assist the grip of the rope, due to compressions. For smoke stack and derrick guys, this device will be found most satisfactory. This firm was awarded three Grand Prizes at the St. Louis World's Fair: One for Wire Rope, one for Wire Rope Tramways, and one for Conveying and Transmission Outfits.

The B. Greening Wire Co., the oldest and best known wire house in Canada, have just issued a new catalogue of wire cloths, wire screenings, and perforated sheet metals, which they manufacture. The pamphlet shows the accuracy with which mesh spaces are made, and will be of great value to users of screening material. The catalogue is one of the most complete in its line that has been published, and the tables show an innovation, in that they give the decimal size of the mesh opening as well as the decimal size of the wire.

The Canadian Westinghouse Company, Limited, has sold to the Hamilton Cataract, Power, Light & Traction Company, for use in its Victoria sub-station at Hamilton, Ontario, two motor-generator sets, each consisting of a synchronous motor and a direct current generator. The motor-generator sets will be of the two-bearing type, the generators delivering direct current at 550 volts to the railway system, and each being rated at 750 k.w. The synchronous motors will take two-phase current at 8,000 alternations and 2,400 volts, and will be rated at 1,380 h.p. The excess of capacity in the motors is provided so that they may be used for raising the power factor of the transmission system. Power is taken through lowering transformers from the high-tension transmission line from the De Cew Falls station of the company.

A feature of the developments in the Baltimore Electric Power Enterprise is the exclusive adoption of steam turbines as prime movers. A contract recently closed with the Westinghouse Machine Company provides an equipment of 4,000 k.w., in two generating units of 2,000 k.w. each. A Westinghouse electrical equipment has also been contracted for. The steam turbine plant will operate with a boiler pressure of 175 lbs., and a superheat of about 100 degrees Fahr. The plant has been designed on the separate unit plan, which consists of a number of distinct power plants placed side by side, each entirely separate from the other, but each capable of helping out the other in case any link in the system should be disabled. In addition to the precaution against interruption of service which is thus insured, there will be installed a large storage battery which will ordinarily "float" on the system.

The work of extending the Chicago Drainage Canal, in connection with the development of power therefrom, which has been mentioned from time to time in the engineering press, is now well in progress. The plans provide for the extension of the channel now in use for a distance of over 10,000 feet southerly to the site selected for the power house, and also provide for the excavation of a tail-race 6,800 feet long, from this point to the junction with another section of the canal. The extension will be constructed with concrete walls, and an earth and rock embankment. The tail-race is to be 160 feet wide and deep enough to give a minimum depth of twenty-two feet of water; the mean head of this power development will be thirty-two feet, and the net horse power obtained on a flowage of 600,000 feet per minute will be 27,000 h.p., figured on an efficiency of seventy-five per cent. for the turbines. The power units of the plant are designed to pass 100,000 cubic feet at 8-10 of the full discharge. They consist of turbines on horizontal axes of a nominal generating capacity of 6,500 h.p. under a 34-foot head, and at

150 r.p.m. Each power unit is to drive one 3,750 kilowatt 3-phase 2,200 volt generator. At the present time large use is made of compressed air machinery, of which that manufactured by the Rand Drill Co. seems to be the favorite. At present there are thirty-two No. 3 1/2 Little Giant Rand drills, four channellers and a number of pumps all operated by compressed air. The plant includes two Rand Imperial type ten drill compressors, each having a capacity of about 2,000 cubic feet of free air per minute, which is delivered through a system of piping which aggregates ten miles in length. The average depth of the holes drilled is fourteen feet, and the average performance of each drill, per shift of ten hours, is 125 feet. The machines of the Rand Drill Co. have had important and successful competitions with other makes of drills in various parts of the world; they recently came off victorious in the South African contest, and their selection for the work of this extension is another evidence of the satisfaction they give to contractors and engineers.

MINING NOTES.

NOVA SCOTIA.

The Cape Breton Coal, Iron and Railway Co. is considering new plans for the equipment of its properties, and for the extension of work.

The last coal steamer from Nova Scotia for Montreal left Port Morien on December 1st. The steamer followed the ice-breaker up the St. Lawrence.

During the year 1904 there were imported by the Dominion Iron and Steel Co. 68,663 tons of iron from foreign countries: Spain shipped 25,050 tons, Sweden 24,650 tons, and the Lake Superior region in the United States 18,963 tons.

The Mining Society of Nova Scotia, at its last meeting held November 16th, endorsed the action of the Board of Trade in forming a mining company to investigate the mineral resources of Nova Scotia, and pledged its aid to the movement.

The end wall of the coal-washing plant of the Dominion Iron & Steel Company has crumbled and fallen. Lack of proper anchorage is given as the cause. The accident did not interfere with the operation of the plant.

The Cape Breton Coal & Iron Company have completed the survey of a railway line from the colliery at Broughton to the shore of Sydney Harbor, a distance of fifteen miles. The company proposes to erect a shipping pier at the terminus of the railway.

The shipments of coal made by the Dominion Coal Company, Limited, in November were 215,746 tons. This is 51,318 tons less than the output for October. Now that the St. Lawrence trade for the season is over, the outputs will show a considerable decrease, although shipments from Louisburg are fairly brisk.

The Nova Scotia Steel Company, at Belle Island, Newfoundland, will put out 100,000 tons of ore for Sydney alone this season, besides the quantity they have sent to Rotterdam and other points. Up to date they have landed at Cape Breton 80,000 tons, and three steamers with a carrying capacity of 5,000 tons will take the balance before work closes for the year.

The Mining Committee of the Halifax Board of Trade have begun with energy by making a request to the Dominion Government for the services of an expert to investigate the iron ore resources of the province.

The information is asked for in order that the Board of Trade may both protect and encourage investors.

A new seam of coal on the Cossitt areas has been discovered about two and a half miles from Sydney, on the Mira road. A drill test showed a thickness of from six to seven feet; and the slope, which is now down about fifty feet, shows a seam about twenty-four inches thick. The Cossitt areas are contained in a lease which comprises some twenty-five square miles.

The coal-washing plant of the Dominion Iron and Steel Company has occasioned a considerable economy in the working of the furnaces, and has produced a considerable improvement in the quality of the pig iron turned out, as well as somewhat increasing the yield. The steel rods which have been turned out from the new rod mill are giving great satisfaction to customers, and the demand for them is causing the management to contemplate operating the mill on a double shift.

The Nova Scotia Steel and Coal Co. have issued during the month a prospectus for the sale of twenty-five year, six per cent. gold bonds. In this document are some interesting statements. The coal output of the company has increased from 237,000 tons in 1901 to 550,000 tons in 1904. Estimates of the quantity of coal contained in the Point Aconi

and Sydney areas have been put at 155,000,000 tons, but the discovery of the fact that the old Sydney main seam extends across the full width of the Point Aconi areas increases this total quantity to 195,000,000 tons.

The output from the Dominion Coal Company's mines for the month of November was 232,720 tons, distributed as follows:—

Dominion, No. 1	43,551 tons
Dominion, No. 2	49,325
Dominion, No. 3	22,484
Caledonia	44,856
Reserve	44,344
Hub	9,505
International	18,655
	<hr/>
	232,720 tons

ONTARIO.

The plant of the Imperial Steel and Wire Company was put into commission on the 7th day of December; its daily capacity is supposed to be fifty tons.

At the Redeemer mine, near Dryden, some good ore has been found in the 100 and 200 feet levels, close to the shaft, and has been sent to the stamp mill. This mine is chiefly owned by Chicago parties.

The stamp mill of the Redeemer mine, near Dryden, was started late in the month of November. It contains two batteries of five stamps each; the stamps weigh 700 lbs., and the plates are of soft copper and amalgamated with mercury.

Operations at the new plant of the Canadian Copper Co. are going smoothly. The change from the old methods to the newer ones has taken place gradually, and work around the new smelter is now as much a matter of routine as was the work at the old plant.

The Ideal Gold Mining Co., of Detroit, announces that the negotiations for the transfer of its property to capitalists have been abandoned, but new arrangements have been made with Detroit people to obtain the money necessary for the resumption of active mining operations.

The 20,000 tons of 80-lb. steel rails ordered by the Government from the Lake Superior Corporation have all been made and passed inspection; some 14,000 tons have already been delivered to the Intercolonial Railway at Montreal.

The work at High Falls on the foundation of the new electric plant is practically completed. The foundations of the power house are finished, the main coffer dam is completed, and the smaller dams are also finished. A great part of the work can now be carried on during the winter.

The Ontario Bureau of Mines is forwarding a collection of corundum and corundum-bearing rocks to the National Museum at Paris, for permanent exhibition there. The collection has been made from properties in Ragland, Carleton, and Methuen townships, and includes many handsome specimens.

Mr. D. D. Mann, of the Canadian Northern Railway, and Mr. James Hunter, a western mine promoter, arrived at Winnipeg this month to discuss negotiations relating to the development of the Atikokan iron range. If negotiations are satisfactorily concluded, a blast furnace will be located at Port Arthur.

The receipts of coal at Toronto for November were 4,000 tons in excess of the receipts for the same month in 1903; the figures are 11,366 tons, as against 7,074 tons for November 1903. The total receipts at the port of Toronto for the last season were 171,787 tons. This year, the receipts to 1st of December have been 171,405 tons.

Some fine specimens of rich ore from the Paymaster mine have been shipped to the offices of the Northern Development Co., at Detroit, for exhibition. The Paymaster is located in the Manitou district, and shows a very good prospect near the surface. So far, the Manitou gold fields seem to be among the most promising in the Western Ontario country.

The International Nickel Co. made a splendid exhibit at the St. Louis Exposition. Each step in the process of the extraction of the metal from the ore was shown, beginning from the ore and finishing with ingots of copper and small cubes of nickel. The exhibit also contained displays of the manufacture of nickel, including nickel sheets, nickel wire, and kitchenware made from nickel.

Winnipeg despatches would have us believe that wise citizens of that town are going to invest \$200,000 in the manufacture of peat fuel from the bogs near Fort Frances, in the Rainy River country. The Lieut.-Governor of Manitoba and Mr. Wm. Whyte are among the names mentioned as those of parties interested. It will be remembered that no peat venture in Canada has yet been anything but a commercial failure.

The International Nickel Co. have been among the first to avail themselves of the new roofing material, made in Montreal, and known as Asbestos Lumber. This lumber is made of fibres of asbestos compressed into sheets under great pressure. Its advantages lie in the fact that it is fire and acid proof, and hence makes a more permanent roofing material than the iron plates which have previously been in use for the furnaces.

The Kakabeka Falls, on the Kaministiquia River, near Fort William, have been purchased by a syndicate of Montreal people, of whom Mr. Chas. R. Hosmer, Mr. H. M. Holt, and Mr. F. W. Thompson are the principal members. The intention of the syndicate is to develop power to be used and sold in Fort William and vicinity. The manufacturing interests in Fort William are numerous enough to justify the installation of a large electric power plant, and it is understood that active work upon the water power plant will be commenced very shortly.

Reports from the Rainy River district say that it is building up rapidly along the line of the new Canadian Northern Railway, between Fort William and the International boundary line. There is very general activity, saw mills have been erected in many places, arable land has been taken up by the farmers, and new towns are springing up at proper intervals. One million acres of land have been taken up during the last three years, and three-fourths of this large amount is occupied by settlers who have a very respectable percentage of it in cultivation. The town of Rainy River now has a population of 2,000 people. The development of the International Falls as a water power for the generation of electricity is going forward very rapidly.

A large deposit of iron ore, on the shores of Lake Winnipeg, twelve miles from the Canadian Pacific Railway, has been taken up by some capitalists from St. Paul, Chicago, and Winnipeg, who propose to develop the property and construct smelting works in the vicinity. The property is believed to be the same one that has been in the hands of Mr. Proudfoot for some years; the quality is hematite, but there is a considerable amount of both phosphorus and sulphur in the ore, and the hopes of the projectors as to the profitable result from the enterprise are not endorsed by others who are more familiar with the property. That a large deposit of good quality of iron in the centre of Canada would be most desirable is unquestionable, but there is much work yet to be done before any assurance to that effect can be given to the public.

Sudbury has been somewhat excited over the publication in "Hardware and Metals" of an article by Joseph Wharton, of Philadelphia, which particularizes the presence of rare metals in the ores of the Sudbury district. Mr. Wharton has stated that the 300,000 tons of copper-nickel ore which has been treated contained 3,000 ounces of palladium, the market value of which is reported as \$400 an ounce. We do not think that mine owners need be excited by this article, as the cost of recovering the rare metals which occur in infinitesimal quantities in the Sudbury mines, would preclude any extensive mercantile business being transacted in them. People in Ontario should take warning from the furor for cobalt ores which occurred early last spring in connection with the discovery of large deposits of that ore near Halleybury. More cobalt has been taken out of the mines near Halleybury than there is a market for, and it must always be remembered when speaking of the rarer, and consequently more valuable, metallic elements, that the market for them is so extremely limited that no considerable business therein can be built up.

NORTH-WEST TERRITORIES.

The company operating at Edmonton report that they have struck a good supply of natural gas.

The Alberta Telephone Co. is to install a complete telephone system throughout the Crow's Nest Pass district which lies east of the summit.

Advices from interested people tell the Review that the zinc furnace to be erected will be located at Frank, Alberta, instead of at Fernie, B.C. It appears that many of the shareholders in the West Canadian Collieries are also interested in the zinc smelter, and hence the coke and coal used is to be supplied by the Lille collieries, and not by the Crow's Nest Pass Coal Co.

The West Canadian Collieries Company, operating coal mines at Bellevue and Lille, Alberta, have fifty coke ovens of the Solvay type at Lille. These ovens are charged and drawn by machinery, and make about four tons each of first-class coke every twenty-four hours. The coke is sold to the British Columbia smelters.

The Lille collieries are situated on a branch line connecting with the C. P. R. at Frank; the Bellevue collieries are on the main line of the C. P. R., one and a half miles east of Frank station.

At both Lille and Bellevue are prosperous small towns, which depend on the mines for subsistence. The company also owns coal properties at Blairmore and Byron Creek, which, at present, are not operated.

BRITISH COLUMBIA

The coal deposits of the Quilchenna district are being exploited amongst Ottawa investors by R. G. Macpherson, M.P., and others.

The Providence vein has been exposed by stripping for a distance of more than 500 feet, and in places it measures eight feet in width.

At the once famous Rambier-Cariboo mine, in the Slocan, work is now confined to the driving of the cross-cut tunnel, which has now attained a length of a little over 1,300 feet.

The ore shipments from Rossland to the 1st of December, a period of eleven months, totalled 318,000 tons; those from the Boundary district from the same period totalled about 733,000 tons.

The Le Roi mine, under date of December 12th, advises that development of the ore shoot on the 1,450 ft. level has produced ore assaying \$20 in gold and \$5 in copper; the extent of the ore shoot is not yet known.

Mr. Oscar Fernau, the promoter of the Kootenay Zinc Concentrating Company, has optioned several claims on Kootenay Lake. On one of these there is a ledge of solid sphalerite twenty-four inches in width, which assays forty per cent. of zinc and ninety-five ounces of silver.

The Inland Sentinel reports the discovery of a four-foot seam of bituminous coal on the branch line between Sicamous and Okanagan Landing, between Enderby and Mara.

Ore from the dumps of the Brooklyn and Stemwinder mines is being shipped to the Trill smelter. In the neighborhood of 120 men are now employed at these mines and at the Rawhide.

The Fraser River at Lillooet is reported to be at a lower stage than has been known for twenty years. It is anticipated that by February some very rich bars which have been submerged since 1883 will be again uncovered, and that large amounts of gold will be recovered from them.

The Grant mine, on the north fork of Woodbury Creek has been bonded to Eastern people, who will work it during the winter. The last ore shipments were of very high grade, running sixteen per cent of lead and from 435 to 455 ounces of silver to the ton.

The Cousins claim, on Ten Mile Creek, in the Similkameen is reported to carry large percentages of native copper. Specimens taken from the shaft at a depth of twenty-five feet gave forty per cent. of metallic copper in slugs and wires.

Dividends from British Columbia mines in 1904 have not been numerous, but there have been some which were very satisfactory. The St. Eugene paid \$64,000, the Tyee \$43,200, the Le Roi No. 2 \$57,600, and the Cariboo (Camp McKinney) \$50,000, the Providence \$20,000, and the Crow's Nest Pass Coal Co. \$172,254; a total of \$407,324 of which record has been made.

The mines about Silverton, B. C., have been active during the summer, by reason of the bounty on lead granted by the Government. The Hewitt has shipped 400 tons, netting \$30,000; the Wakefield has shipped over 1,000 tons, averaging sixty-five per cent. of lead and fifty ounces of silver; the Fisher Maiden has shipped about 500 tons of dry ore, which was of high grade.

The Last Chance mine, near Greenwood, expects to make shipments this month. The cross cut towards the footwall of the deposit has disclosed two streaks of good ore, one eight inches wide, the other two feet in width, on which levels are now running. The amount of low grade ore already opened is so large that the management is considering the erection of concentration works.

The Jacko Lake country, near Kamloops, has been prospected during the past summer in a thorough manner, and the results obtained promise a brilliant future for the camp. On the Monte Carlo claims, values of twenty-two per cent. copper with \$12 in gold have been obtained, and in the Ajax group total values in excess of \$50 are reported. The widths of these bodies is reported as seven feet on the Monte Christo, and as thirty feet on the Ajax. If such results can be averaged, there should be a permanent camp at Jacko.

The Granby Consolidated M. & S. Co. is using electricity for motive power wherever it is possible to do so. An electric locomotive, equipped

with two 35 h.p. motors, has been ordered from the Westinghouse Co., and will be used in No. 3 tunnel to haul cars to the new ore crusher and ore bins. The ore crusher was manufactured by the Jenckes Machine Co., of Sherbrooke, Que., and has a jaw opening of 36 by 43 inches. It also will be operated by an electric motor.

The survey members of the Canadian portion of the International Boundary Demarcation Commission have returned to Ottawa with Mr. J. J. McArthur who was in charge of the party. The portion assigned to this party ran from Port Hill, Idaho, on the Kootenay River, to Cascade, in the Boundary district; the section between Cascade and Mirway, and that from the Kootenay River to the summit of the Rockies constituted the task of the United States party. There still remain the sections from the Similkameen to the Skagill, and from the Skagill to the coast for next year's work.

The British Columbia Mining Exchange and Investor's Guide for November gives an interesting description of some features of the Skeena mining division at the head of the Portland Canal. Comparatively little work has been done in this district, as white men have only been familiar with it for about four or five years. According to the article mentioned, values seem to be chiefly in silver and copper, with but little gold; the grade, however, appears to be high. One feature we note is the discovery of a deposit of molybdenite, which returned thirteen per cent. of metallic molybdenum. There would appear to be numerous deposits of galena ore, with occasional pockets of dry silver sulphides, and not infrequent occurrences of large bodies of copper gold sulphurets. The climate is reported to be comparatively mild, and the season to be one of unusual length for so high a latitude.

The London British-Canadian Review prints the following:—"The shutting down of the Payne mine appears to have been adopted in anticipation of successfully demonstrating the existence of a rich vein in the lowest, or No. 8, tunnel. A lost vein was found in the lower workings a year and a half ago, and the mine has been thoroughly overhauled and re-equipped with the most modern machinery, specially adapted for once more placing the property at the head of the dividend-payers in British Columbia. A great deal of development has been done of late, and this, added to the amounts paid out for new plant, necessitated a re-arrangement of the company's finances. The directors offered \$90,000 of debentures upon favorable conditions, but only a portion of the required amount was taken up by the shareholders, and in consequence some new arrangement will have to be made before work can be resumed. From all appearances, the Payne mine is in a better condition to-day than it has been since dividends ceased, and it is not improbable that the directors will be able to make satisfactory arrangements for the early resumption of work again."

We fancy the president of the Payne Mining Co., Lieut.-Col. Henshaw, will be delighted to learn this news from London, and that the directors will at once go down in their pockets for this \$90,000, which they have been steadfastly refusing to do since March last.

YUKON.

Bunty Creek, and its tributary, Forlorn Hope, have been added to the list of creeks showing recent discoveries. The gravel is at least twenty feet in depth, but no hole has yet reached bedrock.

Operations on Clear Creek this winter will be few, as experience has shown that the bulk of the ground is too shallow. Lack of depth to the gravel makes it better suitable for summer than winter operations.

Winter work is reported to be well under way on Paradise Hill, Hunker Creek, and advices state that there are many more men at work, from forty to eighty, on Hunker this year than last year.

A strike of gold in a new channel is reported on 245, below Discovery, on lower Dominion Creek. The gravel is reported to run about \$2.50 to the bucket, or nearly \$1.00 per cubic foot. Arthur Le Fleur and partners own the claim.

The application of Tyrrell and Cameron for a right to sell water from Sourdough and Cripple Creeks, tributaries of Bonanza Creek, has been protested by the Bonanza Hydraulic Company, before the Gold Commissioner's court.

The Duncan Creek country, on the Upper Stewart River, will have little work done this winter through the failure of the steamer "Prospector" to reach the upper river. The "Prospector" had supplies aboard, but was unable to get up owing to low water.

Reports from the Tanana district show a great shortage of provisions, which will prevent development this winter. It is also reported that there is a large surplus of men in the camp, not one out of three being able to find employment.

So many applications for water to be taken from Australia Creek and its tributaries have been filed with the mining recorder that the flow of the stream is not one-third large enough to satisfy all of them. These applications have been made in consequence of a furor to hydraulic ground on Sulphur and Dominion Creeks.

From January 1st to October 31st the comptroller of the Yukon Territory has received royalties amounting to \$230,263.90 on \$3,210,566 10 output. The gold, for purposes of royalty, is valued at \$15.00 per ounce, but its average assay value is a trifle over \$16.00; the above output, therefore, would be more correctly valued at about \$10,000,000.00. There yet remains with the banks and with the larger companies an accumulation which will probably increase these figures to nearly \$12,000,000.00.

COAL NOTES

The Joggins mines are now putting out 250 tons of coal daily.

The Gowrie and Blockhouse mines are yielding 300 tons of coal a day.

Dominion No. 1 colliery is now putting out from 2,000 to 2,300 tons per day.

No. 1 Allan shaft, of the Acadia Coal Co., had reached a depth of 450 feet, and No. 2 shaft a depth of 480 feet on the 1st of December.

The Port Hood collieries have made a daily production of 500 tons of coal this year; next year they expect to make a daily record of 750 tons.

The shipment of 5,000 tons of coal to Mexico, made in October by the Dominion Coal Company, was so successful that a contract for 25,000 tons has resulted.

The water shipments of coal by the Dominion Coal Co. in 1904 were 270,054 tons in excess of any previous year.

The C. P. R. coal handling plant at Fort William has unloaded 500,000 tons this season from boats; that of the Canadian Northern Railway at Port Arthur has handled over 200,000 tons.

The Dominion Coal Co. having succeeded in creating a small market for Cape Preton coal in Mexico, are now sending a trial shipment of 3,000 tons to South Africa. The S.S. Melville cleared from Sydney, C.B., for Cape Town and New London, South Africa, November 30th, with this shipment on board, and strong efforts will be made to establish a South African market. If successful in these endeavors to secure a foreign market, the company will be able to maintain operations on a continuous scale throughout the winter seasons. At present, each first of December occasions the reduction of the working force and general curtailment of all operations.

The total tonnage of coal brought by the St. Lawrence route to river ports during the season of 1904 was 1,454,365 tons, or over 200,000 tons more than any previous year. In this large total, the Dominion Coal Co. is easily the first, with the Nova Scotia Steel & Coal Co. second. The imports of Scotch and English coal fell off to less than forty per cent. of last year's tonnage, and the shipments of the Intercolonial Coal Company show a decrease of about 5,000 tons. From a table compiled by F. A. Routh & Sons, coal agents, the receipts have been as follows:—

	1904. Tons.	1903. Tons.
Dominion Coal Co.	1,116,191	846,137
Nova Scotia Steel & Coal Co.	170,319	159,618
Newcastle Syndicate	14,305	12,815
Port Hood Coal Co.	4,634	21,374
Intercolonial Coal Co.	39,349	44,248
Inverness Coal Co.	43,441	17,784
Acadia Coal Co.	15,134	4,277
Scotch and English Coal	47,961	134,339
United States Coal	3,031	2,748
	1,454,365	1,243,340

The Dominion Coal Company asked its employees, on the 28th of November, to enter into an agreement or contract with it for the term of three years at the present rate of wages, urging as its reason for so doing that security from danger of labor troubles would enable the company to enter into long contracts, and would place the business in a more stable condition. The company also claimed that such an agreement and security from strikes would attract a better class of labor, and produce a better quality of coal; formerly the percentage of slack coal was thirty-three, now it had increased to seventy-six per cent. The miners took the matter back to the lodges of the P. W. A. for discussion and consideration, and again met Vice-President Wanklyn and Manager Duggan on the 2nd of December, when some five hours' discussion took place. The number of men at present on the pay roll is much greater than it was two years ago, and the allotment of rooms to the cutters is less than one-half what it used to be; the crowding consequent to this condition prevents the output per man from reaching former figures, and in the opinion of the miners is the cause of the increased cost of production.

The miners are not unanimous as to the three years' contract; the machine runners, shot firers and other high wage men are inclined to accept, but the loaders, drivers and lower paid men object to binding themselves to the present low rate of wages.

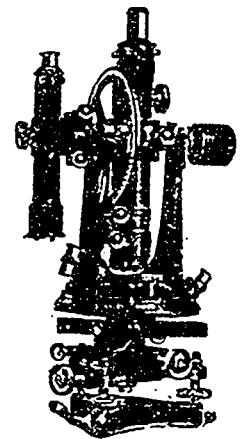
No decision was reached, and further conference is to take place. In the season just closed, the Dominion Coal Co. moved an average of 5,580 tons per day up the St. Lawrence River. These figures are the record on this side of the water (so far as we have been able to learn) for fuel moved by sea by one company.

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Largest Manufacturers of Surveying and Drawing Instruments in the World. Makers to the Canadian Government.



TELESCOPE ON TOP

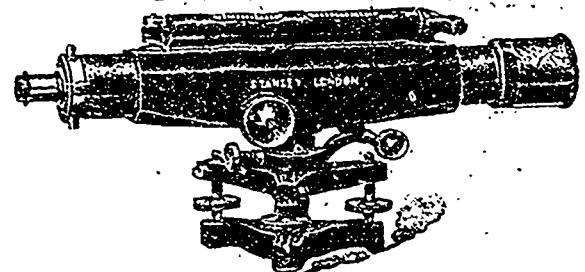


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DUNBAR-SCOTT'S AUXILIARY
TOP AND SIDE TELESCOPE

For vertical sighting it is also most useful and accurate, as by transferring the lines of both positions of auxiliary, two lines at right angles to each other are transferred down a shaft which, if produced, will intersect each other exactly under the centre of the instrument, and no allowance or calculation whatever has to be made to ascertain the centre.

STANLEY'S NEW ENGINEERS' LEVEL



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TWO SULLIVAN DIAMOND DRILLS, one "C. N." and one "H. N." The outfits are comparatively new. Will sell cheap.

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PROVINCE OF NOVA SCOTIA.

Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

PRECIOUS STONES.

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

GOLD AND SILVER.

Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at \$2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills, who are required

to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at \$19 an ounce, and on smelted Gold valued at \$18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licences to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquire promptly, either by arrangement with the owner or by arbitration, all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

THE HON. A. DRYSDALE,

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.

PROVINCE OF QUEBEC

The attention of Miners and Capitalists in the United States
and in Europe is invited to the

GREAT MINERAL TERRITORY

Open for investment in the Province of Quebec.

Gold, Silver, Copper, Iron, Asbestos, Mica, Plumbago, Phosphate,
Chromic Iron, Galena, Etc.

ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

**The Mining Law gives absolute security to Title, and has been
specially framed for the encouragement of Mining.**

Mining concessions are divided into three classes:—

1. In unsurveyed territory (a) the first class contains 400 acres, (b) the second, 200 acres, and (c) the third, 100 acres.

2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (a) as a mining concession by purchase, or (b) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are \$5 and \$10 per acre for mining lands containing the superior metals*; the first named price being for lands situated more than 12 miles and the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, \$2 and \$4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein; in concessions for the mining of the inferior metals, those only may be mined for.

*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals, and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than \$500 if mining for the superior metals; and not less than \$200 if for inferior metals. In default, cancellation of sale of mining lands

(b) Licenses may be obtained from the Commissioner on the following terms:—Application for an exploration and prospecting license, if the mine is on private land, \$2 for every 100 acres or fraction of 100; if the mine is on Crown lands (1) in surveyed territory, \$5 for every 100 acres, and (2) in unsurveyed territory, \$5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds: Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of \$5 and an annual rental of \$1 per acre. Each license is granted for 200 acres or less, but not for more; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE MINISTER OF LANDS, MINES AND FISHERIES,

PARLIAMENT BUILDINGS, QUEBEC, P.

Ontario's

Mining

Lands.

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite; copper in sulphide and native form; gold, mostly in free milling quartz; silver, native and sulphides; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1903 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe.

The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

HONORABLE E. J. DAVIS,

Commissioner of Crown Lands,

or

THOS. W. GIBSON,

Director Bureau of Mines,

Toronto, Ontario.



Dominion of Canada.

SYNOPSIS OF REGULATIONS

For disposal of Minerals on Dominion Lands in Manitoba, the North-west Territories and the Yukon Territory.

COAL.

Coal lands may be purchased at \$10 per acre for soft coal and \$20 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at the rate of ten cents per ton of 2,000 pounds shall be collected on the gross output.

QUARTZ.

Persons of eighteen years and over and joint stock companies holding free miner's certificates may obtain entry for a mining location.

A free miner's certificate is granted for one or more years, not exceeding five, upon payment in advance of \$7.50 per annum for an individual, and from \$50 to \$100 per annum for a company, according to capital.

A free miner, having discovered mineral in place, may locate a claim 1500 x 1500 feet by marking out the same with two legal posts, bearing location notices, one at each end on the line of the lode or vein.

The claim shall be recorded within 15 days if located within ten miles of a mining recorder's office, one additional day allowed for every additional ten miles or fraction. The fee for recording a claim is \$5.

At least \$100 must be expended on the claim each year or paid to the mining recorder in lieu thereof. When \$500 has been expended or paid the locator may, upon having a survey made, and upon complying with other requirements, purchase the land at \$1.00 an acre.

Permission may be granted by the Minister of the Interior to locate claims containing iron and mica, also copper, in the Yukon Territory of an area not exceeding 160 acres.

The patent for a mining location shall provide for the payment of a Royalty of 2½ per cent. of the sales of the products of the location.

PLACER MINING.

Manitoba and the N. W. T., excepting the Yukon Territory.—Placer mining claims generally are 100 feet square; entry fee \$5, renewable yearly. On the North Saskatchewan River claims are either bar or bench, the former being 100 feet long and extending between high and low water mark. The latter includes bar diggings, but extends back to the base of the hill or bank, but not exceeding 1,000 feet. Where steam power is used, claims 200 feet wide may be obtained.

Dredging in the rivers of Manitoba and the N. W. T., excepting the Yukon Territory.—A free miner may obtain only two leases of five miles each for a term of twenty years, renewable in the discretion of the Minister of the Interior.

The lessee's right is confined to the submerged bed or bars of the river below low water mark, and subject to the rights of all persons who have, or who may receive entries for bar diggings or bench claims, except on the Saskatchewan River, where the lessee may dredge to high water mark on each alternate leasehold.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles, but where a person or company has obtained more than one lease one dredge for each fifteen miles or fraction is sufficient. Rental, \$10 per annum for each mile of river leased. Royalty at the rate of two and a half per cent collected on the output after it exceeds \$10,000.

DREDGING IN THE YUKON TERRITORY.

Six leases of five miles each may be granted to a free miner for a term of twenty years, also renewable.

The lessee's right is confined to the submerged bed or bars in the river below low water mark, that boundary to be fixed by its position on the 1st day of August in the year of the date of the lease.

The lessee shall have one dredge in operation within two years from the date of the lease, and one dredge for each five miles within six years from such date. Rental \$100 per mile for first year and \$10 per mile for each subsequent year. Royalty, same as placer mining.

PLACER MINING IN THE YUKON TERRITORY.

Creek, gulch, river and hill claims shall not exceed 250 feet in length, measured on the base line or general direction of the creek or gulch, the width being from 1,000 to 2,000 feet. All other placer claims shall be 250 feet square.

Claims are marked by two legal posts, one at each end, bearing notices. Entry must be made within ten days, if the claim is within ten miles of mining recorder's office. One extra day allowed for each additional ten miles or fraction.

The person or company staking a claim must hold a free miner's certificate. The discoverer of a new mine is entitled to a claim of 1,000 feet in length, and if the party consists of two, 1,500 feet altogether, on the output of which no royalty shall be charged, the rest of the party ordinary claims only.

Entry fee, \$10. Royalty at the rate of two and one-half per cent on the value of the gold shipped from the Yukon Territory to be paid to the Comptroller.

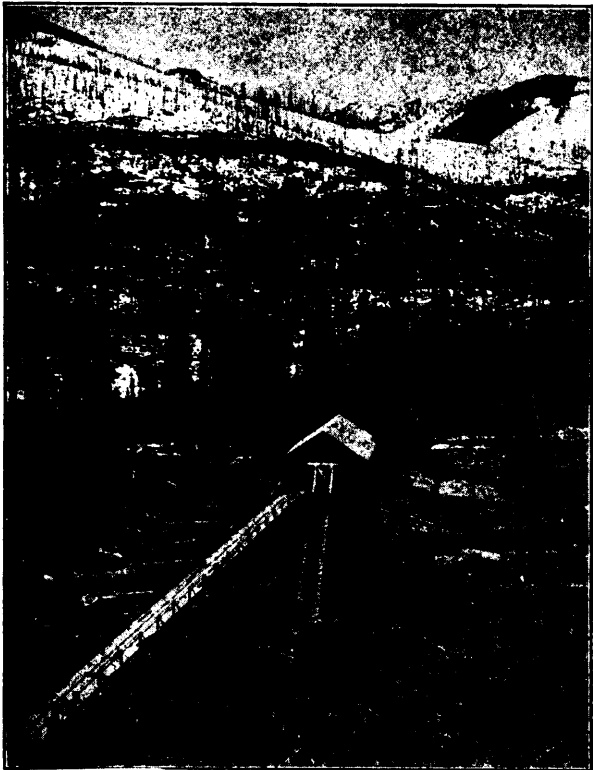
No free miner shall receive a grant of more than one mining claim on each separate river, creek or gulch, but the same miner may hold any number of claims by purchase, and free miners may work their claims in partnership by filing notice and paying fee of \$2. A claim may be abandoned, and another obtained on the same creek, gulch or river, by giving notice and paying a fee.

Work must be done on a claim each year to the value of at least \$200. A certificate that work has been done must be obtained each year; if not, the claim shall be deemed to be abandoned, and open to occupation and entry by a free miner.

The boundaries of a claim may be defined absolutely by having a survey made and publishing notices in the Yukon Official Gazette.

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All unappropriated Dominion Lands in Manitoba, the North-west Territories and within the Yukon Territory are open to prospecting for petroleum, and the Minister may reserve for an individual or company having machinery on the land to be prospected, an area of 640 acres. Should the prospector discover oil in paying quantities, and satisfactorily establish such discovery, an area not exceeding 640 acres, including the oil well and such other land as may be determined, will be sold to the discoverer at the rate of \$1.00 an acre, subject to royalty at such rate as may be specified by order-in-council.



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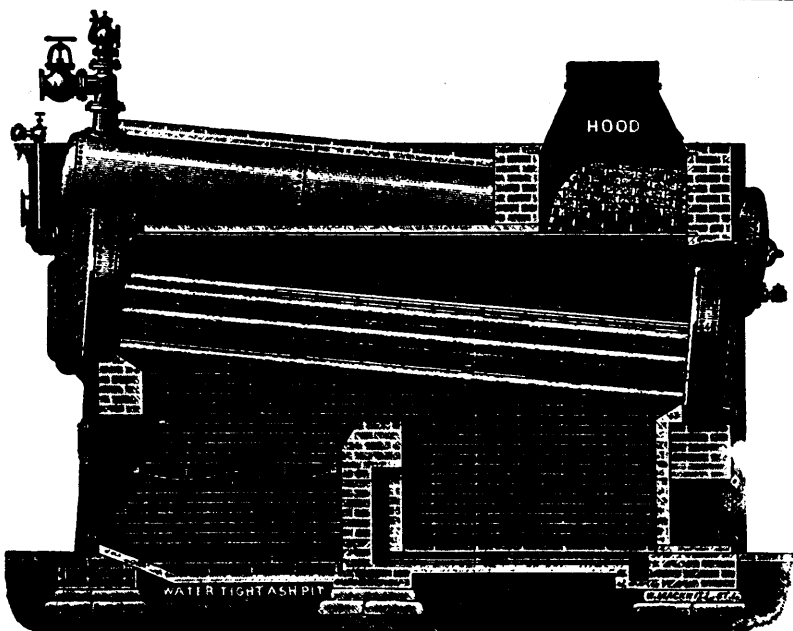
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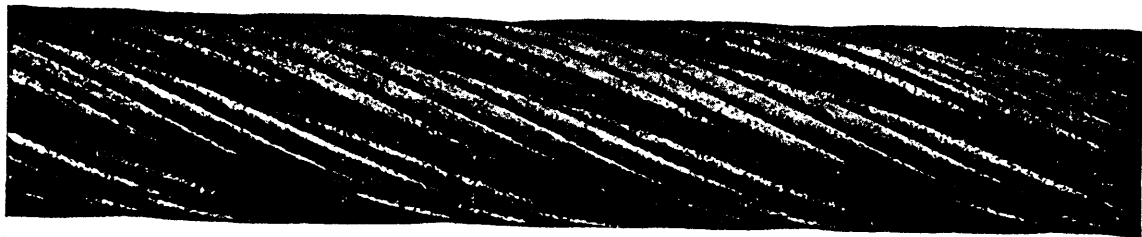
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