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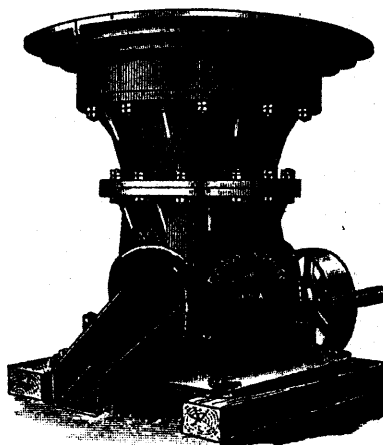
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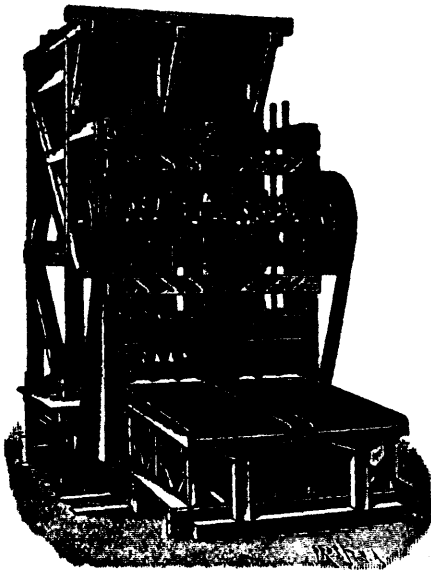
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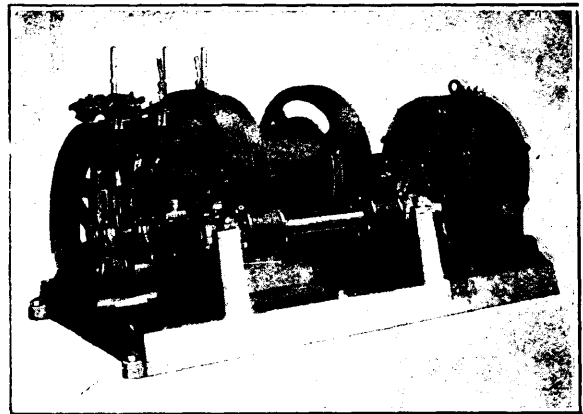
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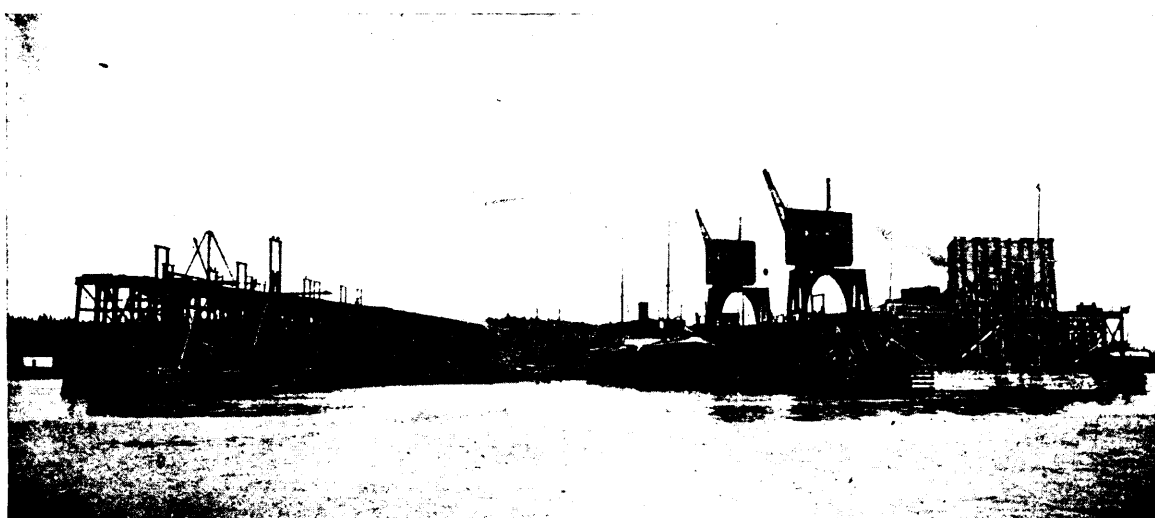
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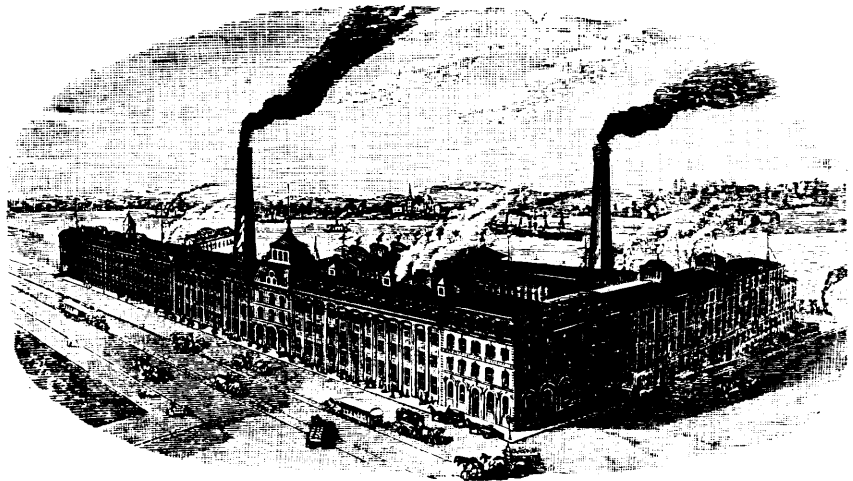
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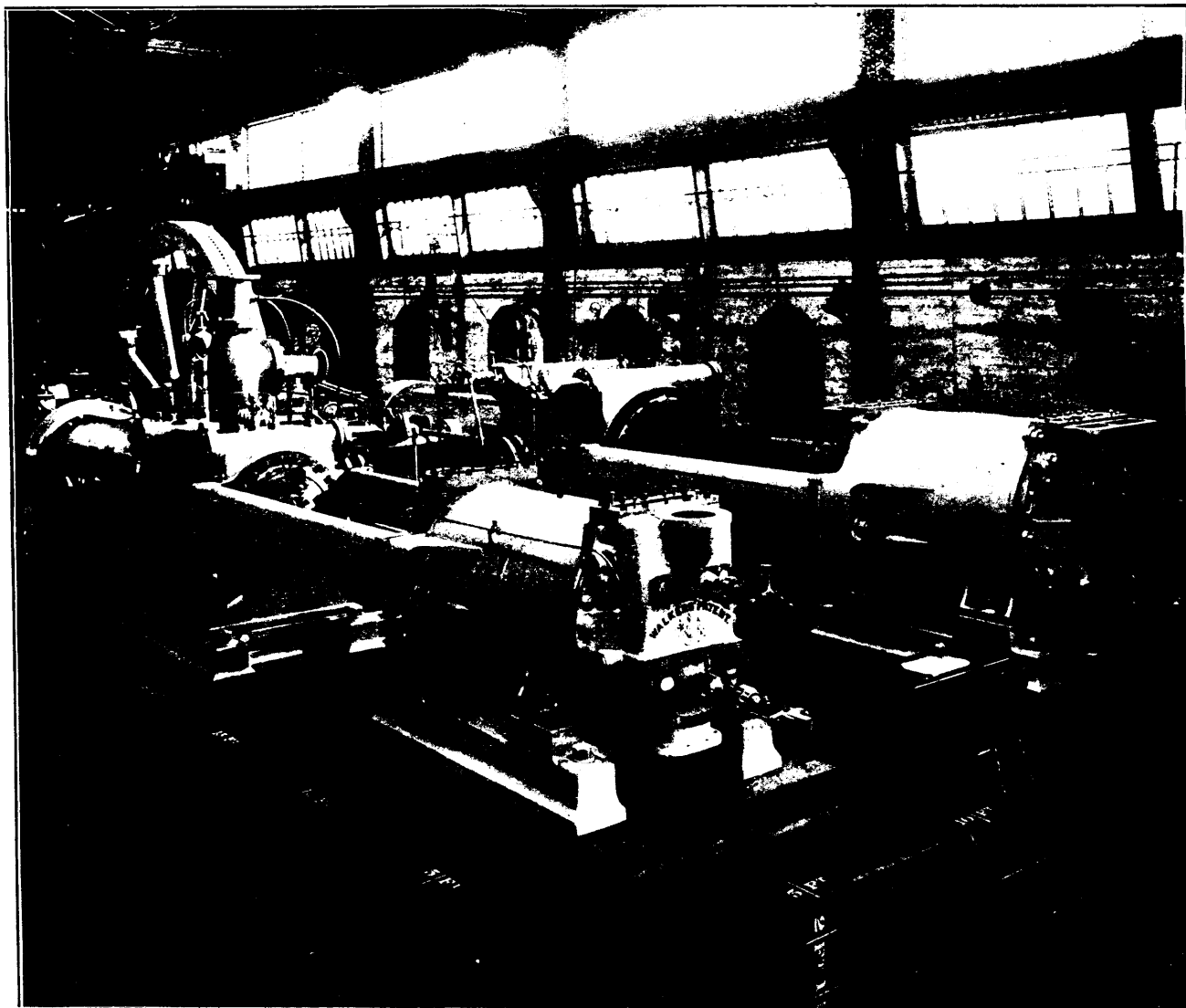
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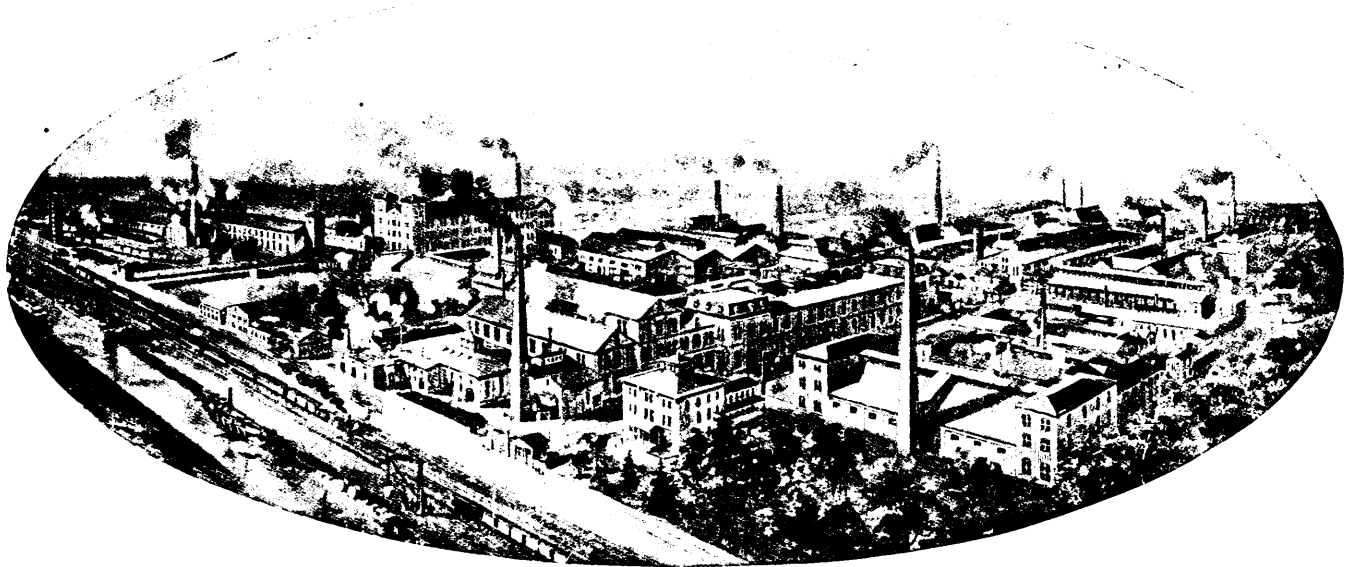
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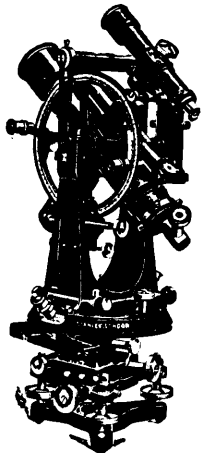
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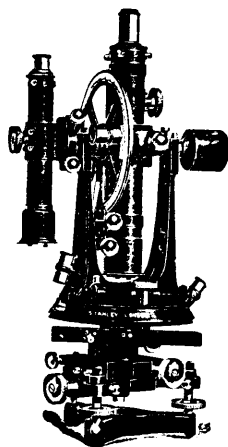
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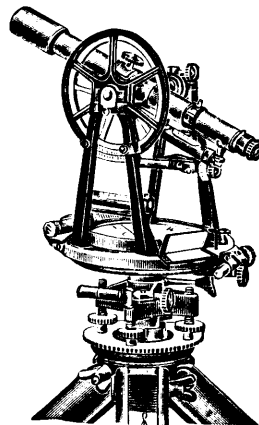
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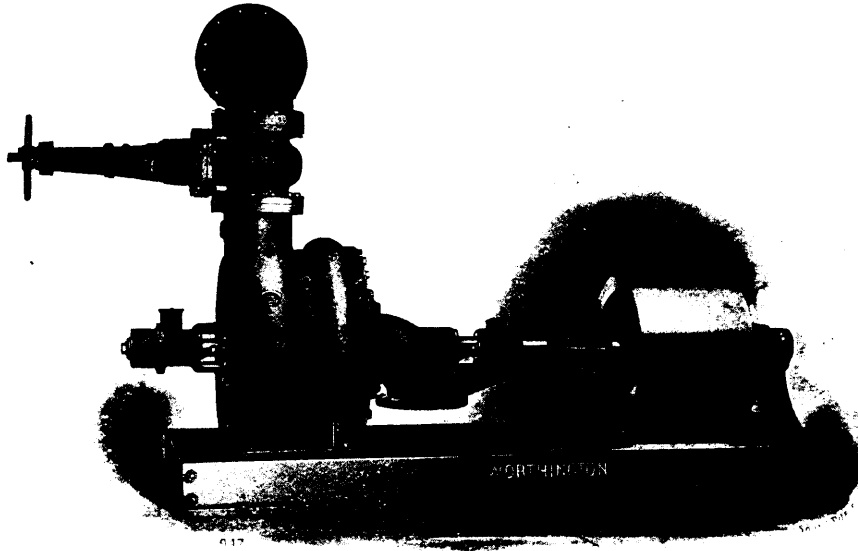
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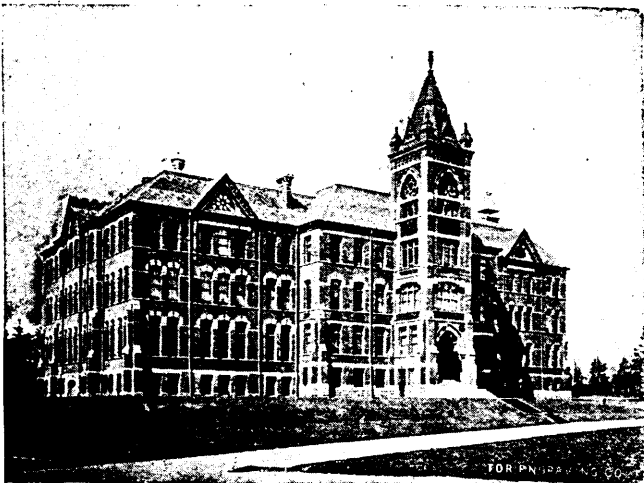
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PUBLICATIONS.

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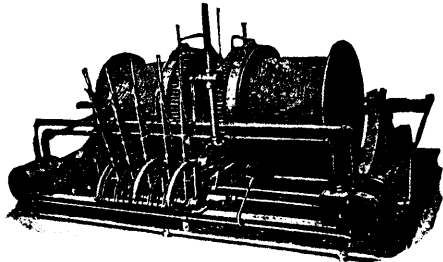
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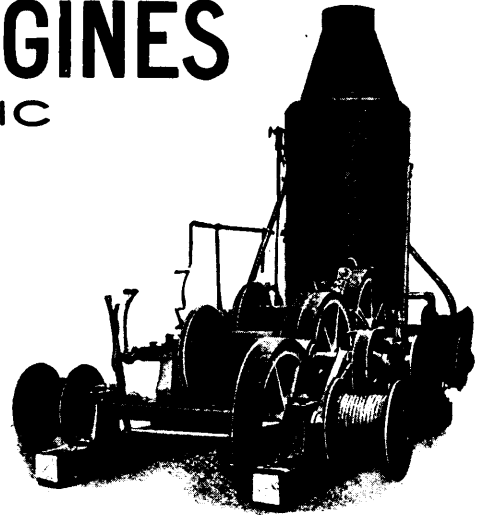


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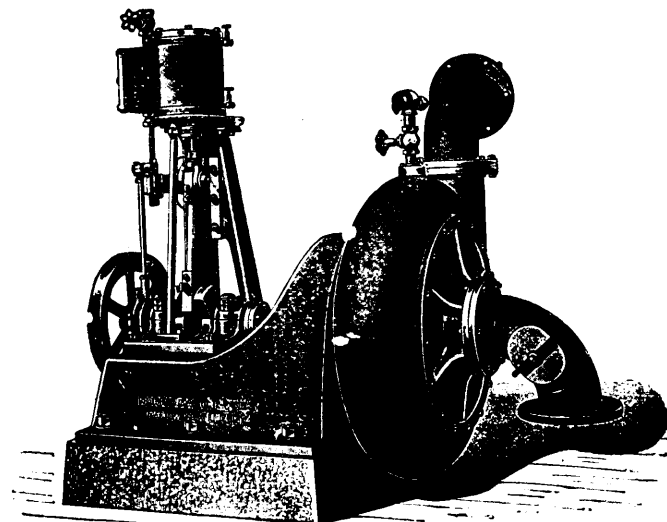
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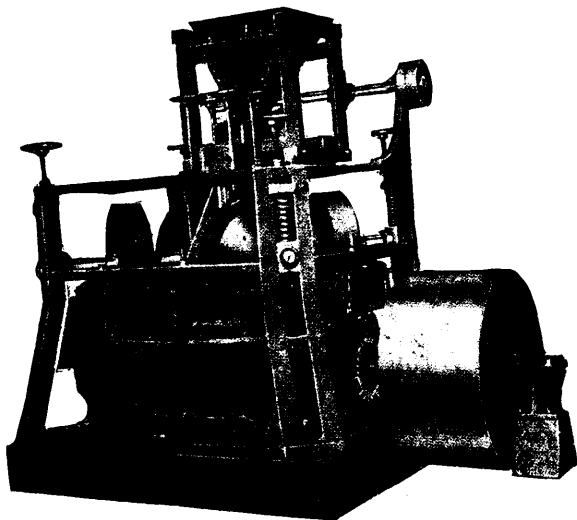
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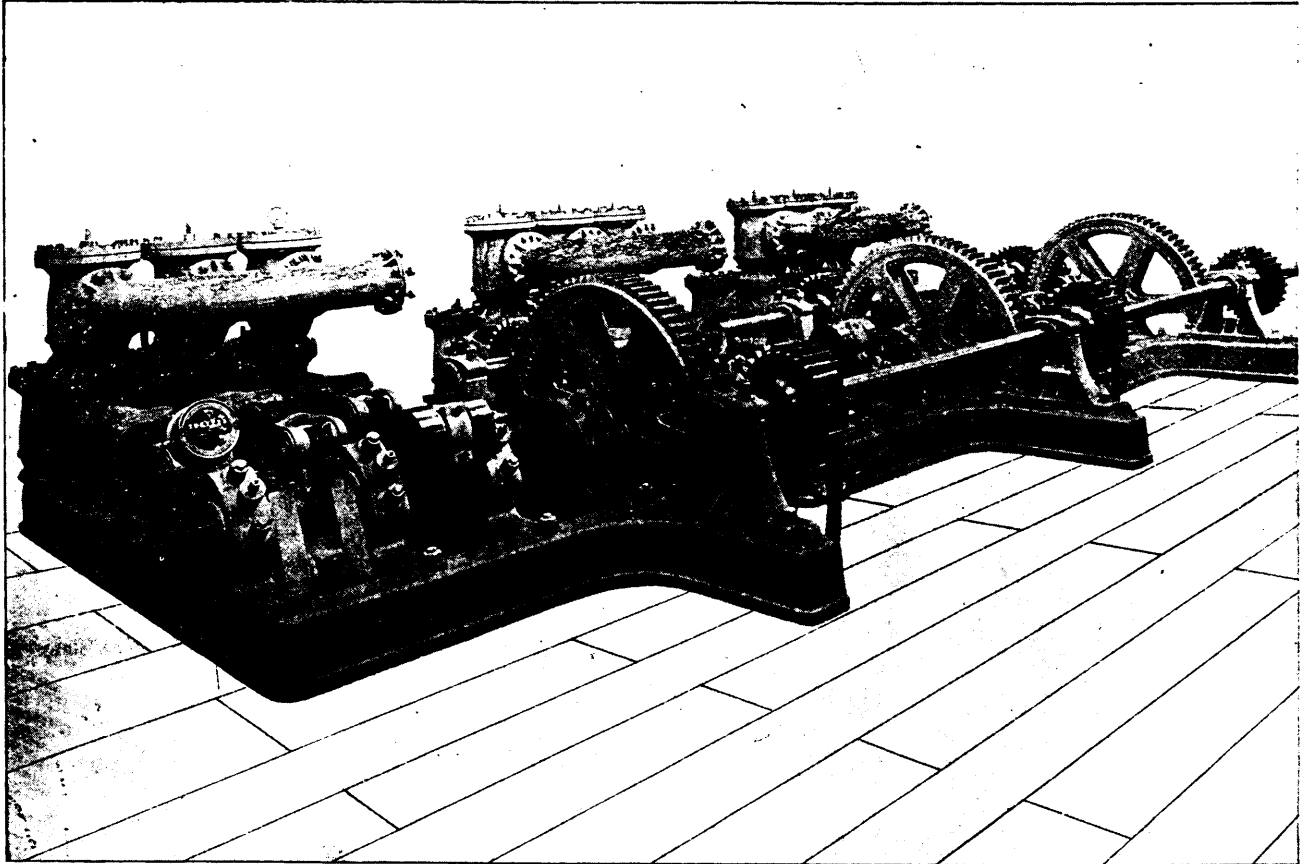
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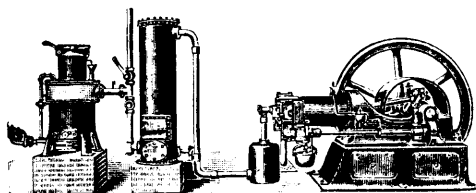
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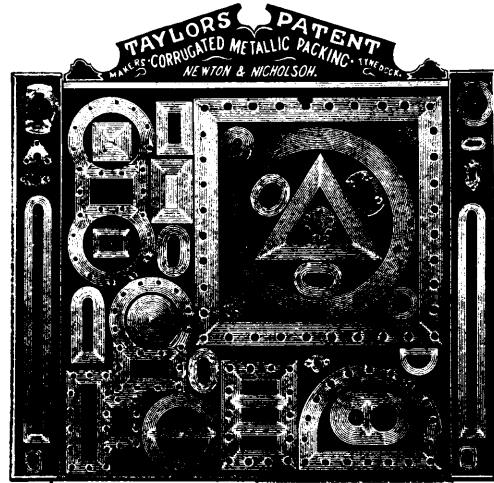
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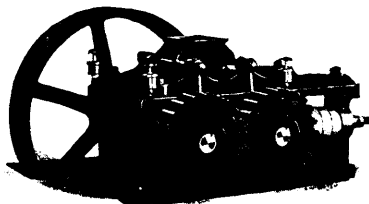
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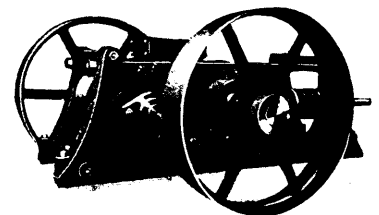
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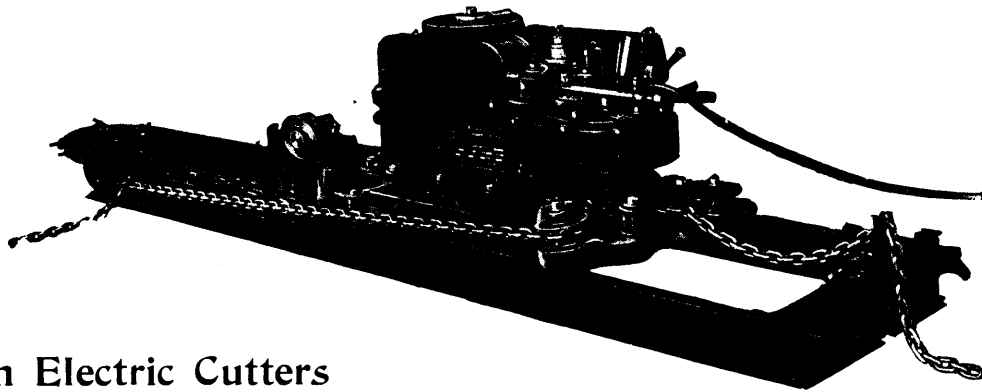
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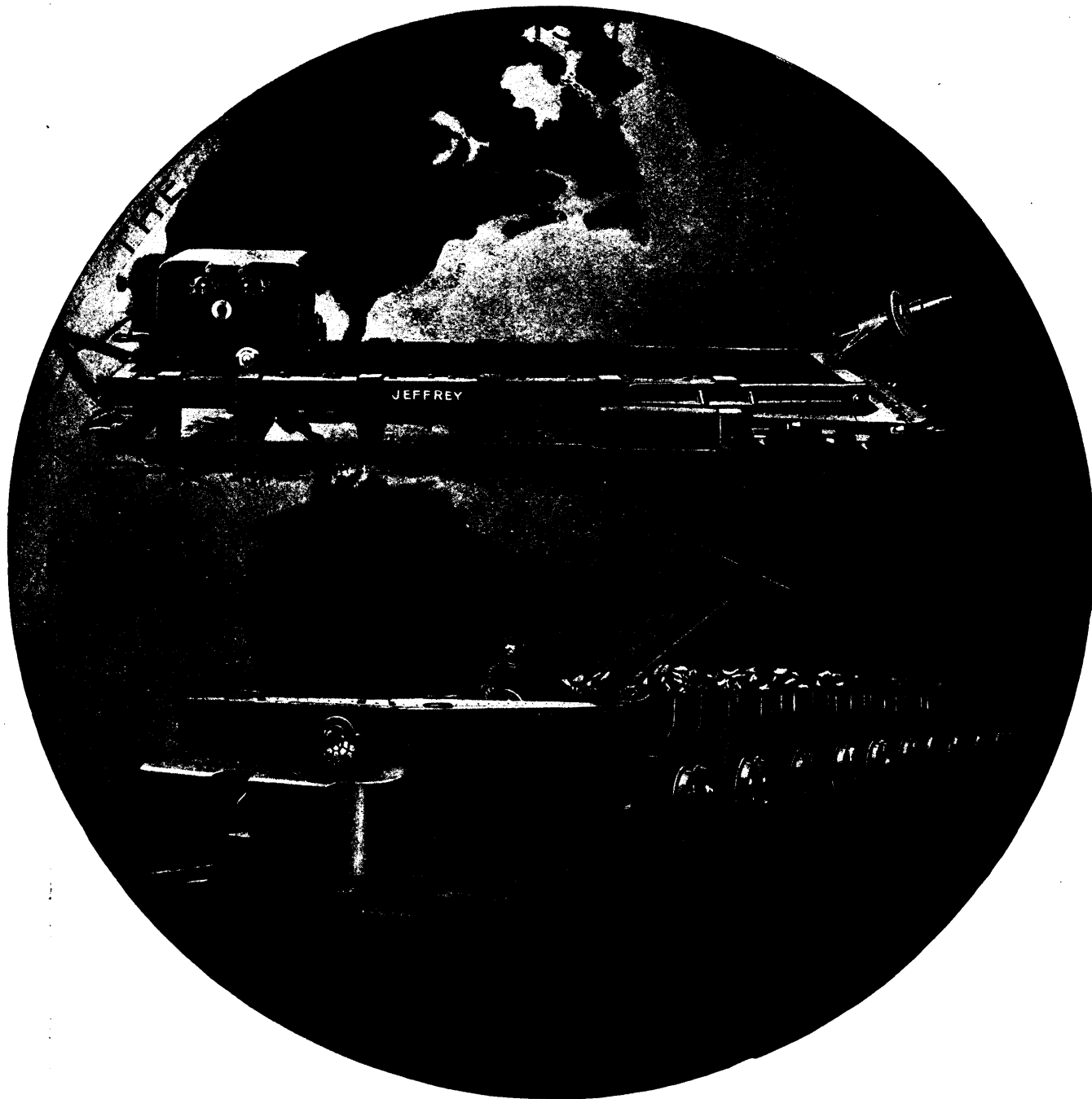
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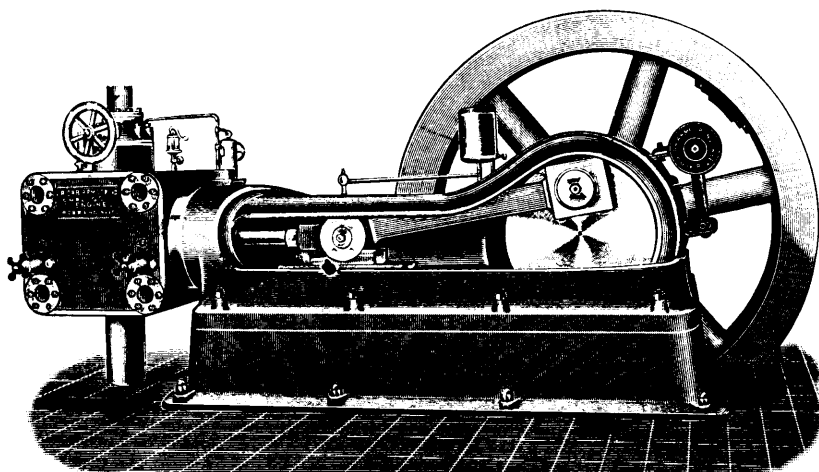
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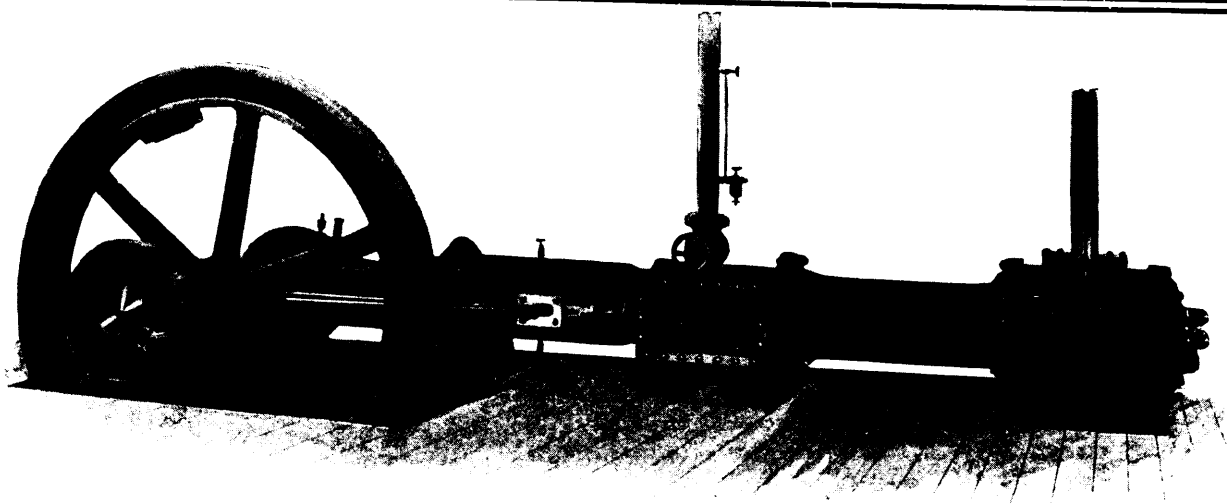
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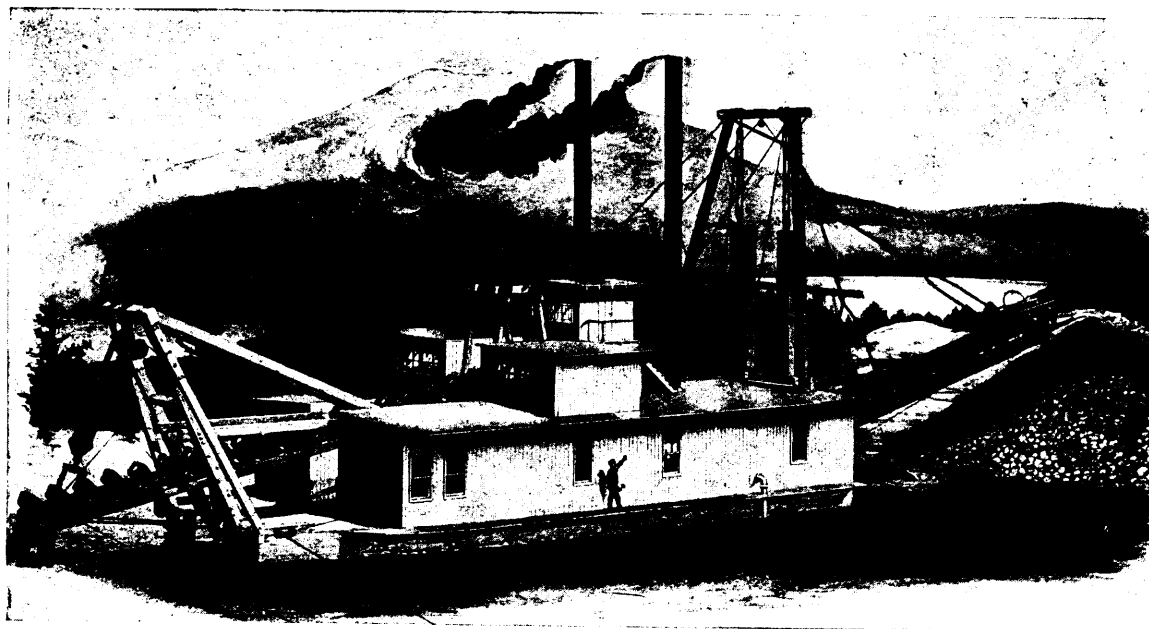
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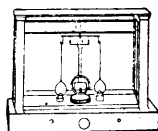
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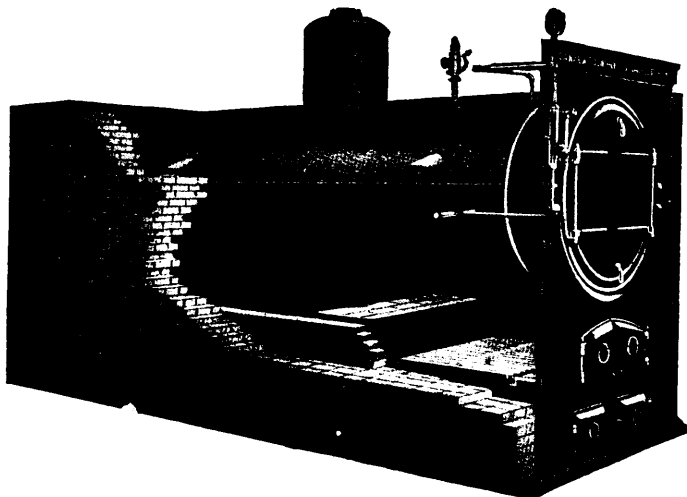
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have also been arranged for hotel accommodation at the famous Chateau Frontenac. We also learn that an excellent programme is assured. Meanwhile a number of important papers have already been sent in, and are now in the hands of the printer. These will be distributed in advance of the meeting in order to give members unable to attend an opportunity to participate in the discussion by submitting their views in writing.

In the great mineral producing State of Colorado an area of over 50 square miles of anthracite coal has been found in the north-western county of Routt. A reconnaissance survey by officials of the United States Geological Survey extended from the Elk River on the east to Lay on the west, and from California Park on the north to a distance of 30 miles south, thus covering some 1,500 square miles. The coal beds are of cretaceous age, but have been altered to anthracite, or semi-anthracite, by the intrusion of lava beds between the layers of sandstones and shales. The vertical thickness of the coal-bearing strata varies from 1,000 to 2,000 feet. The north-eastern part of this area, between California Park and the Elk River is the one in which the cretaceous coals have been changed to anthracite, in other parts of the field the bituminous character of the coal is unchanged.

Advices from Johannesburg state that the tin industry of the Transvaal is making substantial progress, and that two corporations there are already preparing for the crushing and dressing of the tinstone. In this connection some new practice is to be introduced by local men. An attempt is to be made to separate the cassiterite from the gangue by a dry blast or air method. So far as described this pneumatic method acts by a suction current, to which the lighter portions of the slimes are attracted and drawn out through the exhaust, while the heavier particles fall by gravity and are collected into one receptacle. Whether the dry air process will be a success in its application to the tinstone of the Transvaal, is uncertain; the difference in specific gravity between the ore and the gangue is sufficiently great to anticipate a favourable result, but larger scale experiments than have been tried are necessary before passing judgment. Our intelligence is to the effect that a new crushing plant, with a capacity of 125 tons of material per day of 24 hours, is in process of erection.

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We are informed by the secretary of the Canadian Mining Institute that the 1906 Annual Meeting will be held on March 7th, in the old historic city of Quebec. It is understood that the railway companies have, as usual, kindly offered a single fare rate to members and others attending the meeting, while special terms

We are in receipt of a little book entitled "New Year's quotations for the Geological Survey." The author's name is not stated which is a pity since some of the quotations are wonderfully apt, though in cases just a trifle vitriolic. Here are a few:—

- The Survey.—"Let's in new light thro' chinks that time has made."—*E. Waller.*
 B**L.—"How shall we rank thee upon glory's page?"—*Moore.*
 F*****R.—"Rocks whereon greatest men have oftst wreck'd."—*Milton.*
 I****L.—"Better to hunt in fields for health we bought, Than see the doctor for a nauseous draught."—*Dryden.*
 L*W.—"Low was his name, but great was his desire."—*Shakespeare.*
 Mc****S.—"A proper man, as one shall tell in a summer's day."—*Shakespeare.*
 Mc*****I.—"Though every prospect pleases."—*Hymn.*
 M****N.—"The meanest floweret of the vale to thee is opening paradise."—*Gray.*
 M****S.—"Of all those arts in which the wise excel, Nature's chief masterpiece is writing well."—*Sheffield.*
 W*****S.—"The languages, especially the dead, the sciences, and most of all the abstruse."—*Don Juan.*

A correspondent writing to the *Victoria Times*, expresses disagreement with some statements purported to have been made by Mr. O. T. Switzer, manager of the B. A. and B. C. Dredging Companies, in a recent interview on the subject of the disappearance of the "individual" miner from the Atlin district. The writer, after referring to Mr. Switzer's allusion to the enormous disadvantages at which the individual works by reason of the great distance to bed-rock, remarks:—"The deepest ground under operation in the district is about sixty feet, and it is being worked profitably by individuals. Furthermore, this depth is the exception, not the rule. The gradual disappearance of the individual is due to the opposition of the companies, and not because he cannot work the ground profitably." Mr. Switzer was also reported as having said that the increased gold production in 1905 was due to the operation of the large plants. In disproof of this an approximate estimate of the gold produced during the past two seasons by all companies—dredge, shovel and hydraulic—as compared with that produced by individuals, is given as follows:—1904, companies \$130,000, individuals, \$375,000; 1905, companies \$125,000; individuals, \$300,000.

One of the signs of the times in Canada is the present demand for mining machinery and supplies. This is especially the case in British Columbia. In a recent interview with the *Nelson Daily News*, Mr. Botterell, the agent in British Columbia of the Allis-Chalmers-Bullock Company, stated in this regard that his firm are now maintaining four offices in Canada, one at Montreal, one at Toronto, one at Winnipeg, and one at Vancouver, and to meet the increasing demand of the Western country have just completed a new building at Vancouver, at a cost of \$250,000. Among the largest orders which this corporation have lately received have been some from the Granby Company, for the Hill Crest Coal Company in Alberta, and for the Daly Reduction Company at Hedley, in the Similkameen country; in addition to which smaller orders from other companies have been numerous. Mr. Botterell's opinion is that the outlook for the year 1906 is very bright in British Columbia, and that capital, which hitherto has been lacking now seems to be available in quantities sufficient to enable many promising properties to become productive. We are glad to note this evidence of increasing prosperity in the mining business.

The Mining Convention held in Toronto on December the 12th, no doubt served its purpose, and so far as important principles were concerned, the meeting was practically unanimous in its expression of opinion. On the other hand, a number of resolutions were passed that were quite foreign to the objects for which the convention was called, and much time and energy was thrown away in more or less useless discussion on these points. We suppose the Ontario Government not unreasonably feels that it has already done quite enough towards endeavouring to ascertain the wishes of the mining communities in respect to the revision and amendment of the present law, but we believe that much future difficulty and trouble—to say nothing of the impetus industry might be expected to derive from the framing of a good mining law—might be avoided by the appointment now of a Royal Commission to hear evidence, and to finally advise the Government as to a law which would meet as nearly as possible the requirements and conditions of the Province, and at the same time encourage and stimulate mining development. The members of such a Commission would necessarily be disinterested men, apart from other qualifications, which would enable them to serve. The services of such a man as Dr. R. W. Raymond would, for example, in such a connection be invaluable.

The remarkable richness of many of the quartz veins in the gold districts of Nova Scotia has excited the cupidity of workmen and others ever since the discovery of these mines in the early sixties; and, periodically, operators in that province are put to their wits ends to prevent the theft of gold quartz and amalgam. Quite recently the Mining Society of Nova Scotia discussed the matter, and drew up a draft of a bill to be presented to the Legislature of that province for enactment; the object of the bill being that, the finding of gold upon the person of any one, not known to be connected with the management of a gold property, should be deemed *prima facie* evidence of theft. Early in December the Waverley Gold Mining & Electric Power Co's property, at West Waverley, N.S., was robbed by the abstraction of amalgam plates from the mill of this corporation. At the time of the robbery the property was idle, and the mill locked and vacant, but about the last of November it was found that some persons, unknown, had broken into the mill, torn up the plates and removed them from the building. Investigation by the chief detective officer of the Province showed that the plates after probably having been sweated and scraped by the thieves, had been sold to a junk shop in Halifax. Many attempts have been made to trace such thefts to the perpetrators, and to have them sentenced under the laws of the Province, but with little or no success. The only case in which we can remember such robbery having been detected and the perpetrators properly punished, was on the occasion of the robbing of the mill in Oldham, N.S., in the year 1894, when the two thieves who were brothers, were convicted and sent to Dorchester penitentiary for a period of 3 years.

We can scarcely congratulate the Le Roi shareholders on the action taken at the recent meeting,—either in re-electing Mr. A. J. McMillan to the Board or in rejecting the amalgamation proposal. But the folly of the average English shareholder is proverbial. That, however, is a matter with which we should have no concern, but for the fact that Canadian industry is injured by this fool's folly; and all things considered we nearly feel like saying that it would be better for

this country if Englishmen would keep their money at home rather than Canada should get the blame for the countless costly mistakes, bad investments, rotten management, and general idiocy that has characterized so many English-mining ventures in Ontario and British Columbia in recent years. The Englishman is terribly afraid of being "taken in," and probably the chief reason—apart from the exploitation hinted at by the London press that the meeting was "packed"—of the rejection of the resolution favouring amalgamation, was Mr. McMillan's clever recognition of this weakness and his successful appeal to the prejudices of his audience in insinuations regarding the machinations of Canadian interests. How unfair such a meeting can be was shown by the fact that one so disinterested as Prof. Brock was not allowed to speak, but when he attempted to do so his remarks were drowned by cries of "sit down, you're a Yankee!" It is, however, little use in bewailing spilt milk. The scheme, which had it been carried through would undoubtedly have greatly increased the profit-earning possibilities of the respective mines, has so far as the Le Roi is concerned, fallen through. Mr. McMillan is now on top and must enjoy the sensation of having kicked away the prop by which he climbed there. It is not a particularly bright outlook for Le Roi.

One of the important exhibits in the mining section of the Lewis & Clark Exposition at Portland, Oregon, was a model of a new quicksilver furnace, embodying an entirely new idea in the distillation of quicksilver from cinnabar. The furnace is the invention of Mr. W. E. Denis, Manager of the Black Butte quicksilver mine, Oregon. The furnace is primarily designed to treat low grade ore by volatilization, its inventor claims its adaptability to the roasting of other ores when needed. The results claimed for the new apparatus are:—first, large capacity for small initial cost; second, perfect combustion of the fuel, or organic matter of the ore; third, entire elimination of soot in the condensers; fourth, complete extraction in one process, requiring no treatment of residues; fifth, a nearly complete 100% recovery, due to the absence of smoke and steam.

The Denis furnace is fired by gas, the gas being generated in a separate producer. The condition of the fire is under the direct control of the operator, and depends upon the amount of air inlets, the arrangement and manipulation of which is a part of the patent. The gas from the producer is carbon monoxide (C.O.), which is drawn down and under the grate arch of the fire box to a gas holder, from which it is distributed to a series of superimposed combustion chambers, arranged on opposite sides of the ore tower. At each of the combustion chambers hot air, under control, is admitted, and here the carbon monoxide is converted into carbon dioxide, or carbonic acid gas, just before the gas passes over the cinnabar, thereby effecting complete combustion at the point where the heat is to be utilized, and occasioning the least loss possible from travel and radiation. The ore tower through which the pulverized ore is dropped consists of a series of superimposed zones, so contrived that the temperature of each is under easy regulation and control. The stirring of the ore is accomplished by gravity, without the use of rables, and it is claimed for the apparatus that no precipitation of metallic mercury within the furnace is possible, and further, that it is impossible for any unroasted fines to pass over to the condensers.

Mr. Denis claims complete extraction of quicksilver in four hours roasting, whereas the ordinary type of quicksilver furnace requires from 24 to 48 hours. This

saving of time, as claimed, gives the new furnace six times the capacity of the old type furnace, half areas being equal.

The Delaware, Lackawana & Western Railway Company have lately been carrying on a most interesting series of experiments in the application of electricity to the rapid hoisting of water from the Sloan mine, near Scranton, Pa. This shaft has a depth of 535 feet vertically, and drains all the collieries of the company in that particular division; the duty performed by the hoist requires the load to be raised to a height of 550 feet, and the capacity is to be 5,000 gallons a minute, or something over 16½ tons of water, 550 feet per minute. Including the weight of the rope the total load hoisted is over 18 tons, requiring 610 net H.P. To handle this large amount of water necessitated the use of large tanks which, on their part, had hitherto required to be operated or controlled by hand. The new idea in the experiment is the effort to have this hoist work automatically, and the design is to be put to the credit of Mr. H. M. Warren, the company's electrical engineer. Should the machine realize the hope of its builders, the man in attendance will have nothing to do save to sit by and watch, so as to put on brakes in case of any accident or derangement of apparatus. Owing to electrical difficulties it was decided that the hoist to operate these large tanks must be provided with a motor running continuously in one direction, and not reversible. The task of carrying out the mechanical details and providing the automatic attachments was confided to the Wellman-Seaver-Morgan Company, of Cleveland, and the electrical controlling devices were furnished by the Electric Controller & Supply Company, also of Cleveland, Ohio. The Wellman-Seaver-Morgan Company had already had large experience in using motors and hoists operated similarly to this large motor, and the method which they had successfully employed on these other hoists was adopted for this larger one. The mechanism by which this was effected consisted of a motor driving a pair of bevelled gears through one single bevelled pinion. The bevelled gears run loose on a shaft, and are each provided with a Webster, Camp & Lane friction clutch, the operating mechanism for which is so designed that while both clutches can be out at one and the same time, yet only one clutch can be thrown in at a time. The mechanical device by which the hoist is controlled is somewhat complicated, depending upon solenoids acting directly on both clutch valves and brake valves. If this feat of automatism in the operation of the mechanism by which the direction is changed as the tank is emptied of its load, is successful, it will be the first of its kind known to the engineering world, and will necessarily be a matter of considerable interest. That the coal Company, however, believes in taking all necessary precautions against failure is shown by the fact that it has installed a huge pump at the bottom of the shaft with a capacity equal to the water seepage of the property.

While on this matter of the problem of water in mines, it may not be out of place to mention the fact that the Pennsylvania Coal Company, in order to get rid of the water at its Dunmore collieries, is now engaged in driving a tunnel from the mines to the Lackawana River, which when completed will drain the collieries by gravitation. The task of getting water out of deep mines is far more expensive than is usually realized by those who have not had actual experience in the matter. In some collieries it is necessary to pump from 7 or 8 to 14 tons of water for each ton of coal raised to the surface, and the expense, not only

of the operation, but of the installation of the appliances necessary for this purpose, means such an outlay, not only for first cost, but for maintenance and operation, that prices of coal are not always so profitable to the company as might be imagined from the simple figures asked.

Dr. Robt. Bell, Acting Director of the Geological Survey, in a letter which we publish in our correspondence columns, takes exception to the views expressed in an editorial paragraph appearing in last month's issue of the *MINING REVIEW*, commenting on the desirability of greater co-operation between the Survey, the Mines Branch of the Department of the Interior. We regret exceedingly if we have unwittingly given Dr. Bell just ground for complaint, and it is needless to add that our comment was in no sense intended as a reflection on the general work of the Survey, members of whose staff, notably Messrs. Fletcher and Faribault in Nova Scotia, Dr. Barlow in Ontario, Messrs. McEvoy and Broek in British Columbia, and Mr. McConnell in the Yukon, (to go no further back) have done yeomen's service for the mining industry. At the same time we can hardly admit that the argument advanced by our correspondent is such as to incline us to amend in the main our already expressed opinions. Dr. Bell states that the comments regarding the publication of his department, and concerning the relations existing between the Survey and the Mines Branch, are misleading and untrue. It is certainly a fact that the Survey was the first to print reports on the two subjects dealt with in the recently issued Mines Branch monographs. That this point was not made sufficiently clear in the paragraph referred to, may, and doubtless does, appear unfair. We, therefore, hasten to make amends. But that the relations between the two departments is far from cordial, is a fact so generally known that it is scarcely a subject for argument. Dr. Bell further remarks that the Mines Branch monograph on Asbestos and Mica do not give, and do not profess to give, any original information on these subjects. We quite agree; and it were absurd to expect otherwise. The reports are not original, but descriptive. The information is of the character the investing public requires and demands, and which other countries, notably Great Britain and the United States, are ready enough to accord. Dr. Bell, for example, instances the point that the Survey has refrained from publishing details of mining machinery and of the cost of mining, on the score that mining men may object "to their ideas being given away to competitors, while, in respect to costs, there is always a fear of supplying unscrupulous promoters with powder and shot." So far as we are aware there is only one branch of the mining industry in Canada in which there is any sort of attempt at secrecy regarding the machinery used, and the special methods followed by the several operators in turning out a marketable product. That is the asbestos industry. It is confined to a limited area, and is controlled by a relatively few large undertakings. In such a case as this it would, of course, be quite proper for the author of a Government report on the industry to submit a proof of his description of individual properties to owners and request a revision before sending the report to press. In fact, such a course might well be generally followed. But on the subject of costs we fail to see the force of Dr. Bell's reasoning. If a Government report is merely a conglomeration of generalities, what useful purpose can

it possibly serve. Before investing in any undertaking the capitalist wants to have facts—definite and tangible facts—before him. He requires to be in a position to calculate his chances of profit or loss. And it is a decided advantage to him to have these facts presented in concise and handy form, thus rendering largely unnecessary the consultation of many works and books of reference bearing on the subject in question. For this reason, too, brief but comprehensive summaries of industrial conditions in foreign countries are eminently valuable.

Apropos of the foregoing we are, of course, aware that a Mines Section of the Geological Survey was established so long ago as eighteen years, and was intended to be the parallel of the Division of Mineral Resources of the U.S. Geological Survey. This branch of the Geological service is certainly entitled to all credit for the pioneer work accomplished, so far under very difficult circumstances; for it is evident that without a reasonably definite appropriation or grant of money, and with an altogether inadequate staff it has been a practical impossibility for the officer in charge of this Mines Section to afford the public that sort of precise information covering so wide a field as is demanded.

A PROPOSED U. S. DEPARTMENT OF MINES.

The movement in the United States to secure a federal department which shall have charge of the mining industry of the country under the direction and administration of a responsible member of the cabinet is again gaining force, and Mr. Van Duzer, Congressman, of Nevada, has already introduced in Congress a bill providing for such a department. The bill enacts that there shall be, at the seat of Government, an executive department known as the Department of Mines and Mining, with a head appointed by the President, who shall have a seat in the cabinet and shall receive the salary of \$8,000.00 per annum. It is proposed that this Department of Mines and Mining shall have general jurisdiction over all matters pertaining to mines and the mining industries, the Geological Survey, and in fact over all matters committed to any of the Bureaus, departments or branches of the public service transferred by this act from other executive departments of the Government to the Department of Mines and Mining. Also, that there shall be in the said Department of Mines and Mining a Bureau which shall, under the direction of the Secretary thereof, gather, compile and publish information in regard to the same, and disseminate practical and useful information concerning the mines, mineral resources and mining industries of the United States; that the office of the Director of the Geological Survey and the Geological Survey service, and all that relates to and pertains to the same, shall be transferred from the Department of the Interior to the jurisdiction and supervision of the Department of Mines and Mining, and the Director of the Geological Survey is hereby made the director of the said bureau. Subsequent sections refer to the business management of this department, obliging the Secretary of the department to make an annual report of receipts and expenditures, of special investigations and reports required by the President, the Senate or the House of Representatives, and placing in the Secretary's hands the charge of all

buildings and premises, with their libraries and contents, and providing for the issuance of regulations for all subordinate officials. The final section of the bill provides that the jurisdiction, supervision, management and control of mines, mining lands and mining industries, now vested in the Department of the Interior, shall be transferred to and invested in the Department of Mines and Mining.

The movement is interesting, inasmuch as it so aptly coincides with the suggestions made, three years ago, at a meeting of the Canadian Mining Institute for the reorganization and better equipment of the Geological Survey of Canada.

MINING FRAUDS AND STATE INTERFERENCE.

Among the notable papers read at the meeting of the American Mining Congress in El Paso, Texas, during November, was one by the State Mineralogist of California, Mr. Lewis E. Aubury, on "The prevention of mining fraud by state legislation." Mr. Aubury considers that the greatly increased attention now paid to mining necessitates the enactment of stringent laws to protect the investor in mining properties, and thus there is a necessity for legislation to that end in the mining states of the Union. The familiar prospectus of the "fake" mining company, which is successfully used to extract money from the pockets of ignorant investors, whose cupidity is appealed to by the possibility of huge returns from small investments, is well described. We wish, however, that we could endorse Mr. Aubury's contention that millions of dollars of capital are at present passing by the United States and seeking investment in Mexico, South America and *British* possessions. As a matter of fact, Canada during the last ten years, in proportion to its population, has suffered fully as much from promotion frauds as has the United States. Some of Mr. Aubury's remarks are, in fact, directly applicable to the Canadian situation, the following extract being singularly appropriate:—"The investor, with no knowledge of mining, is not generally able to distinguish the good from the bad, and it is useless to tell him of the necessity for securing expert opinion *before* investing. He listens to the tale of the 'faker' and obtains expert advice *after* he has invested, and when the promise made to him has failed to materialize. When he realizes the fraud, he forever abjures mining and mining operators, and loses no opportunity to condemn the same." If these words do not correctly describe the general attitude of Eastern Canadian capitalists, we know of none that will. Mr. Aubury then quotes the bill which he introduced at the last session of the California State Legislature, and which duly became law. The statute reads as follows:—

"SECTION 1.—Any superintendent, director, secretary, manager, agent, or other officer, of any corporation formed or existing under the laws of this State, or transacting business in the same, and any person pretending or holding himself out as such superintendent, director, secretary, manager, agent, or other officer, who shall wilfully subscribe, sign, endorse, verify, or otherwise assent to the publication, either generally or privately, to the stockholders or other persons dealing with such corporation or its stock, any untrue or wilfully and fraudulently exaggerated report, prospectus, account, statement, of operations, values, business, profits, expenditures or prospects, or other paper or document intended to produce or give,

or having a tendency to produce or give, to the shares of stock in such corporation a greater value or less apparent or market value than they really possess, or with the intention of defrauding any particular person or persons, or the public, or persons generally, shall be deemed guilty of a felony, and on conviction thereof, shall be punished by imprisonment in a State prison, or a county jail not exceeding two years, or by fine not exceeding five thousand dollars, or by both.

"SECTION 2.—All acts and parts of acts in conflict with this act are hereby repealed."

Concerning the operation of this law, Mr. Aubury admits that the time is too short to report as to its full benefits. At the time of its enactment California was flooded with mining literature containing the usual glaring misrepresentations which were printed, as usual, in the daily press of the State. Mr. Aubury says that since the passage of his bill the prospectus has disappeared from the state, and the faker has sought fresh fields for exploitation. The State of Washington has enacted a similar law to that framed by California.

Mr. Aubury is wise enough to recognize that you cannot make men honest by Act of Parliament, and that his suggestions, as to restraint by state legislation, may be opposed. He takes the higher standard that, while a large number of people with money may need the services of guardians, yet the mining industry of a country demands, as its due, that the citizens of that country should use every means in their power to safeguard and elevate legitimate mining.

While it is improbable that legislation of this character will be adopted by the Canadian Provinces in which mining is carried on, it is to be hoped that some steps will ere long be taken in this country to limit the activities of the mine "boomster" by penalising the publication of laying prospectuses and advertisements

IRON ORE SUPPLIES.

In a recent issue, the *Iron and Coal Trades Review* devotes considerable space to a critical editorial comment on the iron ore resources of the world. In this article the conclusion is reached that, the conditions which at present govern the iron ore supply of the world must suffer revolutionary changes within the next half-century, and the prediction is made that the conditions now obtaining will be profoundly modified within only *ten* years. At this time when the consumption of iron ore in the world is greater than it has ever been, such an article from an authoritative source is of exceptional interest, although attention has been repeatedly called or late to the fact that known supplies of iron ore are being rapidly exhausted. Meanwhile the American Iron and Steel Association, in a recent publication by the secretary, Mr. James M. Swauk, gives some figures abundantly justifying the general tenor of the article to which we have reference. For example the present blast furnace capacity of the United States alone has now reached the enormous figures of 31,465,000 tons, which is greater by nearly four million tons than the furnace capacity for 1903, as given by the same authority in "The Mineral Resources of the United States." This huge tonnage is more than the world's total production of pig iron ores for any one year prior to 1895. Again, whereas the actual production of pig iron in the United States in



The HON. J. PREVOST, the new Minister of Colonization, Mines and Fisheries in the Quebec Government. Mr. Prevost has expressed himself as being very desirous of promoting the development and welfare of the mining industry in the Province of Quebec.

the year 1903 amounted to 18 million tons, the monthly production of pig iron at the end of the year 1905 was at the rate of 26 million tons of "pig" per annum.

This remarkable increase, (of which we have definite figures for the United States,) was not confined to that country, but extended also to Germany, Great Britain, and the other smaller producers of the world; e. g. the capacity of the German furnaces has now reached between 12 and 13 million tons per annum, the capacity of Great Britain is put at about 11 million tons, and, while the Furnace capacity of France, Belgium and Austria is not accessible, yet the figures of exports from these three countries show that they have increased by percentages running from 12 to 15% over the figures for 1904. Russia, owing to the war with Japan, has suffered in her iron industry as in almost every other respect. As our contemporary remarks the situation, as regards raw material for supply, "is one to give us pause."

The *Iron and Coal Trades Review* in a previous issue published a Swedish compilation of the unexhausted iron ore resources of the world, in which the estimated available ore remaining in the whole world was put at ten thousand million tons. Let us see how long this would last the world at the present figures of increased consumption. As the 1903 figures for the whole world were 101 million tons of ore consumed for a metallic production of 46,420,000 tons, the present yearly consumption of ore, in the same ratio, would be approximately 30 millions of tons more, or, say at the yearly rate of at least 130 million tons of ore. Provided no increase in consumption was required the supply given by the Swedish expert would suffice for 75 years. Consumption however is not standing still but is increasing rapidly and steadily every year, and there is reason to believe that it will greatly increase in the future, and therefore that, as the *London Journal* suggests "We would seem to be within little more than half a century of an absolute iron famine."

So far as the American continent is concerned, we know that in the United States the enormous resources of the Lake Superior region, embracing five ranges and supplying 70% of the total production of the United States, are almost entirely required by home furnaces and that there is no surplus for export. In Spain, the Bilbao ores have more markets than can easily be supplied; Sweden has little or no surplus for export, and such new deposits as are opening in other parts of the world cannot be considered as prospective producers of ore for export for some time yet. It is at this point that the resources of the Dominion of Canada in respect to iron ore loom up quite largely, and are entitled to most serious consideration. The present Wabana deposit of Newfoundland is singular in that it is the one which is most vigorously worked, with the possible exception of the Helen mine, in the Michipicoten range, but at other points in Newfoundland, and at many points throughout Labrador, large but unexploited deposits of iron ore have been noted and examined by Mr. A. P. Lov, of the Canadian Geological Survey, and, from his reports, seem only to require exploitation to become very large sources of supply. In the new district in the northern part of Quebec, lying west of lakes Chibogamoo and Wahkon-ichi, magnetic iron ore is a possibility having already been found in small bodies with indications of much larger ones. Westerly in Ontario, the Hutton, Atikokan and Animikie districts, or ranges, are not only being exploited but are actually producing small quantities of merchantable ore. For these Ontario ranges transportation only requires to be supplied to enable

them to be important factors in the supply of iron ores. Westerly, in British Columbia, the high grade deposits at Kitchener and the reported discovery of hematite in Cariboo district must be noted, in addition to which there are the tidewater deposits of the western side of Vancouver Island, near Port Renfrew, the ores of Texada Island and the entirely unexploited resources of the coast to the north. It is not, we think, optimistic for Canadians to believe that within their own Dominion they have supplies of iron ore sufficient to last their own requirements for the next 100 years, and this without going into the matter of the smaller and less pure deposits which are known to exist in Cape Breton, portions of Quebec, and the older and eastern portions of Ontario. At the present time with the large production of high grade ores, many of which are Bessemer, in the republic to the south of us, there has been no commercial need for the exploitation of our iron resources, but with the continued rapid growth of Canada which we have witnessed during the last ten years, it is only a question of a short time before we shall have positive knowledge, not only of the quality, but also as to the quantity, of these iron ore deposits.

Somewhat remarkable improvements in the quality and quantity of the reserves at the Helen mine have not been made public, but we are in a position to assure our readers of the fact that they exist and that the Helen mine alone, apart from any other opening on the Michipicoten range, will supply a very large volume of ore in the future. On this range (Michipicoten) other deposits are known, some of which (the Josephine) have been partially developed and others have no development whatever.

The reports which have been brought in, during the last two seasons, by the Grand Trunk Pacific surveyors, have contained numerous references to magnetic attractions which have rendered the compass useless for short distances, and some have contained references to large bodies of iron ore, supposedly of the character of magnetite. The Swedish compiler, whose figures our contemporary has used, in all probability knew nothing of the iron ore discoveries of the northern half of North America, and while his figures may cause temporary consternation amongst the iron masters, they cannot be considered inimical to the iron industries of the Dominion, whose vast stores of raw material are only just beginning to be realized by Canadians themselves.

The last mail brings to our table authentic information concerning the iron ores of Australasia which recently have been investigated, in consequence of the determination of the government of New South Wales to aid the establishment of a steel industry in that colony. While Victoria has few, if any beds of iron ore, West Australia, South Australia and Tasmania have large deposits, sufficient for home consumption for more than half a century.

1905-6.

The year 1906 opens under peculiarly favourable auspices for the mining industry in Canada. For some time past evidence has not been lacking of a slow but steady rehabilitation—a recovery from the depressing reaction of inflation and exuberant boom by which a too enthusiastic and optimistic public signifies its

awakening realization of important potentialities. A boom is often merely a premature estimate of potential value. It is misdirected energy, and is responsible therefore for much seeming waste. As such it is deplorable. There is a sowing of the wind and a reaping of the whirlwind. The field is strewn with the corpses of the slain, and the cries of the wounded call aloud for pity and retribution. But just as a decisive battle may clear the atmosphere of international complications, though it unbalance temporarily the equilibrium of trade, so the boom, which it seems every mining region of importance in America must sometimes experience and suffer, is not necessarily an un-mixed evil. Given substance, as well as shadow, sooner or later some will be found wise enough to grasp the substance. While ten dollars may be thrown away on wild-cats, the boom will have been responsible for the investment of one or two dollars judiciously. It has at any rate attracted some capital to the country. In time this must tell. The wild-cats are relegated to the limbo of wild-cats. They are forgotten in the light of better things, and industry which before was secondary to speculation, now takes her proper place. That is what has taken place, and is still taking place, in Canada, and who shall say but that for the Rossland boom of 1896, mining in the Kootenays to-day would be on so substantial a footing. No doubt the process was drastic, the methods quite indefensible, but we have nevertheless to consider facts and accept them for what they are.

It is yet rather too early for us to be able to present an exact statistical statement of the past year's mining operations, but it may be very confidently said that with the exception of Yukon results, which show a falling off, there has been a general increase in mineral production in Canada during 1905. The decrease in the Yukon has, however, no special significance as indicating the exhaustion of the gold areas, but is almost entirely ascribable to a scarcity of water, the past season having been an exceptionally dry one. The chief features of the year in the Yukon have been the inauguration of dredging on a more important scale, and the new quartz discoveries and developments at Windy Arm, Tagish Lake.

The mineral production of British Columbia for 1905 will, it is estimated, have a value of not less than twenty-one million dollars, or an increase of three million dollars over the returns of the preceding year. This estimate appears to us to be well within the mark, or even below it. The great gain in B.C. has been in copper, silver, lead and zinc production, all of which industries have been stimulated by the improved market conditions. The year has been specially marked by important zinc mining developments, and the establishment of reduction works in the Province to treat zinc-bearing ores. More mines probably were worked on a satisfactory margin of profit last year than ever previously, and considerably greater aggregate amounts were distributed in the form of dividends.

In consequence of British Columbia's large mineral output this year, it claims more than ever to have earned the proud title of "the Mineral Province of the Dominion." We are not so sure, however, that if Ontario cared to challenge for the title she would not make so bad bid for it. It is a well known fact that it is easy to juggle with figures to make them tell almost any sort of a tale according to the manner in which they are compiled. Now the Ontario Bureau of

Mines has proceeded on the assumption that the proper basis for valuation is the wealth of the products in the highest condition of refinement to which they are brought at the mines or works in this Province. Other authorities, however, such as the Geological Survey at Ottawa, and the Mines Department of British Columbia, compute the values of the output at the price of the refined metal. This, as will be admitted, makes comparison, between the output say of British Columbia and the output of Ontario very unfair to the latter. For instance, Ontario values copper at about eight cents per pound in the matte or concentrates, and nickel at about seventeen cents per pound in the matte. British Columbia, on the other hand, values its copper at the full market value for the refined metal, which at the present time is about seventeen cents a pound. Lead is also valued in British Columbia at the full market price for refined lead, while the Geological Survey estimates nickel in the matte in Canada as being worth whatever the average value of the metal is in the markets of New York during the year. The nickel contents of ore and matte for 1904 were made up by the Survey at 40 cents per pound. On this basis of valuation, the production for 1905, not including steel, but including both metallic and non-metallic products, will probably reach \$16,500,000.00 or \$17,000,000.00, while if the British Columbia or the Geological Survey bases were adopted the values would be, perhaps \$21,000,000.00 or \$22,000,000.00. The figures for 1904, as published by the Bureau, show a total value of \$11,572,647.00. The output of steel in Ontario for 1905 will have a value of over \$3,000,000.00. The increase is largely due to the new source of silver opened up in the Cobalt mines, and to heavy advances in the production of nickel, copper and pig-iron.

In Quebec, the great feature of 1905 was the new discoveries in the Chibogamoo district, which is likely to become, once transportation facilities are provided, one of the most important productive areas in Eastern Canada. An increase in mineral output will also probably be shown to have been made by this province also, and we expect in next month's issue of the REVIEW to publish an authoritative statement in this regard. In the Eastern Townships the asbestos industry has enjoyed a most prosperous year.

We publish elsewhere an estimate of mineral productions in Nova Scotia for 1905. It will be noted that the coal shipments were the largest on record, and are estimated to have reached the considerable value of approximately \$11,250,000.00. Of almost greater importance, however, are the important developments that have taken place in the iron and steel trade, last year having seen inaugurated the rolling of steel rails in the province. The works of the two big companies have, in fact, been most busily employed filling orders in all departments, and have now sufficient work on hand to keep the plants in operation at their full capacities for some months ahead. Only a slight increase in the gold output is anticipated.

In wishing our readers a prosperous and Happy New Year, we feel that there is every probability of this being realized in the mining industry.

Conditions are now more stable than they have been for years past; there is little to fear in the way of labour troubles or disturbances; industry is becoming established on a firm and substantial basis; and new and promising territory is being opened up throughout the Dominion.

THE DEEP SHAFTS OF THE WORLD.

The following table, showing the location, size and depth in feet of the principal deep shafts of the world, will be of interest to many of our readers. The deepest shafts, as will readily be seen, are those in the copper region of Michigan, on the Keweenaw Peninsula, with the Driefontein Deep shaft in the Rand, S.A. a close second:—

There is no gainsaying the important part electricity is now playing in respect to the economies of mining. One of the latest Canadian applications is that of the Dominion Coal Company, at its Dominion No. 2 shaft, where it has been decided to install a central station of large size to develop electric power in quantity sufficient to operate all of the collieries of this Company. As a first instalment, three generators of 650 H.P. each, will be put into service, their power being distributed by wire to the various collieries, doing away with the maintenance of the individual steam plants at the respective collieries. The various pumping stations of the company will first be done away with, and the

pumps will be operated by electricity. The longest distance over which power will be transmitted for the present will be about 8 miles, to Dominion No. 6. The instalment has been decided upon, after extensive examination and investigation by Mr. H. F. Parshall, an eminent London electrical engineer, who reports that such favourable conditions for the installation of electrical methods do not obtain elsewhere to his knowledge. The Dominion Coal Company will be the first company in America to install a large scale electric plant for the operation of its collieries; while the principal collieries of Germany and Belgium now utilize it for central power stations, there are none in the Pennsylvania region, which have utilized it to such a large extent. The Dominion Coal Company will not be alone in this matter of applying electricity for the operation of its mines. The Nova Scotia Steel & Coal Company, which is preparing to open up a new colliery a mile north of the present No. 3 shaft, is also about to install a plant to do all pumping, winding and ventilating by electricity. In this manner the collieries of Cape Breton will be the first in America to utilize the electric current for operations on a large scale.

Name	Location	Material Mined	No. of Compartments	Size of Hauling Compartment	Size of Shaft over all	Depth in Feet	Remarks
Red Jacket	Calumet, Michigan	Copper	6	6 ft. 3 in. x 7 ft.	25 ft. x 15 ft. 6 in.	4900	Probably deeper at present day. Six compartments 6 ft. x 5 ft. and one 6 ft. x 6 ft. 6 in. Hoists total distance in 1 min. 25 secs.
Tamarack	Tamarack	Copper	5	7 ft. 2 in. x 5 ft. 2 in.	29 ft. 2 in. x 8 ft. 10 in.	4615	
Driefontein Deep	Rand	Gold	7	5 ft. x 6 ft.	42 ft. x 8 ft.	2000 4000	
Ashton Moss	Manchester	Coal		Circular	16 ft. diameter	2880	
Con. California and Virginia	Virginia, Nevada	Silver, gold	3	5 ft. 4 in. x 4 ft. 6 in.	10 ft. x 7 ft. 8 in.	2500	Pumpway 5 ft. 4 in. x 6 ft.
Cadeby Main	Yorkshire	Coal		Circular	16 ft. diameter	2253	
Rose Bridge	Wigan	Coal		Circular		2446	Max. speed of hauling 5,100 ft. per min., or 57 miles per hour.
Dinas Main	South Wales	Coal		Circular	18½ ft. diameter	1794	Sunk and walled in 16 months
Silkstone Colliery	Sunderland	Coal		Circular	16 ft. 6 in. diameter	1740	Hauls 2,000 tons in 8 hours.
Newbattle	Edinburgh	Coal		Circular	20 ft. diameter	1658	Hauls 2,000 tons in 7½ hours.
Centennial Eureka	Eureka, Utah	Gold, silver	3	4 ft. 2 in. x 4 ft. 2 in.	5 ft. 6 in. x 12 ft. 8 in.	1610	Manway 2 ft. 4 in. x 4 ft. 2 in.
Ontario	Park City, Utah	Silver	3	4 ft. 6 in. x 5 ft.	7 ft. x 20 ft.	1500	
Hazleton	Hazleton, Pa., U.S.A.	Anthracite	5	7 ft. 6 in. x 12 ft. 6 in.	37 ft. x 13 ft. 10 in.	1150	Pumpway 3 ft. x 12 ft. 6 in.
No. 5 shaft	Wilke's Barre, Pennsylvania, U.S.A.	Anthracite	5	7 ft. 6 in. x 12 ft.	12 ft. x 32 ft.	1039	2 hoistways, pumpway, up-cast 12 ft. x 14 ft. 10 in., downcast 12 ft. x 12 ft.
Anaconda	Butte, Montana	Copper	3	4 ft. 6 in. x 5 ft.	20 ft. 4 in. x 6 ft. 8 in.		
Butte and Boston	Butte, Montana	Copper	3	4 ft. x 4 ft. 6 in.	18 ft. 4 in. x 6 ft. 2 in.		

A LEAD AND ZINC CONCENTRATOR AT ROSEBERRY, B.C.

By ALFRED W. DYER.

The late successful run of the lead and zinc concentrator at Roseberry, Slovan lake, erected by the Monitor and Ajax Fraction Company and treating the ore of the Monitor and Bosun groups, has attracted some attention, especially in view of the importance of the problem, successfully solved, of the present zinc commission of enquiry undertaken by the Dominion Government and of the general advance in the price of both spelter and lead. That which has been done by this company can be imitated by others as it is by no means claimed that the Monitor and Ajax has the only properties in the Slovan which are worth the working.

The company's mining properties are the Monitor and Ajax groups. The Monitor group, consisting of eight claims, is situated at Three Forks on a branch

line of the Canadian Pacific, the Nakusp and Slovan railway. The Bosun has also a total number of eight claims and is situated on the east shore of Slovan lake, near New Denver. Two claims have been developed upon each property. Upon the Monitor a total of 3,950 feet of development work has been accomplished to date. The output has been 3,207 tons of crude galena ore for which net smelter returns of \$125,268.38 have been received. In addition to this output about 3,000 tons of second class ore have been mined which, after concentration, is expected to produce about 350 tons of lead concentrates and 1,500 tons of zinc concentrates.

On the Bosun the total development measures 4,060 feet and the output, up to date, is 2,920 tons galena and 1,300 tons zinc. The Bosun claims to be the first mine in the Slovan to ship zinc profitably to Europe. That was antecedent to the present operations. The Monitor and Ajax Fraction Company has only recently acquired this property.

The company having a large tonnage of second class ore on hand which could not be marketed profitably, erected a concentrator at Roseberry which would also separate the zinc from the lead ore; the mill is, therefore, a zinc and lead concentrator. The pulverizing machinery consists of one 10 by 20 Blake crusher, a Gates crusher and two sets of 14 by 24 rolls. The concentration and separation plant is a combination of seven four compartmented jigs and sixteen vanners. Besides these there are the usual accessories, automatic samplers, automatic feeders for the rolls and concentrators, trommels, elevators, classifiers, tanks, electric light plant, etc.

The mill is run by water power, the water being conveyed to the mill through an 18 inch pipe under a head of 376 feet. The power is applied through two five foot Pelton wheels.

The sizing and classifying are done by a combination of revolving screens and hydraulic classifiers.

The flow of ore is as follows:—The ore is crushed in the Blake crusher; is then conveyed automatically to the Gates crusher, in which it is ground to a finer size;

finers that which remains is extremely fine and is run into a settling tank, 60 feet long, in such manner as to allow of its being classified into 16 sizes, on exactly the principle which is shewn on the settling of sediment to the bottom at the entrance of a muddy river into a placid lake, the coarser particles coming to rest first. From the settling tank these fines are treated over a system of vanners, the vanner in use being somewhat similar to the Luhrig vanner. Here the final concentration of the fines takes place. The overflow of the settling tanks runs over into yet another settling tank in order that any possible residue may be caught. This residue is sold according to its value. It is impalpable and would run through a 250 mesh. The capacity of the mill, under this system, is 90 tons daily.

The products made upon the three classifiers are treated upon three jigs. The products of jigs and vanners are zinc and lead concentrates, the latter being ready for shipment and the former awaits the magnetic separator. The value of the zinc is largely increased by the separation of iron from it. Iron



New Zinc Concentrator at Roseberry, B.C.

is then passed through a system of three Snider automatic samplers, one one hundred and twenty fifth part of the feed being cut out for assay purposes and then falls into a large ore bin. Hence it is fed automatically into the set of coarse rolls whence it gravitates into the elevator boot and is lifted to the top of the building. Here it passes into four revolving screens, having 12 mm, 8 mm, 4 mm and 2½ mm holes respectively. Each size passes from the screens, by gravity, into its respective set of jiggers; the undersize passing over three hydraulic classifiers, Culver patent.

This latter is a great improvement over former classifying systems, the particular feature being a cross current of water of regulated force which meets the particles descending through the rising jet and drives them transversely. After passing the classi-

contents in zinc ore or concentrates are penalized by the smelters and, moreover, the separated iron has a certain commercial value as a smelter flux, especially as it contains good silver and gold values.

The new feature of the process just described is that no tailings are made upon the jigs. Such tailings are treated as middlings and are put through again, the tailings being thus made upon the vanners. This, of course depends upon the mill feed. The concentrates are practically three to two. It is therefore possible, without largely increasing the installation of machinery to run the tailings as middlings. If the mill feed meant a concentrate of 10 to 1, this could not be done, unless the milling capacity were enormously increased and then the point would remain whether the cost of such increase would set off the extra gain made.

In the case under review 960 tons of ore were put through the mill, between October 17 and November 20, resulting in 693 tons of concentrates and 267 tons of tailings. Nothing is being done at present as the ore dump is frozen up. With the run of the mine being used as mill feed and with the magnetic separator erected, the company looks forward next season to a continuous run. The experiment has been made and made successfully, upon the ore dump, without any expense being incurred in the way of mining excepting some ore bins being erected at Three Forks upon the Monitor end of the holdings of the company.

The actual test, according to the mill returns, supplied by manager M. Gintzburger, are as follows:—

Permuting this return it will be found that the recovery of silver was 89%, that of lead, 73% and that of zinc 86½%. The test for gold was not made on the mill feed.

It will be seen by the above figures that the zinc concentrates contain 3½% lead. This lead is not marketable when mixed with zinc ore and in such small quantities but after magnetic treatment the iron separated from the zinc contained from 6 to 7 per cent. lead and is then paid for by the smelters at the usual rate. As the iron contents amount to about

30% of the total weight of the zinc concentrates, i.e., about 160 tons containing, say 6½% lead, or about 20,000 pounds of marketable lead, it follows that the actual commercial recovery in lead is 83%.

Thus a step further will have to be taken in the erection of a magnetic separator to take out the iron from the zinc. Plans for this plant have already been drafted and submitted for approval. The estimated cost being about \$15,000. It must, however, be understood in this connection that the recent rise in the market price of spelter has altered conditions of mining. With spelter at £18 the ton no zinc ore running 40% or under was much worth considering. With spelter at £28 the case is different.

There has been some criticism as to the location of the present plant but it is explained by the management that the plant was erected in the first instance with the view of its being made a customs mill. Further the shipping facilities are excellent, either by boat or rail (C.P.R.) The site and the available water power are better at Roseberry than at the Bosun itself, which is five miles distant along the lake. Were the mill at the Monitor, nine miles away, the Bosun ore would have to be taken up hill for nine miles. The cost of the mill was \$50,000.

MILL FEED				GALENA RECOVERY					ZINC RECOVERY					
ASSAY				ASSAY					ASSAY					
Tons	Agg. oz.	Pb. %	Zinc %	Tons	Av.	Agg. oz.	Pb. %	Zinc %	Tons	Av.	Agg. oz.	Pb. %	Zinc %	Fe.
966½	20.04	10.29	23.7	156½	\$1.50	54.4	46.5	10.3	537	\$3.60	16.2	3.5	368	15
	19362½ oz.	198843 lbs.	457978 lbs.			8501 oz.	145312 lb				8699 oz.			395730

THE GEOLOGY OF JELL.*

(By Prof. J. F. KEMP).

It is the custom when we meet at the annual dinner to bring up only those subjects which have not been mentioned at all or which have been but incompletely treated during the regular sessions. I have one to present, about which, I think—I may even say I hope—all who hear me know little. In fact I even find it difficult to discover an acceptable name for it. I will therefore select a pseudonym. One of my old friends in college was a very pious individual named Bill Gosman. His early training had been so strict that he found it difficult in his later years to command a suitable vocabulary with which to relieve his emotions when they became strong and get a series of terms which would not offend his conscience. Finally, however, when these occasions arose, he would remark with deep feeling, Jam the jam thing to Jell.

It is of the geology of Jell which I wish to speak to you to-night and as I have said I am the only one here who knows about it as yet. But impelled by that ambition which every scientific man feels to spend some time in exploring a new district which no geologist had previously seen, and being anxious withal some-time ago to have a striking and novel subject to describe upon an important occasion like the present,

*A paper read at the Annual Dinner of the Geological Society, of Canada, Ottawa, December 29th, 1905:

I spent sometime in this the only district near New York which had not previously been exhausted by my colleagues, Dr. Clarke, of Albany and Dr. Kimmel in New Jersey. There have been several travellers who have visited it in the world's history. There was Orpheus who went in search of his lost Eurydice. There were Ulysses and Æneas, and in later times Dante. Nevertheless all of these were anything but scientific observers and while they brought back in each case much that was of great human interest, their references to the geology of Jell are of the most meagre character. In fact the references are all physiographic rather than geologic and relate to plains, rivers, gulches and caverns, without telling us whether the plains were wave cut terraces, lake-basins or deserts in origin, or whether the rivers were at base level or not. Moreover they mix up young, mature and old topographic forms in a way which shows that no one of them had any real grasp of the subject. And as for the geology there is almost nothing said. There remains therefore much of deep scientific interest to impart about Jell.

In order to reach Jell you go down to that portion of New York called the Tenderloin and then, as has been long known, you are right at the entrance. You hunt around until you find the mouth or crater of the conduit up through which the Palisade trap reached the surface. This is on the east side of the Hudson contrary to general belief, and from it the hot molten diabase turned westward, but the old connection was

long since destroyed by erosion. At the entrance, much as if you were going into a North River tunnel, you provide yourself with an asbestos suit so made as to be absolutely a non-conductor. When clad in it one can walk without danger amid the most elevated temperatures. The secret of its composition is known to few, but it was familiar to Shadrack, Meehak and Abednego, the three children of Israel who were in the fiery furnace many years ago. It was also used according to the researches of Professor Pumpelly in Anan, when in periods of excessive aridity the sun at midday made that town as hot as Jell. Its discovery is of the highest importance to one of Canada's leading industries.

The head-piece has small transparent windows of mica very much like a stove door out through which one looks without danger. Inside the back of the jacket is an apparatus containing liquid air for a cooler and as one expires the exhausted oxygen inside the suit, the latter is fitted with an outlet valve so constructed as to let only C.O₂ pass, since should any free oxygen escape there would be a frightful conflagration under the conditions prevailing in Jell.

Thus provided and having a topographical map ruled in coordinate squares, a note-book, a compilation book, an infusible platinum hammer, an inside compass, an outside asbestos rock-bag and a sack of condensed food, I set out.

I ought also to mention one other ingenious and essential piece of apparatus. My suit was provided with two sets of thermergons or heat generators, one in front and one behind, each outside the asbestos suit. By turning switches one or both would emit intense heat rays which would be radiated outward and which, as you will see, were necessary to the trip. I also had an electric lamp.

In the easy descent to Avernus at first you pass over a coarse macadam or pavement of a soft, tuffaceous rock, very much subject to alteration, so that with use it loses all stiffness and resistance. It is called goodresolutionite and specimens may be even found among incompleting manuscripts on the surface of the earth. It seems in the local geological relations to be a close parallel with the garnet, reservianite and andalusite of the contact zones which are occasionally exposed to view in the upper world, but it extends a long distance, since at present the centre of heat is far below the surface.

After a short descent upon the goodresolutionite I met the level of the ground water as would be necessary in our local conditions of rainfall. I noted the change in the character of the wall-rock at this horizon, but did not pause, being keen for the larger problems at greater depth. I waded right into the ground water, which was of meteoric origin in this case and for which I felt less regard than is cherished by some geologists. Having once gone below its surface a few feet, I turned on the switch of my rear thermergon and at once heat rays were radiated backward boiling the water furiously to steam of pressures only reached at the point of dissociation of the hydrogen and oxygen. The inevitable result was that I was driven forward much as if I had a powerful screw propeller aft. In a very short space of time I passed entirely through the groundwater zone, which, as everyone knows now is comparatively shallow. Mr. John W. Finch, state geologist of Colorado, has endeavored to show that it is about 1,000 ft. My patent log, which I trailed out astern, registered just 1017 feet, which shows the ex-

treme accuracy of Mr. Finch's estimate. Having passed the zone of the groundwater, which I may also remark is practically still and moves so little as to be of no particular geologic importance, I walked briskly downward amid dry rocks, just such as we meet in the depths of the Lake Superior copper mines.

Gradually however I passed to the limit of the zone of possible fractures and found the walls of the passageway closing in and the bottom becoming choked with the spalls and gob which had scaled off under pressure. Moreover the goodresolutionite began to bulge up in the floor just as shales and fireclay creep in the entry of a coal mine. For fairly tough and resistant rocks like our local mica schists and gneisses President Van Hise has calculated that the zone of fracture extends to a depth of 8342.75 meters. While it is difficult to note in a hasty trip at just what point the possible fractures end, yet by adding to the records of the patent log for the ground water, the depth of the overlying vadose region and the records of my pacing survey, checked by a pedometer, I found the depth of the zone of fracture to be 7979.87 meters, or 362.88 meters say about 1100 feet less than President Van Hise's estimate but on the whole corroborating him very well.

The question may arise in your minds as to how I proceeded at all as the zone of fracture ceased, but the solution of this difficulty is really quite simple. As the rocky walls closed in, I turned on my front thermergon at moderate capacity, and my rear one at twice this amount. The powerful heat rays melted the rocks for the space of a few feet around, and the extra heat of the rear thermergon generated from the dissolved vapors and occluded gases a preponderating pressure a tergo which drove me forward at good speed and with small difficulty gradually I traversed the zone of mixed fracture and flowage, and finally the zone of flowage itself. In the end and after passing 41,387.63 meters of the latter I suddenly shot out into an open space and found myself standing upon the pyroclastics which at this point formed the floor of Jell.

You may raise the question as to the possibility of an open space below the zone of flowage, but it strictly follows from physical principles. The zone of fracture ceases because the pressure is so great that cavities are impossible. The rock is squeezed together and compacted as tightly as matter can be. As one penetrates the zone of flowage the matter reaches a point when it cannot be compacted further, and it attains the property of absolute resistance. Below this surface which is roughly spherical there lies the region of no strain, and it is a matter consequently of physical indifference whether the central space is hollow or is filled.

As I found myself upon the pyroclastics which at this point form the floor of Jell. I shut off my thermergons, and in the clear though not bright unearthly radiance that diffused itself everywhere I sought to examine my surroundings. The cavern was a passageway of moderate size which led on to more highly illumed regions beyond. The location was Jell quadrangle, northeast corner, outcrop, igneous and apparently basaltic in nature. Proceeding 721 meters along the passage I found a dike of a leucocratic phycrocrystalline jellynose—striking N.E.—and after that uniform granitoid walls of gehennose, which constitutes the main country rock. So far as my wanderings took me in Jell this was the solid rock and it varied only in that moderate differentiation had produced a greater or less abundance of the several constituent minerals.

Thus we have in the quantitative system dofelic sodi-potassic gehennane, and dofemaniac, sodicalcic, gehennane. The rock would furnish some interesting microscopic data but these though valuable for record are always deadly dull in a paper that is read.

I pass therefore to the real questions of interest which may be solved in Jell. These are the origin and production of the several kinds of igneous rocks, and the solution of that puzzling problem the sources of the metallic ores, and more especially the sulphur compounds.

My observations show that the various kinds of igneous rocks are produced under the direction of the Jevil-in-Chief very much as charges are mixed for a furnace. Thus that the materials for the various lavas exist at the centre of the earth there is no doubt. The only point of interest is the form in which they occur. As a matter of fact the following are kept in storage reservoirs in a molten state and under pressure. They can be tapped off as needed and in any desired proportion. There is a reservoir of pure SiO_2 , one of Al_2O_3 , one of Fe_2O_3 , one of FeO , one of MgO , one of CaO , one of K_2O and one of Na_2O . In these there are slight impurities of P_2O_5 , Cl , S etc. but there is also a separate reservoir of FeS_2 , mingled with lead, copper, zinc, silver and gold. When the Jevil-in-Chief orders andesite, he issues instructions for the proper proportional parts of these ingredients and the subordinate jevils run them together and over into a spout which connects with the volcanic conduit. Into this and on the principle of the injector, is run under enormous pressure steam and other mineralizers and the whole mixture, boiling and seething, forces its way through the zone of flowage and so to the upper world. At rare intervals the metallic bath is tapped into it, especially during the expiring stages, and then ore deposits result as the igneous action in the upper world draws to a close. But I hear the Secretary of the Society say how can all this be in accordance with the planetesimal hyp. I do not see myself how in Jell it can be, but if carried away by that interesting figment of the imagination the planetesimal hypothesis you question the existence of Jell you contradict not only the testimony of the distinguished travellers who preceded me, but my personal observations and the testimony of all the orthodox divines for centuries.

Time fails me to enlarge upon these topics although as you will see they furnish the clew to much that has troubled many thinkers hitherto.

One other question will arise regarding Jell. Did I see nothing of the various remedial forms of treatment of the wicked which other travellers have noted? I did not, except in one minor case. They generally were given up about one generation ago and passed out of use. The only survival is one for the treatment of wicked cephalopods and brachiopods. Both these groups of organisms are provided with resistant shells into which after evil deeds on the surface they retired with impunity. In Jell the wicked ones have been gathered by thousands into a vast pool of water. First acid is turned in on them and it dissolves the shells to their great discomfort while nourishing the tissues; then alkaline calcic solutions are let in which reproduce the shells while destroying the tissues, and thus alternately these two reactions are carried out until complete repentance is produced and the head Jevil can say "Now will you be good."

I fell into conversation with the Jevil-in-Chief and we discussed many topics of interest. He informed me that among his other schemes for abstracting the water

of Niagara he had contemplated sinking a shaft from the head of Goat Island and letting down directly into Jell 222.367 cubic feet per second of both Canadian and American water to use as steam in propelling the eruptive rocks to the surface. But the State Geologist of New York had raised such an agitation against using the waters for other purposes than the manufacture of sarsaparilla and other soft drinks that the subordinate Jevils in the New York Legislature and the Ontario Parliament refused to take his orders. So we parted and regretfully ending this interesting conversation I retraced my steps to the point where I had entered, passed up through the zones of flowage and fracture, through the ground water and vadose region and shot up out of the ground in the Tenderloin. No one paid the slightest attention to me for everyone thought I was just one of the workers in the tunnels under the river who had been blown out by leaky air, an occurrence now so common that it no longer excites remark.

THE COBALT-NICKEL ARSENIDES & SILVER DEPOSITS OF TEMISKAMING.

This most valuable and comprehensive report, by Prof. Willet G. Miller, Provincial Geologist of Ontario, constitutes Part II of the Report of the Bureau of Mines for 1905.

We have previously had occasion to congratulate the Ontario Bureau on the practical nature and value of bulletins issued therefrom dealing with the economic minerals of the Province, and from an economic standpoint the present monograph is in many respects the most interesting of the series and is bound to attract a great deal of interest and attention with the investing public.

After briefly summarizing the information given in respect to the situation and discovery of the Cobalt Silver Ores in the area, examined during 1904, by the Provincial Geologist, the report states that since then a considerable amount of exploration work has resulted in the further discovery of a number of extraordinary rich deposits.

The deposits at Cobalt occupy narrow, practically vertical fissures or joints which cut through a series of usually slightly inclined metamorphosed, fragmental rocks of Lower Huronian ages.

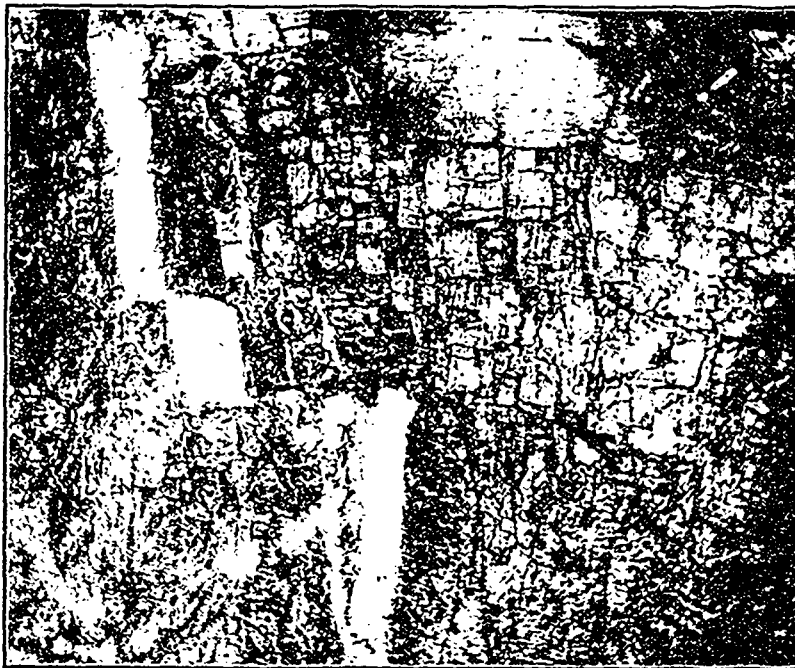
Mr. Miller states:—"The material in these veins has, in all likelihood, been deposited from highly heated and impure waters which circulated through the cracks and fissures of the crust and were probably associated with the post-Middle Huronian disbase and gabbro eruption. It is rather difficult to predicate the original sources of the metals—silver, cobalt, nickel, arsenic and others—now found in these veins. They may have come up from a considerable depth with the waters, or they may have been leached out of what are now the folded and disturbed green stones and other rocks of the Keewatin. Analyses of various rocks of the area have not given a clue as to the origin of the ores. As these ore bodies in the vicinity of Cobalt station may be said to be unique among those known in North America, we have no chance of instituting comparisons on this continent. Some European veins, however, such as those of Annaberg, Joachimsthal and other localities which will be again referred to, show a similar association of minerals. The origin of these has been explained by most authors by the supposition that the metals were leached from the surrounding rocks. The



The Little Silver Vein, southwest corner of location R. L. 404. The cliff is about 70 feet in height, and is composed of almost horizontally lying Lower Huronian rocks. At the bottom of about 15 or 20 feet of well banded graywacke-slate. This is followed by about the same thickness of feldspathic quartzite, overlying which, at the top of the cliff, is a coarse conglomerate. The greatest thickness of the vein, as originally exposed, was about 8 inches. The strike is east and west, and the dip, as the photograph shows, is almost vertical.



Slabs of silver from the Trethewey Mine, location J. R. 7. The slab standing upright by the hammer is the 79 pound specimen referred to in the text.



Cobalt Hill vein, northwest corner of location R. L. 404. The photograph shows the fractured character of the rock and a gentle anticline. The vein is seen to be in step-like forms as if it had been affected by horizontal faults, but the ore is not brecciated.

writer has found, however, from the descriptions which have been published of most of these European occurrences, that there are usually basic dikes in the vicinity of the veins. These dikes appear to have in some cases the same relation to the ore bodies that those of diabase and gabbro have in the Ontario Cobalt region."

The more immediate ores in these veins are native silver, with smaltite, niccolite, and related minerals. In addition, there are a number of secondary or decomposition products with rather indefinite characteristics, such as asbolite, consisting essentially of the oxides of cobalt, manganese, etc. The cobalt bloom and annabergite occur intermixed, at times, in proportion such that the red color of the former counteracts the green colour of the latter, a white claylike substance being the result. There are occasionally other sulphides present than those mentioned, especially in the wall rock. These consist of copper pyrites and bornite, which are the sulphides of lead; and iron pyrites, the disulphide of iron. Zinc blende is found occasionally. These minerals in the wall rock were probably deposited before the vein minerals.

been so rich in silver, cobalt, nickel or arsenic as those of Ontario.

The five or six productive properties from which shipment have been made during the last few months, all carry, with one exception, high silver values, as do also the veins more recently discovered. During the year, production for the first quarter ending March 31st, during which shipments were made, was 354.05 tons of ore valued at \$293,552. The ore thus averaged \$829 a ton. The average percentage of the metals in the ore was as follows:—

	Per cent.
Silver.....	4.802
Cobalt.....	8.264
Nickel.....	4.739
Arsenic.....	34.668

The 4.802 per cent. of silver represents 1,406.27 ounces a ton. The cobalt, nickel and arsenic in one car load are not included, no returns having been made.

During the second quarter, March 31st to June 30th, the shipments were 537 tons, valued at \$394,552, or an average of \$734 a ton.



La Rose vein.

One characteristic of the group is the subordinate part which sulphur plays in comparison with arsenic. Antimony, which is not abundant, is found in some compounds where arsenic might be expected to be found, since the latter is so much more abundant. For instance, while both native silver and arsenides are present in abundance, no compounds of arsenic and silver have yet been recognized although they are probably present. It would also be reasonable to expect to find some compounds of bismuth, since this metal occurs in the free state in considerable quantities in some parts of the deposits. It might also be expected that native arsenic would occur at times. The report notes that nearly all the chemicals of minerals found in the Joachimsthal deposits of Bohemia are present in the Temiskaming ores. But these Bohemian deposits do not appear to have ever

The average percentage of the metals in the ore for this quarter was:—

	Per cent.
Silver.....	4.158
Cobalt.....	6.890
Nickel.....	3.091
Arsenic.....	30.912

The metals in the ore were sold at approximately the following prices:—Silver, 55 to 60 cents an oz. Troy for 90 per cent. of the contents, cobalt, 65 cents, nickel, 12 to 15 cents, and arsenic about 1 cent a pound.

During the first quarter of the year, shipments were made from the La Rose mine, the New Ontario mine, from the McKinley and Darragh, and by the Nipissing Mining Company, working the Cobalt Hill and Little

Silver veins in the north-west and south-west corners of R.L. 404, prospectively. At the present time there are probably fourteen or more shipping mines. Ore shipped so far has been sorted by hand, while much ore that in other localities would be considered high grade is accumulating on the dumps. It is expected that in the near future this ore will be milled, and so help materially increase the output of the region. The extraordinarily high grade value of the shipping ore is shown in the statement that on the Trethewey vein \$200,000 worth of ore was produced from an open cut 50 feet long and 25 feet deep, the maximum width of the vein being not more than 8 inches. The amount realized from the shipment of one carload of 30 tons of ore from this mine was between \$75,000 and \$80,000 and the analyses of a shipment of 50 tons gave approximately the following percentage of metal:—Arsenic, 38%; cobalt, 12%; nickel, 3.5, and silver, 190,000 ounces.

Elsewhere in the report reference is again made to the Cobalt Hill vein, which was described in the 13th Report of the Bureau. This vein was one of the four discovered at the time of Professor Miller's visit to the

"Most of the cobalt-silver veins occur in the Lower Huronian. A few have been found in the diabase. There is no reason, so far as the writer can see, why the veins should not also occur in the under-lying Keewatin and some of the more recently discovered ones, near the centre of location R L 404 appear to be in this group. The Keewatin greenstones and other rocks are tougher and do not fracture with the same ease as the over-lying series of the Lower Huronian. Hence the solutions have not had the same freedom of movement in the former as in the latter. In so far as the precipitation effects which the rocks of either series may have on solutions working through fissures in them there seems to be little difference between the two. Many of the pebbles and boulders and much of the cement material in the Lower Huronian have been derived from the under-lying Keewatin. Hence one would think they would have about the same influence in precipitating substances from solutions as the rocks of the latter formation. The distribution of the Lower Huronian, as will be seen from the map, is irregular. At one time, in all likelihood, it formed a complete layer or mantle over the uneven surface of



district in Nov., 1903. The ore is described as unique, in that silver is absent, in paying quantities, the values being confined to cobalt, nickel and arsenic.

Following an interesting chapter on the analysis of the ores of the district, is a description of the cobalt-silver veins. Most of those worked have been developed by means of open cuts, but the most systematic development work has been done on the La Rose, where a shaft has been sunk and drifting carried on at the 80 feet levels. It is stated that approximately a million dollars worth of ore has been blocked out on this vein; but this is said to be probably the largest ore body yet found in the area, and Mr. Miller states that it would hardly be correct to infer that smaller veins can be followed as persistently. We quote the following upon report:—

the older rocks. This has been removed to a considerable extent by erosion, leaving the rocks now in more or less isolated belts and patches.

"The more important veins so far found in the Lower Huronian lie in what may be called three parallel belts. Those first discovered are in a belt which runs about parallel with the railway in the vicinity of Cobalt lake. A small belt connects the northeastern corner of Peterson lake with the northwest corner of Cross lake. A third belt stretches from Giroux lake to the southeast end of Cross lake, in which important deposits occur. Although these three belts have a strike approximately in a northeast and southwest direction, the strike of the veins is not uniform, as will be seen from the plan. Those on J B 7, J B 6, and on the location immediately southwest of the latter claim

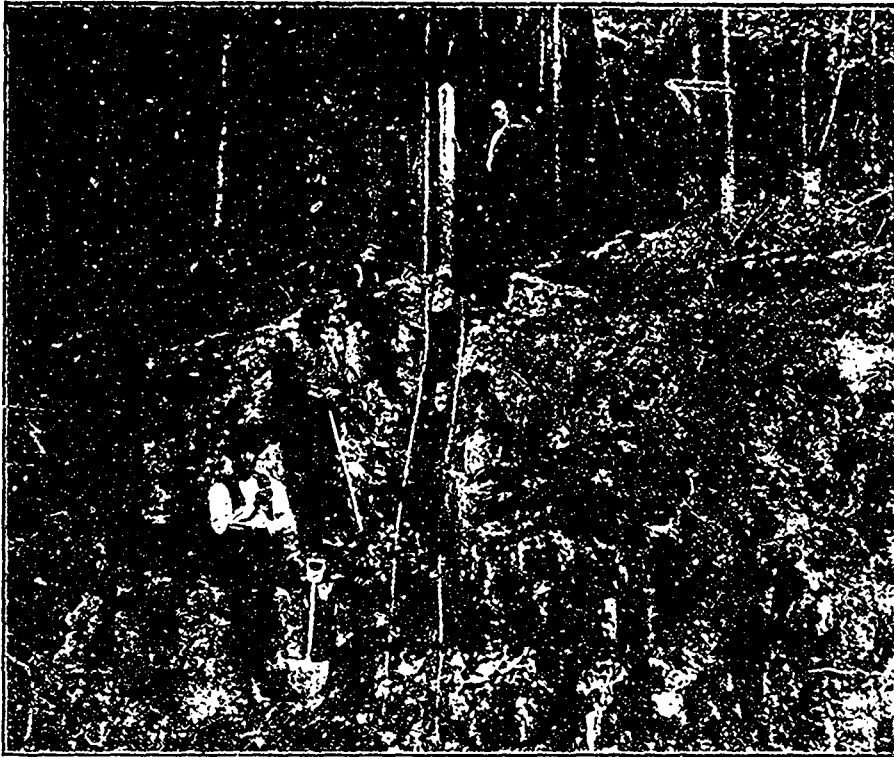
strike east and west. The veins on J S 14 and J B 1 strike approximately northeast and southwest, while that in the northwest corner of R L 404 strikes northwest and southeast. The vein in the southwest corner of this location strikes east and west, which is the direction of strike of the majority of the veins.

"None of the veins are wide. The width of ore in the Trethewey vein on J B 7, for instance, had a maximum width of about 8 inches, while the vein in the northwest corner of R L 404 has 14 inches of ore and that on J S 14 showed about 18 inches. Some veins which have been traced 100 feet or more average not more than one inch in width. The surface, being uneven and more or less covered with loose deposits and with green timber, does not afford an opportunity of tracing the outcrops of the veins any great distance, and it is not known definitely how long most of the outcrops would prove to be if the material referred to were removed from the surface of the solid rock.

"It is also impossible to give much definite information concerning the depths to which these veins will reach. Most of them do not appear to cut through the older Keewatin series which forms an uneven sur-

less depth near the outcrop than some distance away from it. Similarly, if a diabase dike or mass cuts through the Lower Huronian in a vertical direction we have evidence of a greater depth in an adjacent vein than if the diabase cut through the Huronian at a lower angle. In the latter case the vein may be disconnected or cut through by the diabase at no great depth from the surface. Examples of both of these occurrences can be cited in the field. It is likely, however, that in some cases, at least, a vein passing downward through Lower Huronian conglomerate or slate will penetrate sheets or sills of diabase which it may encounter. Similarly veins starting at the surface in a diabase sheet or sill will likely penetrate underlying conglomerate or slate, judging from what we know of the veins of the Port Arthur district were the diabase bears a similar relation to the fragmental series."

There are three or four exceptions to the statement that the veins occur in the Lower Huronian, thus at the northwest corner of Cross lake silver and associated metals have been found in diabase, and also, in the Township of Dymond, cobalt bloom has been found in the diabase. Veins have recently also been found in



Trethewey vein and discovery post, J. B., 7, May, 1904.

face below the Lower Huronian. In the vicinity of Cobalt station the latter rocks are found on hill-tops which stand about 500 feet above the low water level of Temiskaming, where similar outcrops are found.

"The depth to which a vein may reach depends, therefore, on whether it descends into an old valley of the older rocks or whether it lies above a former hilltop. No one can tell this of course without diamond drilling or sinking a shaft. Evidence of the probable thickness of the Huronian or vein-bearing formation can, however, be determined by noting the outcrops of the Keewatin or the intrusive diabases. An exposure of Keewatin surrounded by the Lower Huronian represents an old hilltop. It is therefore evident that a vein which strikes towards this outcrop is likely to have a

the diabase on the Handy and Jacobs locations, this latter being the chief producing mine in the diabase.

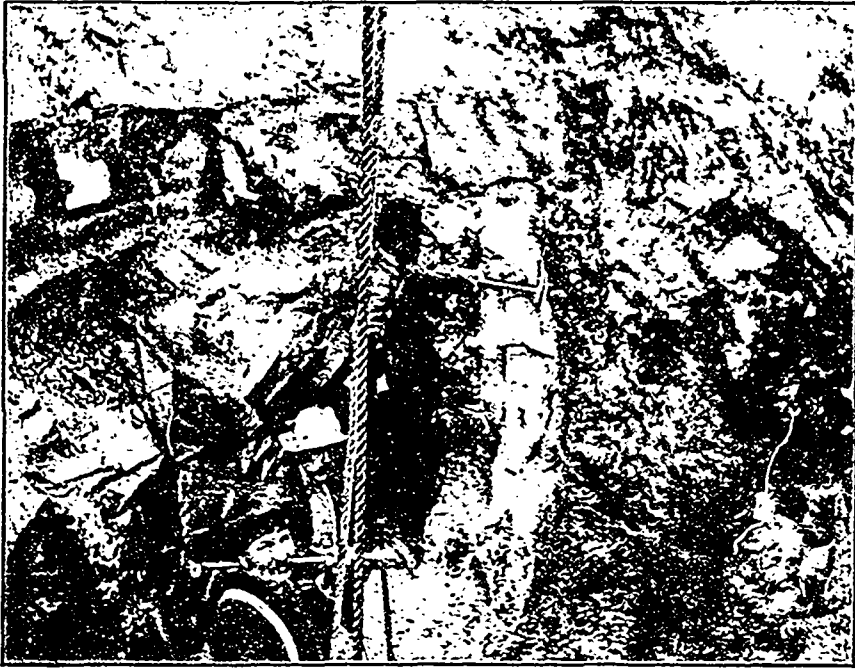
The area so far productive in the Cobalt region is shown on the geological map and plan accompanying this report, to be covered by a rectangular with a length of $2\frac{1}{2}$ miles in a north and south direction, and a width east and west somewhat less. The chief properties in the northwest part of this rectangular are in the vicinity of Cobalt lake and the railway, and another important group lies immediately south of Glen and Kerr lakes, in the southeast of the rectangle.

The system of water courses in this district is a remarkable one. The chief watercourses follow either a northeast or southwest, or northwest and southeast direction, the latter being the more prominent. Con-

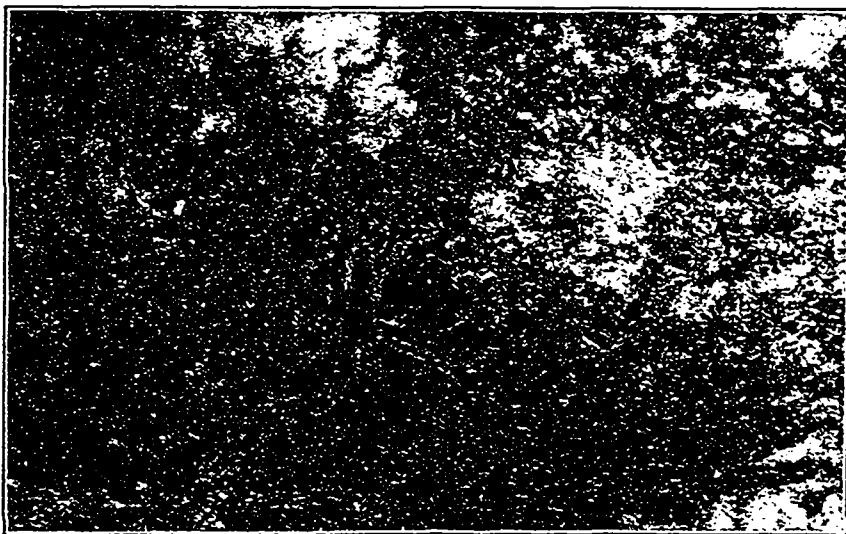
cerning the origin of the two great systems of water courses, little information is at present obtainable, thus it is impossible to say whether the courses follow fault lines or simply folds. They have, doubtless, been due to regional disturbances in the post-Middle Huronian times. Much of the surface of the country is covered by recent and glacial deposits, and the exposed rocks present a complex of igneous and metamorphosed

fragmental material with the minor faults and folds, and that it will be difficult to prove the existence of what may be called regional faults or folds.

The report also deals with Lake Superior silver deposits of the silver mines in the area adjacent to Port Arthur. There is also a chapter on other Canadian nickel-cobalt ores, and a brief account of foreign cobalt deposits.



Vein showing on the wall of a pit at the La Rose mine November, 1904. The width of the vein is equal to the space between the head of the hammer and the man's hand on the handle.



A typical silver-cobalt vein on J. B. 6. The head of the hammer shows the width.

THE BEARING OF ENGINEERING ON MINING.

With Especial Reference to Mining Education.*

By Prof. J. B. PORTER, Hon. D.Sc.

Lord Milner, in his altogether admirable book on Egypt, has much to say of the work done by engineers in reclaiming and developing that wonderful country. He refers, of course, to the men of our day and generation who have laboured, and are still labouring, to control the Nile, to economise and distribute its waters, to build railways through the desert; in a word, to carry to successful completion by modern means public works most of which have been proposed, or at least dreamed of, since the beginning of history.

The book does not concern itself greatly with the past but incidentally it tells us that in ancient times "Egypt had very good engineers," who did great deeds. On other pages misfortunes and failures are clearly laid at the doors of those in authority who have from time to time failed to make proper use of the available resources of engineering science.

The great thing about the book as a whole is its masterly presentation of the advantages of British influence, of honesty, order, and commonsense in government; but to an engineer its secondary thesis is of even greater personal interest: the absolute beneficence of engineering works in the development and utilisation of natural resources.

I have referred to Egypt because there we find the remains of perhaps the earliest of all engineering work, there we see some of the most interesting and one of the most notable achievements of the last century; and, finally, because there we have just completed one of the grandest and most directly beneficent works of modern engineering. Egypt thus shows us in a very clear and simple way what the engineer has done for the good of mankind; but the same story may be read in every part of the world, and, to my mind, it is one of the greatest stories of modern times.

I do not wish to make light of the great work that is being done in other departments of science, or even to weigh one branch of knowledge and one kind of effort against another, but I do believe that none possesses greater interest, none is more honourable, none is of greater use to the nation or to the world at large than engineering.

The influence of engineering in mining is but one case in the general proposition just stated, and though probably not as important as those of several other branches of engineering development, its aggregate importance is immense.

Mining has been one of the world's great interests from very early days; but until recent years it had been so uncertain that its development has been greatly retarded. The discovery of the mineral was in nearly all cases a matter of chance; mining, owing to difficulties of pumping, hoisting and ventilating, was usually on a small scale, and often most hazardous and costly. As a result, profitable operations were confined to rich or favourably-situated ores and coals, and quite too frequently enterprises failed when apparently well under way, owing to some unforeseen mischance, or to the loss or decreased value of the ore body. Chance still plays a great part in mining, but it is no longer the ruling influence. The first discovery in a new region is still usually fortuitous, but it is promptly followed by good scientific work. Government surveyors map out the district, and its geology, in a broad way, and private mining geologists direct the detailed

prospecting. Modern appliances, of which the diamond drill is by far the most important, make it possible to explore to any necessary depth with celerity and economy, and thus the size and value of the ore bodies can be approximately determined before extensive mining operations are begun.

Mining proper, deferred until these preliminary explorations give it justification, can now proceed with almost as great certainty of success as any other branch of engineering; and thanks to high explosives, rock drills, and all the modern appliances for hoisting, pumping, ventilating, etc., the operations can proceed with such rapidity and certainty, and with so little danger, that large outputs can be produced at a cost per ton that is usually a small fraction of what it was a generation ago.

These improvements in methods and reductions in cost have played a great part in the development of our modern material civilization. In ancient times, and even until less than a century ago, gold and silver, and perhaps also gems, were the chief products of mines. Now, in spite of an increase of many fold in the output of these materials, in spite of such mines as we have seen within the last few days—producing more gold and gems themselves than did the whole world fifty years ago—these precious metal industries form but a small part of the work of the miner, whose high duty it now is to produce the main part of all the structural materials of modern engineering, and the coal which has become the almost universal fuel of the present day. The wealth of a country still depends to a great extent on its agriculture and on the number and thrift of its people, but place as a world Power can be better measured by its production of coal and iron.

This great development of the mining industry that I have briefly indicated has been largely due to improvements in general engineering, and to the opening up of new districts and to the creation of new or increased demands for material; but those in charge of the actual underground operations deserve a full share of praise, for, in addition to original work on their own account, they have been keen to seize upon each new invention that could be turned to their uses.

Gunpowder was used (I believe first in the mines of Saxony) long before the disappearance of plate armour. Nitroglycerine and its compounds, invented little more than a generation ago, were promptly accepted by mine and tunnel engineers, and were extensively produced at the mines themselves before they were commercially procurable elsewhere.

I need only name Watts to remind you that his inventions were primarily made on behalf of mining. Tramways were laid in mines as soon as on the surface. Cable haulage was used in scores of collieries before it appeared in the streets of even the most progressive of the American cities. The electric tram was, I believe, first used on the surface; but one was in successful operation fully sixteen years ago underground, and to-day there are thousands of miles of underground lines, with an enormous aggregate tonnage, operated by the most recent of means.

I had intended to illustrate this development of mining at some length by means of slides, showing the changes which have taken place in methods and appliances, but, unfortunately, the slides have failed to reach me, and I shall, therefore, illustrate only one branch of mining, and only one group of mines. The mines at Kimberley are, however, almost ideal for my purpose, and afford a wonderful, yet typical, illustration of the progress of the art of mining. Thirty years ago the methods employed here were as crude as possible. The district was new and inaccessible, and

*A lecture delivered before the British Association at Kimberley, South Africa, Sept. 6th, 1905.

methods abandoned half a century before in more favoured places were the best that could be employed. The great wealth of the district soon, however, attracted a large population which in turn brought about rapid development, able men took charge of the work, and to-day the mines at Kimberley are thoroughly modern in every way, and in some respects set an example of high achievement to the whole world.

In mining operations we rarely produce a material pure enough as it comes from the pit to be of immediate use. Coal and iron ore are sometimes fit enough, but even they are usually sorted, and often elaborately washed before they go to the consumer. Nearly all other ores contain comparatively little of the valuable mineral—say, 2 to 20 per cent. in most ores of lead, copper, zinc, etc., and the merest fraction of a per cent. in the ores of gold and silver. In extreme cases the proportion is amazingly minute. Gold ore from the Rand averages little more than one-third of an ounce per ton—which means that it contains about one part of gold to 100,000 parts of worthless rock, which have to be crushed, separated and disposed of before the gold can be utilized. In some gold mines where conditions are very favourable one-six-hundred thousandths of gold can be profitably treated, as in certain gold gravels in California and Australia. One part in fifteen millions has been known to pay operating expenses. These cases are the extreme results of large-scale work with most modern appliances and methods; but they are all surpassed here in the Kimberley district where, I am told, there are mines which are, or at least can be worked at a profit on so low a recovery as one-tenth of a carat per load. A carat weighs a little over 3 grains and a load of blue ground weighs 1,600 lbs. One-tenth of a carat per load is therefore one part in about forty million. The average richness of the blue ground is greater than this and may perhaps reach one part in ten million, but even this recovery is lower than that of any other profitable mining enterprise, and the first mentioned figure of one in forty or perhaps million is the extreme achievement in this direction of the mineral industry, and literally surpasses the proverbially impossible task of finding a needle in a haystack.

It is, of course, the exceedingly great value of the diamond which makes it possible for mines to handle so much worthless material in order to get the little particles of precious stuff, but this fact does not lessen our interest in the operation, and the concentration practiced here may well be considered one of the most remarkable achievements of modern mining engineering.

The Kimberley mines are also giving us admirable engineering in other directions. Their arrangements for hoisting and handling material are very good and for several years they have held the world's record for maximum output from a single shaft, in spite of the efforts of mines and collieries in many lands. They have also developed and modified the old system of mining by caving and filling to a degree of perfection, which, all things considered, is most remarkably safe, economical and rapid.

I have a series of slides, which I will now show, depicting the gradual advancement in connection with local mining engineering from the earliest days of the Diamond Fields up to the present. (The views comprised a fine series illustrating admirably the developments referred to, and were received with applause. Referring to the picture of the De Beers Workshops—the last of the series—the lecturer said: "The De Beers Company buy their machinery at the places where it is manufactured when it is possible to do so

to advantage, but they make their own repairs, and do a lot of engineering work in the shops you see depicted, including the making of big guns when necessary.")

It would be easy to give other illustrations of mining development, but enough has been said to show that the men in charge of our mineral industry have been alert, and have not failed to keep pace with engineers in other lines of work. The full measure of what they have done can perhaps be best shown by a few approximate figures.

Table of approximate tonnages and values of minerals produced in 1903-4:—

Name	Tons of Ore.	Value of Crude Ore or Metal.
Aluminium	15,000	£ 1,025,000
Antimony	200,000	500,000
Arsenic	50,000	100,000
Asbestos	50,000	250,000
Asphaltum	600,000	1,300,000
Baryta	220,000	250,000
Bauxite	149,000	100,000
Chrome Ore	100,000	250,000
Coal	882,000,000	220,000,000
Copper	4,000,000	35,000,000
Diamonds	5,500,000	6,000,000
Feldspar	80,000	200,000
Furnace Fluxes	30,000,000	10,000,000
Gold	50,000,000	70,000,000
Graphite	77,000	1,100,000
Iron	100,000,000	110,000,000
Lead	10,000,000	11,100,000
Manganese	2,200,000	2,200,000
Mercury	200,000	900,000
Nickel	400,000	2,000,000
Petroleum	26,000,000	4,800,000
Precious Stones (ex-diamonds)	1,000,000	1,200,000
Phosphates	3,500,000	3,000,000
Salt	12,000,000	6,000,000
Silver	5,000,000	18,500,000
Sulphur	500,000	2,100,000
Zinc	2,000,000	13,000,000
Totals	1,135,832,000	520,875,000

These statistics might be elaborated, and pointed with illustrations and descriptions of old and new methods of mining in such a way as to make a very interesting lecture; but there is little to be gained by dwelling longer on this part of our theme.

Engineering, or specifically, mining engineering, has played a great part in the development of the world's resources, but the work is but begun. Our mines have barely scratched the surface of the earth; our engineers have developed the merest fraction of its total resources. If the signs of the times are true, we may safely say that the engineering age has just fairly begun, and that the developments of the future, especially in beneficent use of natural resources, will inconceivably surpass anything we now know.

In view of what I have just said, it is our plain duty to see that the young men who are to be the engineers of the next generation shall be as fit as possible for their great task. Until, say, two generations ago, engineering work of all kinds in civil life was done either by military engineers, by men educated in pure science, or by men trained on the works and often lacking any but the most elementary schooling. None of these men were properly educated for engineering in the modern sense, but on the other hand an unusual proportion of them were beyond doubt especially fitted for their work by temperament or circumstances. This fact is evident from the high average of ability and of single-minded devotion shown by the engineers of that time.

(To be continued next month).

SOME SUGGESTED AMENDMENTS TO THE YUKON MINING LAW.

(By J. B. TYRELL.)

Premising that placer mining in the Yukon Territory is very different from placer mining in any other part of the world, and that therefore the Mining Laws, to be suitable here, must needs be different from the mining laws of other countries:—

FREE MINERS CERTIFICATES.

Every man in the Yukon Territory is living directly or indirectly off the product of the mines in the country. If the money paid for Free Miners' Certificates is urgently needed by the Government as a means of increasing the revenue, every man in the Territory should be obliged to take out such a certificate for the tax should be equally levied on all, irrespective of whether a man is a direct producer or not. If the money is not urgently needed for revenue purposes, and whether it is needed or not, it certainly should not be levied as a tax on a particular industry, and that the vital industry of the country.

The necessity of obtaining such a certificate means a considerable loss of time to every prospector and mine owner in the country; but more than that it means that no man, no matter how favourable the conditions surrounding him, is at liberty to prospect, and stake a claim, unless he has already provided himself with a certificate giving him a right to do so. It is thus a direct discouragement to the old prospector by taking money from him when he needs it most, it prevents hunters, trappers, etc., from prospecting for if they discovered precious metal some one else would be very likely to stake the ground before they would be able to go and get a certificate and return to the ground, and in general it engenders the feeling that it is useless to prospect unless definite arrangements have first been made with the Mining Recorder. Had such a regulation been in force in the Western States during the past fifty years it is certain that the discovery and development of their mines would have been greatly retarded.

PLACER MINING CLAIMS.

All claims should be of the same size, and should be as nearly as possible square, so that the direction and character of the "pay," and the location of a claim on a main stream, on its tributary or on no stream at all would make the least possible difference. In staking such a claim most men will comprehend and define its shape and extent much more clearly than if it is longer in one direction than in the other.

In regard to the size of such claims, considering the tenor of most of the gold-bearing ground likely to be discovered in the Yukon Territory, and the expense of installing efficient machinery on it, one thousand (1,000) feet square seems to be a reasonable size, and this is the same area as the creek claims under the present regulations. But the question of the size of claims is one involving a discussion of whether the land should be divided up among very many owners, or whether it should be held by fewer owners who would probably mine more systematically, and I shall not take up that matter here.

In order to encourage exploration and prospecting, a discoverer should be allowed to take a larger block of ground than the above, say two claims long and two claims wide, for the discoverer has an inherent right to a reward for his successful search, while the stamperers or subsequent locators and those who profit by the enterprise of the discoverer have only such rights as the State sees fit to give them, with the view of

furthering the development and best interests of the country. It should here be borne in mind that the successful prospector, the discoverer of valuable mineral, is the cheapest and most efficient immigration agent that the country possesses, and that the country is bound to profit by his discovery, no matter how rich a strike he makes.

If oblong claims such as those defined under existing mining regulations, namely 500 feet long and 1,000 or 2,000 feet wide, are continued, a well defined base line on the creeks is almost a necessity to avoid great confusion, even though it may be an expensive expedient. However this base line should be merely directive as to the course of the boundary lines of the claims, and should not determine the positions of the claims themselves, as it does at present. For instance a man might stake a creek claim on some of the creeks in the Klondike district, be given 1,000 feet on each side of the base line as provided for by the present regulations, and still the creek would not be on his claim at all, but would be a long distance away to one side of it. If a man stakes a creek claim, or any other claim for that matter, he should be allowed to choose where the middle line of that claim would be, irrespective of the distance of the base line on one side or the other from him. His Number 1 stake would govern the position of this middle line, which would then be run from this stake parallel to the base line in a general direction towards his Number 2 stake. From this middle line, and at right angles to it, his claim might then extend 500 or 1,000 feet as was thought advisable. A man would thus be given only such ground as he wanted, and in which he had confidence, and which he would be likely to thoroughly prospect.

DISPUTES.

Disputes as to the location and boundaries of claims should be decided by the Gold Commissioner on the ground, where the parties to the disputes would be able to explain and point out the conditions clearly and fully. Had this been the case in the past, ninety per cent. of the litigation with which this country has been cursed would have been prevented, and litigation means waste of time, energy and money, three things that are so necessary for the opening up and development of the country, and perhaps worse still, it engenders a feeling of utter despair in the possibility of free and unhampered work and progress.

On this point I cannot do better than quote from Mr. J. H. Curle, the eminent Mining Engineer, who spent part of the summer of 1901 in the Klondike district, and who in his book "Gold Mines of the World," writes as follows:—"The Gold Commissioner, his assistants, and the Claim Inspectors, seem to have no power—or to be afraid to use it. Their only remedy is, 'Oh, take it into court.' Dawson, as a consequence, reeks with lawyers and litigation. A couple of Australian mining wardens, of the old school, who would ride up the creeks themselves, interrogate the parties to a dispute, and settle the matter on the spot—sticking the boundary and water-right pegs into the ground themselves, and warning the men to touch these at their peril—would do more good than the dozens of officials there now, and would soon empty the courts of litigants."

REPRESENTATION OR ASSESSMENT WORK.

After a claim has been granted to a man, he should be allowed the fullest liberty to work it as he may see fit, consistent with the freedom of his neighbour. Some men are slower at determining the best methods of working their ground than others are, or they may

work slower than others do when they have determined on a method, preferring small profits to financial ruin, even if the latter is accompanied by the applause of the multitude. However, they are not necessarily poorer citizens on this account, and if the value of a citizen is to be determined at all by his willingness to remain in the country and become part of its population, working carefully and conscientiously all the time, rather than by the rapidity with which he is able to seize on some rich prize, and carry it off to enjoy elsewhere, he should be encouraged or at least protected in such careful work as he is trying to do, and should not be continuously urged to join the rush, and get out of the country as quickly as possible. The town of Dawson and the Klondike district in its vicinity, if carefully nurtured, may form a nucleus for the development and settlement of the whole of the surrounding portions of this vast territory, whereas if the enterprise of the country, namely mining, is forced onward regardless of cost, this camp is destined before long to dwindle out of existence, and the Yukon Territory must then look for its re-opening to the overflow from our great neighbour across the International Boundary Line.

Nothing will conduce more to the stability of the population than to give to each man a right, after he has opened up and developed a piece of ground, to live on it and hold it as his own, so that even if his claim should cease to be remunerative if worked under present conditions, he may have a home to which he can return when he is not employed elsewhere without let or hindrance from anyone; without being obliged to report to the Government annually or at any time his whereabouts; and without being subjected to the possibility of change of tenure from year to year.

If this view is correct, rather than the one that the State is very anxious that any gold in sight should be taken out of the ground as quickly as possible, or in a mining sense that the country should be gutted at once, regardless of the development of its ore reserves, the annual assessment work, of the Government valuation of \$200.00, necessary to be done and proved before the Mining Recorder each year, before a renewal of a mining claim can be obtained, has dwindled to an absurdity.

On developed mining property it is simply an unremunerative vicious tax, which is all used up in the collecting, from which the Government receives no revenue, and which does not contribute to, or assist in, the permanent settlement of the country. A man owning valuable developed mining property should not, and in most cases will not, be diverted from the plans and methods that he has determined on for the operation of his mine by a tax, however absurd, of two hundred dollars a year.

On undeveloped mining property the assessment work, as provided for under the present Mining Regulations, has rarely, if ever, increased its value, either to the individual or to the country. Residence on such property for a certain length of time each year might reasonably be demanded to encourage settlement, and as an evidence of good faith, but after this good faith has been shown, by the doing of a reasonable amount of development, a title should be given which would be free from all restrictions and interference.

In both cases the present perpetual tax of two hundred dollars a year should be done away with.

TITLE.

There is very little need of emphasizing the necessity for better and less hampered title to mining ground

than is now given to holders of mining claims. The exploitation of the Alluvial and Bench gravels of the Klondike has already needed a rather heavy investment of capital, but the time has now come when still heavier investments are necessary if the low-grade gravels are to be worked at a profit. The money for these investments must be looked for in the money markets of the East, where it can be obtained at a low rate of interest, but before it can be obtained at all a satisfactory title to the ground must be produced. I have no hesitation in saying that of late years the lack of an apparently secure title has been the greatest bar to obtaining money for investment here in large mining enterprises.

Besides, if absolute titles were given to mining properties, there would be no necessity of granting concessions or special privileges to any one, for in that case capital could be obtained for the working of a group of claims on any desired scale or by any method.

FREEDOM OF ACTION.

No reason suggests itself to me why a miner should not be as free from continuous paternal Government control as a farmer or any other citizen. If he were so freed, in this country at least, he would soon lose his reputation as a kicker and would drop back into the position of a quiet unobtrusive man who attends to his own business. He should be treated as an independent and honest man until he is clearly proved to be otherwise. There is probably nothing more humiliating to him than the necessity of constantly appearing before the wickets of the Government offices to submit his statements to the adjudication of the clerks there employed, and often to receive tardily as favours what he knows that he can demand as his rights. The laws are intended for his benefit, and not for his hindrance, annoyance and humiliation, and other things being approximately equal he will go where he will not be so humiliated.

In conclusion, I would add that the best laws in the world may be formulated, but unless these laws are administered with impartiality, integrity and promptitude they will be of little value in promoting the welfare of the community.

NOTES ON SOME RECENT EXPERIMENTS*

On the Magnetic Concentration of Iron Sands from The Lower St. Lawrence.

(By JOHN F. ROBERTSON, M. Sc., S. Can. Soc. C.E.)

In attempting to use the iron sands from the lower St. Lawrence in a blast furnace, three difficulties are met with:—

First, the low percentage of iron on account of the dilution of iron bearing minerals with ordinary sand.

Second, the presence of an amount of titanium much greater than that usually considered permissible in an iron ore.

Third, the fineness of the material.

The third difficulty can be overcome by briquetting and may be left to the metallurgist. This note deals only with attempts to cheaply overcome the first and second difficulties.

The apparatus used in the experiments described below is of special design based on the Heberli drum separator. It consists of a thin hollow brass cylinder about eight inches in diameter and six inches long, revolving loose on a hollow axle through which wires are passed to a set of eight electro magnets arranged

*From a paper read before Mining Section Can. Soc. C.E., Nov. 30th 1905.

radially around the axle, and together filling one-half of the drum. The pole pieces just clear the inside of the brass cylinder. Each has a width of $\frac{7}{8}$ to $1\frac{1}{4}$ inches as desired, perpendicular to the axis, and a length of about six inches parallel to it. Each magnet is wound with fifty-five turns of insulated wire, and the wires are led out through the hollow axle to a connection board so arranged that the magnets can be connected in series,

In concentrating dry sands, the machine is run as in Fig. 3, the sand being fed near the top of the revolving cylinder. The non-magnetic material is collected directly under the edge of the cylinder, while the iron, pulled radially by the magnets and moved by the cylinder, passes under the latter and falls off on the other side.

When working with wet sand, the cylinder is rotated

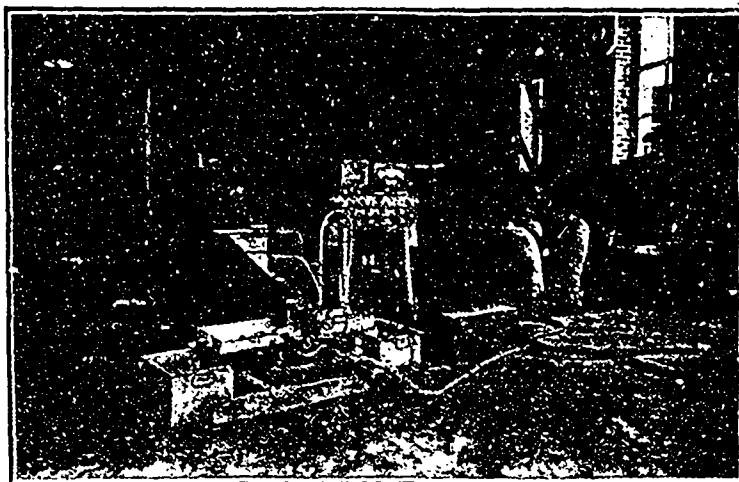


FIG. 1. View of Apparatus.

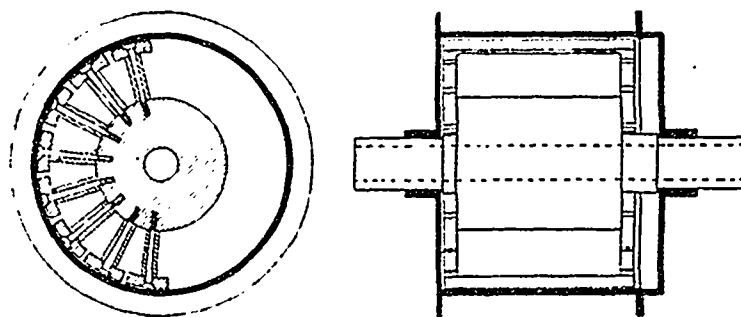


FIG. 2.
Sectional Elevations of Separator.

or parallel, and each can be given either north or south polarity. In the experiments described below, the magnets were all in series, with alternate polarity thus: N-S-N-S-N-S. The magnets do not revolve with the cylinder, but may be set to cover any 180 degrees of its circumference desired. The sand is fed to the machine from an adjustable hopper which can be placed in different positions so that the feed can be run in at the top or at any part of the side of the revolving cylinder. Fig. 1 shows a photograph of the whole machine and Fig. 2 two sectional elevations of the cylinder.

The advantage of having the magnets of alternate polarity is that the little grains of iron are turned end for end in passing each magnet. As there are eight magnets, the grains of iron are reversed six or seven times, and in trying to arrange themselves to suit the magnetism of the various poles they liberate the grains of sand which might otherwise be entangled in a bunch of grains of iron and thus be carried over into the finished product.

The apparatus was designed to be run either dry or wet and the drum can be rotated in either direction and at a great variety of speeds.

in the opposite direction, and the sand fed against the side about half way down. The sand, with some water from the jet A (Fig. 4), reaches the cylinder at B. That part of the cylinder is moving upwards, and the friction of the magnetic material as pulled by the magnets is great enough to carry it with the cylinder against the stream of water from the jet C. The non-magnetic minerals, not being attracted, are washed down and away. D and E are two water jets to clean the cylinder from any materials which tend to adhere beyond the proper points for discharge.

It was found that the co-efficient of friction of magnetite on brass is so low that the grains tended to accumulate in rows in front of each pole piece. This difficulty was overcome by placing a few strips of electric tape across the drum parallel to the axis. Covering the drum with canvas was also tried, but while this gave good results in dry concentration, it carried too much non-magnetic stuff when run wet.

The magnetic field utilized in the separator is the stray field. As first designed, the gap between the pole pieces was made quite small, with the result that a large current was required to produce a sufficient strength of stray field outside the cylinder. The gap

was then widened, giving better results. It is now proposed to further increase the air gap between the pole pieces, and enclose the whole working side of the apparatus in an external shield or armature. This will cause a stronger and more even field to pass through the drum, or will make it possible to secure the present strength of field with far less current.

As preliminary work, several field strengths were tried, the weakest used gave practically no concentrates, while the strongest took out nearly all the titaniferous material as well as the magnetite. As magnetite has a much higher magnetic permeability than ilmenite, there should be some strength of field at which the heads product obtained contains almost

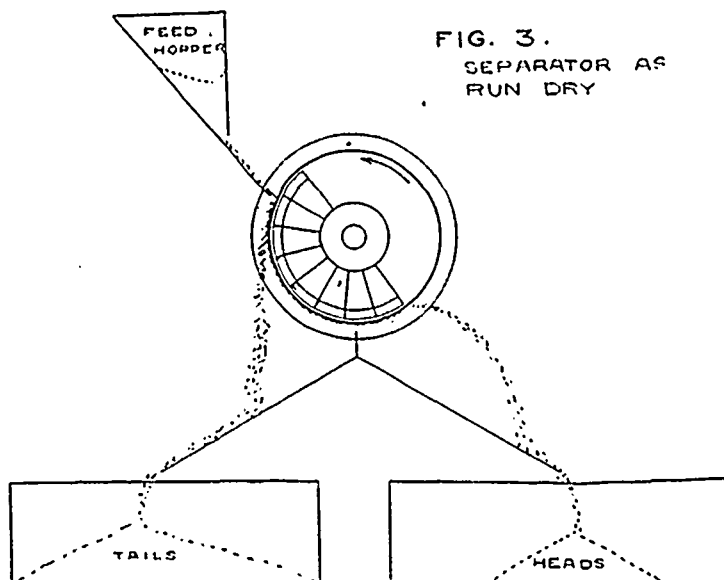


FIG. 3.
SEPARATOR AS
RUN DRY

The only dry run that has been completely assayed as on a sample of sand containing about 57% metallic iron and 16.2% TiO_2 . It is probable that the major part of the titanium was in the form of ilmenite. Some may have occurred as rutile, and some no doubt was contained in minute grains of ilmenite enclosed in magnetite. Assuming that the titanium occurred as ilmenite ($Fe Ti O_3$) the 16.2% of TiO_2 had combined with it $16.2 \times 56/80 = 11.3\%$ of iron, so the

all the magnetite and still very little ilmenite. Unfortunately grains of ilmenite cannot be distinguished by the eye from grains of magnetite and assays for titanium in the heads and for iron in the tails should have been made to show what were the limiting amperages for successful concentration. In the test in question, this was impracticable and a current of seven amperes was used.

The result from 52 lbs. of sand was 22 lbs. of heads

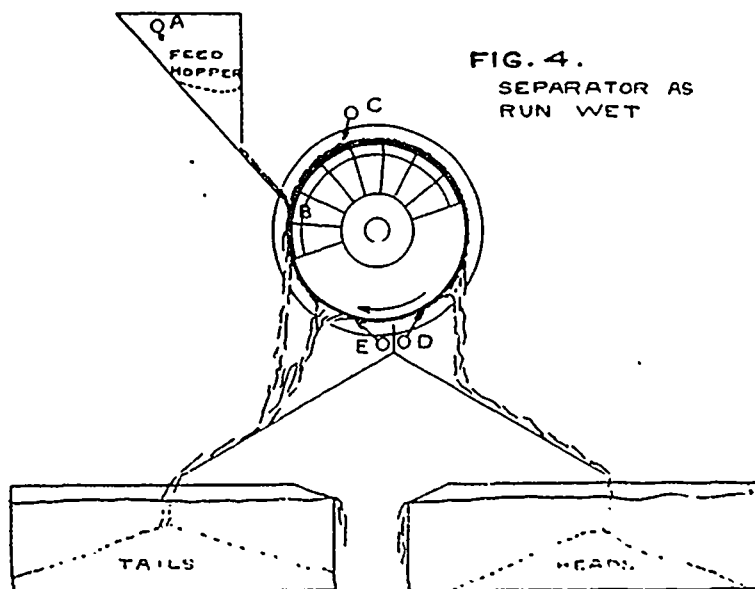


FIG. 4.
SEPARATOR AS
RUN WET

amount of iron capable of being magnetically separated from the titanium would be only $57.0 - 11.3 = 45.7\%$. If rutile (TiO_2) was present the percentage of iron free from titanium may have been more. If much titanium was enclosed in magnetite the free iron may have been less.

assaying 70.46% of metallic iron and 1.91% of TiO_2 and 30 lbs. of tails assaying 45.30% of metallic iron and 23.30% of TiO_2 . This works out to a recovery in the heads of 65% of the total free iron, the heads carrying less than 1/16 of the titanium. A considerably better recovery than this could have been ob-

tained with a slightly higher amperage and no harm done to the product as iron ore having 2.5% of TiO_2 or under is not abjected to by blast furnace people.

A screen analysis of 43½ lbs. of tails from a somewhat similar dry run showed:—

- | | |
|--|----------|
| (1) Remaining on an 80 mesh sieve | 97 lbs. |
| (2) Remaining on a 100 mesh sieve. | 27½ lbs. |
| (3) Passing through a 100 mesh sieve | 5½ lbs. |

Assays of these three sizes showed:

	Fe%	Si O ₂ %	TiO ₂ and Al ₂ O ₃ %
Over 80 mesh	35	15.0	35
80 to 100 mesh	42	4.5	35
Under 100 mesh	60	1.5	15

The capacity of the machine dry is about 300 lbs. per hour. Its resistance as used is 3 ohms, so the magnets with seven amperes passing required about 150 watts or 1½ H.P. It takes less than 1½ H.P. to drive the cylinder, so the total consumption of power is less than one-half H.P. A large machine designed for economy of power could easily do equally good work with one-half or one third of the current and power per unit weight of sand, viz., from 100 to 150 watt hours per 300 lbs. At 10 cents per kilowatt hour, this would amount to 7 to 10 cents per ton of sand. The capacity can probably be further increased by running any but very rich sands very fast so as to make a large amount of poor heads, and then cleaning these heads by re-running them.

Run wet, the machine will probably duplicate the work it does dry, but the adjustments need more careful watching and the capacity is lower. Six wet runs on sands from Seven Islands gave heads containing 1.10, 2.36, 2.30, 1.48, 1.48, and 1.67% of TiO_2 . Preliminary runs on each ore and numerous assays are necessary for the determination of the adjustments required. A wet run for the exhibit of the Quebec Government at the Liege Exhibition, which had to be done without assays or sufficient preliminary work, gave concentrates carrying 7.13% of TiO_2 . This sand was practically identical with that used in the six wet runs mentioned above, all of which gave very low titanium in the heads. The assays made after the test was completed, are as follows:—

Heads.	Metallic Iron	64.31%
	TiO ₂	7.13%
Tails	Metallic Iron	44.95%
	TiO ₂	20.17%
Heads.		27 lbs. 12 oz.
Middles (not exhibited).		3 lbs. 10 oz.
Tails.		27 lbs. 11 oz.

61% of the free iron was got into the heads with about 1½ of the titanium. The sand was the same as that used in the dry run previously described, and is practically identical with that which gave such excellent results when preliminary assays were made.

The capacity of the separator wet is about 100 lbs. per hour. About 0.02 cu. ft. of water per minute is required to reduce the damp sand to a pulp, and about 0.10 cu. feet per minute to wash the tails from the heads. Sometimes water is used for cleaning the heads and tails from the bottom of the cylinder and sometimes not. The water could easily be pumped back and used over and over. The total power used in the present small machine when running wet costs on an average about 50 cents per ton of sand, but on a large machine this could certainly be cut down to one half or one quarter that amount. The separator either wet or dry is usually run at 87 revolutions per minute. The amperages used range from 3 to 11, 5 and 7 being the commonest.

The machine used in the above tests was designed by Dr. J. B. Porter, Professor of Mining Engineering, and built in the shop of the Mining Department of

McGill University. The work detailed was all done under his advice and general direction, but great credit is due Mr. R. A. Chambers, a former student, for tests which he carried out on the Seven Islands sand. The author is responsible for the more recent work and thanks are due Mr. J. Obalski, the Mining Engineer of the Province of Quebec, for material. The chemical analyses were nearly all made by Mr. M. L. Hersey, Provincial Analyst, by authority of Mr. Obalski. The main part of the sand was furnished by Mr. William Robertson, of Montreal, but the Seven Islands sand came from Mr. Ganong, of Quebec. The wet and dry tests last made were carried out at the suggestion of Mr. Obalski and samples of all products were included in the Canadian Exhibit at Liege this year.

On the conclusion of the paper the author exhibited a set of samples of the sand sent to Liege, as follows:—

1. Original sand.
2. Heads of dry concentration.
3. Tails dry concentration.
4. Heads of wet concentration.
5. Middles of wet concentration.
6. Tails of wet concentration.

THE GEOLOGICAL SURVEY'S REPORTS ON ASBESTOS AND MICA.

To The Editor:

Sir,—On page 144 of your last issue you make certain comments regarding the publications of this Department and concerning the relations existing between this Department and the Mines Branch, which are so misleading and indeed so far from the facts that I feel sure you will not hesitate to correct the wrong impression these remarks must give the un-informed reader by publishing in your next issue the facts of the case as viewed from the side of the Geological Survey.

The reports that have caused your remarks concerning the above-mentioned relations are those on mica and asbestos by Mr. Cirkel. Anyone not entirely acquainted with the facts and reading your editorial, would certainly receive the impression that Dr. Haanel, inspired by a happy idea, issued these bulletins and that the Geological Survey, not to be outdone, issued a sort of belated rival report.

The actual circumstances of the case are, however, very different. The bulletins on mica and asbestos by Mr. Cirkel do not give, and do not profess to give, any original information concerning these subjects. They are simply (see Mr. Cirkel's letter and introduction) a "collection" of "data and general information," and they purport to be nothing else. More than half the report is based, and partly acknowledged to be based, on information supplied in the reports of our Department—reports and papers by Dr. Ells (see footnote) and a bulletin by the same gentleman (1903-04) of which no mention is made. That part of the reports which is not practically Dr. Ells', deals with (a) mining in foreign countries, (b) details of mining machinery, and (c) the cost of mining. Without the slightest wish to decry Mr. Cirkel's work, I may say that the Geological Survey has generally left these three subjects alone. As to the mining in foreign countries, we find it more convenient to simply give references; as to details of machinery, the mining men, rather naturally, object to their ideas being given away to competitors, and we make a point of publishing no information that could harm legitimate private enterprise; and, finally, as to the cost of production, experience has shown that Govern-

ment reports dealing, except in a very general way, with these matters are apt to be turned to account by unscrupulous company promoters who are able to put their own version on almost any statement of the kind that may be made.

In this connection, I may say that certain figures in one of these bulletins have already raised considerable trouble, as you, in your position, probably know better than I.

As regards the supposed friction between the Mines Branch and the Survey, you do not seem to be aware that Mr. Cirkel's mica report was revised, edited, and to a considerable extent re-written, by the editor of this Department, who, at Dr. Haanel's request, was permitted to help the Mines Branch in this publication. Dr. Haanel has since signified, in a letter to the Minister, his favourable appreciation of the manner in which this work was carried out.

I remain, Sir,

Yours truly,

ROBERT BELL.

Asbestos, 1886, Geological Survey Report.
1887-88, Geological Survey Report.
1888-89 Mineral Resources of Quebec.
1890-91, Papers in Mining Review and Ottawa Naturalist.
Mica, 1894 Bull. Geol. Soc., U.S.
1899 Vo. 12 Ann. Rep.

RECENT MINERAL DISCOVERIES ON WINDY ARM

A timely and interesting report has just been issued by Mr. R. G. McConnell, B.A., of the Geological Survey of Canada, on the subject of the mineral discoveries which have recently created so much attention on Windy Arm of Tagish Lake, in the Yukon. The principle ore deposits, the report states, occur on the West side of Windy Arm, a southerly branch of Lake Tagish. Windy Arm joins Tagish Lake near its head, and extends south for a distance of 12 miles, its course being nearly parallel to that of Bennett Lake. Two sheets of water enclose an area of mountainous country about 8 miles, and in this region the most recent discoveries have been made. Communication to the new mining district is afforded by the White Pass & Yukon Railway, and it is stated that a railway can easily be built from the Cariboo crossing, along the shores of Lake Nares, Tagish Lake and Windy Arm, to Conrad City. There is also a second feasible route from Log Cabin station.

The report states that: "The mineralized area on Windy Arm is situated a few miles north of the great granite area of the Coast Range. The rocks outcropping along the lower part of Windy Arm consist of a wide band of crystalline limestone, followed, going south, by hard slates and shales passing in places into feldspathic quartzites and associated with dark and gray cherts and red jaspers. This clastic series is cut off and replaced about five miles above the mouth of the Arm by an eruptive rock of a porphyritic character, exposures of which outcrop along the shores of the Arm for a distance of about five miles. The porphyrite is followed, going southward, by strongly cleaved dark argillites and fine-grained tuffaceous sandstones alternating with bands of conglomerates and limestone. These rocks are less altered than the slates and associated rocks north of the porphyrite area but no data sufficient to determine the age were obtained. They are cut off a few miles south of Windy Arm by the great granite mass of the Coast Range.

The porphyritic rock separating the two series of clastic rocks constitutes the principal metalliferous formation of the district. It crosses from Windy Arm to Bennett lake in a band about four miles in width and also extends some distance east of Windy Arm. It has not been studied in detail, but is evidently somewhat complex in character.

A granite area about three miles in width occurs on Lake Bennett north of the porphyrites and associated rocks. The granite is separated from the latter on the lake shore by a narrow band of slates and limestones, but, further inland, comes in contact with them. It is a medium grained, gray rock similar to the Coast Range granites and probably belonging to the same period of igneous activity.

The largest and most persistent veins so far discovered occur in the porphyrite area. They are not, however, confined to this formation, a few occurring in the granite and some, also, in the

slates. The veins occupy typical clean-cut fissures with regular walls often slickensided and grooved. They are comparatively narrow but as a rule exhibit remarkable persistency in strike. The Uranus vein, with a width of from one to four feet, has been traced by small openings and surface showings for a distance of about 1,500 feet and may extend much farther, while the Montana vein, with a maximum width of five feet in the portion explored, has apparently been cut at a distance of 1,600 feet from the main workings and may also of course be very much longer. The Venus No. 2-lead has a width of nine feet at two openings about 400 feet apart, and must extend for long distances in both directions. Numerous other veins such as the M. and M., the Joe Petty and Venus No. 1 are traceable by surface outcrops for several hundred feet. Portions of all these veins are concealed by slide rocks and their full length was not ascertained.

The dip and strike of the veins are exceedingly irregular. The Montana vein strikes N. 43 W., while the direction of Venus No. 2 is about N. 42 E. The M. and M. strikes nearly north and south. The dips are nearly all to the south and west and vary in steepness from 12° in the Montana to 50° in Venus No. 1.

The gangue in all the veins is mainly quartz. Single and multiple lines of interlocking quartz crystals is a constant feature. In a few instances, portions of the vein filling consist of alternating layers of quartz and country rock. The latter, in such cases, is always heavily mineralized, usually with iron, and weathers to a rusty colour.

The list of metallic minerals contained in the veins as identified in the field, and in the laboratory of the Survey from specimens brought back by the writer includes the following:—Native Silver, Argentite, Stephanite, Freibergite, Pyrargyrites Galena, Tetrahedrite, Chalcopyrite, Native Copper, Malachite, Azurite, Iron Pyrite, Arsenopyrite, Pyrrhotite and Sphalerite.

The general outlook for the camp is considered exceedingly promising, and its opening up marks an important event in the mining history of the country.

The mining conditions are not unfavourable. Most of the veins are situated at distances of from half a mile to four miles from the lake and at elevations of from twelve hundred feet to three thousand six hundred feet above it. Aerial tramways can therefore easily be constructed for the carriage of the ores to the lake shore for concentration and can also be used to take supplies to the mines. Miners' wages during the past season amounted to \$3 50 per day for eight hours work, and ordinary labourers obtained the same amount for ten hours work. The cost of supplies, considering the short distance to the seaboard, and the almost continuous rail connection, ought to be moderate. The climate, while severe during a portion of the year, will have little effect on mining operations.

THE MINING CONVENTION AT TORONTO.

The Mining Convention to consider what changes should be made in the Ontario Mining Laws met at Toronto on the 12th of December and continued in session for four days. The result of the deliberations was the adoption of the appended resolutions, though some of them were not adopted by any means unanimously, and several of them were adopted after many delegates had left the meeting. Mr. W. D. Macpherson, barrister, of Toronto, was elected Chairman of the convention, and Fred. A. Fenton, of the same city, secretary.

(1). That it is the opinion of this convention that there should be only one mining law for the whole Province.

(2). That all lands belonging to the Crown, whether surveyed or unsurveyed, and whether valuable for timber or not, should at all times be open for exploration and sale, and that no lands should at any time or under any circumstances be withdrawn from exploration or sale by order in Council or otherwise, and that when discovery of mineral be made on a timber limit valuable for pine, of sufficient value to warrant mining operations, a location title be issued to the discoverer, so that he may have a negotiable interest in his discovery, and that after such location the owner of the timber berth be given a limited time, not to exceed three years, in which to remove the pine, after which date the ownership to the mineral discovery shall be absolute, subject only to the working conditions under the mining act.

(3). That the district known as New Ontario, and any other section of the Province of Ontario which is or may become valuable for minerals, should be formed into recording districts, with a recording office in each district, and that all applications for mineral shall be made to the recording office of the district in which the mineral is found. That each recording office shall have on file all applications and all records for its division, and also maps showing all locations, which shall be open for inspection by the public.

(4). That it would be injudicious to provide for payment of any royalty or for a special tax applicable to the mining industry.

(5). That any licensee may stake out a location without first making a discovery of mineral thereon, under stringent working conditions to be decided by this meeting.

(6). All locations shall be forty acres, except in the case of fractional locations. In unsurveyed territory the location should consist of a fractional part of a lot as mentioned in subsection 2 of section 18 of the Regulations of Mining Divisions governing the Temiskaming Mining Division.

(7). That the licensee may stake out a mining location on behalf of himself, or any other licensee, square in shape, and the bearings of the outlines thereof shall be due north and due south, and due east and due west astronomically. Such location shall be 20 chains in length and 20 chains in width, containing 40 acres. And the licensee shall plant at each of the four corners of such location a post of wood in the order following, viz.: No. 1, at the north east corner; No. 2, at the south east corner; No. 3, at the southwest corner; No. 4, at the northwest corner; the number in each case to be upon the side of the post turned towards the post which follows in the order in which they are named; and if one or more corners of a location fall in any situation where the nature or shape of the ground renders the planting of a post or posts impracticable, such corner or corners may be indicated by placing at the nearest suitable point a witness post, which in that case shall contain the same marks as those prescribed herein for corner posts, together with the letters W.P., and indication of the bearing and distance of the site of the true corner from such witness post. And the licensee shall also plant a post of wood 6 feet southwest of the northeast corner post, to be called the recording post. And such recording post shall have four faces at least six inches wide, and shall be at least four feet above ground. Where there are standing trees upon a mining location so staked out the licensee shall blaze the trees and cut the underbrush along the boundary lines of the location about two feet wide. Where there are no standing trees the licensee shall mark the boundary lines of the location by planting pickets or stakes thereon, or by erecting thereon monuments of earth or rock, not less than two feet diameter at the base and at least two feet high, so that the lines can be distinctly seen. The licensee, on behalf of himself or on behalf of any other licensee for whom he may have staked the location, shall nail upon the recording post of such location the staking record, in which he shall insert the date of staking.

(8). That all locations shall be recorded within 15 days after staking, if within 10 miles from recording office, but that one day additional be allowed for each additional 5 miles.

(9). That during the period allowed between the date of staking and the date on which the said claim is required to be recorded, in accordance with the preceding resolution, the licensee first staking the same shall be entitled to full possession of the said claim, and to otherwise have his rights fully preserved in respect thereof.

(10). That a licensee may be required to expend at least \$100 in actual mining work during 90 days immediately succeeding his application, excluding from such computation the months of January, February and March, and also a similar amount during the three succeeding years, or prior thereto, but such expenditure shall be computed at the rate of \$3 per day for each days work performed by a grown man, and that an affidavit proving such expenditure be filed with the recorder within 30 days after the time allowed for the performance of each such expenditure.

(11). For every adjoining five locations or less held by one or more licensees and which are principally valuable for base metals, all such development operations may be carried on upon one or more of the locations.

(12). That, whereas, there are numerous deposits of good iron ores in Ontario which at present are not being worked because our furnaces to a great extent use United States ores, this convention recommends that the Ontario Government grant to the ore producer a bounty for the production of each ton of iron ore raised in the province.

(13). That the Dominion Government be recommended to admit coal free of duty, if used to make coke to be used for the smelting or treatment of iron ores.

(14). That the price of mineral lands should be uniform all over the province, at the rate of \$2.50 per acre in surveyed territory and \$2 per acre in unsurveyed territory.

(15). That the Department of Lands and Mines should be divided into a Department of Crown Lands and a Department of Mines, with a minister at the head of each.

(16). That all mining partnerships shall be recorded at the recording office in which the mining claim is registered, and a simple method for the registration, dissolution and enforcement of other rights of the partnership shall be provided.

(17). That all affidavits required under the Mines Act may be sworn to before any Justice of the Peace, Notary Public, Commissioners for taking affidavits in the High Court, or any

agent appointed under the Mines Act or any Crown Lands agent.

(18). That in the opinion of this meeting the province of Ontario should erect a smelter and refinery capable of smelting, treating and refining the silver-cobalt ores, and should make provision for the treating and refining of the copper and nickel ores of the province.

(19). That although in the opinion of this convention of Ontario miningmen, it is desirable that assistance be given by the Dominion Government in the way of granting of bounties on pig iron smelted in the Dominion, we wish to strongly protest against the present system of paying bounties on pig iron smelted from foreign ores, and ask that the same be discontinued when the present law expires in June, 1907, but that the bounty on pig iron made from domestic ore be placed at \$3 per ton for the next five years.

(20). It is recommended that any miner's license issued shall entitle the holder thereof to stake and hold mineral locations upon Crown lands in all parts of this province. That all such licensees shall assume the responsibility of assisting in extinguishing, and at all times endeavouring to prevent forest fires on Crown lands, subject to a penalty of not less than \$20 in case of refusal to so act. That such licenses shall run for one year from the date thereof, and shall not be transferable. That no person, or joint stock company, shall be recognised as having any right or interest in or to any mineral location unless he or it shall have an unexpired miner's license.

(21). That the northerly 6,400 acres of the Gillies timber limit (which comprises 64,000 acres), be conveyed and granted by the Province to a company to be incorporated with \$900,000 capital, in \$1 shares, 300,000 of such shares to be divided pro rata free of charge, but fully paid up, among the licensees of the Temiskaming mining division, licensed prior to December 9, 1905, 300,000 fully paid up shares to be given free to the Province of Ontario, and 300,000 shares to be sold at par to citizens of Ontario, who apply for the same, and deposit ten per centum of such price at the time of making such application, in order to secure money to purchase the pine thereon and carry on development operations, and to make suitable reward to parties who know of the existence of minerals on the said lands, such treasury shares to be allotted equally per capita in the event of over-subscription. That each section of shareholders be entitled to the exclusive right of electing three directors to constitute a board of mine directors for the company.

Some amendments were offered to this resolution but after discussion it was decided that both the resolution and the amendments should be laid on the table. The general opinion expressed was that the problem is one of the most difficult the Government has to deal with, but that some satisfactory solution would be arrived at.

(22). That the Government be recommended to proceed at once with the re-survey of all townships where marks are obliterated, and also survey all valuable mineral lands in unsurveyed territory, and that the corners of all sections be marked with iron posts.

(23). That the Government should procure expert evidence as to the advisability of fully testing the Thunder Bay silver district by sinking through the silicious schists of the Animikie formation, into the lower Huronian strata, for the purpose of demonstrating the value of veins in the lower formation.

(24). That any applicant for a mining location shall at the expiration of the time for his development work file with the recorder at least two affidavits of practical miners that he has complied with the regulations, otherwise the claim shall be considered abandoned.

(25). That no licensee shall stake out or apply for more than two mining locations principally valuable for precious metals, or more than four locations principally valuable for base metals, within a radius of six miles thereof during any one calendar year, either in his own name, or in the name of any other licensee.

(26). That in the opinion of this convention it would be advisable for the Ontario Legislature to offer prizes for the demonstration of satisfactory methods for the treatment of refractory ores for which no satisfactory method is now in use or known in this country.

(27). That the section of the Municipal Act giving township councils ownership of minerals on concession and side lines be abolished, and the mineral thereon should be dealt for direct with the Crown Lands Department, the same title to be issued as is issued for the adjoining land.

(28). That contests arising regarding the location and ownership of mining claims should be decided by a mining commission sitting judicially at various mining centres, whose decisions should be subject to appeal to the Court of Appeal only.

(29). That this convention ask the Government to consider the question of lands from which the prospector is debarred on account of the impossibility of perfecting title, and of larger mineral areas held idle, and devise some remedy if possible.

BRITISH COLUMBIA MINING IN 1905.

The Nelson *Daily News*, in a special issue dated January 1st, publishes a most exhaustive review (largely compiled, we understand, by Mr. E. Jacobs, editor of the *British Columbia Mining Record*) of mining in British Columbia during the past year. In considering the mineral production made, it is estimated that an increase in yield to the value of nearly \$2,500,000.00 will be shown, and in fact the year will be a record one in respect to production. The following comparative table is given of the yield of 1904, and estimated returns of 1905.

The next following table shows the respective totals of value of minerals produced in 1904 and 1905:—

	1904	1905	Increase.	Decrease.
Gold, placer	\$1,115,300	\$1,110,000	\$5,300
Gold, lode	4,589,608	4,610,000	\$50,392	
Total gold	\$5,704,908	\$5,750,000		
Silver	1,719,516	2,045,000	325,484	
Copper	4,578,037	5,430,000	851,963	
Lead	1,421,874	2,368,000	946,126	
Zinc		320,000	320,000	
Total metalliferous.	\$13,421,335	\$15,913,000		
Coal	3,760,884	3,090,000		\$670,884
Coke	1,192,140	1,210,000	17,860	
Building materials, etc.	600,000	750,000	150,000	
Total non-metalliferous	\$5,553,024	\$5,050,000		\$676,184
Total increase			\$2,661,825	
Less decrease.			676,184	
Net increase			\$1,985,641	

Being about 10.4 per cent.

SUMMARY.

	1904	1905
Metalliferous	\$13,424,336	\$15,913,000
Non-Metalliferous	5,553,024	5,050,000
Total production	\$18,977,359	\$20,963,000

In calculating the values of the several minerals to obtain the totals shown in the foregoing table, placer gold has been taken as worth \$20 per oz., lode gold at \$20.67 per oz., silver at 60 cents per oz less 5 per cent; copper at 15 cents per lb., lead at 4.6 cents per lb. less 10 per cent.; zinc has been averaged at \$24 per ton, coal valued at \$3 and coke at \$5 per ton of 2,240 lbs.

The quantities of minerals produced were as under:—

	1904	1905	Increase.	Decrease.
Gold, placer—Ozs	55,765	55,500		265
Gold, lode—Ozs	222,012	224,490	2,448	
Total gold—Ozs	277,807	279,990	2,183	
Silver Ozs	3,222,481	3,587,719	365,238	
Copper—Lbs.	35,710,128	36,200,000	489,872	
Lead Lbs	36,646,244	37,200,000	20,553,756	
Zinc—Tons		13,330	13,330	
Coal—Tons of 2,240 lbs.	1,253,628	1,030,000		2,3628
Coke—Tons of 2,240 lbs.	238,426	242,000	3,574	

The features of the year have been, briefly, the great increase in the copper and gold output of the Boundary District, which very nearly carries a million tons; the increase in silver-lead production, and the development of the zinc mining industry.

A special article is contributed to this issue by Mr. G. O. Buchanan, on the "Lead Situation," in which it is stated that the production for the calendar year (December being estimated) is 28,636 tons, divided as follows:—

	Lbs. Lead.
Hall Mining & Smelting Co (Nelson)	17,785,862
Canadian Smelting Works (Trail)	12,785,901
Elsewhere in B. C.	11,206,169
Exported in ore to Europe.	15,525,835
	57,272,767
Equal	28,636 tons
Output, 1904	20,000 tons
Increase	8,636 tons

Mr. Buchanan states that except for the blank in shipments from the St. Eugene caused by damage to their works by fire (the months of October and November having been practically lost), the output for 1905 would have gone close to that of the banner year, 1900, which was 31,679 tons.

For the fiscal year ending June 30, 1905, the returns to the department of trade and commerce for bounty purposes show as follows:—

	Lbs. Lead.
Delivered to B. C. Smelters	33,704,932
Exported to Europe	21,972,999
Total	55,676,931
Equal to 27,838 tons.	
Bounty earned, home smelted lead	\$240,058.71
Bounty earned, exported lead	97,157.30
Total	\$337,216.01

For the year ending June 30, 1904, the figures were:—
Lead production 13,397 tons.
Bounty earned \$195,283.92

The term for which a bounty was payable upon lead in ore exported to Europe ended on June 30, 1905, and a proposition for the extension of the term was not favorably considered by the government.

On November 29, 1904, lead was quoted in London at £12 12s. 6d., and the rate of bounty payable was reduced, the rate of diminution being 1.3579 cents per 100 pounds of lead for each advance of one shilling and three pence above £12 10s., the whole bounty being wiped out by 57 of such advances.

The price went to £13 3s. 9d. on January 6, fell to £11 17s. 6d. on March 3, rose to £12 11s. 3d. on April 4, and from that time has steadily climbed until £16 was reached on November 29, and the extinction of bounty payments, for the time being, was accomplished.

On December 12, £17 8s. 9d. was reached, but at the moment of writing this, the quotation stands at £17 2s. 6d.

The extremes of variation for the last five years have been:

1900—September 15	£18 0 0
1902—January 14	10 5 0
1903—March 12	13 15 0
August 16	10 18 9
1905—December 12	17 8 9

That lead will remain permanently above £16 is not to be expected, but it is probable that we have seen the last of £12 lead. The predominant influence of the American Smelting & Refining Company, not so much in favor of an extremely high price, as of a steady price, is beginning to be internationally felt, and there is beyond that, universal testimony to the fact that the legitimate demand for lead has overtaken the supply, that the demand is growing and bound to grow, and the sources of fresh supplies are not in sight.

Of our home-smelted product the electrolytic refinery at Trail is now treating 50 tons per day, or at the rate of 18,000 tons per annum. At the present moment the refinery is busy with orders for Canadian consumption, and it is probable that we can count the Canadian market as good for, from this time onwards, 18,000 tons per annum.

The product of the Trail refinery in both silver and lead exceeds in purity any hitherto produced upon a commercial scale, and both metals command a premium in competition with the product of other refineries.

The year has introduced an era in the provision of lead smelting facilities. In the early spring the Sullivan company's new smelter went into blast at Marysville in East Kootenay.

This smelter has two stacks of a capacity of 100 tons per day (only one of which has yet been in use) each, and the appointments and machinery embody the most modern features.

With commendable enterprise this company installed as a part of their plant a Huntington-Heberlien outfit of ovens and pots for ore roasting.

While nothing as to results has been given out by the company, the fact is patent that the smelter has run almost continuously with no ore supply except that afforded by their own mine, a grade of ore with some reputation as difficult, from a smelting standpoint.

That the object lesson has not been lost is evidenced by the fact that at both the Hall Mines and Trail smelters, similar roasting plants are under erection.

The Hendryx smelter at Pilot Bay after nine years of idleness is undergoing renovation at the hands of the Canada Metal Company, and it is announced that the lead stack will soon be in commission.

This latter company, of which C. Fernau, Esq., M.I.M.E., is the manager, and which has its head office at Nelson, and which has almost completed at Frank, Alta., a massive establishment for the treatment of zinc ores, proposes to have also a lead stack at an early date at Frank. This multiplication of smelters and introduction of metallurgical economics, should certainly foreshadow better treatment rates for the producer at an early date.

The subject of zinc will no doubt be fully dealt with elsewhere in this review, but it may be mentioned here that some profitable disposition of the increasing quantities of zinc ore developed in connection with lead mining in the Slocan and

Ainsworth camps, had become the most serious problem confronting the mine owner.

The problem has been attacked from all sides, by local enterprise in the installation of separating plants, by foreign capital in the erection of the magnificent works at Frank, and by commission of enquiry under the direction of the most eminent living specialists, employed by the Dominion Government.

As items of special interest we have room for but few.

The long tunnel on the Rambler-Cariboo is scheduled to reach the ore body (at least the place where it ought to be) on May 1. Ore from stringers recently cut has shown values similar to those for which the shipments from the upper workings were framed.

The Monitor and Ajax fraction mine after a prolonged suspension of production has again entered the list of shippers, and its mammoth and completely equipped concentrating mill at Rosebery is in successful operation.

In the Ferguson camp the Silver Cup mine has large quantities of ore in sight, and is ready to ship heavily.

The La Plata Mines on Kokanee creek (we once spoke familiarly of them as the Molly Gibson) have concentrating works installed, and a bright future outlined.

A question of "apex rights" growing out of the 1892 Mineral Act, of which the contestants have been J. M. Harris of the Reco mine, and the Byron N. White Co., has resulted in much prosperity to the legal, and mining expert fraternities, and to a decision which for the present upholds the apex rights of the Byron N. White Co.

The Ivanhoe, after holding for some years a place near the head of the procession as a shipper, has paused to take breath, and recover its ore bodies.

The old time Blue Bell, now in the hands of the Canada Metal Co., is being put in shape for heavy production, and will be an important factor in feeding the works at Pilot Bay and Frank.

In the Slocan camp the "leasing system" has come to stay, having proven profitable to both parties concerned, and the Payne, Whitewater, Whitewater Deep, Wakefield, Lone Bachelor, Hewitt, Emily Edith and a host of others are under operation on that basis.

Extensive works for the corrosion of lead were established during the year in Montreal by the Carter White Lead Company. The contract for their supply of pig lead for a term of years is held by the refinery at Trail. Their methods of corrosion is new and improved, and this coupled with the perfect freedom from adulteration of the lead from Trail has enabled them to put upon the market a grade of paint lead never equalled. The works are rushed with orders, and their requirements of raw material accordingly increased.

Largely as the result of the persistent agitation begun and for the last seven years carried on in this district, the finance minister carried through Parliament at its last session a bill increasing the duty upon corroded lead from 5 to 30 per cent.

At a sitting of the Tariff Commission held in Nelson in September, interested parties were heard upon the subject of an increase in the duty upon other lead products (including pig).

The Tariff Commission is expected to report at the coming session.

COAL NOTES.

ALBERTA.

It is reported that the Western Canadian Collieries Company is, since the new washer has been installed at Lille, now producing a very fine quality of coke. This is the first coalwasher to be installed in Alberta. It is of the Lührigtype, with a capacity of over 700 tons a day.

The Canadian-American Coal & Coke Company recently commenced working on the principle seam of the mine, which has been abandoned since April last, on account of fire. It is proposed to increase the working force of the mine by the employment of 100 more miners, as it has proven difficult to maintain a supply sufficient to meet the demands of the C.P.R.

BRITISH COLUMBIA.

The *Official Gazette*, in a recent issue publishes the following list constituting a board of examiners under the Coal Mines Regulation Act for the current year. Cumberland collieries:—Appointed by the owners, Charles Matthews; alternates, David Walker, John Combs. Appointed by the Lieutenant-Governor in Council, John Kesley. Elected by the miners, James Reid; alternates, Thomas Ripley, Joseph Horbury.

For the Extension colliery:—Appointed by the owners, James Sharp; alternates, Alex. Bryden, Alex. Shaw. Appointed by the Lieutenant-Governor in Council, W. G. Simpson. Elected by the miners, Thomas Doherty; alternates, Wm. Anderson, Benj. Berto.

For the Nanaimo colliery:—Appointed by the owners, Thomas Mills; alternates, George Wilkinson, Charles Graham, Appointed by the Lieutenant-Governor in Council, Thomas Budge. Elected by the miners, George Moore; alternates, John R. McKenzie, George Johnson.

For the Michel colliery. Appointed by the owners, A. R. Wilson; alternates, Wm. Powell, Thos. Corkill. Appointed by the Lieutenant-Governor in Council, Evan Evans. Elected by the miners, James Wylie; alternates, Sidney Bert, Joseph Thomas.

For the Coal Creek colliery:—Appointed by the owners, David Martin; alternates, Andrew Colville, John Hunt. Appointed by the Lieutenant-Governor in Council, John McCliment. Elected by the miners, J. H. Suggett; alternates, Wm. Moore, Chas. Webber.

Coal mining generally on Vancouver Island is now again in a prosperous condition. At Cumberland No. 7 mine has been well opened up, and is producing a fair tonnage of anthracite, discovered some three or four years ago. During recent developments a serious fault was encountered, but this was passed through in due course, and excellent coal again reached. During the year the buildings destroyed at No. 4 have been re-erected, and a series of large shops have also been built at Union Bay.

It is reported that the Carbonado colliery will probably be closed down temporarily before the end of January. The company find it is much more economical to operate the Coal Creek and Michel collieries at the full limit, in order to supply the market requirements. It is estimated that the Carbonado colliery does not pay to operate when the output is less than 600 tons daily.

NOVA SCOTIA.

Two promising seams of coal, one of 5 feet wide, were recently discovered at the Smith mine, at Maccan. The recently organized Eastern Coal Company, operating this property, contemplate installing screening and other machinery immediately.

The Nova Scotia Steel & Coal Co. are making preparations for the opening of a new colliery at Sydney mines to be known as "Sydney No. 4." This colliery will be opened about a mile north of the present Sydney No. 3. The new colliery will be one of the largest operated by the Nova Scotia Co., and it is the intention to operate it by electricity entirely. In every other respect, also, the very best and latest methods will be adopted.

The Inverness Railway & Coal Company is sinking test pits preparatory to putting down a new shaft about half a mile from the present bankhead.

THE GEOLOGICAL SOCIETY OF AMERICA.

The eighteenth winter meeting of the above Society was held in Ottawa on December 27th, 28th and 29th. The following papers were read:—

A New Species of Soda-alumina Pyroxene. By S. Weidman, Madison, Wis.

A Dike of Mica-Peridotite from Fayette Co., Southwestern Penn. By J. F. Kemp, New York City.

Origin of Leached Phosphates. By C. H. Hitchcock, Hanover, N.H.

Bibliography of the Geology, Mineralogy and Paleontology of Brazil. (Read by title). By John C. Branner, Stanford University, Cal.

The Peninsula of Calabria in its Tectonic-Geographic and Geodynamic aspects. By William H. Hobbs, Madison, Wis.

Torrential Deposits, and the Origin of Sandstones and Conglomerates. By William H. Hobbs, Madison, Wis.

Volcanic Craters of the Southwest. By Charles R. Keyes, Socorro, N. Mex.

Hawaiian Notes. By C. H. Hitchcock, Hanover, N.H.

Western Sierra Madre of the State of Chihuahua, Mexico. By Edmund Otis Hovey, New York City.

The Oldest Pre-Cambrian Rocks. (15 minutes). By C. K. Leitch, Madison, Wis.

Algonkian Formations of Northwestern Montana. By Charles D. Walcott, Washington, D.C.

Paleogeography of St. Peter Time. (Read by title). By Charles P. Berkey, New York City.

Notes on Arctic Geology. (Lantern Views; 20 minutes). By Albert P. Low, Ottawa, Can.

The Lefroy, a Parasitic Glacier. (Lantern Views; 20 minutes). By William H. Sherzer, Ypsilanti, Mich.

Origin of the Massive Block Moraines in the Canadian Rockies and Selkirks. (Lantern Views; 20 minutes). By William H. Sherzer, Ypsilanti, Mich.

THE WORLD'S PRODUCTION OF COAL.

The British Board of Trade statement for 1904, just received, gives the total coal production of the world (exclusive of bromic lignites) as 790,000,000 tons of 2,240 lbs. Of this large amount the United States alone produces rather more than one-third, and Canada a little less than one-onehundredth. The following table shows the yield of each of the five largest coal producing countries for three years:—

Years.	United Kingdom.	Germany.	France.	Belgium.	U. States.
	Tons.*	Tons.†	Tons.†	Tons.†	Tons.*
1902.	227,095,000	107,474,000	29,365,000	23,877,000	269,277,000
1903.	230,334,000	116,638,000	34,218,000	23,797,000	319,068,000
1904.	232,428,000	120,816,000	33,838,000	23,507,000	314,563,000

* Tons of 2,240 lbs. † Metric tons of 2,201 lbs.
‡ Provisional figures.

In the next table we give the production of the principal British colonies:—

British India	Australian Commonwealth.	New Zealand.	Canada.	Transvaal.	Cape of Good Hope.	Natal.
Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
7,438,000	7,112,000	1,420,000	6,825,000	2,012,000	185,000	714,000

The consumption of coal per head of population in these colonies is shown in the next table, in which it will be noted that Canada leads, due, doubtless, to our cold climate.—

Australian Commonwealth.	New Zealand.	Canada.	Cape of Good Hope.	Natal.	Transvaal.
Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1.30	1.71	1.81	0.29	0.40	1.23

DOMINION STEEL COMPANY IN 1905.

The record made by the Dominion Steel Company the past year has been very satisfactory. The total production of pig iron was 162,000 tons, of the open hearth steel furnaces 173,500 tons, and of the rolling mills 47,000 tons. Of eighty pound steel rails, 44,000 tons have been already turned out. The production of coke amounted to 242,150 tons.

Over half a million tons of coal was consumed by the company in its different operations, as well as 380,184 tons of iron ore, 267,237 tons of limestone and dolomite, and 13,711 tons of gravel and sand.

During the height of the season 4,000 men were employed by the company, and the pay roll exceeded \$2,000,000. Perhaps the most important announcement that the company has to make is that it has advanced from being a mere purveyor of raw materials to the position of a producer of finished materials.

From the United States, Spain and other foreign countries, the following minor supplies were drawn: 19,403 tons special iron ore, 1,257 tons manganese ore, 2,531 tons pyrites ore, 1,850 tons spiegel, ferro manganese, etc.; 3,150 tons fluorospar, 461 tons calcined magnesite. During the greater part of the year two blast furnaces were in operation, but about the middle of November a third was blown in. The fourth will be kept in readiness to take the place of any of the other three that may require to go off for repairs.

At the beginning of 1905 six open hearth furnaces were in operation. This number was gradually increased until the whole ten were in use in September and the remaining months of the year.

As a result of tests, Dominion wire rods have practically captured the Canadian market, and importations have been reduced to a minimum.

PLATINUM IN PLACE IN BRITISH COLUMBIA.

It is reported that ore, carrying 4 oz. of platinum to the ton, has been discovered on a claim on Bear Creek, Nicola district, B.C., these returns having been obtained from analyses made by Messrs. Baker & Sons, platinum refiners of New York. In this connection, a Mr. C. F. Law, of Vancouver, writes to the *Engineering and Mining Journal* as follows:—

"It may interest your readers to know that a discovery of platinum has been made in place, on Bear Creek, a tributary of the Tulameen river, in British Columbia. Baker & Co. report that a sample of ore, sent to them for assay, contains approximately 4 oz. platinum per ton. This sample was taken by myself from an ore-shoot 4 ft. wide in a fissure vein. This was sampled by Thomas Kiddie, manager of the Crofton smelter, in British Columbia, and was found to contain: copper (wet), 1.38%; silver, 20.83 oz.; gold, 2.64 oz. per ton from wall to wall without selection. The presence of platinum was not suspected, although the vein occurs in a known platinum district; and the same belt of rock in which the vein occurs has yielded platinum where eroded by the Tulameen river. The gangue is quartz, the ore itself being pyrite, pyrrhotite and chalcopyrite, in schist close to the granite."

"I was led to have this ore assayed for platinum by an article which appeared in your Journal some time ago, referring to platinum values having been found in the nickel-copper ores of Sudbury and the copper ores of the Rambler mine, Wyoming."

ONTARIO MINING INTELLIGENCE.

(FROM OUR OWN CORRESPONDENT.)

A case affecting the ownership of the Josephine iron mine, near Michipicoten Harbour, was recently argued before the Hon. F. Cochrane, Minister of Lands and Mines. Decision was reserved. Alois Goetz, a resident of Michigan, petitions to be declared, by right of discovery, the owner of the mine. The ownership of the property is also claimed by the Lake Superior Corporation as part of the land grant to the Algoma Central Railway. The latter has been for some years in possession of the mine on which extensive development work has been carried on.

The Savage Cobalt Company, one of the new companies recently organized to operate at Cobalt, has a 42 acre property at the south end of Peterson Lake. A shaft has been sunk 50 feet, where a rich vein has been struck, but some trouble having arisen from water a steam pumping plant has been installed, which will be in operation the first of the year and work continued throughout the winter. The company has also erected necessary buildings on the property. A sample of 60 lbs. of ore sent to the School of Practical Science, Toronto, yielded a handsome return and ten veins of silver have been found on the territory so far prospected.

The Cobalt Development Co. has acquired and paid for a silver-cobalt property in the township of Coleman and one in Bucke, and is negotiating for another in Coleman. It is proposed to work these properties directly the snow is off the ground in the spring. Stock is issued in shares of \$100 and the proceeds will be used in development. The directors are:—Messrs. Ewan Mackenzie, President, Toronto; William Dobie, General Manager and Treasurer, E. W. Gillett Co., Toronto;—Lamb, Cordova Mines, Ont.; E. I. Sifton, London, Ont.; Perry L. Hobbs, Cleveland, Ohio; Thomas E. Aikenhead, Hardware Co., Toronto; P. MacIntosh, MacIntosh Food Co., Toronto; Henry D. McNaughton, Rochester, N.Y.; George Stevenson, Toronto. G. D. Hardy is performing the duties of Secretary and Manager.

Decision has been given in the case of Gaizer vs. Thompson, referred to in the December number of the *MINING REVIEW*, as affecting Cobalt properties. A lease had been issued to Thompson, who held the property in trust for the Hudson's Bay and Temiskaming Mining Co. The Attorney General, to whom the case was referred, has decided that an action should be brought in the High Court of Justice to set aside the lease, which means that it is a case which should be investigated, and it will now go before the Courts on its merits. The ground on which it is sought to set aside the lease is that there was no valuable discovery of mineral. The case was argued by Mr. J. M. Clark, K.C. for Gaizer and Mr. E. F. B. Johnston, K.C. for Thompson.

With reference to the possibility of finding diamonds in New Ontario, referred to recently, Dr. Bell, acting director of the Canadian Geological Survey, states that he does not believe that they will ever be discovered in Canada.

A syndicate in which Toronto people are interested, is understood to have secured the right to use a German process for the treatment of Cobalt ores. The company has a capital of a million or over, and will erect reduction works in the Cobalt district at an early date. The difficulty with the Cobalt ores has been that there is no process known by which they could be

refined so as to save all their constituents, and the New Jersey Co., which has purchased a large proportion of the output, has much of it on their hands untreated. The German process is a secret one, but should it be a success, much low grade ore, now left on the dump, can be turned to account, while full value will be realized for the ores of high grades. In addition, the smelting will be done in Canada and so add another industry.

The new iron field in Algoma, west of the Vermillion River, some 60 miles from navigable water at Killarney, is stated to be from 30 to 40 miles long and second in importance only to the Mesaba range. The ore is partly Bessemer and contains only from 6 to 7 per cent. of phosphorus and 61 per cent. of iron. Part of it is in the unsurveyed territory and some is covered with valuable pine timber, which may give rise to difficulty similar to that over the Gillies limits at Cobalt. With a railway to deep water the rate of freight to Cleveland and other lake ports would be about \$1 a ton, which is considerably less than from Duluth.

The McLeod claim at Cobalt has been purchased by B. B. Harlan, of Chicago, who has a gang of men working on it with very satisfactory results.

Mr. Harold A. Wylie of Port Arthur, has closed an important deal for some iron lands near that town, which, it is understood, will soon be developed.

Mr. A. C. Boyce, M.P., is reported to have made a lucky strike at Cobalt, and to have realized profits amounting to from \$50,000 to \$100,000.

The transfer of the Bruce mines to the Copper and Smelting Co. of Ontario has been completed. The new company, which is capitalized at \$1,000,000, is largely English. Extensive operations will be commenced, and these mines, which at one time produced copper of high grade, will again be the scene of great activity.

Work has been commenced near Lake Wahnapitae on the extension of the James Bay Railway from Sudbury to Moose Mountain in the Township of Hutton. This will give an outlet for the rich iron ores found there. The freight charges on that contract will pay the whole of the fixed charges on the James Bay Railway from Toronto to Moose Mountain.

The agreement entered into between the Nickel Copper Co. and the Hopsfner Refining Co. for amalgamation has been ratified by both companies, and the latter has now been absorbed by the former.

The *Toronto News* thus hits off the recent mining convention in that city, where harmony did not certainly prevail: "At the Mining Convention:—Moved and seconded, that the Government do everything possible for us and that we refuse to pay a royalty or anything else to the Government. Carried amid wild cheers."

The Arsenical Ore Reduction Co. is developing its property at Grey's Siding, two miles north of Temagami, and has over 50 men at work under Mr. Albert Smith, a New York engineer. The plant is being doubled.

An iron pyrites property at Rib Lake, in New Ontario, is being opened up. A trial shipment has been sent to Buffalo. It belongs to Mr. Smallman, of London.

Mr. J. M. Kilbourne, of Owen Sound, recently appeared before the tariff commission and asked to have the duty on cement increased 10 cents per barrel of 350 lbs. He stated that the cement manufacturing industry in Canada represents a capital of \$9,215,000 and gives employment to 10,000 people.

The Windy Arm Mining Co., referred to in the December number of the *MINING REVIEW*, is now fully organized. It is composed of Toronto people, who have subscribed sufficient capital to develop the claim as soon as the snow goes in the spring. The Conrad mine in the same district, is claimed by Col. Conrad, a well known Montana miner, to be the richest in the world. He says he has arranged to spend a million and a half dollars in development and work will go on all winter. In running a cross cut the vein was struck again. Two more tramways will be built, and the White Pass and Yukon Railway will build a branch to Windy Arm.

Some remarkably rich samples of gold were recently shown at the Bureau of Mines, Toronto, and which Mr. T. W. Gibson, the director, pronounces to be the richest he has ever seen. They were in the possession of Mr. Anthony Blum, president of the Laurentian Gold Mining Co., and were said by him to have been taken from the company's mine near Lake Manitou.

The Canadian Clay Workers Association, which was organized a year ago, held its first annual meeting at Hamilton, on December 13th; when the name of the society was changed to the Ontario Clay Product Manufacturers' Association. The president was requested to interview the Minister of Lands and Mines to urge the establishment of a technical school at the Agricultural College, Guelph, to teach clay working. The following were elected officers for the ensuing year:—Messrs. S. J. Fox, M.P.P., Lindsay, president; J. B. Miller, Toronto and Wm. Hancock, Hamilton, vice-presidents; C. S. Bechtel, Waterloo, secretary-treasurer. Among others who addressed the convention was Prof. Baker, of the School of Mines, Kingston.

The name of The Ontario-Minnesota Mining Company, Limited, has been changed to The Ontario-Duluth Mining Company, Limited.

Mr. W. G. Tretheway, the owner of one of the richest mines at Cobalt, announces that he has arranged to erect a smelter near that town for the treatment of the ores of the district.

The Manitoba Peat Company of Winnipeg, Limited, and the J. B. and J. C. Mining, Development and Smelting Co., extra-provincial companies, have been licensed to do business in Ontario.

The Ontario Government has cancelled a large number of mining leases for default of payment of rent. The leases cover properties in the townships of Drury, Coffin, Trill, McMahon, May, Gilmor, Nairn, Moneriff, Hyman, Lorne, Salter, Galbraith, Shedden, Craig, Merritt and Houghton in Algoma district; Dryden, Falconbridge, Calvin, Awrey, Hagar, Seadling, Chisholm, Davis and a number of locations near Lake Wahnapitae in Nipissing district; Blake, Gillies, Strange, Dorion, and Papoonge in Thunder Bay district; Jaffray, Haycock, Van Horne, and a number of locations near Rat Portage. On Lake of the Woods and Lake Manitou in the district of Rainy River north. These leases were nearly all granted in the early nineties, for ten years. The amounts in arrears are small, in most cases under one hundred dollars. Of course many of them are worthless for mineral or the holders would not forfeit them for such small amounts. There are a large number more to be cancelled, it is stated about two thousand in all.

MINING IN THE KOOTENAYS IN 1904.

(FROM OUR OWN CORRESPONDENT.)

The twelve months just passed has been a record year for the mining districts of British Columbia. From the camps of the Boundary country, Rosland, Slocan, Lardeau and East Kootenay there has been exported a total tonnage of over 1,300,000 tons of ore. Boundary's output has largely increased, Rosland has held its own, while the Slocan and East Kootenay have nearly approached the output of the banner year (1900) of lead-silver production in British Columbia. The increase has been due to a variety of causes chief among which, however, may be placed the increased value of the metals, the bounty on lead, the lessening rate of smelter charges, both in respect to copper and lead.

Three-fourths of the total tonnage is derived from the Boundary country and the greater part of that tonnage is due to the enormous output of the Granby mines. It is true that the ores are chiefly low grade, the proportion of high grade ores being even lower this year than last, although the opposite expectation was formed. But the low grade mines are those with the greater permanency and moreover afford steady employment to hundreds of men, not alone in the mining of the ore but also in the smelting, refining and transportation industries. As in the Boundary the smelters treating the ores of those camps are situated in the district itself, it follows that the money expended in mining, transportation and smelting largely remains in the country and helps to upbuild the district. The number of shipping mines in the Boundary has not largely increased during 1905 but much extra prospecting has been accomplished whose fruits will be apparent in 1906. It is for this reason that all the smelters are increasing or are about to increase their furnace capacity. The Granby is now operating eight furnaces; the British Columbia Copper smelter at Greenwood, with two furnaces is doubling this number and the Dominion Copper smelter at Boundary Falls is about to increase its plant in a similar manner.

North and south of the Boundary district, mines situated along the Kettle river and others found westward in the Okanagan and Similkameen are awaiting transportation, which seems likely to be forthcoming immediately, to become productive.

Nor are the prospects of the mines at Rosland one whit less bright, although the district has not been without its troubles. For example the recent concentration experiments have been no more successful than those previously attempted. In December, 1904, it was declared that the costly experiment made by the former management of the War Eagle and Centre Star mines had failed. Apparently this was caused by the manager going directly contrary to the expert advice received. This year the Le Roi has followed suit. It erected an experimental plant on its ground, occupying about the only level spot on the whole of the property, going, necessarily, into the further expense of hoisting its ores. There was no expert in this particular case, the man employed being a "practical man" but the result was the same. The only real success in this direction was accomplished on the Velvet Portland on a 30 ton scale, but being modest has not attracted the attention it merited. The success in this case seems to have been due to the use of hydraulic classifiers, the same idea being successfully carried out on a much larger scale in the Roseberry plant on Slocan lake. However, with a smelter rate of \$3 a ton, concentration is not the pressing

necessity it was when the rate was \$8. The gain in the price of copper, if permanent, should make the difference, especially with the new treatment rate, between profitable and unprofitable ore, in many a mine around the Roseland camp.

As has been already stated the silver lead production has been exceptionally great, the most important producing property being the St. Eugene, but during the year a smelter has been started at Marysville and is treating a large output from the Sullivan mine. At other properties such as the Rambler Cariboo, the Payne, Slocan Star, Lucky Jim, Monitor, Ajax, Bosun, Bluebell, Highland, Silver Cup, Triune and other extensive development operations have been in progress, while some have also been productive. Production was maintained during the year by over 100 mines, of more or less importance. The price of lead has been one of the causes of the increase but yet another has been the increased facilities provided by the smelters. The new roasting process, known by half a dozen names, for the desulphurization of the ores, was installed at the Marysville plant under the name of the Huntington-Heberlein and similar roasters are in course of erection at Trail and at Nelson, cheapening considerably the cost of reduction. One factor of importance in the improvement that has taken place is the establishment of the Orient as a market for our lead and silver by the C.P.R. Yet another factor is the process, now struggling into perfection, of separating the zinc from the lead. As long as zinc was penalized heavily in the smelters, lead ore which carried much zinc, and such is the case with a large percentage of Kootenay silver lead properties was handicapped. Now with the establishment of the Monitor Ajax Company's zinc works at Roseberry and of the plant at Kaslo, this disability is being removed simultaneously with a rising market in lead and the zinc itself. When zinc was an ingredient to be dreaded in and lead ore, when spelter ruled around \$90 a ton, little indeed was thought about the zinc properties abounding in the hills of the Kootenay. To-day things are far different. Spelter has risen to \$140 the ton. A mill has been erected at Roseberry which will separate the zinc from the lead. Other will follow. There was a further problem to be attacked and that was the further separation of the iron from the zinc, iron being penalized in a zinc concentrate just as zinc is penalized in a lead ore. Magnetic separation, first started upon the Payne mine, has solved this problem to a great extent, although the last word is far from having been said. A zinc separator is in progress at Kaslo and another is about to be erected by the Monitor Ajax Company, while zinc and iron magnetic separators are in course of construction at Pilot Bay. The latter enterprise is a part of the plans of the Canadian Metals Company which has already partially erected a zinc smelter at Frank. The scheme is to get ore from the lead and zinc mines on or near Kootenay lake, bring them down to Pilot Bay, there separate the lead from the zinc and the iron from the latter concentrates and then ship this zinc, greatly reduced in bulk from the original ore to the Frank smelter. It is hoped that the whole project will take definite form some time during the coming year, much to the lasting benefit of the whole country.

In addition to the districts thus glanced at mention should be made of the Windermere camp where a number of mines such as the Red Line, Paradise, Delphine and others await the construction of the Kootenay Central railroad to begin development and shipping on a large scale.

A further point is that a number of low grade free milling properties seem to be likely to be profitably operated in the future through an adaptation of the cyanide process by Dr. Hendryx, which method has lately been successfully applied at the Reliance mine near Nelson.

COMPANY MEETINGS AND REPORTS.

CONSOLIDATED CARIBOO HYDRAULIC.—In his report to the Directors, Mr. J. B. Hobson states as follows:—

"Owing to lack of ample precipitation the past season turned out the most disappointing one experienced since the equipment and opening of the property. The total quantity of water afforded amounted to only 45,071 5-10 inches, which was sufficient to warrant the opening of the mine for regular mining operations.

"The small quantity of water available was, however, used to face up the bank so as to afford Mr. Charles Hoffman, the expert for Mr. John Hays Hammond, an opportunity to test the gold values of the deposits of the upper bench from the floor of the excavation to the surface.

"When the canals were opened and sufficient water accumulated in the pooling reservoirs the water was used at intervals of a few hours each to clear the cuts and sluices of the ice that accumulated therein during the winter months. This work commenced on the 20th day of April, and was completed on the 11th day of May. During the progress of the work, including 74 hours' washing, 8,275 miners' inches of water were used.

"Washing to remove the talus and to face up the bank

commenced on the 12th day of May and continued for a period of 354 hours, equal to 14 days and 18 hours' washing. During the progress of the work 36,796.85 miners' inches of water were used to wash out volcanic mud capping from which was recovered 1,268.7 ounces of gold, valued at \$21,733.47—an average yield of 11.81 cents per cubic yard. The duty attained for the water used was about five cubic yards per miners' inch per 24 hours."

The following is a summary of the season's prospecting:—

Total time occupied in washing top gravel, 354 hours, or 14 days 18 hours; total quantity of water used washing gravel, 36,796.85 miners' inches; total quantity of top deposits washed, 183,984 cubic yards; average duty of water per miners' inch, washing gravel, 5 cubic yards; average yield per cubic yard washed, 11.81 cents; average yield per 2,500 miners' inches of water used, 24 hours, \$1,268.7 ounces; value of gold recovered since 1894, \$1,212, 03.04; total value of gold recovered from June 1, 1894, to June 22, 1905, \$1,233,936.51.

"The precipitation for the season commencing at close of mining operations on September 4, 1904, and ending June 22, 1905, turned out the lowest recorded for the district since the phenomenally dry seasons of 1864 and 1887. Precipitation for season, 1904, 24.39 inches; precipitation for season, 1905 (rain-fall 7.04 inches, for snowfall 6.75 inches), total for season, 13.79 inches; season, 1905, precipitation less than that of 1904 by 10.60 inches; quantity of water available and used during season 1905, 45,053 miners' inches; season of 1905, water supply less than that of season of 1904 by 180,146 miners' inches.

"The rain precipitation occurred in such light showers that only on three occasions, namely, October 20, 1904, .60 inch; May 11, 1904, .68 inch; and May 20, 1905, .75 inch, did it prove sufficient to contribute any water to the reservoir lakes.

"The snowfall, which averaged 67.05 inches on the watershed tributary to the reservoir lakes, went too slowly under the influence of moderately warm days accompanied by northerly winds and temperatures falling under freezing point at night—bad weather conditions for a water supply and accounting for the unusually small percentage of the snow precipitation that was contributed to the reservoir lakes."

"Careful gaugings of the water supply flowing from Spanish lake from November 15, 1904, to date, indicate that the watershed tributary to that lake is capable, even with the light precipitation recorded for the past season, of affording ample water to keep the mine in continuous operation throughout the open season, and the company's water system should be extended with all possible haste to that source of abundant and permanent water supply.

"The 10 ft. x 10 ft. sluice tunnel was advanced 679 feet at a cost of \$16 34 per foot, making a total length to face 930 feet, and leaving 300 feet of tunnel and 60 feet of upraise to complete the new opening into the hydraulic excavation, the floor of which is now about 75 feet above the bedrock of the channel. During the months of May and June, several dikes of extremely hard rock were encountered, which interfered with the progress of the work and added materially to the cost thereof. The tunnel and upraise should be completed without delay so as to facilitate the working of the high grade deposits included in the lower bench and on the bedrock and the cutting out of about 4,000 feet of sluice, which is very expensive to maintain.

"The large amount of necessary repairs and development work done during the progress of the past two seasons work leaves the water supply system and the mine in as good condition as possible for the continuous use of an abundant water supply; but the mine will not be in first class condition until the sluice tunnel is opened and the bank can be worked in one bench from surface to bedrock.

"The upper gravels washed during the season showed a marked increase in grade indicating that the low grade zone encountered in the current-crossing has been passed.

"A bank blast of about 6,000 kegs of black powder, to cost about \$27,000, is strongly recommended. Such a blast would disintegrate and break up ready for economical washing the heavy capping of indurated volcanic mud at a cost not exceeding one cent per cubic yard, as against a cost of about 12 cents per cubic yard to break it up with dynamite and hard labor. The proper disintegration of indurated alluvial deposits tends to increase the washing duty of the water, thereby increasing the gold output, besides working a material reduction in the cost of mining."

The total run last season was only 14 days 18 hours, cutting down the production to 1,268, 4/10 ounces, or \$21,733.47.

LE ROI MINING COMPANY.—The Directors submitted the following report at the meeting held on December 8th:—

The accounts show a balance in favor of profit and loss of £49,741. This result is arrived at after paying to the bank £4254 on account of interest and advances, and after writing off £21,345 for exploration and development and £14,139 for depreciation of machinery and plant, surface improvements, etc., at the mine and smelter. In the year there were fortunately

extra profits (1) of about £10,000 owing to the receipt of a better price for matte at Tacoma under the contract arranged by Mr. Wilson and approved by Mr. Mackenzie; (2) of about £7000 by reason of the increased price of copper, and (3) of about £2000 owing to the decreased price of coke. The ore mined was of higher value than in the previous year by 31.47 per cent, or, say, £34,843 on the tonnage mined during the year, and was produced more especially from the 700, 800 and 900 foot levels.

The accounts show that the liabilities at June 30 amounted to £54,394 and the liquid assets amounted to £125,483. This is an improvement in surplus liquid assets upon the previous year of £56,886, and is largely owing to the advantage of sending matte to Tacoma under the contract, which made the proceeds immediately available, instead of waiting several months, as heretofore, when shipped to New York.

The board regrets to have to state that the important body of high grade ore referred to in the previous report as having been discovered in the 1450 level, averaging \$30 per ton in value and nine feet in width, has not been productive of the results that were then expected, only 3011 tons having been extracted below the 1350 foot level from November, 1904 to June 1905, and 1422 tons during the following three months. The gross value of the 4433 tons, made up of the two above amounts, was \$88,407, and the total expenses were \$72,249, leaving a net profit of \$16,158. The proportion of richer ore thus obtained, though raising the general value of the ore mined, bears very little upon the profits, inasmuch as the total amount of ore reported to have been raised during the fiscal year was 114,960 dry tons.

The small experimental plant for treating the value of water concentration ordered by the board, and referred to in the previous report as in process of erection by the company under Mr. McMillan at Rosslund, commenced running on July 1 and has not, unfortunately, answered the expectations which were entertained in regard to it. Instead of \$13,000 which it was expected to cost, \$33,049 has been laid out upon it. Mr. Mackenzie was obliged to shut it down as it was not adapted for the work required.

During the whole of the year the ores from the mine were sent by Mr. McMillan to the Northport smelter in place of the Trail smelter as advised by Messrs. Bradley and Mackenzie, with a direct loss in one year, on the statement of the company's accountant at Rosslund, through continuing to use the smelter, of \$109,575. It was in these circumstances, and upon the authority that the directors entered into a contract with the Canadian Smelting Works.

The ore reserves are unfortunately low. They were estimated by Professor Brock, of the Dominion Government Geological Department, in January, to be 124,000 tons, but Mr. Astley reports that the deposits are very irregular and "spotty," and at the close of the year Mr. Astley "found it impossible to accurately estimate them." Mr. Astley and his foreman, Mr. Trevarrow, reported to Mr. Mackenzie on Sept. 1 that the ore reserves did not exceed at that date 39,000 tons, containing gross values of \$10.68 per ton. Mr. Mackenzie states that the ore reserves in the Le Roi have never been so low as at present, and an immense amount of development work will be necessary during the coming year.

In the last report the directors referred to the question of consolidation of interests with other companies and to the commencement of negotiations for that purpose, which were naturally expected to occupy a considerable period of time. The companies proposed to be amalgamated with the Le Roi Mining Company are: The St. Eugene Consolidated Mining Co., Limited, the Centre Star Mining Co. Limited, including the War Eagle properties; the Canadian Smelting Works at Trail, including the Rosslund Power Company.

Mr. Mackenzie's report contains not only his opinion that the proposed amalgamation is desirable in the interests of the Le Roi Company, but also his recommendations as to the proportions which he considers to be fair and reasonable between the different companies to be amalgamated. Mr. Mackenzie concludes his report as follows: "I would recommend the Le Roi Company to enter the consolidation on the terms previously stated, firmly believing that there is no question of doubt as to the results being beneficial to the shareholders." It will be easily be understood that the progress of these negotiations has formed a matter of constant consideration not unmixed with anxiety to the board. They have all along felt that the results in the working of the Le Roi mine from time to time were precarious, and that the expectations occasionally held out to them were far from being realized. They have thus been forced to the conclusion that it would undoubtedly be to the interests of the Le Roi shareholders to participate on equitable terms in the working of a strong and prosperous company as was generally approved at the last meeting.

The directors therefore strongly advise the shareholders to adopt the recommendations of Mr. Mackenzie, which they themselves believe will, if carried out, result in the earning of regular dividends in the future. In the report of Mr. Mackenzie the

proposal, so far as the Le Roi shareholders are concerned, is that they shall receive in exchange for their shares 24 per cent. in the capital of the new company to be formed, and, without including the value of cash and stores, he estimates that a dividend of no less than 19 per cent. per annum will be earned by the combined companies on a capital of \$4,000,000, equal to, say, \$800,000.

If however, the proposed amalgamation is carried out according to the present intentions, the capital of the combined company will be £1,200,000, of which £1,100,000, representing the amount referred to by Mr. Mackenzie in addition to values of cash and stores of the various companies, will be divided proportionately between the various companies and £100,000 will remain unissued, and will be available for taking further properties into the amalgamation or for other purposes. The Le Roi Company would be allotted as its share, 24 per cent. of this capital, amounting to £264,000, on which regular dividends of 14 per cent. or say £37,000 a year, might be expected and this in a new company not overburdened as the Le Roi Company has hitherto been, with an excessive capital. A sum would it is expected, be realized by the Le Roi Company in cleaning up the Northport smelter and for cash and stores of, say, £60,000. Out of this £30,000 will be paid as a cash working capital to the new company, and the balance of, say £30,000 will be available for distribution amongst the Le Roi shareholders. In addition to the Le Roi contribution of £30,000 the other companies will similarly contribute their proportions, which will amount to £95,000, and the new company will thus start with a working capital of £125,000, which it is considered will be sufficient to carry on its operations in the best possible way.

Mr. Aldridge who will be responsible for the management of the new company, and who is intimately acquainted with the various properties, reports that in the past year the St. Eugene Company earned a net profit of \$575,827, and had in its treasury in cash \$372,000; the Centre Star Company, which since negotiations have started has absorbed the properties of the War Eagle Company, earned a net profit of \$144,846, and had in its treasury and in cash due, \$217,254; and the Canadian Smelting Works earned a net profit of \$188,850, and had an earned reserve of \$223,496. So the above Canadian companies had altogether a net profit of \$909,523 in the year and a surplus of cash on hand of \$812,938.

The great advantages to be derived from this amalgamation are fully set forth under the following six headings in Mr. Mackenzie's report: (1) A reduction in the cost of mining and exploration; (2) a substantial saving in administrative and office expenses; (3) reduction in freight and treatment charges; (4) reduction in present cost of marketing copper; (5) competent management and skillful direction of exploration work under one head; (6) the prestige and advantages of a large and powerful corporation with sufficient capital to assure the future, backed by the support of a great transcontinental railway vitally interested in the upbuilding of a profitable mining and smelting industry in British Columbia.

At the meeting the resolution adopting the report and accounts was carried unanimously, but when a second resolution was put to the meeting to agree to the scheme of amalgamation, it was lost by a large majority.

The Chairman thereupon demanded a poll, which he said would be taken by voting papers being sent to the shareholders, who would be asked to return them within a fortnight.

The motion to re-elect Mr. Waterlow, a director, was also negatived, and resolutions re-appointing Mr. MacMillan and the three gentlemen mentioned by him as directors, were carried, the Chairman demanding a poll in each case.

MINING NOTES.

ALBERTA.

Oil has been struck in one of the wells of the Western Oil & Coal Company, which owns a large tract of land in South Western Alberta.

BRITISH COLUMBIA.

BOUNDARY.—It is announced that the British Columbia Copper Company is about to make a further large expenditure, increasing the capacity of its Greenwood smelter to 300 tons daily, and contracts have recently been let to the Power & Mining Machinery Company for the building of three blast furnaces 84 x 240 inches, having a combined capacity of 1,800 tons daily. These changes will also necessitate the enlargement of the ore bins, and a machine shop will also be added. The contract for additional electrical equipment has been placed with the Canadian Westinghouse Company and consists of a 500 horse power motor to drive the compressor plant at the Mother Lode mine and three 50 kw. stepdown transformers.

For the smelter department have been ordered three 300 horse power motors to drive the large new blowers, an additional

100 kw. motor generator, besides several smaller motors. In addition there are five trolley locomotives for hauling ore from the bins to the blast furnaces and the slag to the waste dump.

With the completion early in the spring of the new service into the Boundary district of the West Kootenay Power & Light Company, additional electric power of 60,000 volts will be utilized at the smelter and mine.

SLOCAN.—The case of the Lanyon Zinc Company vs. the Payne Mining Company was recently settled out of court, each side agreeing to pay its own costs.

ROSSLAND.—A contract has been let for carrying the winze from the 1,550 ft. level at the Le Roi, down to the 1,750 ft. level. It is proposed, should this ground prove as rich as expected, to deepen the main shaft from the 1,350 ft. level.

On December 17th a tremendous explosion of powder occurred at the Centre Star mine, killing Mr. J. Ingraham, formerly Chief of Police of Rossland, and causing considerable damage to the mine buildings in the vicinity.
Add British Columbia Mining notes—

LILLOOET.—The Iowa & Lillooet Gold Mining Company's dredge, which has been in operation during the past season on the Fraser River, below the town, is said to have made a very satisfactory showing, the average daily recovery having been in the neighbourhood of \$100.00. During the year placer mining was carried on at Cayoosh Creek, Alexander Creek, the north fork of Bridge River and on the south fork of Bridge River, and Cadwallader Creek. The Lorne mine was also worked, good values being recovered from the ore which was crushed in an arrastra.

EAST KOOTENAY.—A 2 per cent. dividend was paid to shareholders of the St. Eugene Company on January 5th. The earnings of the mine during 1905 were over \$500,000.00, of which sum \$25,000.00 was distributed as dividends in quarterly amounts at the rate of 2 per cent.

NELSON.—It is reported that a number of iron claims on Crawford Creek have been sold to a syndicate of Cleveland and St. Paul purchasers.

ATLIN.—Referring to reports in the *Victoria Press* that the day of the individual miner in Atlin is practically over, the *Atlin Claim* emphatically denies the statement. Our contemporary states as follows:—These views are simply a re-hash of the stuff with which the coast papers are deluged every fall by company managers, company promoters and their hangers-on. These gentlemen have the stage all to themselves as the individual miner stays at home and works to keep up the annual gold output. If the Minister of Mines report of the output was dependent on the results achieved by the majority of the companies, Atlin would cut a very sorry figure. The individuals, proportionately, are taking out the most gold and the interviews that emanate from company promoters claiming that the day of the individual miner is over are ridiculous. The wish is father to the thought.

NOVA SCOTIA.

During the month of December the Dominion Iron & Steel Company made a very remarkable showing. The blast furnaces produced nearly 21,000 tons of pig iron; the open hearths, which at the beginning of the year were producing about 10,000 tons of steel, last month, turned out over 20,000 tons. The rail mill whose previous best record was less than 8,000 tons, made last month 10,000 tons. The output of the rod mill was 6,760 tons of wire, notwithstanding the fact that it was idle for two shifts, thus beating the Sharon mill record of 6,200 tons. In this regard, a 25,000 ton order from the Grand Trunk Railway Co., one of 5,000 tons from the Temiskaming Railway of Ontario, and one of 25,000 tons for the Intercolonial Railway of Canada have been completed. An additional order of 37,000 tons from the Grand Trunk, besides a heavy order from the Canadian Pacific, have been accepted for the new year. With a view to the largest winter's output of iron and steel in the history of the plant, the company during the year made the greatest importations of iron ore and limestone on record, the quantity of the former material brought from iron ore mines at Wabona alone amounting to over 400,000 tons, against a little more than half that amount in former years. At present the company have three thousand men on the payroll of the Sydney plant and this is the largest number of hands employed since manufacturing operations were commenced.

ONTARIO.

Mr. E. T. Corkill, who recently visited the Algoma district, reports that a new concentrating mill, with a capacity of about 60 tons per 24 hours, has been installed at the Superior Copper Mine. The plant includes a three-compartment hydraulic separator and four No. 4 Wilfley tables. It is stated that the Elmore oil plant at the Massey Station copper mine has treated

about 3,500 tons of ore during the past year, and has succeeded in recovering copper values to the extent of from 75 to 80 per cent.

The Lake Superior Company recently contracted to supply the C.P.R. with 60,000 tons of steel rails, to be delivered this year.

At the session of the Tariff Commission, held at Sault Ste. Marie on December 21st, the Lake Superior Corporation asked that a duty on coal for coking purposes, amounting to 53 cents per ton, be removed. It is urged that if this tax be removed, large coke works will be established on the Canadian side of the line. The company's steel plant uses 500 tons of coke per day.

Two big gushers are reported to have been struck in the Leamington Oil Fields on December 9th, one on the property of the Leamington Oil Company, which flowed ten barrels an hour, and the other on Concession 7, which has been flowing about 3,000 bbls. per day.

Mining operations are to be carried on extensively at the Aitakan iron mines this winter, and arrangements are now being made to install the necessary machinery on the properties. Operations will be carried on under the direction of Mr. J. C. Hunter.

A very rich strike of ore is reported to have been made at the Laurentian mine, which was recently re-opened, a blast at the 85 ft. level disclosing a great mass of visible gold in the quartz.

During the month of November the Big Master mine produced gold to the value of \$3,000, as a result of 30 days crushing. The concentrates were estimated to be worth \$800.

In the Cobalt district several claims have recently been sold for good prices. Thus a claim on Cross Lake was sold to the Imperial Mining Company for \$60,000; the McLeod and Glendinning mines were sold for, it is reported, \$250,000, and two or three other properties have been purchased at equally high prices.

Mr. Smith, Inspector for the Temiskaming Mining Division, states that since April 5th, he has issued 1,000 licenses for the division. There is every indication that next spring the rush to the mining fields of the division will be greater than at any time this year.

YUKON.

The Mining Committee of the Yukon Council is now engaged in drawing up a code of mining laws, which will be acceptable to those operating in the territory. Several meetings have been held of late, and there has been a singular unanimity of view as to the main points requiring amendment in the present mining law. It is the intention of the Committee to submit its recommendations to Ottawa, when it will be brought down in the form of a bill, to be presented at the next session of the House.

MINING MEN AND AFFAIRS.

On Nov. 28th, Mr. J. F. Halloran transferred his entire interest in the *Mining and Scientific Press* to Mr. T. A. Rickard, lately editor and part owner of the *Engineering and Mining Journal*, New York. It is the intention to maintain the high character of the paper and to keep it in its position as the representative mining journal of the *Great West*. Mr. Edgar Rickard, of Berkeley, is already business manager. Mr. T. A. Rickard will assume active editorship on the first day of 1906. Mr. Arthur H. Halloran, son of the former proprietor, will be one of his assistants. Several of the leading writers in the profession have undertaken to contribute practical articles bearing upon mining and metallurgy. As both the editor and the business manager are mining engineers by training and familiar with the chief mining regions of the world, it is expected that the *Mining and Scientific Press* will gain in interest to its readers and in usefulness to its advertisers.

The secretary of the Canadian Society of Civil Engineers has addressed the following circular to members:—

"On the invitation of members residing in Toronto, and by resolution of the Council, the annual meeting of this Society will be held in Toronto, during the fourth week in January. It is expected that special railway facilities will be available for members attending the meeting. A detailed programme will be forwarded to you early in January."

Mr. Alex. Dick, General Sales Agent of the Dominion Coal Company, recently returned from an extensive tour of the American and Canadian coal fields. Mr. Dick states that the coal trade is in a very flourishing condition, the Dominion Coal Company's output last year having been a record achievement.

Mr. R. H. Anderson has been appointed mine manager at the Sullivan mines, East Kootenay, B.C.

Mr. J. H. Plummer, President of the Dominion Iron & Steel Co., recently left for a brief sojourn abroad. Prior to his departure Mr. Plummer stated that the company is now maintaining an output at the rate of 20,000 tons of pig iron per month, all

of which is being converted into steel. This tonnage, however, is certainly gaining and I believe it will reach 25,000 tons by spring. The prices, while fair at Sydney are not high when compared with those in the States. From the large orders on hand and being received there is no doubt about the rail mill being fully occupied. The heavy demand is no doubt caused by the open hearth rails proving to be of a superior quality.

Mr. Geo. A. Walkem, who for over four years past has acted as manager of the Vancouver Engineering Works, has resigned his post. Before leaving Mr. Walkem was presented with a handsome testimonial by the employees of the company.

Mr. W. French, Mechanical Superintendent of the Hall Mines smelter at Nelson, B.C., was presented by the employees on Christmas Day, with a gold watch and chain, in token of their regard and esteem.

COMPANY NOTES.

TILT COVE COPPER.—The secretary has issued the following circular to shareholders, dated November, 30th:—I beg to inform you that at a meeting of the members of the Committee of Management of this company, held to-day, it was resolved—“That an interim dividend of 3s. per share be and is hereby declared on the shares of this company, free of income tax, payable on the 5th day of December, 1905, to the shareholders on the books of the company on the 4th of December, 1905, and that the transfer books be closed during the said 4th day of December, 1905. Holders of share warrants to bearer are informed that coupons No. 7 will be paid at the above rate, free of income tax, on presentation at the company's office. In sending you this notice of interim dividend the committee desire to point out that this dividend is based on the profits for eight months, namely, from 31st December, 1904, to 31st August, 1905, which includes the realization of the large stock of ore brought forward from 31st December, 1904.”

LE ROT.—“November shipments amount to 8,000 tons, containing 2,550 ounces of gold, 4,350 ounces of silver, 187,600 lbs. of copper. Estimated profit on this ore, after deducting cost of mining, smelting, realization and depreciation, \$17,000. Expenditure on development work during the month, \$9,000.”

NEW VELVET PORTLAND MINE, LIMITED.—Registered November 18, by C. W. Brown & Ayles, 2 Gresham Buildings, E.C. Capital £10,000, in £1 shares. Objects:—To acquire, prospect, examine, explore, and work any property or ground supposed to contain gold or minerals in Canada or elsewhere, in particular to take over the undertaking and all or any of the assets in British Columbia of the Velvet Portland Mine, Limited; to adopt an agreement with W. Trotter and C. W. Brown; and to carry on the business of gold and general miners, metallurgists, &c. Minimum cash subscription, 10 per cent. of the shares offered to the public. The first directors (to number not less than two nor more than five) are: E. H. Clarke, A. Maclean, and W. J. Newhall. Qualifications of subsequent directors, one share.

TYEE COPPER (VANCOUVER ISLAND).—November: Smelter ran 11 days, and smelted—Tyee ore, 2,304 tons; Customs ore, 265 tons; total, 2,569 tons. Matte produced from same, 220 tons. Gross value of contents (copper, silver, and gold) after deducting costs of refining and purchase of Customs ore, \$31,062.

DOMINION COPPER COMPANY, LTD.—The following circular has been issued to shareholders:—Pursuant to the plan of reorganization under which the Montreal & Boston Consolidated Mining & Smelting Company, Limited, (hereinafter called the Consolidated Company) conveyed its properties to your company the new board of directors was elected on July 28, 1905, and thereupon assumed the management of your company.

The contemplated issue of bonds, amounting to \$700,000, was at once consummated. Out of the funds received from all sources, including the bond issue, your company has paid (1) the balance amounting to \$339,158.79 due under the so-called “Dominion” agreement for the purchase of stock of your company; (2) a large amount of debts of the consolidated company, which were specifically assumed by your company; (3) the charges incident to the reorganization and the expenses of general administration; and (4) about \$50,000 for equipment, supplies, labor and other outlays in developing the mines of the company, and preparing to start the smelter.

The company now has balances in bank aggregating about \$115,000; and has mining and smelting supplies worth about \$30,000.

The assets acquired by your company comprised among other properties, a large majority of the capital stock of the Montreal & Boston Copper Company, Limited, which owns the smelter. After the present management assumed charge of

your company in July last, Messrs. Munroe & Munroe asserted against the Montreal & Boston Copper Company a claim, amounting to about \$17,000, for alleged services and advances to that company. The claim is being vigorously defended. The Crow's Nest Pass Coal Company also asserted a claim against the Montreal & Boston Copper Company amounting to about \$20,000 for coke alleged to have been furnished to that company about two years ago. In addition, there have been asserted against that company claims amounting to about \$7,000 for legal services alleged to have been performed by Canadian and New York lawyers, and other claims aggregating over a thousand dollars. A Canadian firm of lawyers also demands \$3,068.70 for alleged services to the Consolidated Company.

The assertion of these claims came as a surprise to the present management. Careful investigations regarding them were at once instituted. While claims against the Montreal & Boston Copper Company are not liabilities of your company, it is claimed, they are so far as valid enforceable against the smelting property, and may have to be taken care of in some way.

Your company appointed Mr. Samuel Newhouse as general manager of the mining operations of the company and employed Mr. M. M. Johnson as consulting engineer. The work of developing the mining properties of the company has been actively taken up. The smelter of the Montreal & Boston Copper Company not having been properly cared for was found to be in an unsatisfactory condition, and required extensive repairs. It is not properly located or equipped to treat the ores economically for any great length of time. Preparations have been made, however, to start it. About 50 men are now employed at the mines and smelter, and when the smelter is in operation about 200 men will be employed.

It is the intention of the management, acting under the advice of the general manager and consulting engineer, to ascertain as nearly as possible the character and volume of the ores in the various mines, and thereupon to determine to most expedient methods of handling and treating the ores. In order to obtain accurate and reliable conclusions in regard to these matters it seems necessary to operate the smelter for some period at least. The smelter has been put in repair, and it is expected that it will be blown in by the first of December, and will be capable of treating from 600 to 700 tons of ore per day.

MINING STATISTICS.

BRITISH COLUMBIA:

J. W. Harrison, in his report of the California Coal market for November, states that British Columbia deliveries during that month were 36,427 tons. The coal deliveries at San Francisco during 1905 are estimated as being fully 30 per cent. below the quantity received in 1904.

The production of the Vancouver Island mines is given as follows:—Wellington collieries, 60,893 tons; Western Fuel Company, 89,285 tons. The *Phanix Pioneer* states that the production of the Boundary district for the year reached the large total of 949,140 tons, of which the Granby mines contributed 665,000 tons, the B.C. Copper Co., 178,000 tons; the Brooklyn-Stemwinder, 54,000 tons, and the Raw Hide, 27,000 tons.

The output of the Crow's Nest Pass Coal Co. for 1905 was as follows:—

	Tons.
Coal Creek Mines	429,382
Michel mines	311,071
Carbonado Mines	95,170
Total	835,623

The Fernie coke ovens produced 127,062 tons; the Michel oven 127,037 tons, and the Carbonado ovens 7804 tons, making a total for the year of 261,933 tons, which at \$4.50 per ton realized \$1,178,698.50. It takes 100 tons of coal to make 60 tons of coke, so that the 261,933 tons of coke produced represents 436,555 tons of the total coal output leaving 399,068 tons of coal, which at \$2 per ton brought into the treasury \$798,136, making a total revenue for the year just closed of \$1,976,834.50.

Total shipments of coal by Western Fuel Company for the year 1905 were 169,874.05, divided as follows: January, 16,855.14; February, 16,530.10; March, 24,519.07; April, 28,510.09; May, 21,004.00; June, 3,354.00; July, 1,520.17; August, 1,211.05; September, 2,042.10; October, 10,447.00; November, 24,199.14; December, 27,260.07.

Shipments of ore over the Kaslo & Slocan Railway, from eighteen shipping mines for the year, is said to have been 11,580 tons, valued at \$273,700.00, of which the zinc contents represented 42.6 per cent.

The lead returns from the Hall mines smelter for November show over 1,000 tons of lead ore received and nearly 300 tons of lead contents, notwithstanding the fact that no ore was received during the month from the St. Eugene mine. The chief lead shippers in order were the Alice, Whitewater, Reco, Emily, Edith and Highlander.

The lead returns from the Trail smelter for the month of November showed lead contents of ore treated as having been rather over 150 tons; 500 tons of lead ore were received.

The *Rosland Miner* publishes the following table of ore shipments for the year:—

	Tons.
Le Roi	113,566
Le Roi (milling)	3,240
Centre Star	96,630
War Eagle	66,909
Le Roi Two	9,472
Le Roi Two (milled)	10,630
Jumbo	10,729
Cascade-Bonanza	150
White Bear	1,100
White Bear (milled)	3,220
Crown Point	350
Spitzec	4,809
Velvet-Portland	1,977
Gopher	180
Homestake	30
Lily May	90
Inland Empire	30
Total	323,112

NOVA SCOTIA.

The *Morning Chronicle* estimates the value of the coal output of the province, for the year 1905, at \$11,250,000; coke, \$650,000; gold, \$320,000; iron ore, \$80,000; other minerals, \$620,000; pig iron, \$3,500,000; steel, \$3,800,000; and steel rails, \$1,500,000. The coal shipments were the largest on record.

During the year 1905 the Nova Scotia Steel and Coal Co. produced 560,000 tons of coal, 120,000 tons of coke, 58,000 tons of pig iron, and 22,000 tons of steel. These are the largest figures in the history of the company.

The record made by the Dominion Steel Co. the past year has been very satisfactory. The total production of pig iron was 162,000 tons, of the open hearth steel furnaces 173,500 tons and of the rolling mills 47,000 tons. Of eighty-pound steel rails, 44,000 tons have been already turned out. The production of coke amounted to 242,150 tons. Over half a million tons of coal was consumed by the company in its different operations, as well as 380,184 tons of iron ore, 267,237 tons of limestone and dolomite and 13,711 tons of gravel and sand. During the height of the season 4,000 men were employed by the company, and the payroll exceeded \$2,000,000. Perhaps the most important announcement that the company has to make is that it has advanced from being a mere purveyor of raw materials to the position of a producer of finished materials. At the beginning of the year six open hearth furnaces were in operation. This number was gradually increased until the whole ten were in use, in September and the remaining months of the year. The company's wire rods are considered of fine quality and now have the Canadian market captured.

Returns for the Dominion Coal Company for the month of December were as follows:—

Dominion No. 1	34,899
" No. 2	42,355
" No. 3	14,415
" No. 4	32,687
" No. 5	36,032
" No. 6	3,061
" No. 7	8,644
" No. 8	10,209
" No. 9	15,665
	198,017

Shipments, 187,598.

During the month of November shipments from the respective collieries were as follows:—

	Tons.
Dominion Coal Co., Ltd.	278,856
Cumberland R'y & Coal Co.	40,473
Acadia Coal Company	22,670
Intercolonial Coal Co.	23,617
N.S. Steel & Coal Co.	59,108
Inverness R'y & Coal Co.	11,593

ONTARIO.

The Bureau of Mines reports that the output of the metalliferous mines and works of the province for the nine months ending September 30th, are as follows:—Gold, \$67,259; silver, \$1,300,000; nickel, \$2,531,000; copper, \$522,746; cobalt, \$75,000; iron ore, \$157,640; pig iron, \$2,207,864; steel, \$2,421,549; arsenic, \$2,400. The shipments from the mines in the Coleman township area amounted to 1,802 tons, the contents of which, stated separately, were as follows:—Silver, \$1,300,000; cobalt, \$75,000; nickel, \$6,100; arsenic, \$2,400. Total, \$1,383,500. Making allowance for the conversion of pig iron into steel, the total value of the metalliferous output for the nine months was about \$9,000,000. For the whole of 1904 it was \$5,061,677, so that the rate of production during the present year is more than double that of 1904. The present year will be the record one for the production of nickel in Ontario. The output for the nine months is already in excess of the total yield for 1903, which up to the present time showed the largest output.

MINING INCORPORATIONS.

ONTARIO.

Sovereign Cobalt Mining Company, Ltd.—Capital \$200,000.00, in shares of \$1.00 each. Head Office, Toronto. Provisional directors: Messrs. Joseph Marsland Horrocks, William Andrew Smiley and Frank Joseph Stanley.

Canadian Forty-Mile Gold Dredging Company, Ltd.—Capital stock \$600,000.00, in shares of \$100.00 each. Head Office, Toronto.

Ontario Cobalt Developing Company, Ltd.—Capital \$350,000.00, in shares of \$1.00 each. Head Office, Toronto. Provisional Directors: Messrs. Stephen Moffatt Hay, James Walter Curry, Jos. Bingeman, James Kenniston Paisley and Elmer Eugene Wallace.

The Pittsburgh-Cobalt Company, Ltd.—Capital \$75,000.00, in shares of \$10.00 each. Head Office, Toronto. Provisional Directors: Messrs. Chas. D. Robbins, Sydney Frederick Heckert, Wm. Alfred McCutcheon, Harrison Orville Patch and Samuel McElroy.

Toronto Cobalt Mining Company, Ltd.—Capital \$300,000.00, in shares of \$1.00 each. Head Office, Toronto. Provisional Directors: Messrs. Hamilton Bender Wills, Whitford Vandusen and John Samuel Humberstone.

RECENT PUBLICATIONS.

Report of the Klondike Gold Fields, by R. G. McConnell, B.A., Pt. B., Annual Report, Vol. XIV, Geological Survey of Canada, Ottawa, 1905. This report is based on field work carried on during the season of 1903. Parts of the preliminary report on the district, published in 1900, are also incorporated in the present report.

Report on the Geology of a Portion of Eastern Ontario, by R. W. Ells, LL.D., Pt. J. Annual Report, Vol. XIV, Geological Survey of Canada. This report should accompany carbon sheet 119, compiled by Mr. Jos. Keele, B.A., Sc., and deals with the geology and mineral resources of the large area contained therein.

Report of the Bureau of Mines, Ontario, 1905, Vol. XIV, Pt. I, Toronto, 1905. This voluminous report is comprised in a volume of 375 pages, and is divided into chapters, the first being a statistical review of mining conditions in the Province for the year 1904, the second, an account of the summer mining classes, by Dr. W. L. Goodwin, while the mines of Western Ontario are discussed by Mr. W. E. H. Carter; the mines of Eastern Ontario, by Mr. E. T. Corkill, who also contributes a chapter on "Petroleum and Natural Gas." Mr. P. Gillespie writes on the cement industry of Ontario, while there is an account of the explorations in Abitibi, by Mr. J. G. McMillan; a chapter on the Loon Lake iron-bearing district, by Mr. W. N. Smith, and on the Boston Township iron range, by the Provincial Geologist, Mr. W. G. Miller; and a long and interesting report on the iron ranges of Michipicoten West, by Mr. J. M. Bell.

The total mineral production (metallic and non-metallic) of Ontario, during 1904, was valued at \$11,572,647.00. This, rather less than five million dollars, represented metallic production.

The Nature of Ore deposits, by Dr. Richard Beek, Professor of Geology and Economic Geology, Freiberg Mining Academy, translated and revised by Walter Harvey Weed, E.N., with 272 figures and a map, 2 Vols., first edition, The Engineering and Mining Journal, New York and London, 1905. We have received a copy of this valuable work, a comprehensive review of which will appear in a future issue.

The Colliery Manager's Pocket Book, 1906. We have received from the publishers, The Colliery Guardian Company, Ltd., London, E.C., a copy of this useful pocket book and diary, which is now in its 37th year of issue. The book contains much useful information of a character required by engineers and others engaged in working coal mines.

NOVA SCOTIA MINING INTELLIGENCE.

Our special correspondent sends us the following list of areas applied for during the month of November:—

DISTRICT.	AREAS.
Stornont	227
Oldham	20
Little Beaver Lake	30
Montague	29
Malaga	6
Brookfield	46
Salmon River	233
Sheet Harbour	46
Shiers Point	6
Kemptville	26
Gold River	3
Renfrew	9
Chezettcook	12
Mills Village	18
St. Pauls Brook	20
Lake Catcha	15
Total	746

In November the Anderson mill at Lake Catcha crushed 29 tons quartz, which yielded 23oz. 17dwt. Ogrs. gold. In November at the Taylor mill, Oldham, 531 tons quartz crushed yielded 547oz. of gold.

METAL MARKET CONDITIONS.

COPPER.—In a recent circular Messrs. Morrison Kekewich & Co., of London, write as follows:—

Copper conditions are very strong and most interesting, and there has been active trading, as prices have advanced. Cash standard is £2 higher, and three months £1 15s. The position now is acute, consumption is increasing and already larger than even the increased production can keep pace with. Electrical and other demands are taking very large quantities. There is now no available copper before March-April, and consumers are in an awkward position. There are no stocks anywhere, and the short selling has been chiefly done by those who have no knowledge of the real situation, which has been developed so strongly and promises to continue even more so.

In their med-monthly report on copper, Messrs. Jas. Lewis & Sons write:—

The dearth of copper has become very acute, and great difficulty is experienced by manufacturers in obtaining necessary supplies for delivery during the next two or three months. For prompt and early delivery excessive prices are being paid, and full prices for delivery in three or four months. The covering of "bear" sales forced up the value of standard copper to £81 for January delivery and to £80 for three months prompt on the 14th inst.—an advance of £3 5s. on early and £2 10s. on forward delivery since the 1st inst.—but the pressure of sales to realize profits reduced it to £80 and £79 2s. 6d. on the 15th; the closing value to-day is £79 2s. 6d. and £78 15s. 0d. For best selected ingots £88 10s. has been paid—the highest price for many years. English high conductivity wire bars are not obtainable for delivery before March, while American wire bars only offer for April delivery at £87 per ton, 18½ cents per lb. having been paid by American consumers for delivery up to

May; the quotation for Lake being 18½ to 19 cents per lb., though a sale at 19½ cents is reported. Large sales of Japanese copper continue to be made to Europe for delivery in three to six months' time, and it was reported on the 7th inst. in well-informed quarters in New York that of the copper purchased there and shipped to China some 20,000 tons had been resold to Europe at prices 30s. to 60s. per ton below the prevailing quotations. Leading authorities, however, deny that the quantity sold is as large as 20,000 tons, but undoubtedly a considerable quantity will be shipped from China to Europe. The prevailing "famine" may therefore continue for another two or three months, but after that time it will probably be relieved by the receipt of additional supplies from Japan and China. Larger shipments to Europe may also be expected from the United States as no more copper is likely to be shipped to China for some time to come, and it is very doubtful if the recent apparent increase in the home consumption (as shown by the following figures) will continue, good part of it being probably due to delay in forwarding ore and fuel from the mines and collieries to the smelting works in consequence of the temporary scarcity of railway wagons. Undoubtedly the present high value of copper will greatly stimulate its production, while it will reduce its consumption in some directions—notably in the manufacture of sulphate of copper. The production of copper in the United States is this year believed by those best qualified to judge, to have increased about 12½ per cent. over that of 1904.

The latest New York quotations are:—lake, 18½ at 18½; electrolytic, 18½ at 18½; casting copper, 18½ at 18½.

LEAD.—The London market continues to show strength, English lead being quoted at £17 11s. 3d.; Spanish lead, £17 10s. The American Smelting and Refining Co. has recently fixed its price at 5.60 New York and 5.52½ St. Louis.

SPELTER.—London quotations are £28 15s. at £29. Recent sales in the St. Louis market have ranged from 6.47½ at 6.50 Zinc has been selling in sheets f.o.b. cars Lasalle and Peru widths from 32 to 60 in., and lengths from 84 to 96 inches at \$7.75 per 100 lbs.

SILVER.—Prices last month ranged from 65½ to 65¾.

IRON AND STEEL.—The *Engineering and Mining Journal* states that foundry iron is quiet and prices unchanged. For northern iron the following prices are quoted:—No. 1X, \$19 at \$19.25; No. 2X, \$18.25 at \$18.75; No. 2 plain, \$17.75 at \$18.25; gray forge, \$16.50 at \$17; Virginia foundry is held at \$18.60 at \$19.10 for No. 1, and \$18.25 at \$18.75 for Alabama, \$18.60 at \$19.10 for No. 1, and \$18.10 at \$18.60 for No. 2. Basic has been \$18.25 at \$18.75 for Alabama, and 25c. less for Northern. For Southern iron, on dock, quotations are: No. 1 foundry, \$18.75; No. 2, \$18.25; No. 3, \$17.50; No. 4, \$17; No. 1 soft, \$18.75; No. 2 soft, \$18.25; gray forge, \$16.50. Southern prices are firm, and a little extra is asked for special deliveries, especially on No. 2 soft. Prices for cast iron pipe are steady on a basis of \$28.75 per net ton for 6-in. pipe, car-load lots at tidewater points.

Iron bars are 1.845 at 1.895c. for common and 1.945c. for refined. Still higher prices are expected. Steel bars are 1.745c. tidewater. Store trade is done at about 2.50c. for iron and 2.25c. for steel. Steel plates are still in strong demand. Tank plates are 1.745 at 1.825c.; flange and boiler, 1.845 at 1.945c.; universal and sheared plates, 1.745c. up, according to width.

STEEL RAILS.—No change in standard sections. Light rails are in demand, prices ranging from \$26 for 35-lb., up to \$33 for 12-lb. rails. Girder rails are not in request just now, in this territory.

MINING AND INDUSTRIAL SHARE MARKET.

(Specially Reported by Messrs. Robert Meredith & Co. Montreal.)

The market for mining stocks is gradually undergoing a change, and there is now a considerable enquiry for many of the stocks in the Rossland district.

The consolidation of the War Eagle with the Centre Star, and the report of an ore strike in the latter mine has created a quiet demand for the stock of this property, and has also brought enquiries for other stocks, which for a long time past have been almost forgotten.

In the Boundary district the Granby Consolidated is the only stock in which there is any trading, but in the eastern district the Silver Lead properties are now looking up; in spite of the disaster, the St. Eugene has paid its quarterly dividend

as usual, and this has drawn attention to this property, and Canadian Gold Fields Syndicate.

Amongst the industrials the common stock of the Dominion Iron & Steel has been the feature, and there has been quite a big speculation in it.

Nova Scotia Steel has also participated in the improvement of the Steel industry. In Dominion Coal there has been but little doing.

There is a strong undertone to all markets just now, and the indications are that this year will see speculation again turned to mining stocks, and that the industrials will participate in the improved trade of the country.

The following are the latest quotations:—

Par value of shares.	Asked.	Bid.
.10 Canadian Gold Fields Syndicate.	.05½	.05
1.00 Centre Star.	.35½	.34½
1.00 Deer Trail Consolidated	.01½	—
1.00 Giant.	.03½	—
10.00 Granby Consolidated	.10½	.10½
10.00 Montreal and Boston	—	—
1.00 North Star.	.00	.04½
1.00 Payne	—	.02
1.00 Rambler Cariboo.	.40	.15
1.00 Republic.	—	—
1.00 St. Eugene.	.50	.49
1.00 White Bear.	.04	.00
100.00 Nova Scotia Steel (common)	.68	.66
100.00 Nova Scotia Steel (preferred)	122.00	118.00
100.00 Dominion Coal (common)	78.00	76.00
100.00 Dominion Coal (preferred)	123.00	121.00
100.00 Dominion Iron and Steel (com.)	27.00	26.50
100.00 Dominion Iron and Steel (pfd.)	76.00	74.00
— Dominion Iron and Steel (bonds)	\$4.00	\$2.50

INDUSTRIAL NOTES.

We have received from the B. Greening Wire Company a handsome calendar for the new year. The firm writes as follows:—"Since last we had the pleasure of addressing you we have issued our new catalogue—one for each department. We hope you received yours safely, but should you not have done so, or should it have become mislaid, let us know, naming the line you are particularly interested in, and we shall have pleasure in forwarding you another. Our painting tower, destroyed by fire last March, has been rebuilt with all the latest improvements we could hear of or our experience could suggest, and we are now turning out Screen Cloth in 100 ft. or 50 ft. either green or black. Kindly note 100 ft. rolls are the standard. Our Netting Mill is running full time, and we fully expect to be able to meet any demand that may be made upon us for this or Screen Cloth. We particularly request correspondence regarding any of our lines. In wishing you the compliments of the season and a prosperous 1906, we desire to thank our numerous friends and customers for past favors, and solicit a continuance of same."

Mr. C. S. Powell, general agent of the Westinghouse Electric & Mfg. Company, who has for sometime occupied offices at 11 Pine Street, New York, has removed to the offices of the Company on the 19th floor of the Trinity Building, 111 Broadway. The Westinghouse Electric & Mfg. Company, in addition to their offices in the Hanover Building at 11 Pine Street, occupy the entire 19th floor of the Trinity Building.

The Westinghouse Electric & Mfg. Company are doing a large business in equipping mines with electric locomotives, to replace the older forms of haulage, whether animal or mechanical. Electric mine haulage considered from either the points of efficiency or economy, has so many advantages, as compared to the older practice, that the time is not far distant when any other method of mine haulage will be the exception. A recent contract closed by the Westinghouse Company is one with the Newport Mining Company, who have decided to equip their mines at Ironton, Mich., with both surface and underground electric haulage. They will use electric locomotives the year around in the various levels underground for bringing the ore to the bottom of the shaft, and after the transportation season has closed will use electric locomotives on the surface for hauling ore from the top of the shaft to the various stock piles for storage. For these purposes they have ordered 6 four-ton Westinghouse mine locomotives. Electrical apparatus for the equipment of the necessary power station will also be provided by the Westinghouse Company, consisting of a 150 Kw., 250 volt generator direct-connected to a Corliss engine of 130 r.p.m., and a three panel switchboard, besides other auxiliary apparatus.

Two 50-h.p. boilers, and compressor and other plant, have been installed at the O'Brien mine, at Cobalt.

At the Preston and Elkhorn mines, at Greenwood, B.C., electric hoists have been recently installed. These hoists were supplied by the Denver Engineering Works.

RECENT MINING AND METALLURGICAL PATENTS.

(Specially reported for the CANADIAN MINING REVIEW.)

- 804,053—Coke-Oven. Mathew E. Rothberg, Cleveland, Ohio.
A coking-oven having in combination a series of adjacent coking-chambers, reverting heating-flues in the side walls of the coking-chambers, a transverse stack-draft flue in the foundation at one end of said heating-flues, vertical off-gas flues connecting said stack-draft flue with said heating-flues, a transverse air-supply flue in the foundation parallel to said stack-draft flue and at the other end of said heating-flues, and combustion chambers under the ovens and having connection with said air-supply flue.
- 803,544—Apparatus for Refining Lead by Electrolysis. Anson G. Betts, Troy, N.Y.
The combination with a cathode, an anode and an electrolyte adapted to dissolve metal from the anode and electrodeposit the same; of a containing-vat having its inner surface formed of a metal capable of being dissolved in said electrolyte and of a potential intermediate between that of the cathode and that of the anode.
- 803,886—Treatment of Iron Ores, etc. Carleton Ellis, New York, N.Y.
Process for reducing iron ores which consists in treating a progressively-advancing stream of the ore with a flame of high heat intensity and in interposing between said flame and ore a flame or current of a reducing character.
- 803,830—Ore Concentrator. James J. Kennedy, Guthrie, Okla.
In an ore-concentrator, a sluice-box, means for delivering ore thereto at a point near its bottom, and means for supplying air to the box in a plane above that of the feed of the ore and toward the top of the box.
- 803,737—Furnace for Smelting Ore. Ralph Baggaley, Pittsburg, Pa.
A matte-furnace having converting-twyers near the bottom adapted to play into a clean body of molten matte, smelting-twyers above adapted to play into a floating charge, connections extending from the converting and smelting twyers and supplying thereto air under pressure, and a burner supplying heat above the smelting-twyers.
- 804,186—Process of Treating Ore-Slimes, etc., containing Gold, Silver, or other values. Louis J. Drabek, Turner, S.D.
A process of treating ore-slimes to obtain values therefrom, charging the slimes with a cyanid solution into a tank causing the slimes to settle and accumulate in thickness in the bottom of said tank discharging the thickened portion by its own weight and that of the overlying solution into the top of a second tank having a barren solvent solution therein, filtering off the value containing solution, allowing the heavy slimes to settle and accumulate in the bottom of said tank, discharging them into a third tank where they are washed with water, and then filtering the values from the slimes so treated.
- 804,412—Dumping Car. John H. Kelly, San Francisco, Cal.
The combination of a truck, a car-body tilting thereon, a swinging gate closing the front end of said car-body, a cable secured at its ends to said gate and to the frame, parts carried by said frame and car-body around which the cable passes, the position of the parts being such that when the car-body is tilted the cable is relaxed to allow the gate to swing open.

- 804,408—Gold Separator. Frederick M. Johnson, San Francisco, Cal., assignor to Rose Gold Reclamation Company, San Francisco, Cal., a Corporation of Arizona. In a gold-separator, a box or sluice having a retaining-bottom composed of fibrous or textile material, in combination with wire screens; arranged one above the other and in contact, and forming two continuous layers, the upper layer being, alternately, such wire screen and such fibrous or textile material.
- 804,227—Mechanical Roasting or Desulfurizing Furnace. Henry Howard, Brookline, Mass., assignor to Merrimac Chemical Company, North Woburn, Mass., a Corporation of Massachusetts. In a furnace, a drying-chamber mounted thereon to receive and dry the material to be treated, manually-controlled means to directly introduce waste heat from the furnace into the drying-chamber and subject the contents thereof to the action of such heat, an agitating device within the chamber, and means to positively feed the dried material from the chamber into the interior of the furnace.
- 804,751—Roasting Furnace. August R. Meyer, Kansas City, Mo., assignor to The United Zinc and Chemical Company, Kansas City, Mo., a Corporation of New Jersey. The combination in a furnace, of a hollow shaft, a series of hollow arms extending in pairs from the opposite sides of the shaft and communicating with the latter, a rod extending centrally through the shaft, and a series of partitions extending across the shaft between its ends and centrally through the arms and supported in part by said rod.
- 804,466—Concentrating and Amalgamating Table. John A. Hamilton, St. Peters, South Australia, Australia. The combination with a table, and means to freely suspend it, of a rotatable shaft, a shaft-section on the end thereof, a universal joint connecting the shaft and shaft-section, a weight connected to and eccentric to the shaft-section, and means fixed to the table and through which the shaft-section can freely move longitudinally, whereby the table is moved in elliptical paths when the shaft is rotated.
- 805,017—Metal Leaching process. Thomas B. Joseph, San Francisco, Cal.
A process of extracting metals such as gold, silver, copper and nickel from ores containing the same when in a suitable condition, which consists in subjecting the said ore to the leaching action of a solution containing water sodium cyanid and ammonium carbonate, the carbonate being in excess of the cyanid, and precipitating the metals from the solution by any well-known method.
- 805,090—Amalgamator. Charles W. Patten, Lynn, Mass.
An amalgamator comprising an elongated, mercury-containing trough, having a weir at its discharge end, one or more submerging drums at the inlet end thereof, and means for discharging a series of water-jets on to the surface of the mercury between said weir and said drums, and adjacent the latter.
- 801,870—Ore Distributing Car. Ralph S. Moore, Portsmouth, Ohio.
The combination of a floor made up of moveable sections, and suitable means for, successively separating the same one from the other beneath their load, from one end of said floor.
- 805,215—Ore Concentrator. Matthew R. Lyle, Oakland, Cal.
A concentrator comprising an inclined sluice-box having elongated openings at the bottom thereof, channels presenting elevated edges at the edges of said openings, and means for rocking said box so as to advance the material contained therein progressively by gravitation toward the lower extremities of said openings.
- 805,289—Magnetic Separator. Harry E. Heath, Windsor, Conn., assignor to General Electric Company, a Corporation of New York.
The combination with a stationary conductor, of a plurality of pole-pieces travelling longitudinally thereof and in proximity thereto, and means for conveying the material to be treated beneath said pole-pieces.
- 804,936—Metallurgical Process. Willis E. Everett, Tacoma Wash.
A process which consists in first, in preparing a suitable preliminary melt and heating it to incandescence; second, in subjecting the previously-pulverized materials, which are to be treated, to the action of liquid oxygen, whereby they are reduced to an extremely-frigid condition and are caused to occlude a portion of said oxygen; third, forcing this frigid mixture into and through the incandescent melt whereby the metals in said mixture are largely freed from sulphur and phosphorus and are rapidly fused, and finally separately drawing off the metal and slag at different levels.
- 805,854—Magnetic Ore-Separator. Eric Hedburg, Joplin, Mo., assignor by mesne assignments, to American Reduction Company, Chicago, Ill., a Corporation of Arizona. In a compound magnetic ore-separator and in combination a vertical shaft, an upper and a lower electromagnet mounted axially thereon, each magnet being provided with two pole-pieces which form a shell enclosing the windings, and with a non-magnetic ring having a central outwardly-extended flange upon which the contiguous edges of the pole-pieces rest whereby the latter are separated, said pole-pieces having air-passages therethrough, means for supplying a current of air to the interior of the lower magnet, and means for conducting the current of air from the lower magnet into the interior of the upper magnet.
- 805,577—Treatment of Ores and the like. James Nicholas, Waterloo, England.
The treatment of materials containing zinc, by mixing the pulverized materials with water, and with a chlorid, and then heating the mixture, leaching this so-treated mixture with water, and reducing the metallic compounds contained in the leached residue to a metallic state.
- 805,836—Method of Producing Iron. Ralph Baggaley, Pittsburg, Pa.
A process which consists in precipitating on screen material a crust of iron-and sulphur bearing impurities from furnace-fumes, removing sulphur therefrom and then smelting the residue and recovering the iron.
- 805,783—Electric Furnace. John S. Dorian, Niagara Falls, N.Y., assignor to Cora M. Dorian, Niagara Falls, N.Y.
An electric furnace comprising a heating-chamber, a pair of electrodes arranged in the chamber, and a resistance member electrically connected said electrodes, one of said electrodes being movable lengthwise of the resistance member for varying the extent of its exposure or its heating effect.
- 805,555—Process for refining Copper-Nickel Matte. Noak V. Hybinette, Westfield, N.J.
A process which consists in first roasting the matte to oxides, then leaching with weak sulphuric acid; thereby extracting principally sulphate of copper, then heating with sulphuric acid at least to a temperature where hydrous sulphates do not exist, leaching with weak sulphuric acid, thereby extracting principally sulphate of copper, then heating with hydrochloric acid to a temperature enough for partial decomposition of the anhydrous chlorids, leaching with weak acid and repeating the said heating when necessary thereby obtaining a nickel oxide, suitable for refining by ordinary means.
- 805,835—Fluxing Copper Ores. Ralph Baggaley, Pittsburg, Pa.
A method which consists in charging into a copper smelting blast-furnace metallic iron as a flux.

MAJOR DAVID BEAMES,

Late I.S.C., and of Berkhamstead, England.

If the above will communicate with C. J. Walker's Advertising Agency, 24 Coleman Street, London, England, he may hear of something to his advantage.

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 thereon; 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.

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; zincblendes, galena, pyrites, mica, graphite, tale, 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

HON. FRANK COCHRANE,

Commissioner of Lands and Mines.

or

THOS. W. GIBSON,

Director Bureau of Mines,

Toronto, Ontario.



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.

Licenses 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 transfer, 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 lands 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 condition 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. W. T. PIPES,

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.



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 1,500 x 1,500 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.

Department of the Interior.

Ottawa, February, 1904.

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 \$2200.

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.

PETROLEUM.

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.

W. W. CORY,

Deputy of the Minister of the Interior.

DEEP DRILLING

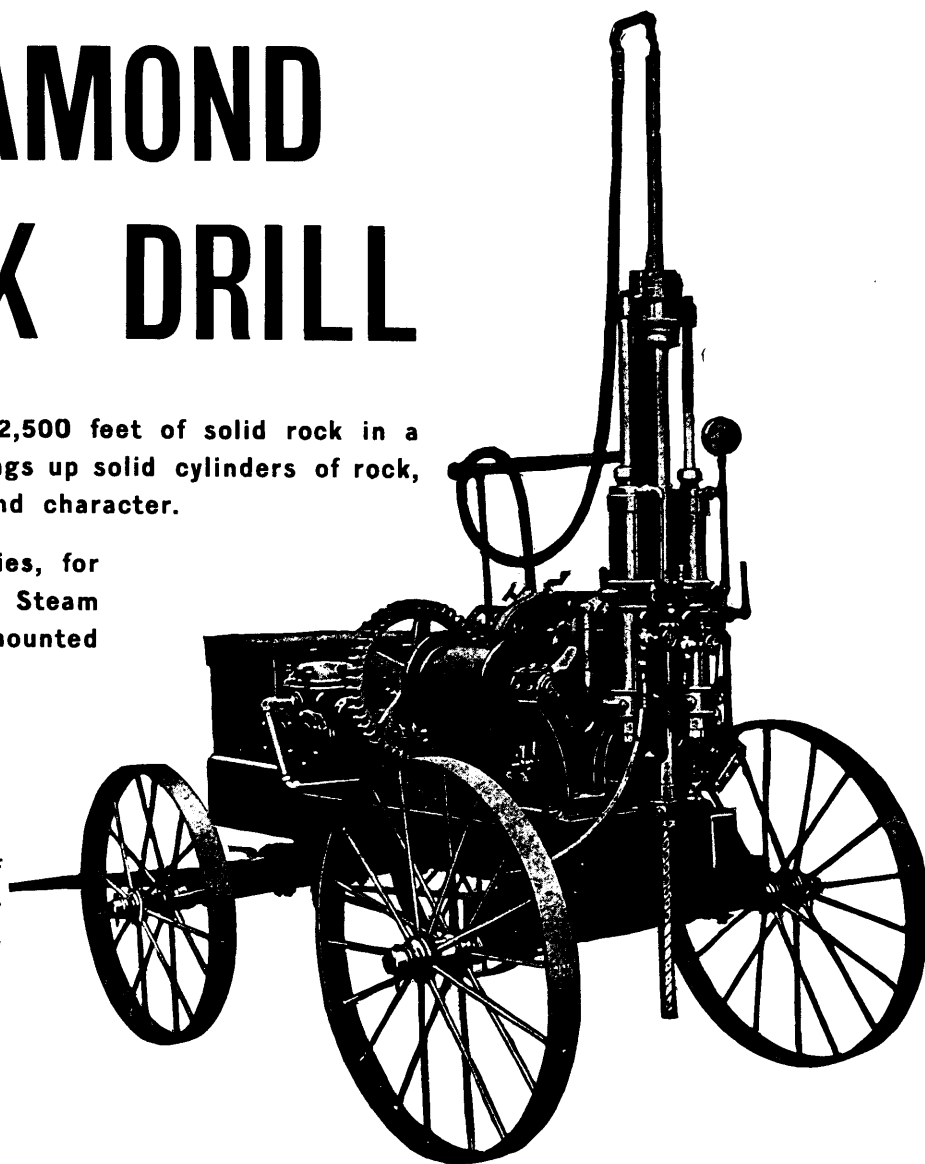
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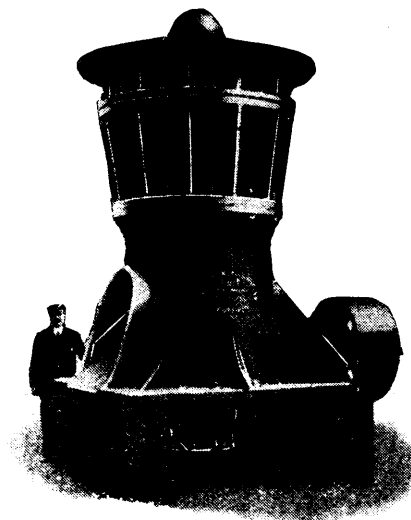
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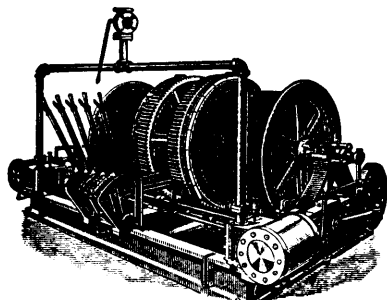
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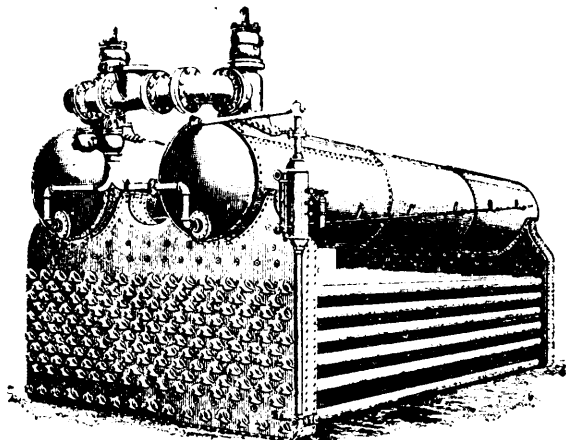
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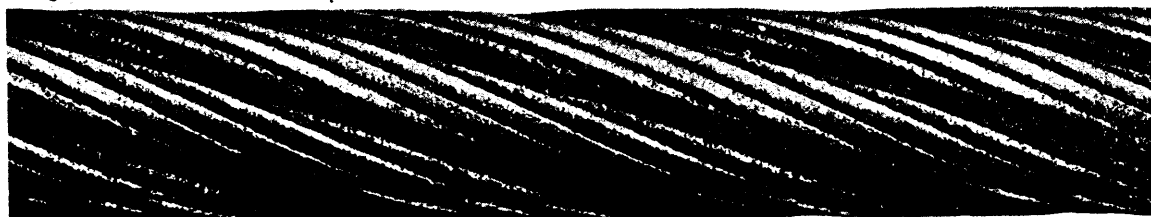


Illustration of Winding Rope, 240 fms. long x 3½ circ., Galvanized Special Improved Patent Steel, Compound make, supplied to Kennell Collieries, Bolness, Scot., which gave a record life of 6 years and 2 months. Showing condition when taken off.

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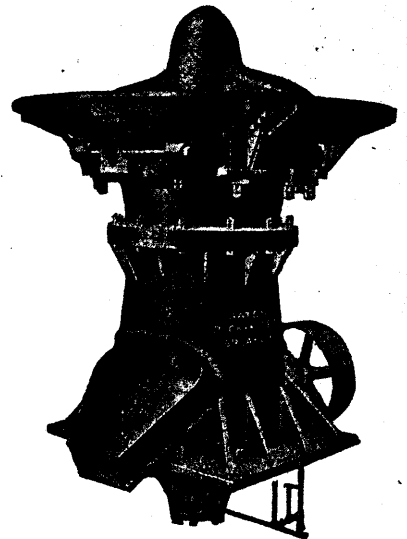
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