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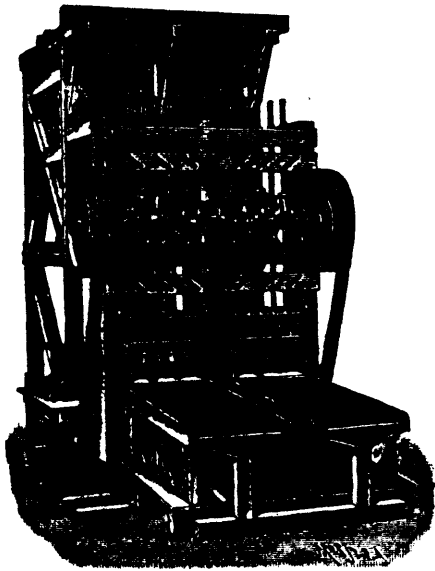
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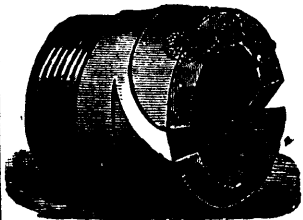
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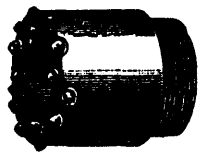


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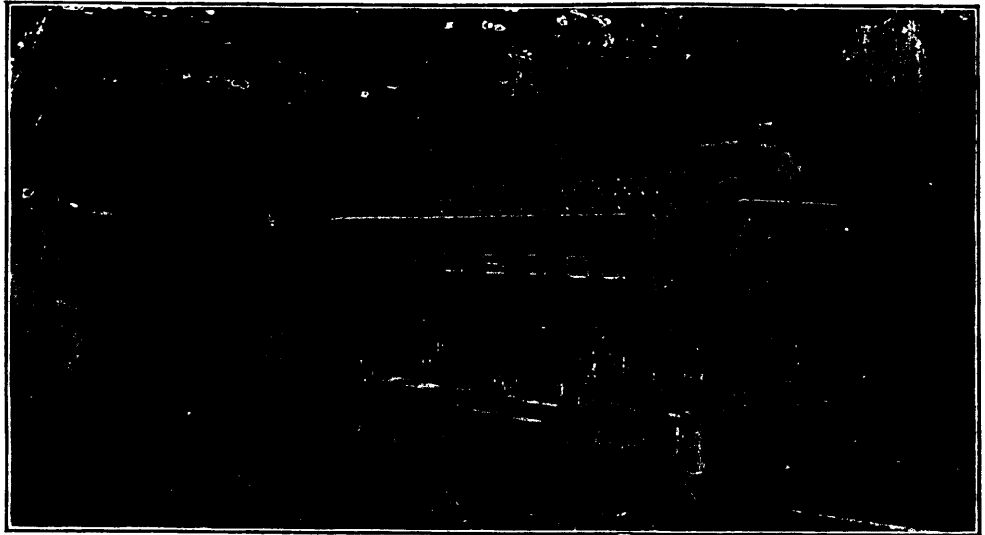
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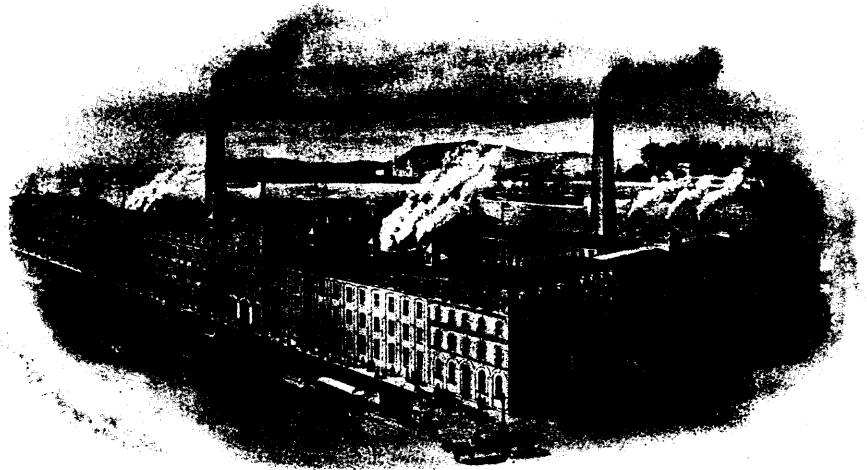
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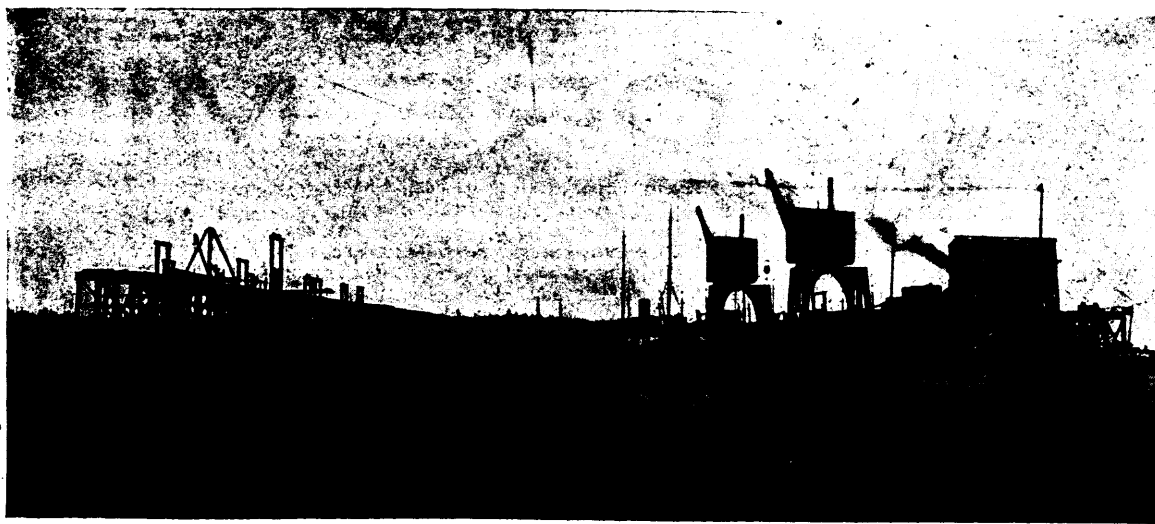
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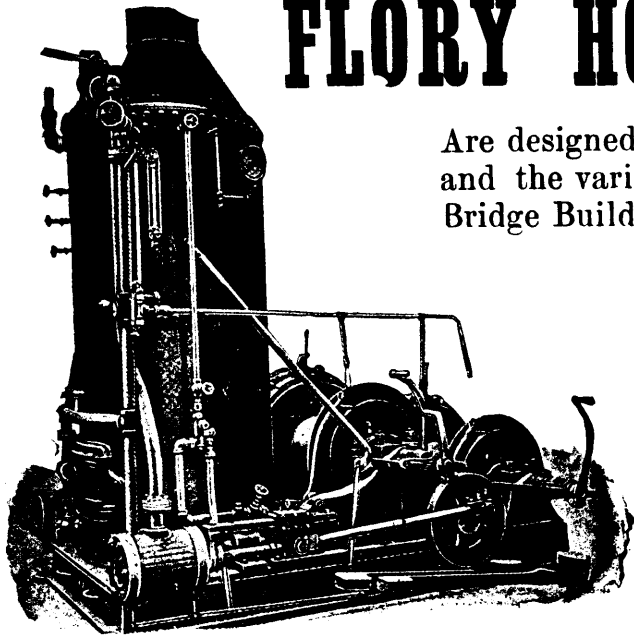
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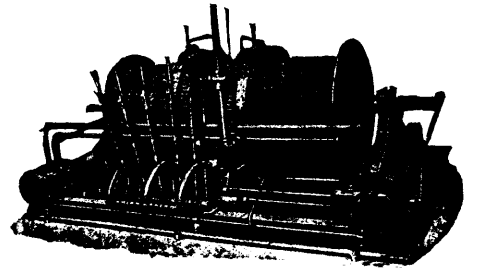
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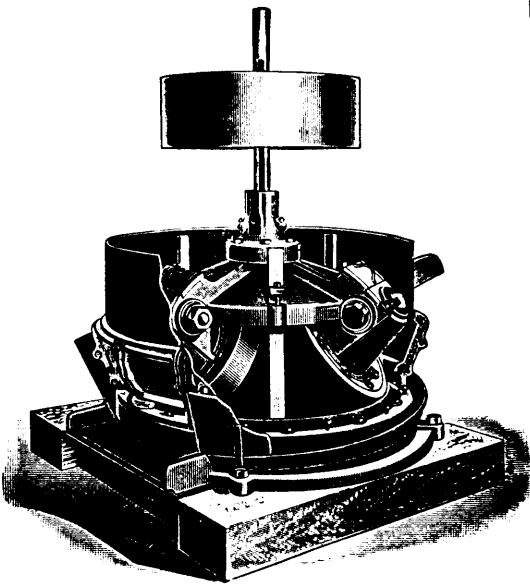


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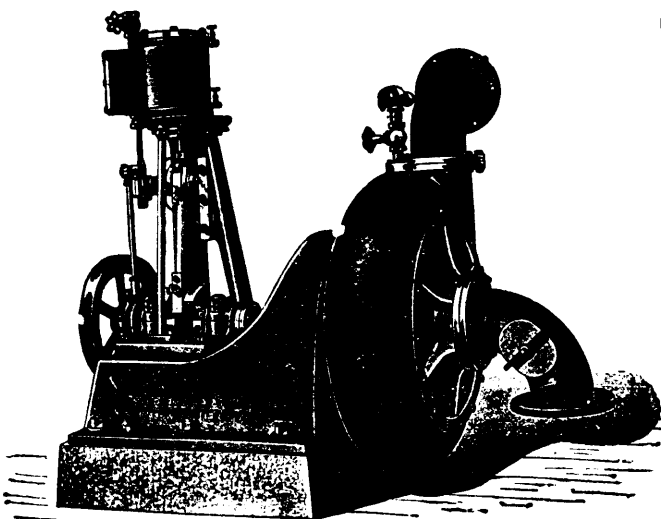
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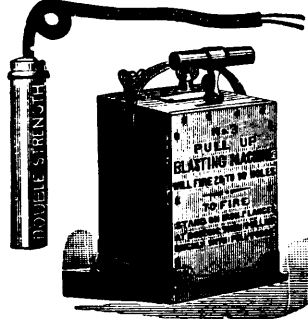
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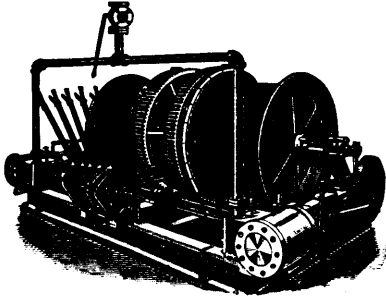
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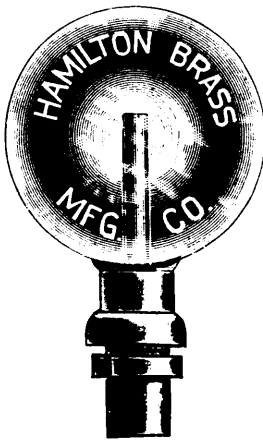
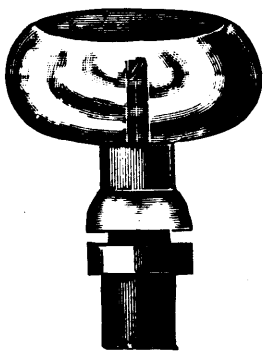
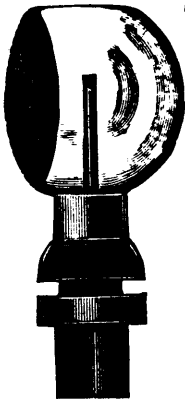
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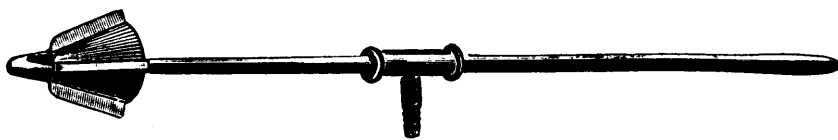
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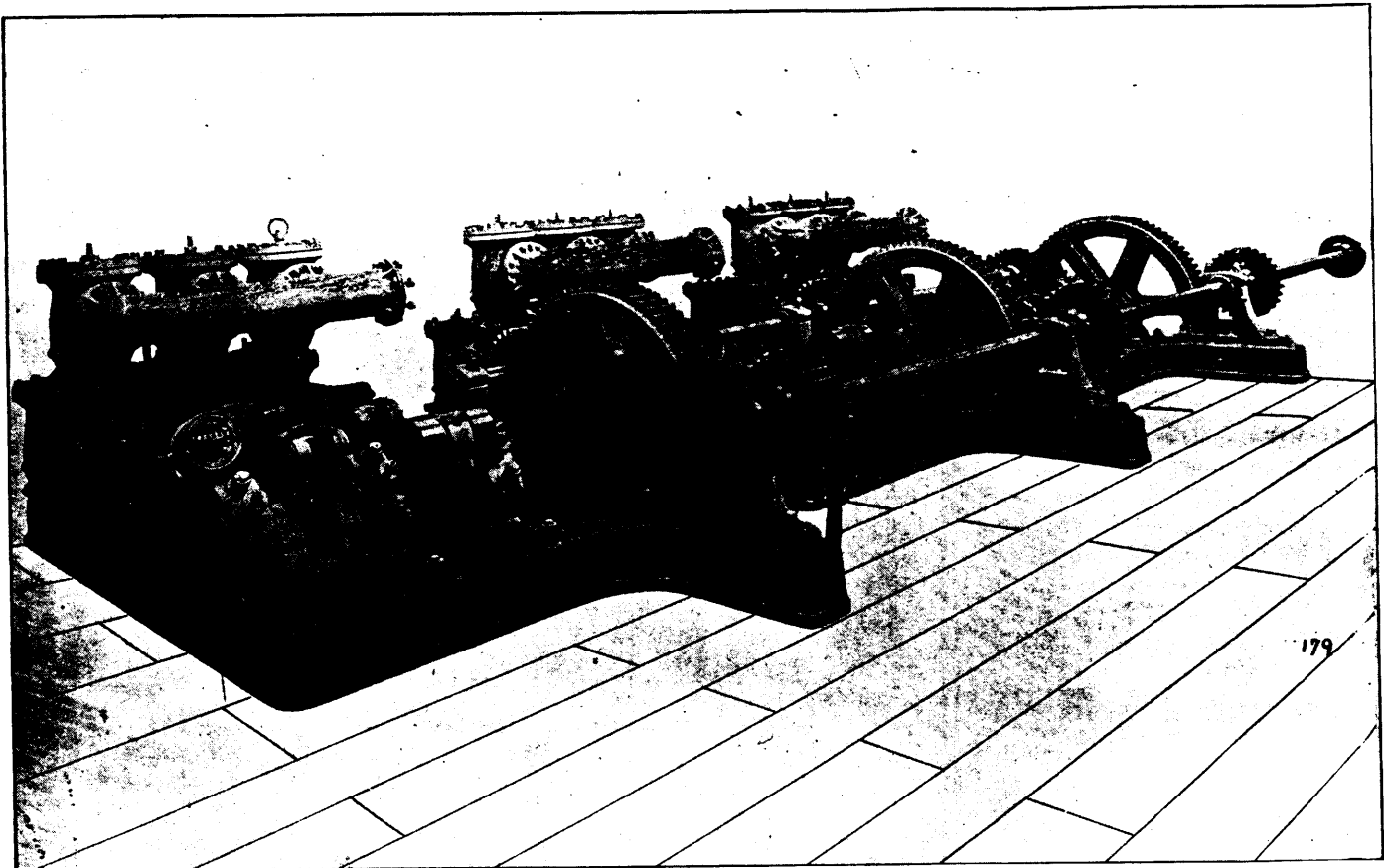
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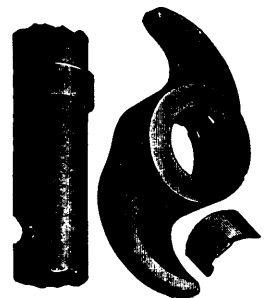
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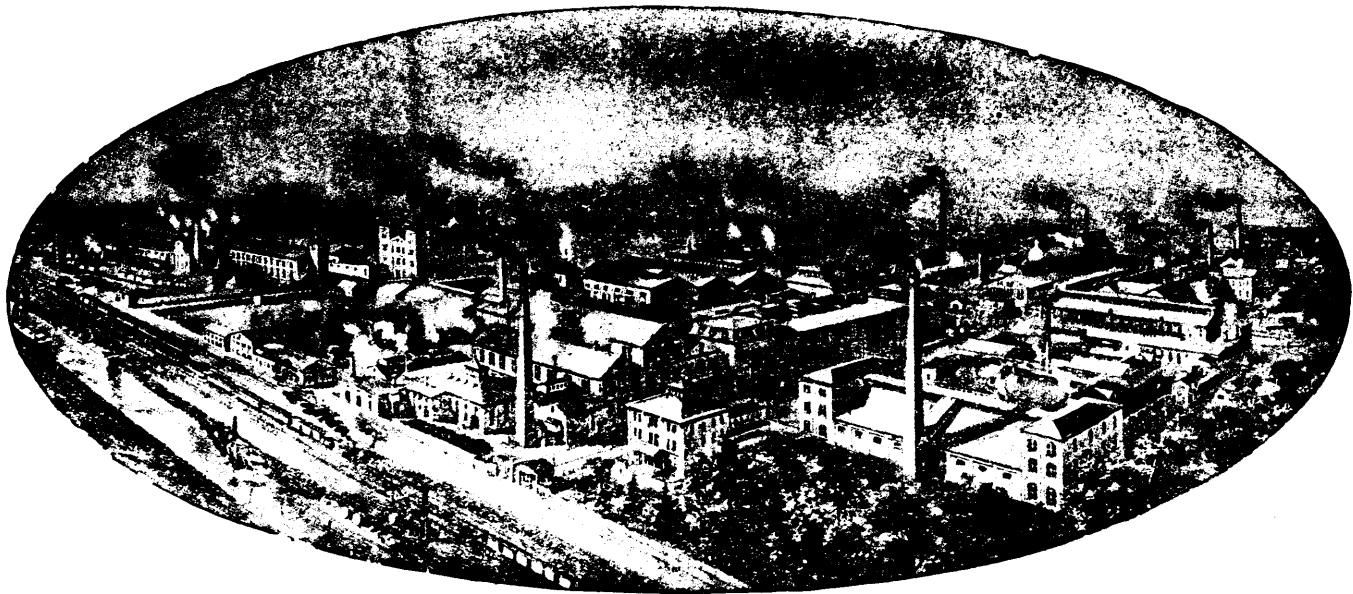
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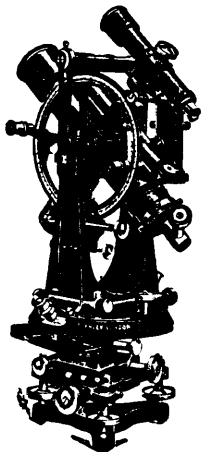
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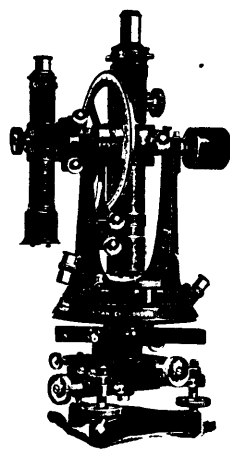
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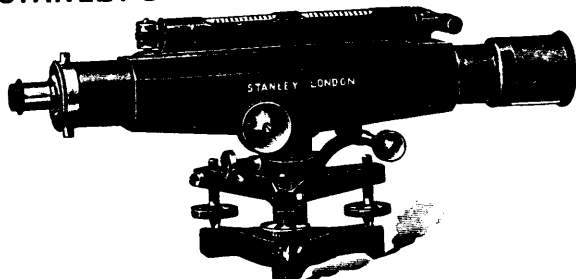
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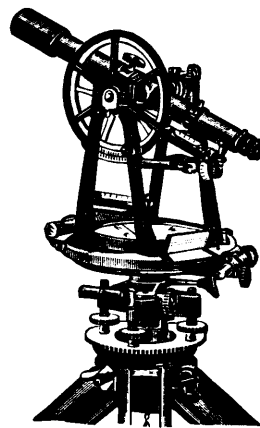
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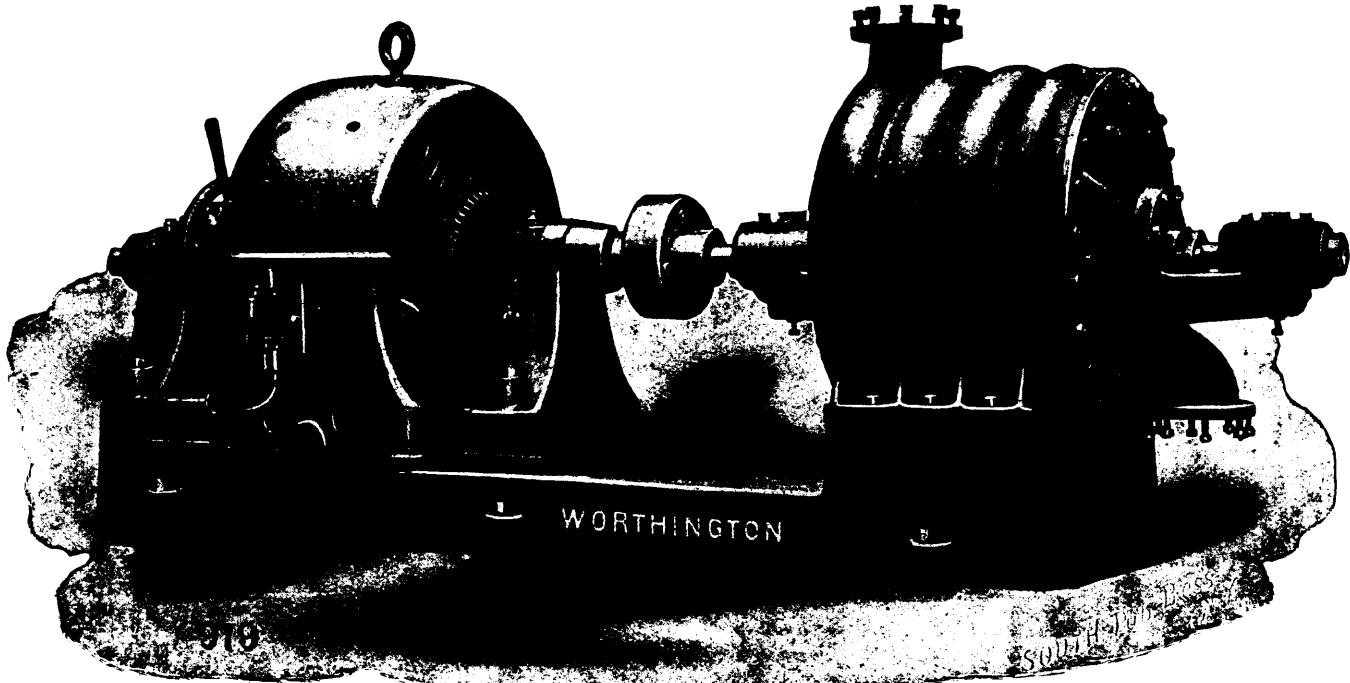
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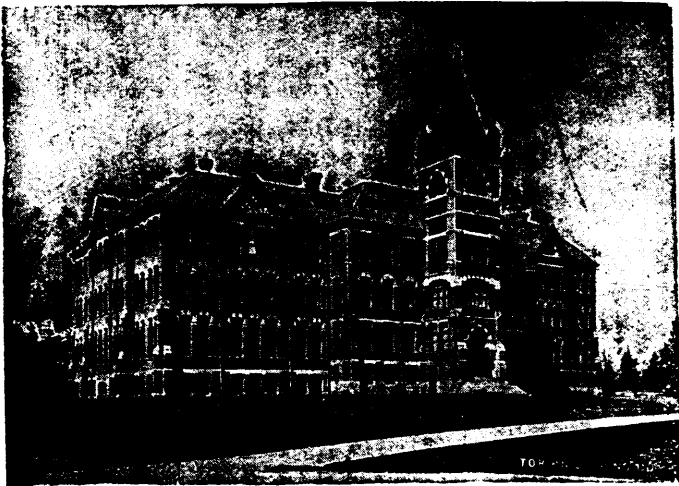
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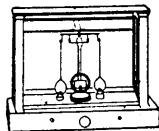
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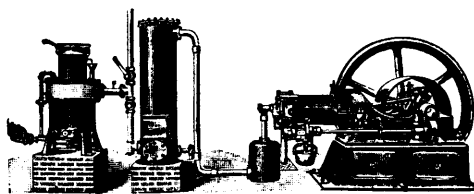
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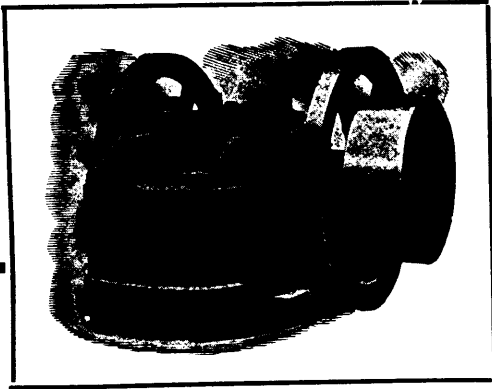
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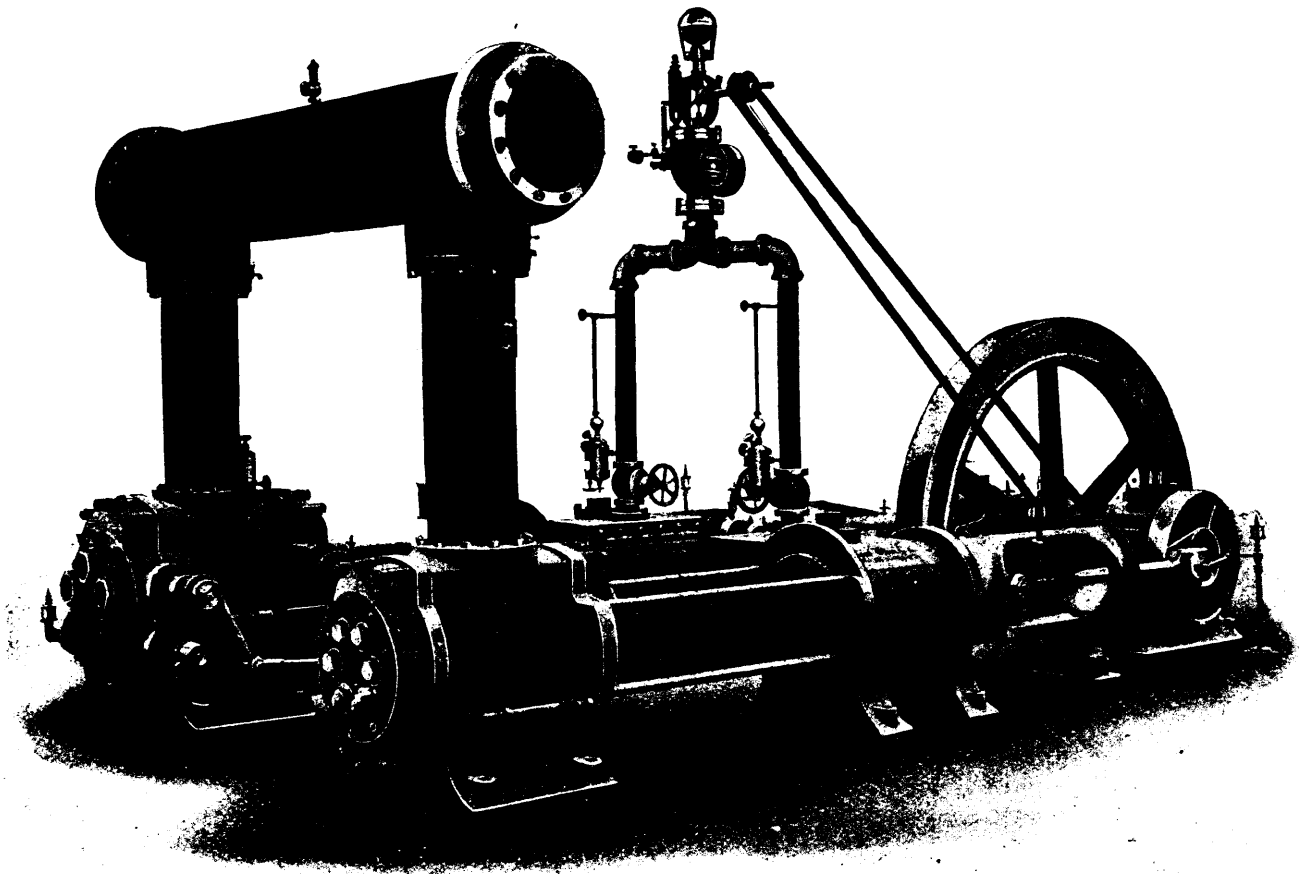
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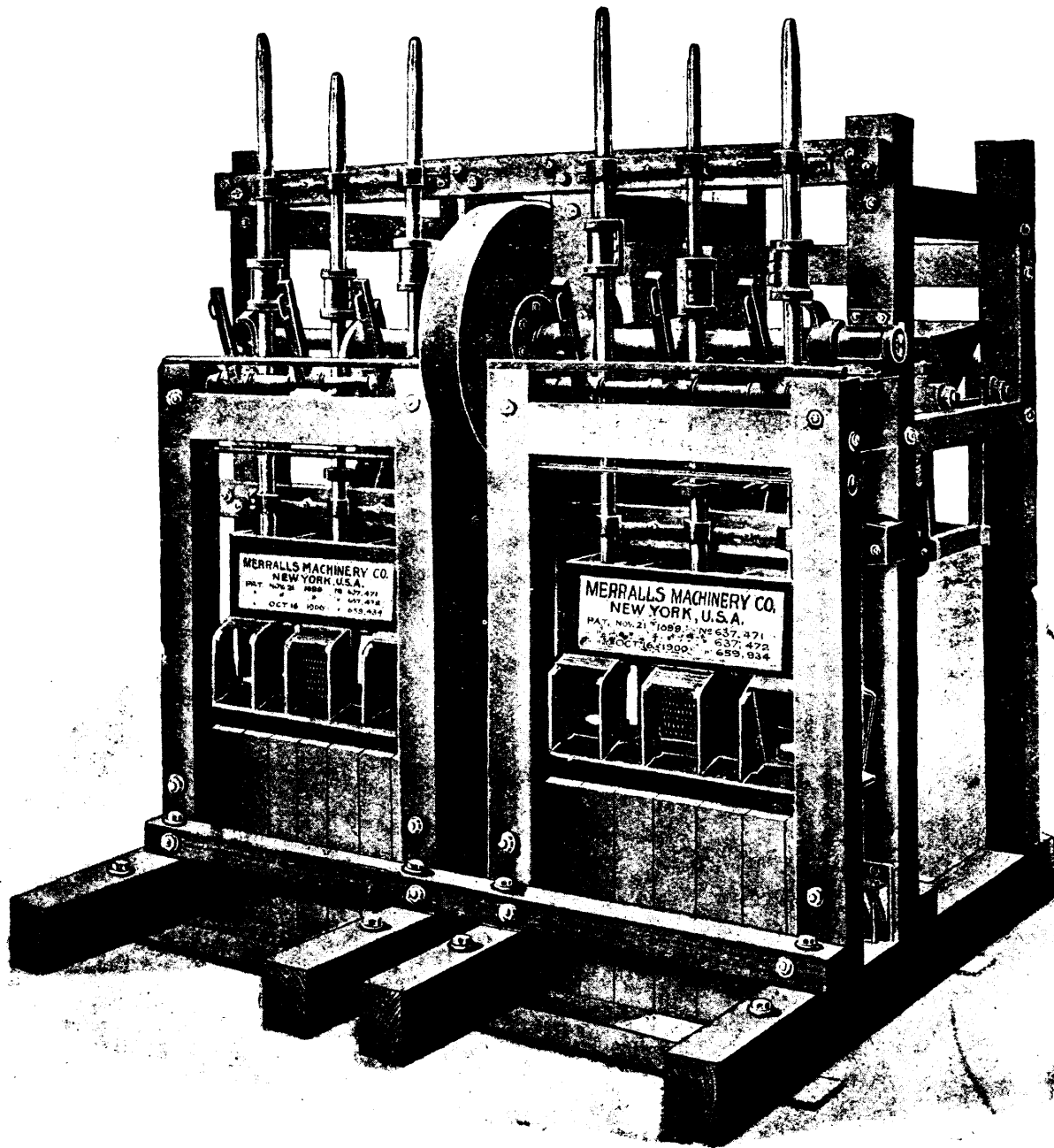
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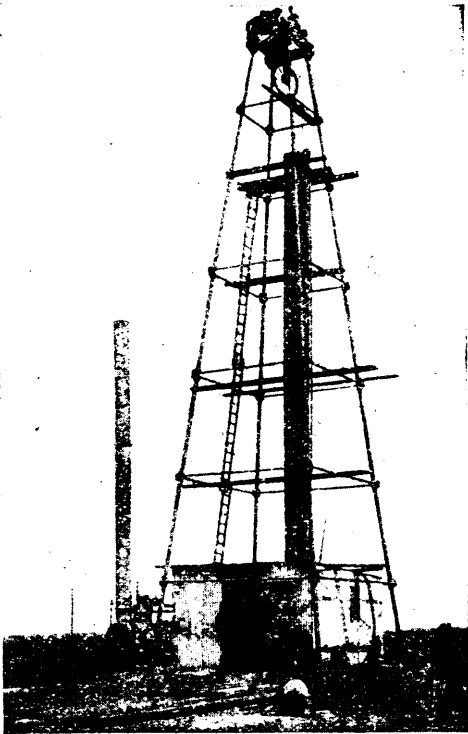
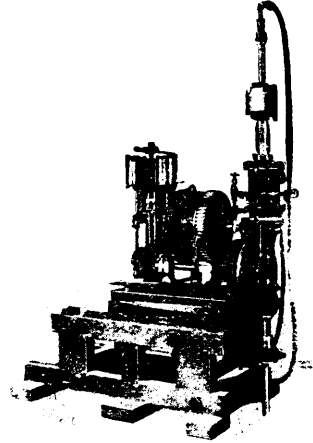
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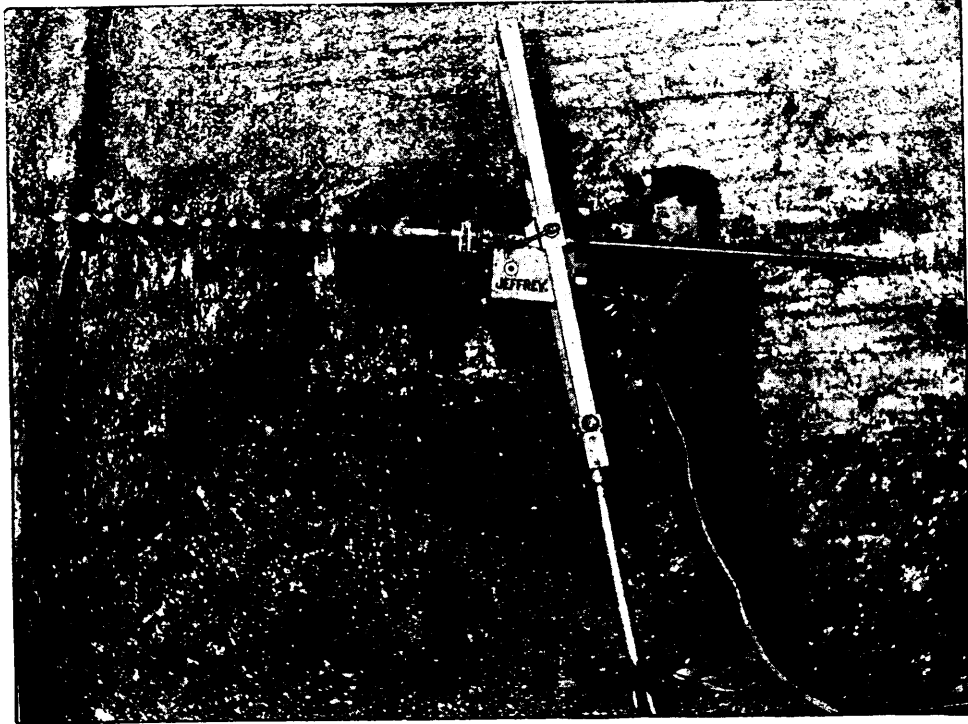
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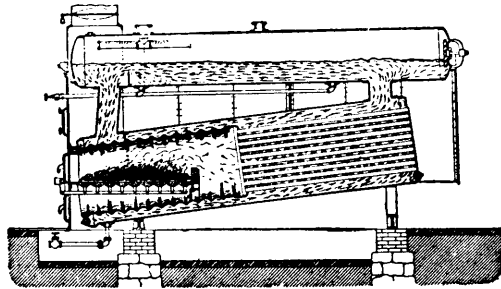
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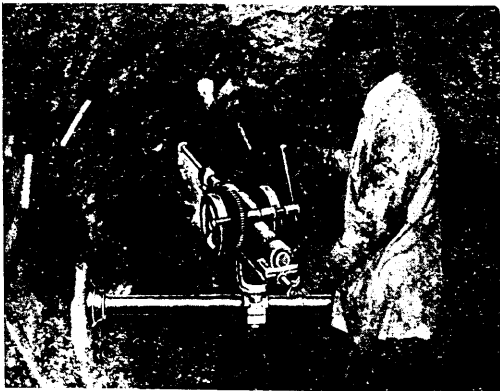
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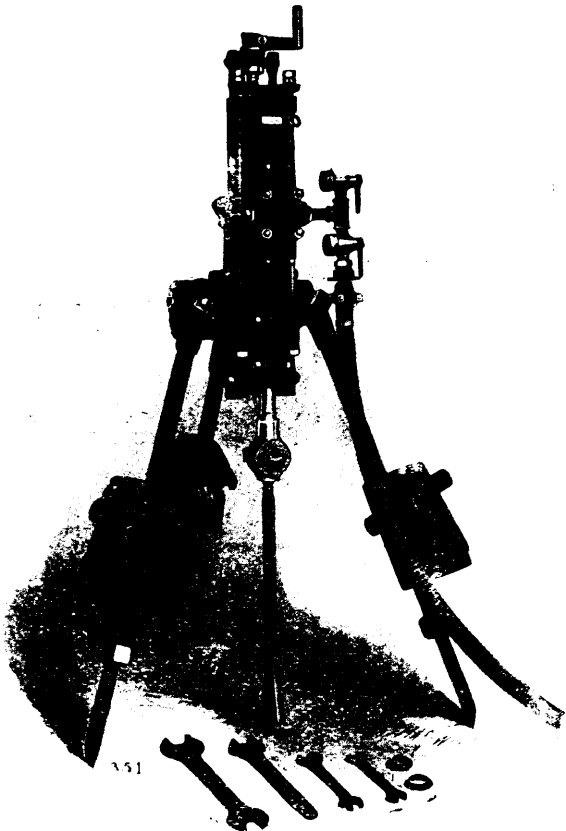
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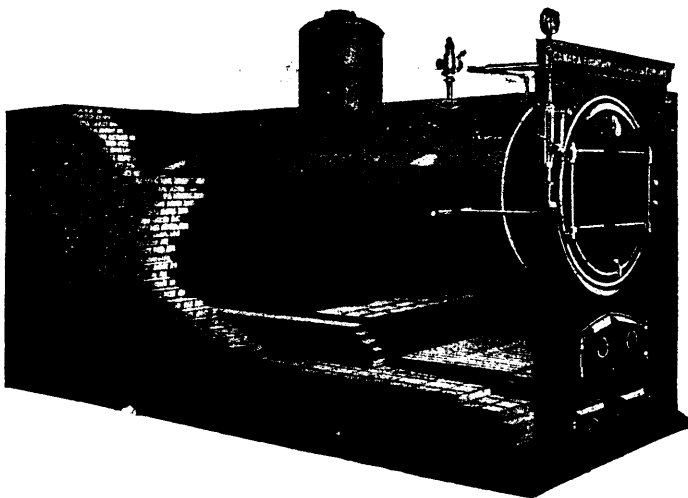
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The CANADIAN MINING REVIEW

Established 1882

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The REVIEW'S columns are always open for the discussion of questions cognate to the mining industry.

Advertising copy must reach the REVIEW OFFICE *not later than the 15th of each month* to secure insertion in next issue.

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The news, to which we make editorial reference, of the closing down of the lead stacks in British Columbia, is far more serious than appears at first glance. In what way it may affect the corroding industry just established in Montreal is not yet clear, but the news is certainly discouraging if it is verified.

What the Dominion Government may think of an industry which requested a bounty, at the hands of important and representative Canadian citizens, on the ground that it only needed just a little and a temporary push on its way to enable it to travel far and successfully is an interesting pipe meditation.

In this case the amendment to the resolution appears to have been the gist of the matter. It will be remembered that Messrs. Blackstock, Drewry, *et al.*, of the St. Eugene Mining Company applied for an extension of the bounty to ores shipped abroad for treatment, and that sundry lengthy (and perhaps contentious) meetings were held by the silver-lead mine-owners at first to combat, but afterwards to approve of, the amendment. A settlement was reached by the St. Eugene Company agreeing to supply the balance of the amount needed to keep the lead stacks going, when it was permitted to export its surplus.

Facts in this issue show that out of 3,200 tons sold in March by the St. Eugene Co., only twenty per cent. went to the British Columbia smelters, while eighty per cent. of the production was shipped to Europe. Facts also show that the mine owners of the Slocan, incredible as it may sound, knew their own resources so little that their estimates of ore tonnage were ridiculously overstated. There is, perhaps, no remedy for a case of "false pretences" made before the Dominion Cabinet, but a second request for help to the Dominion Government is very likely to meet with the silence of contempt.

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With the next issue of the MINING REVIEW Mr. H. Mortimer-Lamb will assume the editorial chair, and Mr. J. E. Hardman, who has acted as editor since the death of Mr. Bell, will retire. Mr. Hardman's personal and professional interests demand more of his time than the position of editor allows, but he will remain as a special contributor to these columns.

The personality of the new editor requires no introduction to our readers. Mr. Lamb's extensive editorial experience and his able conduct of the British Columbia *Mining Record* have made him *persona grata* to the mining fraternity of Canada, and a large portion of the brotherhood in the United States and Great Britain. He will well maintain the previous character of the REVIEW as a free, outspoken and impartial exponent of Canada's mineral interests.

Until the expiration of the existing contracts between the St. Eugene Company and its foreign buyers there is little hope of the continued production of silver-lead bullion in the Kootenays, unless the situation is grossly misrepresented by the western press. Mr. J. J. Campbell is reported to be optimistic, having yet six weeks' supply for one furnace.

The London "Rialto" has published an interesting account of the dismissal of the libel action taken against the Ottawa "Journal."

"Mr. J. Carling Kelly is a gentleman of whom our readers have heard in the past. Early in last year we published certain articles concerning him, and from one of them an extract was reprinted by the Ottawa Journal. Against that paper Mr. Kelly, who is a Canadian, and who was one of the promoters of the Sapphire Corundum Company in this country, promptly commenced proceedings for libel. He also instituted similar proceedings in this country against ourselves. The action in the Canadian Court came on for hearing in due course, and in the result a verdict was given for the defendant newspaper, which has never yet been condemned in an action for libel. Kelly appealed, but failed again, and he has no further redress on the other side of the Atlantic."

The Lead Situation in British Columbia.

Advices from British Columbia, under date of the third instant, inform us that there is such a deficiency of lead ore at the present time as to occasion the closing down of the lead furnaces at both Nelson and Trail. The information we have received is to the effect that this is the result of the over-estimation of the resources of the silver-lead mines in West Kootenay; there is no hint that there is any deficiency whatsoever in the great silver-lead mine of the country in East Kootenay.

The St. Eugene mine, under the contracts and agreements which were entered into some twelve months ago, undertook to supply any deficiency (up to a certain figure) which the home smelters needed, having the privilege of shipping abroad such amounts as were not needed by the local smelters. We are informed that the St. Eugene Company is keeping its agreement as to the specified amount to be sent to Trail and Nelson, but that this amount is not sufficient to keep both stacks in operation, and that a larger amount cannot be obtained from East Kootenay by reason of the big contracts it has entered into with European purchasers.

The REVIEW has known for some time the fact that, at the very period when the Government bounty was granted on lead ores, it was pretty well understood among the knowing ones that the lead properties of the Slocan had either been gutted of their lead ores, or that the silver values were gradually entering into the zinc blende of the mines, so that the zinc ores were the ones which carried the high silver values. Since that time there have been no fresh discoveries of new silver-lead bodies which have promised any tonnage, and the situation looks, at first glance, to be somewhat serious. Many of the old stand-bys in the Slocan country are either exhausted or closed down, or furnish principally zinciferous ore.

On top of, or perhaps, more correctly speaking, preceding, this public statement of the deficiency of lead ores, the *Sandon Standard* has recommended an agitation on smelter charges, and the matter has been taken up by one or two of the other papers in British Columbia, notably the *Nelson Tribune*. It

seems to the REVIEW that the points made by the *Sandon Standard* are made without knowledge of the complete facts in the case, and which have been published during the last twelve months; but apart from that, and irrespective of any legitimate or illegitimate movement to obtain better rates for smelting, the closure of the lead stacks seems to us to point to the existence of other conditions than those having reference merely to smelter charges. If there is an actual deficiency of lead ore in the country, the question of smelter rates, bounties, or of Government "pap" is entirely apart from the solution of the problem.

British Columbia mining has had enough to stagger under during the last three years, owing to the apathy of the investing public, and the bad odor into which the whole province got, through the selfish misrepresentations and actions of the boomers who flourished from 1896 to 1901. The REVIEW is also insistent in taking the ground that any industry dependent for its existence upon the supply of Government aid, either in the shape of bounties or duties, had better be left to die a natural death, inasmuch as its prolonged existence is at the expense of the rest of the community, and inasmuch also as no amount of artificial feeding can make the infant strong and lusty. Personally, we do not think that the miners of British Columbia have ever given due recognition (certainly not publicly) to the enormous aid and assistance which their industries have received from the two smelting corporations which have met the miners more than half way for the last nine or ten years. In this respect the *Tribune* is perfectly correct in its reference to both the Trail and the Nelson smelters. C. P. R. directors have known, for many years, that the operation of the Trail furnaces *per se* were not profitable, and that the smelting corporation was kept alive through the advantages it offered to the transportation company. Shareholders, or even readers of the annual reports, of the Hall Mines, Limited, have known that the operations of the two stacks of that company were not attended with any dividends to the shareholders. We do not here deny some of the statements made by the *Sandon Standard*, but we are inclined to the opinion that such statements are not calculated to revive the industry, or to encourage the investment of new capital in the country.

British Columbia must work out its own salvation in the matter of its mines. Like all other mining countries of any prominence, it has experienced its period of boom at the hands of irresponsible adventurers, who have taken therefrom in a few years the legitimate profits of many years, and have left to their successors in the various corporations that have been formed only legacies in the shape of deficits, bad properties, and a generally offensive odor about all mining ventures in that country. Given a few years of wholesome living and good house-cleaning, and the disagreeable odor mentioned will have vanished, and the natural resources of the country be operated by men who are not interested in boomsters' yarns, but who insist upon looking at the matter without spectacles of either rosy or bluish hues, and who are willing to wait for the legitimate fruition of their hopes.

On the Discoveries of Cobalt-Silver Ores in Ontario.

In September, 1903, laborers on the line of the Temiscamingue and Northern Railway, which is under construction by the Ontario Government from North Bay to the Abitibi region, found mineral which they at first regarded as copper-bearing, but which was identified by the Bureau of Mines as smaltite. Mr. Willet G. Miller, the Provincial Geologist, visited the section in November of that year, and created no little excitement on his return by announcing in the public press that both native silver and rich cobalt ores had been found in place, and there was, in all probability, a somewhat extensive area in which similar deposits might be found.

In the spring of 1904 quite an influx of prospectors and mining men took place, resulting in the opening of half a dozen deposits, and the subsequent information has been favorable enough to induce the investment of considerable amounts of capital.

The bulk of the work which has been done has centered round what was formerly known as "Long Lake," which has been rechristened "Cobalt Lake." This lake lies about one-half mile south of the southern boundary of Bucke Township, and between Sassaganaga Lake and Pickerel Lake. The longitude is about 79 degrees 41 minutes west, and the latitude 47 degrees 23 minutes north. On the northwest side of the lake is the station of Cobalt, which is about five miles southwest of Haileybury.

The ore is essentially a smaltite, varying at times to nicolite by the substitution of nickel for cobalt, but the attraction of the region is the occurrence of silver, both in metallic form and as sulphides, which is associated with the cobalt-arsenic minerals. The metallic silver is, of course, secondary, and occurs in sheets, threads and minute nodules along both cleavage planes and interspersed with the smaltite and gangue.

The lateral extension of the veins or veinlets is masked by the heavy covering of soil or by the moss which grows thickly on bare rock surfaces in that latitude; the longest tracing yet made has not exceeded one mile. The vertical depth of the veins is also, as yet, indeterminate, the deepest shaft on March 1st having reached only 80 feet. The country rock is marked on the map as igneous, but there seem to be both igneous and stratified members in the district. The more probable solution appears to be that the strata of Silurian limestone and Huronian slates which appear to the northwest of Long Lake have been interlaminated or altered by lenses of agglomerate or ash rock, the volcanic ejectamenta of previous ages. The well banded slates at the bottom of some of the cliffs pass into breccia agglomerates at the top of the cliffs.

The veins are nearly vertical, and cut the slates and agglomerates at a low angle.

The principal operating properties at present are:

- (1) The Trethewey.
- (2) The Timmins.
- (3) The McKinley-Darragh.
- (4) The Earle.
- (5) The Wright.

The Trethewey property consists of forty acres situated north of Cobalt Lake on lot J. B. 7. Up to the 1st of March, Mr. W. G. Trethewey, the owner, had shipped about seven carloads of ore, from which the return approximately was about \$1,700 a ton.

The Timmins property was discovered by Messrs. Henry and Noah Timmins and David Dunlap, who have parted with the controlling interest to some other people. Some seven or eight cars have been shipped from this property, two of which were extraordinarily rich, averaging nearly \$2,000 a ton. Locally, this property is believed to be the richest and best of the district. The Timmins property adjoins the Trethewey on the west.

The McKinley-Darragh property comprises lease 3401 at the south end of Cobalt Lake, and is a little less than forty acres in extent. Messrs. Anderson (of the J. R. Booth Co.) and Gorman, of Ottawa, are interested in the property, which has shipped about eighty tons of good ore. In working during this last winter the owners made an unfortunate miscalculation, and drove one of their tunnels through into the lake, letting in its waters and drowning that particular working. They are now stripping the surface from one or two places, and are making some open cuts in which they have a very fine showing of the vein, which, on inspection, reveals a very liberal sprinkling of metallic silver.

The Earle properties are held under the name of the "Nipissing Mining Co.," and comprise eight locations of forty acres each, or something over 300 acres in all, from which quite a number of shipments have been made of high grade ore. Local rumor has it that Mr. Earle represents the International Nickel Co., and that this company is acquiring all the valuable properties possible, with a view to enabling that corporation to effectually undersell the cobalt coming from New Caledonia.

The Wright property has been optioned to Messrs. Jacobs, Hersey et al, of Montreal, who have been working the property vigorously during the last five or six weeks, and now have a carload of very high grade ore ready for shipment. This property is located to the southeast of most of the other producing locations, being on lot 269, just south of Kerr Lake. Adjoining the Wright location to the east is a property in which the Messrs. Drummond, of Montreal, are also interested, and from which, as yet, no shipments have been made.

The general character of the ores are of the "poor man" order, the silver being massive near the surface and easily discerned by the eye without assay tests. Several geologists who have seen the district have expressed doubts as to the permanency of the silver contents, believing that these will diminish with depth. The experience of Mr. Trethewey appears to bear out these views, as the bulk of the silver values on J. B. 7 ceased at about forty feet in depth, but against this is to be placed the results of the workings on the Timmins property, which show no diminution in silver values with increase in depth.

The district is certainly one of interesting and unusual geological and mineralogical features. It strikes the inex-

perienced man at once as a perfect Eldorado, but the older man, experienced in native silver propositions, is inclined to look at the deposits as of a temporary nature, as far as the silver contents are concerned. But one, experienced or otherwise, cannot fail to realize that the section through which the Ontario and Northern Railway is now building is an exceptionally rich mineral country, and one which will add very greatly to the reputation of Ontario as a mining province.

Little has been said in the press about the discoveries of ore in the Temagami Lake section which lies, roughly speaking, about twenty-five miles southwest from this silver-cobalt region near Haileybury. In the Temagami Lake section deposits of auriferous pyrites have been leased from the Government, and are now being worked with prospects of great remuneration. These pyrrhotites of the region round the northeast arm of Temagami Lake also carry a very fair percentage of nickel, although not so large as the pyrrhotites of the Sudbury district. It is also probable that the region round Wahnapiatae, which has been known for some years as a gold-bearing section, may also contain remunerative deposits of the precious metal. The whole country extending from Temiscamingue Lake southwesterly to Lake Wahnapiatae, is a region of plutonic masses seamed and gashed with quartz and vein-filling materials which contain both gold and silver. The region is well worth the attention of prospectors, and indeed of capitalists, and the completion of the Government railway will afford access to the district in a better way than has been hitherto possible.

CORRESPONDENCE.

"The Percussive Theory."

To the Editor:

Sir:—Some little time since the writer noticed that one of your correspondents asked for information on this subject, and as he (the writer) has probably written more on this subject than any other mining engineer, he has pleasure in forwarding you the following information, to enable your correspondent to study it at his leisure, as the details would be too lengthy to quote in this letter.

The writer does not claim the priority of the suggestion of the applicability of this theory to colliery explosions, as it was first publicly mooted by Mr. Joseph Dickinson, retired Inspector of Mines, as an explanation of the unusual phenomena which were clearly demonstrated in the workings of the Udston Colliery after the explosion in 1887. The subject was not, however, followed up by Mr. Dickinson, and received only very scant attention from other engineers until 1902, when, during the enquiry into the explosion at the Mount Kembla coal mine, near Woollongong, in New South Wales, it was again brought into prominence. The evidence given at this enquiry conclusively proved that the origin of the explosion was a huge fall of rock roof in a large goaf, which caused such violent percussive effects on the air, that an explosion (of dust) occurred in one section of the mine, and resulted fatally to a large number of miners, directly and indirectly, and also demonstrated extraordinary effects on the mine itself. Dr. Robertson, the consulting engineer of the

colliery company, and his co-experts, in their evidence, stated that the effects produced were entirely the result of sudden percussion of the air, which alone was responsible for the heat effects, and that in fact there was no explosion at all, in the sense in which the word "explosion" was generally applied to colliery disasters.

This argument was based on an article contributed by the present writer to the Colliery Guardian, entitled "Notes on the Talk o' th' Hill Explosion," which appeared without the author's name in the issue of that paper for the 21st of February, 1902.

Other references will be found in the writer's evidence before the Royal Commission on Explosions from Coal Dust, Q. 4634-4676; and in the following communications to the Colliery Guardian, viz.: "Some Effects Produced by the Sudden Compression of the Ventilating Air Current in Mines," Nov. 22nd, 1895; "Position of the Coal Dust Theory," June 12th and 26th, 1896; "Some Pressure Effects Shown by Colliery Explosions," Oct. 23rd, 1896; "Flameless Explosives and Coal Dust," July 5th, 1901; "The Coal Dust Problem," Jan. 10th, 1902; "Firedamp Explosions," April 25th, 1902; Correspondence in the Colliery Manager Journal, Jan. 10th, 1902; an article on the Senghenydd Explosions, Feb., 1902; in the Engineer, "Coal Mine Explosions," Feb. 12th, 1897; and in the Iron and Trades Review, Sept. 26th, 1902; "Damping the Air of Mines as a Safeguard Against Explosions," in Mines and Minerals, October, 1903; on "Spraying and Watering Problems," and in contributions to discussions in the Transactions of the North of England and Federated Institutes.

The Blue Book Reports on the Quarter, Udston, Tylors-town, Albion, Llanerth, Universal, Mount Kembla, Fernie and other Colliery explosions should also be carefully studied, as they give accounts of effects which indicated that the initiatory point of an explosion might be at two or more points, at very long distances apart. In the case of the Universal Colliery, it will be seen, on referring to the plans, that the experts were not in agreement as to the direction of the blast or blasts in several instances: one expert placed the origin of the explosion on the east side of the pit, whilst others were equally positive in placing it on the west side; but, without troubling to find which is the most probable, we have the evidence that the only man who escaped out of the pit alive was in the direct line of fire between the east and the west, and, therefore, if the flame of the explosion had actually traversed from one side to the other, he could not possibly have survived. If, however, we take the percussive theory into account, we can then imagine that the man being, so to speak, placed between two fires, was only exposed to pressure, and as this was not sufficient to kill him, it must have been reduced by his nearness to the pit shaft.

Students of "percussive" phenomena should also carefully study all recorded instances of explosions in air compressors or in their air receivers. In the majority of instances it will be found that the explosion occurred immediately after increasing the speed in answer to a demand for more air. At one time it was thought that two stage air compression would totally remove the risk of explosion, but a reference to the Iron and Coal Trades Review, for April 22nd, 1904, will show that even this mode of compression was not a safeguard.

Electrical investigators may possibly in time give us some material help in understanding percussive phenomena, thus—assuming that every atom of matter or gas has its own electron, and that a positive and negative electron form an ion, and also assuming that something occurs to separate

these electrons, and causes them to rush about (as a lecturer described it) looking for their own or fresh partners—what is the result? Percussion develops heat, and, if that heat is sufficient, flame also, and we may therefore aptly consider what forces of electricity are brought into play. The writer has heard it suggested that chemical union is really electrical union, but here the writer may get out of his depth, and must trust to some other investigator to clear up the mystery.

Yours faithfully,

JAMES ASHWORTH, M.E.

Highfield House, Chaddesden,

Derby, Eng., March 7th, 1905.

The Bed-Rock of the Gilbert River Gold Fields, Quebec.*

By JOHN A. DRESSER, M.A., St. Henri de Montreal, Que.

The gold hitherto produced in the Province of Quebec has been taken principally from the placer deposits of the Chaudiere basin in the County of Beauce. The important deposits have been found not in the valley of the Chaudiere itself, but along its tributaries, especially the Famine, Du Loup, Gilbert and Des Plantes. Of these, the Gilbert is probably the best known. All have been described at various times in the reports of the Geological Survey, particularly by Michel, Ells, and Chalmers.

It has been thought by all investigators, as far as could be ascertained, that the source of the gold is in the underlying rock, or in that of the immediate neighborhood. The bed-rock has been often described as noted for its decomposed condition and quartzose character, and in all cases has been considered to be an altered sediment.

Michel pointed out in 1866 that gold occurs in important amounts on the Gilbert, only within a quite definite area, and this opinion has been corroborated by the observation of subsequent workers. The extent of the gravels thus far known to produce gold, as pointed out to the writer last summer by Jerome Carillon, foreman of the Gilbert River Goldfields Co., coincides very closely with those indicated by Michel. Within this area, exposures of the bed-rock are rare. In the channel of the Gilbert River, however, near the Gilbert River Gold Mines post office, which is about the centre of this area, an accessible exposure occurs, and specimens of a similar rock are brought up from the deep diggings in which the gold is found. This rock is a variety of porphyry, a volcanic rock of the same class that underlies the gold-bearing gravels in Dudswell in the County of Wolfe, and which is the country rock of the well-known copper lodes at Eustis, Suffield and Capelton, in the township of Ascot, near Sherbrooke.

The latter is the rock of the mineralized belt which extends from Lake Memphremagog to Lake St. Francis, and includes the mines at Capelton, Eustis, Suffield and other parts of the township of Ascot, as well as portions of Stoke and Weedon. It has yielded the greater part of the copper thus far produced in the Province of Quebec. Similar rocks form a longer and larger area, known as the Sutton mountain belt, some twenty-five miles farther to the northwest, and also occupy a third large area along the boundary of the State of Maine, in the vicinity of Lake Megantic. The extent of the last mentioned occurrence is not yet at all definitely known. The volcanics in the Gilbert River area are thus some fifty miles northwest of those at Lake Megantic, and

thirty miles northeast of the similar rocks of the Ascot belt at Lake St. Francis. The latter have hitherto been supposed to end at that point, but, from the agreement of the rocks of the Gilbert River in position, and also in petrographical character, with the rocks of the Ascot belt, they appear to be a continuation of that group.

The rocks of the Ascot and the Sutton belts belong to the porphyry-andesite series of volcanics, and seem to be frequently more acid in the vicinity of the copper deposits. They are in all cases extremely crushed, sheared and otherwise altered, and in consequence their original volcanic character has only recently been discovered. The ores which they contain are yellow, gray and purple copper, with green and blue carbonates. They frequently carry important amounts of gold, and, sometimes, of silver. Placer gold is also found in the gravels of many of the streams running over this rock, of which the best known are the Kingsley, Big Hollow, Rowe's, Willard's and Hall's Brooks on the south side of Stoke Mountain, in the township of Dudswell.

An interesting parallel to the relations of the gold-bearing to the other rocks, as presented on the Gilbert River, was pointed out to me by Mr. John Blue, manager at the Eustis Copper Mines. Here a hill, 700 feet high, is composed of a ridge of volcanic rock 500 feet in height, capped by 200 feet of sediments. Gold occurs along the little brook which runs down the hill near the mine, both in the gravel and in quartz veins, up to the limit of the volcanic rock, above which none has been found. This seems to represent in miniature the conditions at the Gilbert River.

The Capelton-Eustis properties were originally developed as a gold property, but the percentage of gold declined as lower levels were reached, while the amount of copper greatly increased. Yet gold is still a factor of appreciable value in many of these ores. It is also worthy of note that the gravels of the St. Francis River carry small amounts of gold between Lennoxville and Sherbrooke, and also at Melbourne. In the former locality the river crosses the copper-bearing volcanics of the Ascot belt, and at the latter, it crosses the Sutton band, which is of similar character, and receives the discharge of some smaller streams which flow over those rocks.

On the whole, the conclusion seems to be justifiable that the placer gold of southeastern Quebec may in all cases be derived from the same series of volcanic rocks that contains the principal copper deposits of the region. Hence, it would follow that alluvial gold in this region should be looked for only in localities underlain by these volcanics, or in lower parts of the valleys of the streams which traverse, or have traversed, them; and that it may occur in any part of the area occupied by these rocks in which the conditions have been favorable to the formation and preservation of placer deposits. The occurrence of gold seems, at all events, to be a reliable indication of the proximity of copper-bearing rocks, in this district.

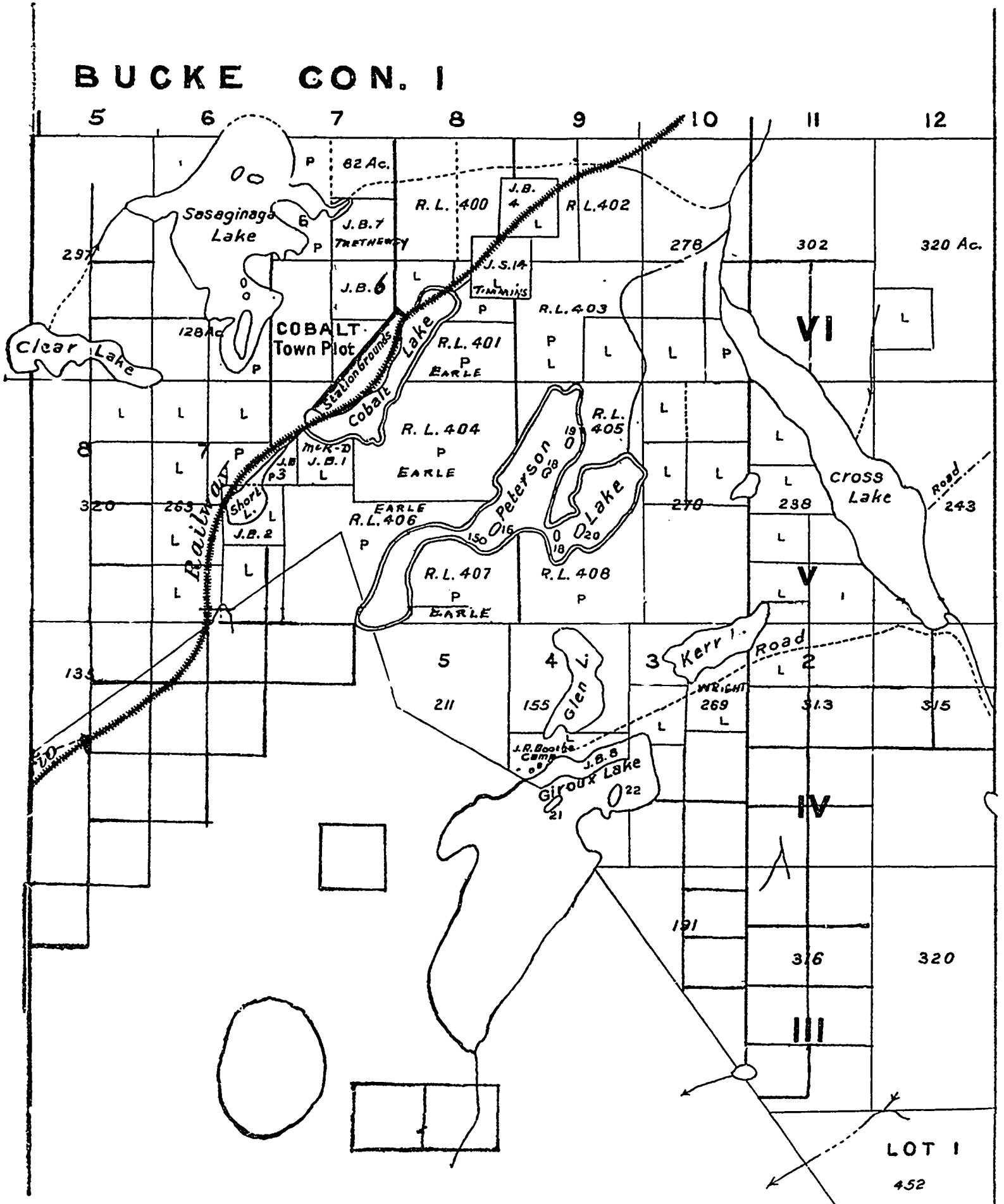
Uniform Mining Statistics in Canada.*

By EUGENE COSTE, E.M., Toronto.

It is, I think, admitted by the members of this Institute that an annual uniform presentment of Mining Statistics by the Mining Bureaus of the different Provinces of Canada would be an immense step forward in the interests of the

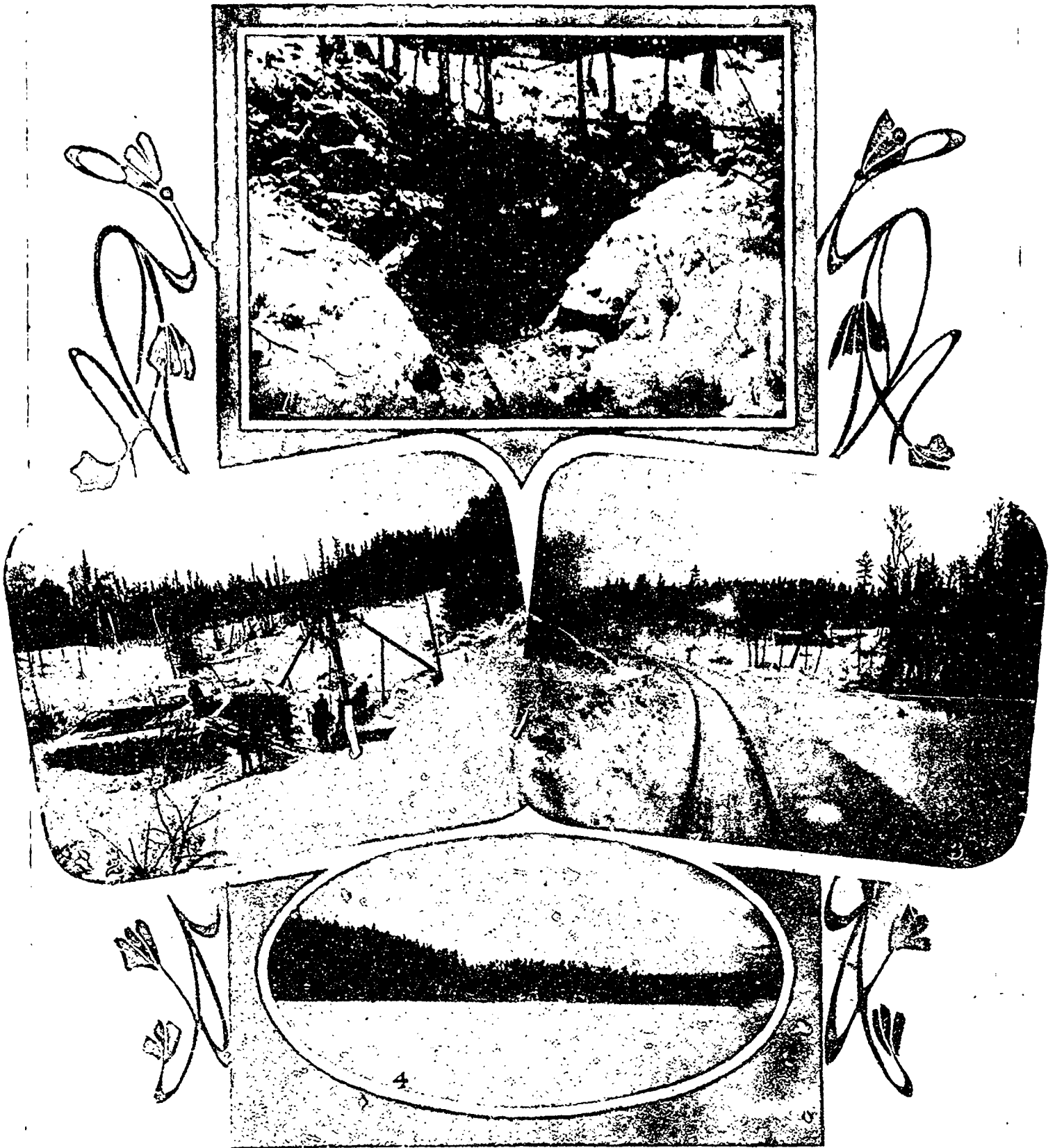
* Published by permission of the Acting-Director of the Geological Survey of Canada.

* Read at the Montreal meeting of the Canadian Mining Institute, March, 1905.



SKETCH MAP OF THE SILVER-COBALT REGION, ONTARIO.

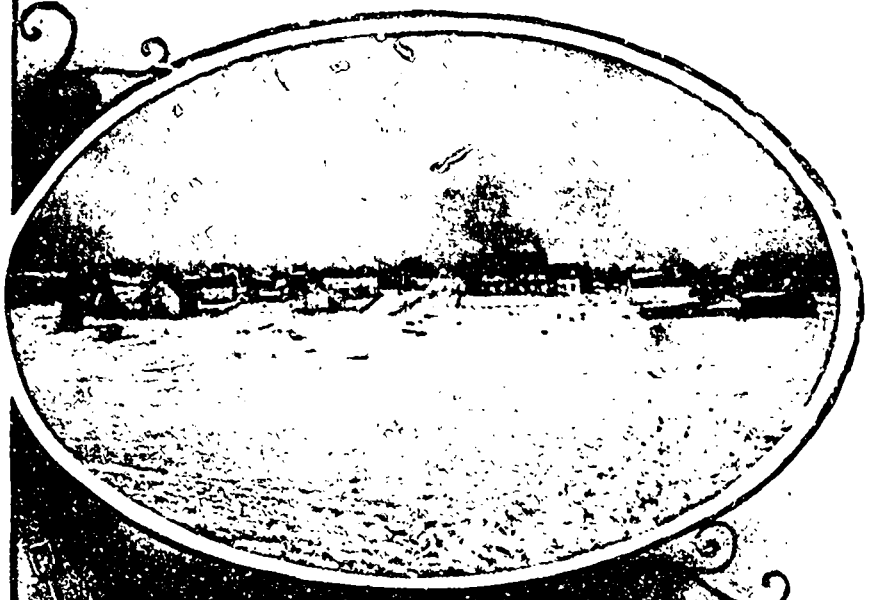
See descriptive article on page 69.



1. Cut on McKinley-Darragh Property.
2. Timmins Property.

3. View of Timmins Property from Ontario and Northern Railway.
4. View of McKinley-Darragh Property from Cobalt Station.

See descriptive article on page 69.



1. Trethewey's Vein.
3. New Liskeard Sliding

2. View of Haileybury from Lake Temiscamingue.
4. Nipissing Mining Company's Principal Pit, Earle

See descriptive article on page 69.



1. Wright Property Cabin in the Woods
2. Wright Property, Sacked Ore on Bank of Kerr Lake.

3. Wright Property, looking towards Kerr Lake.
4. Wright Property, showing Vein on Hanging Wall.

See descriptive article on page 69.

mining industries of the country. The Dominion Government could then readily publish annually through the mining division of the Geological Survey, or otherwise, complete uniform mining statistics of the whole country by simply adopting the uniform tables of the different provinces. A great deal would thus be gained, and nothing could possibly be lost.

For this most important reason, and for other reasons set forth in my short paper on this subject, which I had the honor to present to this Institute two years ago, permit me to suggest the adoption of the annual publication by the Mining Bureaus of the different Provinces of the following two tables:

TABLE A.—MINERAL PRODUCTION.

In which the first marketed products of all mines, quarries and concentrating mills would be recorded by quantities valued at the places of production.

TABLE B.—MANUFACTURED PRODUCTS FROM MINERALS.

In which the quantities of metallic and other manufactured products from smelting, metallurgical, chemical or other works, would be recorded as finally produced and marketed at these works and with the value they are sold at, at these works.

A short correspondence between the heads of the different Mining Bureaus would soon establish the place for each mineral or manufactured product, whether in table A or table B, and we would then have the perfect uniform presentment so much desired, and which would be of so much value to us all and to the country.

I append below for illustration a list of the present annual products of Canada thus grouped in two tables, A and B, according to their more or less advanced state of manufacture. But, as I have said, the heads of the Mining Bureaus might conceive and agree on a better grouping of the products, and from time to time new products will, no doubt, have to be added to one or other of the tables, and it is quite possible of course that I may have omitted some of the products now being marketed in the country, and which complete mining statistics should cover.

TABLE A.—MINERAL PRODUCTION.

PRODUCT.	PRODUCT.
1. Actinolite.	18. Mineral Water.
2. Asbestos, different grades.	19. Molybdenite.
3. Asbestic.	20. Moulding Sand.
4. Baryte.	21. Natural Gas.
5. Chromite.	22. Ochre.
6. Coal.	23. Ores of any metals, when sold as such.
7. Corundum.	24. Peat.
8. Feldspar.	25. Petroleum, crude.
9. Fire Clay.	26. Phosphate.
10. Gold.	27. Platinum.
11. Granite.	28. Precious Stones.
12. Graphite.	29. Pyrites.
13. Grindstone.	30. Salt.
14. Limestone, for flux.	31. Sands and Gravel.
15. Gypsum.	32. Stones (all sorts).
16. Marls.	
17. Mica.	

TABLE B.—MANUFACTURED PRODUCTS FROM MINERALS.

PRODUCT.	PRODUCT.
1. Aluminium.	Lubricating Oil.
2. Arsenic.	Benzine and Naptha.
3. Bricks (all sorts).	Gas, Fuel Oils and Tars.
4. Carbide, of Calcium.	Paraffine and Wax Candles
5. Cement.	16. Pig Iron— From Canadian Ores. From Foreign Ores.
6. Coke.	17. Pigments.
7. Copper Matte.	18. Quicksilver.
8. Ferro-chrome.	19. Pottery and Terra Cotta.
9. Fertilizers.	20. Phosphorus.
10. Lead.	21. Sewer Pipe.
11. Lime.	22. Steel.
12. Mattes or metal of any other mineral.	23. Sulphuric Acid.
13. Nickel matte.	24. Tiles and Drains.
14. Nickel-steel.	25. Zinc.
15. Oils (refined). Illuminating Oil.	

I suggest the annual publication of these two tables by the Mining Bureaus of the different provinces in addition to and independently of the way the statistics have been presented by these Bureaus in the past, as for the sake of comparisons, or for other very good reasons, it might be found desirable by these Bureaus to continue their annual presentation of other tables, with fine values "or otherwise," exactly as done before.

Bornite Ores of British Columbia and the Yukon Territory.

By WM. M. BREWER, M.E., Victoria, B.C.

The several occurrences of well defined contact deposits of bornite ore at various localities throughout western British Columbia and the Yukon Territory present many characteristics which make a study of them peculiarly interesting. These localities are very far distant one from the other, and up to the present time no continuity of the geological conditions from one camp to the next can be traced.

It would be entirely incorrect to describe the occurrences as occupying a belt or zone, because as a matter of fact the various camps in which this character of ore predominates are found entirely isolated from each other, but possessing very similar geological conditions, and especially is there a striking similarity in the matrix of the ore. So striking is this that it is impossible to distinguish with the eye any difference between much of the ore found on Texada Island from that on Gribbel Island, nearly 400 miles north from Texada and near the entrance of Gardner Channel, or for that matter that found in the White Horse Camp in the Yukon, over 1,000 miles distant from Texada or Vancouver Island, and vice versa.

HISTORICAL.

The first discovery reported in British Columbia of the indications that a body of bornite ore had occurred, was from Texada Island early in the nineties, but the news attracted but little attention, because of the ore occurring as impregnations disseminated through a felsite dike which was in contact with crystalline limestone, and having on the surface no well defined walls. The discovery was considered of but little value, and was turned down by miners and engineers generally.

* Read at the Montreal meeting of the Canadian Mining Institute, March, 1905.

This occurrence of ore was found near Marble Bay, on the eastern coast of Texada Island, on an old Crown-granted piece of land owned by Christie and Palmer, the former being the late well-known Toronto biscuit manufacturer, and the latter the president of the Toronto Type Foundry. These gentlemen showed their faith in the possibilities of the discovery by commencing mining operations on quite an extensive scale, which have been continued ever since until the ore body has been proven to maintain continuity from the surface to the present depth of the working shaft, about 500 feet, and the present owners, who purchased the property from Christie's estate after his death, about three years ago, have actually paid the purchase price, \$200,000, from the profits of the ore mined, and are still shipping at the rate of 1,500 tons monthly.

Soon after the discovery of this class of ore near Marble Bay, another body, apparently entirely distinct, but only about half a mile distant, was found on Crown-granted land owned by a syndicate of Victoria business men. This property was floated as the Van Anda Copper and Gold Mining Company, with a \$5,000,000 capitalization, sufficient in itself to sink it to the deepest depths of the ocean, but although owing to mistakes of the management, the company did get into financial difficulties, yet the fact stands forth prominently that the ore body has maintained its continuity in the Copper Queen Mine, to a proven depth of 680 feet, below which depth the shaft has not yet been sunk. The ore on all these properties on Texada Island has yielded excellent values in gold, silver and copper from the grass roots, roughly speaking, an average of about \$15.00 per ton has been obtained, and several shipments of ore from between the 560 and 620 foot levels on the Copper Queen carried as high as \$20.00 per ton in gold in addition to copper and silver values.

Later, other deposits of bornite ore were discovered about three miles distant, and towards the north end of the Island, but although much prospecting has been done since, it appears as though this character of ore was confined to the limited area bounded by the lines of these three properties, so far as Texada Island is concerned, and even in this limited area that occupied by the actual mining operations on known deposits is confined to four pieces of ground each less than 1,500 feet long by 600 feet wide.

The next discovery of bornite ore was made in 1898 in the mountains bordering on Sidney Inlet, on Vancouver Island, by two prospectors, Jones and Kincaid, and later, but during the same year, other discoveries were made in the same neighborhood by McKinnon and Shafer.

During 1899 McIntyre and Grainger, two Yukon pioneers, found ore of similar character near White Horse, the present terminus of the White Pass and Yukon Railway, and further prospecting has determined that such ore occurs at intervals along a zone about sixteen miles in length.

About the same time discoveries of a like character were made by prospectors from Whatcom County, State of Washington, on Gribbel Island, about 400 miles north-westerly from Vancouver.

During 1904 still another body of this ore was opened up by the Vancouver Island Development Company, under the management of Mr. Cecil, a pioneer mining man from Australia. This discovery is situated on the eastern side of Vancouver Island, about four miles westerly from the town of Ladysmith, and about two miles from the line of the Esquimalt and Nanaimo Railway Company.

These are all the discoveries of well defined bodies of bornite ore reported from the coast districts of British Colum-

bia, but in the interior, in the Similkameen district, on Copper Mountain, very extensive deposits are found, and others of less extent on Ten Mile Creek, a tributary of the Nicola River. These occurrences in the interior though, bear a marked difference both with regard to the geological conditions surrounding them, and the matrix in which the ore occurs, to those on the island, and near White Horse.

GEOLOGY AND MINERALOGY.

With some slight local differences, which I will refer to later, the geological conditions under which the bornite ore occurs on the islands named (except the occurrence near Ladysmith), and in the White Horse Camp bear a striking similarity.

The oldest rocks are the limestones, but whether these belong to the Carboniferous or Cretaceous eras it is almost impossible to determine, because of having been rendered fully crystalline, therefore no fossils by which their exact age could be ascertained can be found. The late Dr. Dawson, in his reports on the geology of Canada, has classified them as probably belonging to the Cretaceous, thereby connecting them with the sandstones and conglomerates in which are found the coal seams belonging to that era, or, as the same authority says, some of the limestone possibly may belong to the Carboniferous age.

The sedimentary rocks were disturbed, and tilted up from their original horizontal position by the intrusion of masses and dikes of such eruptive rocks as diabase, diorite, granite, syenite and felsite, so that the dip of the limestone, especially at its contact with the igneous rocks, is almost vertical, and rarely less than at an angle of 28 degrees.

As an appendix to the report of the Minister of Mines for British Columbia, for 1903, the petrography of some of the eruptive rocks which occur as intrusions in the neighborhood where the bodies of bornite ore are situated on Texada Island is given. The samples were examined by Dr. Barlow, petrographer to the Canadian Geological Survey. They were taken from the Cornell Mine, and are described as follows:

"Felsite near shaft, second level—the ore-bearing matrix—the hand specimen shows a fine grained crystalline rock of greenish gray color, and earthy lustre. Under the microscope the rock has distinctly porphyritic structure, and from the mineral content is an augite porphyrite. Finely twined plagioclase, and colorless augite comprise the phenocrysts. The former occurs in tabular form while the latter is rather irregular. The base is in great part composed of augite, with which is associated turbid granular aggregates of epidote and calcite in the interstitial spaces. Pale brown garnet (almanditic) and colorless apatite are present as accessory constituents.

"Ore-bearing matrix.—The rock is a pale green granular pyroxenite, holding a large amount of accessory almandine garnet. Microscopically it consists principally of polygonal and rounded idiomorphic individuals of pyroxene. Sausuritized plagioclase and a pale brown garnet occupy angular spaces between the pyroxene individuals. The garnet shows well defined optical anomalies. This rock, from its association, is a deep-seated basic phase—possibly a segregation of the augite porphyrite.

"Diabase porphyrite from second level.—The rock is fine-grained greenish in color, and has a somewhat sheared appearance. Under the microscope it is seen to be a much decomposed diabase porphyrite, and is evidently a deeper-seated portion of the magma. The plagioclase is probably near the basic end of the series. Its well developed zonal

structure shows a different composition for the interior and periphery, of which the former is the more basic and much saussuritized. The pyroxene has altered to a pale green pliochroic actinolite, with a separation of turbid epidote and a little calcite. Some irregular aggregates of brown biotite, numerous grains of magnetite and a few of apatite complete the section.

"Ore-bearing matrix, third level.—The non-metallic minerals composing the bornite matrix are pale green pyroxene and brown garnet. The microscopic section shows that the matrix is principally garnet—similar to that already described—with a subordinate amount of colorless augite. The garnet is much cracked, and these cracks are filled with the sulphides, chalcopyrite and bornite, and these are connected with the larger grains."

No microscopical examination, to my knowledge, has been made of any of the rocks found in other camps in which bodies of bornite have been discovered, but in almost every instance the matrix of the ore is identical with that occurring on the Cornell Claim, so that the above description given by Dr. Barlow, will, without doubt, apply to the same character of rock in other localities.

With the exception of the mineral claims situated near Ladysmith, those on Gribbel Island, and those in the Similkameen district in the interior of the mainland, limestone (fully crystalline), is always found as one wall of the ore bodies, usually it forms the foot wall. The ore bodies occur usually at the contact between this limestone and the so-called felsite, but sometimes between limestone and diabase, though this rarely occurs.

The diabase, syenite, granite and diorite which occur as intrusive masses and dikes, have apparently exercised no influence over the deposition of the ore bodies, in fact, in many cases, especially on Texada Island, it would appear as though many of these intrusions belonged to a more recent period than that in which the ore bodies were deposited, because some of the dikes are found to cut through the ore body, and by actual work it has been demonstrated that by driving through the dike the ore body is found on the opposite side.

In some instances, notably on the Arctic Chief mineral claim near White Horse, the matrix of the ore near the surface is magnetite and chlorite, but about 60 feet below, these minerals disappear, and garnetite is found as the gangue material.

It would appear as though the deposition of the bornite was due to replacement, for when it occurs at the contact of limestone and felsite there is no well defined wall on the felsite side, but instead, a gradual change from solid ore with a little felsite and garnetite to almost barren felsite and garnetite, with masses and crystals of bornite shot through those rocks irregularly, and from that to the barren rocks. On the 500 foot level of the Copper Queen mineral claim on Texada Island the crystalline limestone wall on the footwall side is nearly vertical; it is as well defined and regular as the wall of a house; next to it were four feet of solid bornite ore, then a gradual change to barren felsite and garnetite, next about eight feet in width of absolutely barren country, and beyond that a solid body of bornite, twelve feet wide in portions of the drift, then a well defined hanging wall almost vertical, composed of crystalline limestone slickensided.

On the Victoria mineral claim, near Ladysmith, the bodies of bornite occur in a matrix chiefly composed of silica in large crystals. The walls of these bodies are granite, the ore bodies themselves occurring as three distinct veins in a badly crushed zone of granite lying between well defined walls of massive

granite flanked on the foot wall side by conglomerates and sandstones belonging to the Cretaceous coal measures. Limestone, either in its original sedimentary condition or altered to crystalline is entirely wanting, so far as I could see during a recent visit, when I made a partial survey of the ore bodies and the surrounding geology.

On Gribbel Island the bodies of bornite ore, so far as development at present shows, occur in a gangue composed of feldspar, garnetite and calcite, between walls of syenite schist, which close to the ore itself is very fine grained, and has been evidently subjected to great lateral pressure. Further removed from the ore body this rock becomes much coarser grained and has a more granitoid appearance, in fact, it is a question whether it should be classified as syenite or granite. A microscopical examination is necessary to settle the classification.

The crystals of feldspar, garnets and calcite in the matrix of the ore bodies on Gribbel Island are large and most beautiful specimens, the crystallization being almost perfect, and the coloring so delicate and lovely that it seems a great pity that the crystals are not hard enough to be used as gems.

So far as the ore bodies near Sidney Inlet, on Vancouver Island, are concerned, I am unable from personal observation to describe the geological conditions, but from several specimens of the ore which have come under my notice, I found that so far as the matrix is concerned it is practically identical with that of the ore on Texada Island. From descriptions which have been given me I am of the opinion that the geological conditions also are very similar.

In the White Horse Copper Camp the fact that while nearly every discovery made along the zone, in length about sixteen miles, and of variable width, has been a body of bornite ore overlaid by a shallow zone of copper carbonates, there are a few instances where the surface ore is unaltered chalcopyrite, occurring under practically the same geological conditions as do the bodies of bornite, and at about the same elevation, but in a zone which appears to lie parallel to that known as the main copper belt in which the bodies of bornite occur.

For several good reasons the development work in the White Horse Camp has been quite limited, and when I last visited that district in 1904 I found that only on one property (the Copper King) had the ore body been prospected to a depth exceeding 100 feet. The limestone footwall on which the ore lay had been followed down on its dip, and at a depth of about 126 feet the ore body exposed was solid chalcocite, which assayed close to 50 per cent. in copper. In the workings above, considerable chalcocite had been found mixed with the bornite, but at no point had the ore body been entirely composed of chalcocite until the depth mentioned was reached.

The highest grade copper ore that has ever been shipped from British Columbia mines in any quantity came from the Copper King during the fall of 1900 when a sample shipment of 8½ tons, which was sent to the Everett Smelter in the State of Washington, yielded 45.6 per cent. in copper.

Another feature peculiar to the ore deposits in the White Horse Camp is that quite frequently pockets of molybdenite ore occur associated with the bornite ore, and still another feature is that very frequently tremolite occurs as a gangue or matrix in addition to garnetite and felsite.

The geological conditions surrounding the deposits of bornite on Copper Mountain in the Similkameen District are entirely dissimilar to those in any of the other districts referred to in this paper. In fact the occurrence of ore bodies themselves bear a striking dissimilarity, for instead of the ore bodies being lenses of variable extent of solid ore in a

garnetite or felsite matrix, they are very extensive bodies of diabase with masses and grains of bornite disseminated through the rock with great regularity and to such an extent as to give a value of an average of about 5 per cent. copper to the ton through a width of upwards of 100 feet and beyond that limit to an undetermined width. This fact has been actually demonstrated by development work on the Sunset Mine on which much more extensive operations have been carried on than on any other prospect on the mountain.

One of the chief reasons for my having noticed particularly the several occurrences of bornite ore in the camps referred to in this paper, is that these bodies are isolated, but in near proximity occur zones or belts of considerable extent in which are found deposits of chalcopyrite, pyrrhotite and magnetite. On Texada Island there also occurs veins of gold-bearing quartz, which are free milling at the surface and for a shallow depth below. In the White Horse Camp though, so far as at present known, there are only those bodies of chalcopyrite to which reference has already been made.

The geological conditions which surround the occurrences of bornite ore are to some extent dissimilar to those which surround the other sulphide ores mentioned, except in the White Horse Camp. For instance, on Vancouver and Texada Island the felsite dikes which occur as intrusions and closely associated with the bornite ores, are wanting in the proximity of the occurrences of the other sulphide ores, which almost invariably occur, either in fissures in the diorite or diabase country rock or else as contact deposits between those rocks and crystalline limestone.

For this reason the theory, I believe, is warranted that the felsite has had a greater influence over the deposition of the bornite ores than have had any of the other igneous rocks, for even where other rocks are found as wall rocks there is always evidence of the presence of felsite in the matrix, and besides this fact, except in the Similkameen country, the line of demarkation between the ore and any wall rock except the felsite is not only clearly defined but invariably there is a gouge of talcose material of variable thickness, very rarely less than one inch and sometimes several inches, between the ore body and the wall, but this is always wanting when felsite forms one or other of the walls. I regret that because of constant travelling I have had no opportunity to make more thorough research with regard to the deposition of the bornite ore, and also regret that time will not permit me in this paper to more fully describe the various occurrences and call attention to other characteristics which I have noticed.

Canadian Metallurgical Products for the Far East.*

By FRANK HOBART, Assoc. Editor, *The Engineering and Mining Journal*.

It is hardly fair to dignify by the title of a paper what is, at best, intended to convey a few suggestions; and some of them are not new. The mineral production of Canada is increasing on certain lines, and now needs, or will soon need outlets for the surplus over domestic consumption. It seems to me that Canadian producers can do better than to look entirely to Europe and the United States for such an outlet, especially as the Pacific Coast of the Dominion is the section where the surplus is most likely to exist.

The Far East,—China, Japan and India,—is the region where new markets are to be found to the best advantage.

* Read at the Montreal meeting of the Canadian Mining Institute, March, 1905.

China is a consumer on a considerable scale; the country possesses mineral resources but they are imperfectly known and have been developed, if at all, in a very limited and imperfect way.

We can hardly gauge the actual consumption of metals, owing to the absence of all reliable statistics, but the imports or purchases of foreign material can be ascertained. Japan is different: there, the metals are mined and treated in a modern and intelligent way. The resources are limited, however, and the country cannot supply its own needs with the sole exception of copper. India is not a mining country. In spite of its vast extent the mining and metallurgical output is insignificant, and the needs of its people must be supplied from abroad.

One of the more important of the metal products of Western Canada is lead, and there is complaint of an insufficient market. Canadian lead is shut out of the United States by a high duty and of Europe by the long railroad haul to the Atlantic seaboard. Now from the best attainable information, China and Japan buy yearly from 35,000 to 40,000 tons of lead. To this, India adds 10,000 or 15,000 tons more. Much Canadian lead has already gone to the East; but there is no reason why a great deal more should not be sent.

The chief competition to be met with here is from mines of the Broken Hill group in New South Wales. They have been favoured by the proximity of Sydney to the Chinese ports, but the bounty now paid on Canadian lead ought to compensate for the difference in freight rates.

Lead prices in the East are governed by the London market, but Canadian lead is ruled by the same market if sent to Europe, and the chances are that it would bring a better return if sent across the Pacific.

During the past half year Chinese merchants have been large buyers of copper in New York. In part this demand has been due to the extra demand caused by the Russian war, which has absorbed much of the metal which Japan formerly sold to China; but in part it is certainly due to an increase in consumption in China itself, the cause and extent of which we are not yet able to determine, though there is no doubt that it exists.

I have seen recently copper from the Lake Superior mines, shipped from Houghton directly to Hong Kong, by way of Seattle, requiring rail transportation across half the continent, with its attendant charges.

British Columbia is getting to be a large copper producer. Why should not copper from the Boundary District, from Vancouver Island, or from Rossland, go to China, when it has to pay little more than the ocean rates?

When our zealous member, Mr. Gardé, succeeds in establishing a zinc smelter in British Columbia—which I hope he will do—there is little doubt that a market for some of his spelter can be found across the Pacific. Brass and bronze are in large use in Japan and China and there is little zinc ore known in either country.

A great hope for future Trans-Pacific trade is to be found in the possible building up of an iron industry in British Columbia. Canada has then what the United States does not possess on the Pacific Coast—iron ores and fuel suitable for metallurgical work. Across the Pacific are countries which buy iron and steel and will continue to buy it; China, because of lack of mine development and of metallurgical skill; Japan, because the country is deficient in iron ores. Moreover, the loss of the market in Manchuria and Korea, which was threatened by Russian domination, seems likely to be averted. There is a great prize waiting in the Far East for American iron-

makers, and the advantage will be with those who can locate themselves on the western coast of the continent. It is even possible that they can compete with the British, German, and Belgian mills, which now supply India.

Australia is also a large market for iron and steel, and all efforts to establish iron manufacture there have failed, thus far, owing to a combination of circumstances, which is likely to limit production in the future also.

These are only suggestions, and have, as I said before, doubtless occurred to others also, so that I do not pretend to claim originality for them. They resolve themselves all into a simple sentence.

The Far East needs metals; why should not Canada have its share in supplying the demand?

Rock and Ore-Crushing Machinery.

Within the past few years the Hadfield Steel Foundry Co., Ltd., of Sheffield, England, has gone quite extensively into the matter of constructing stone and ore-crushing machinery, and has enlarged its works for this purpose. The result has been not alone the improvement of details in the design of various types of crushing machines, but also in the application of alloys and metals which have not hitherto been employed. The research work of the managing director of the company, Mr. R. A. Hadfield, and his modifications of different processes, has resulted in cast steel being now very extensively employed in places where formerly cast iron was used. The saving is not alone in weight, but also in the greatly increased strength of the parts. The particular brand of manganese steel known as the "Era," introduced by Mr. Hadfield in other connections, has been utilized for liners, jaw-faces, and teeth for crushing-rolls. The consequent reduction in weight is important, as a crushing plant is always required to be of a portable nature, and in any case has frequently to be sent to countries where railway facilities are limited.



We publish an illustration of the Hadfield and Jack patent "Heclon" gyratory breaker. In the design of which there are several important departures. In all other machines of this type the crushing-head, or cone, is fixed on a solid shaft, and the downward thrust is taken at the lower end of the shaft. This is objectionable, because the shaft is supported where the motion is the greatest, and there is set up a frictional resistance which develops considerable heat, and this interferes with smoothness of working, and adds to the power which is necessary for driving. Usually the conditions are such that dust finds its way into the eccentric. In the Hadfield patent the central shaft is hollow, and its bearing is at the upper end, where motion is practically nothing; the fact that the hollow shaft fits over the outside of the eccentric results in all dust and dirt being effectually excluded. It is also hardly necessary to point out that, with the hollow shaft, there is less likelihood of invisible flaws, so that this important piece of the crushing plant is likely to be more reliable.

As shown in the figure, the "Heclon" breaker consists of a body portion constructed of cast iron, with a base plate of the same material, and a diaphragm running in a diagonal direction for the passage of the broken material. The upper portion of the body is made of cast steel.

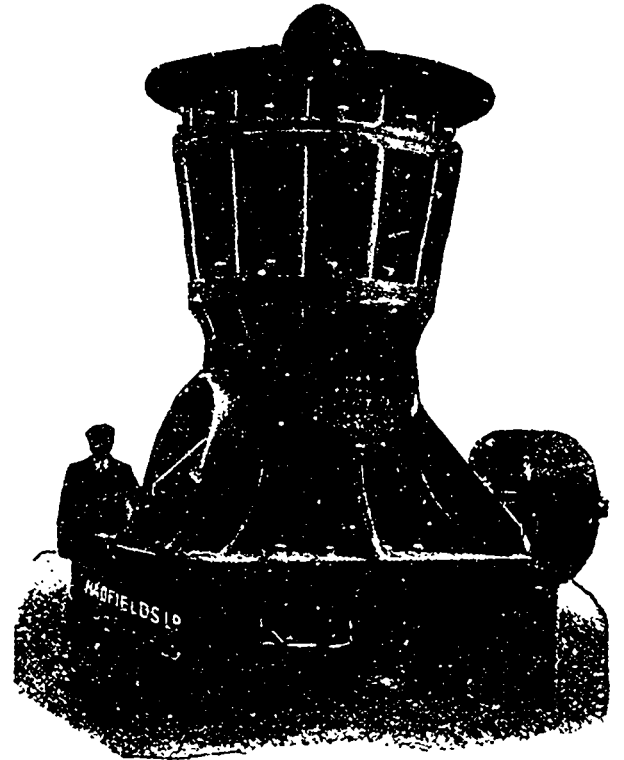


Fig. 1.

lined with "Era" manganese steel concave ribbed plates; above this a cast-steel hopper is securely attached by bolts. In this hopper is formed a three-legged spider connecting with, and supporting, the boss. The conical head forming the breaker is carried on the hollow steel shaft, and the arrangement of the operating gear is an interesting feature in the design. The shaft does not revolve this head, the motion given being purely oscillatory or gyratory, and such rotation as may occur in prac-

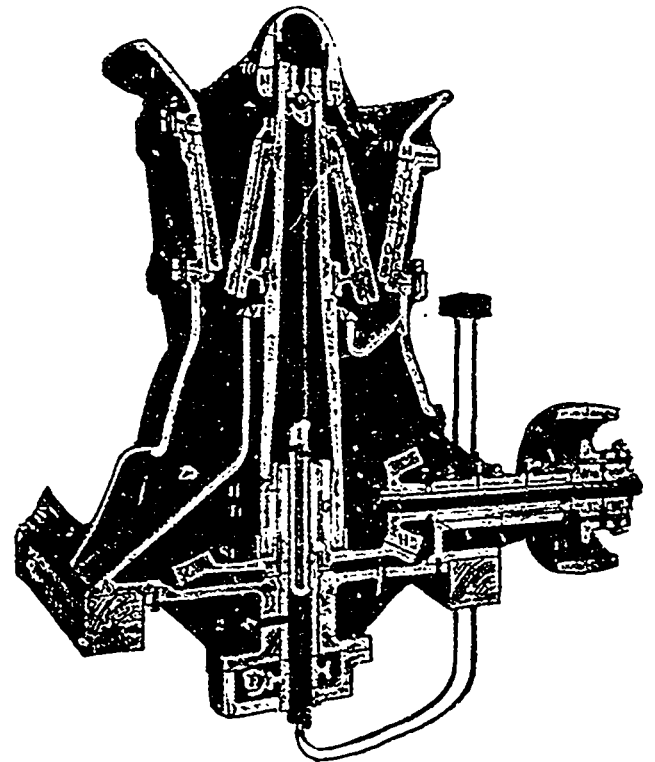


Fig. 2.

tice is entirely due to friction of the stone or ore between the head and the concave plates. The head has an outer mantle of "Era" manganese steel. The oscillatory motion is transmitted to the shaft and thence to the conical head by means of an eccentric boss cast on the

base gear-wheel, which latter is operated by a bevel-pinion on the horizontal shaft, as shown. There is securely attached to the base plate a steel shaft marked A, which takes the thrust from the eccentric boss of the wheel B. The eccentric boss on the bevel-wheel works inside the hollow steel shaft C. Anti-friction metal bushes are placed between the shaft A and the inner surface of the eccentric boss, and also between the outer surface of the eccentric boss and the inner surface of the hollow shaft, in such a manner that they can be easily taken out to be examined when necessary. The weight of the hollow shaft is carried on a special bronze ball at the top, where, as we have already said, the motion is practically nil. The degree of fineness to which the material is crushed can be regulated by winding the centre shaft D up or down through the medium of the worm and worm-wheel, shown at the lower end of the shaft.

The eccentric bearing requires careful lubrication, and the manufacturers make it a special point that only the best oil shall be used for this purpose. The method of supplying oil to the eccentric is important. A constant supply passes over the inner and outer bushes, the oil being fed from a box some feet above the level of the main bearing through two small tubes. The oil from the bearing finds its way partly under the dust-cap E and partly past the inner bearing down to the base-plate, whence it drops through the small pipe F into a receptacle whence it is recovered for filtration and subsequent use.

To secure absolute freedom from dust in the main eccentric bearings a cast-steel ring E is placed outside the hollow shaft resting on the boss of the horizontal wheel. As this ring is constantly lubricated with oil, in the manner already referred to, there is no possibility of dust finding its way into the bearings through this channel. To prevent dust or light particles getting down into the gear from the crusher-head, another dust-collar, G, is provided at the base of the head; this rests on a projecting trunk which runs up from the inclined diaphragm in the body of the machine. The machine is driven by means of a belt and pulley, shown in the figure. This drives through the medium of safety breaking-pins and a bevel-pinion geared to the horizontal bevel-wheel B. A very long bearing is provided for this shaft, which is lined with anti-friction metal. Those parts of the machine which are subject to abrasion have renewable liners of "Era" manganese steel. The inclined diaphragm and the arms of the spider are also protected by thin cast sheets of this metal. Great care has been paid to secure absolute metallic contact in respect to the mantle over the cone; the inner surface is coated with a hard white alloy, which can be made perfectly smooth and regular so as to insure a close fit on the head.

The Hadfield Company have manufactured ten of these gyroscopic breakers of the largest size for the Premier (Transvaal) Diamond Mines, Limited. They will be used for breaking the blue ground carrying the diamonds preparatory to its further reduction by large crushing rollers. This is one of the largest single orders yet placed for crushers, the combined capacity of the ten machines being in excess of 1,000 tons per hour.

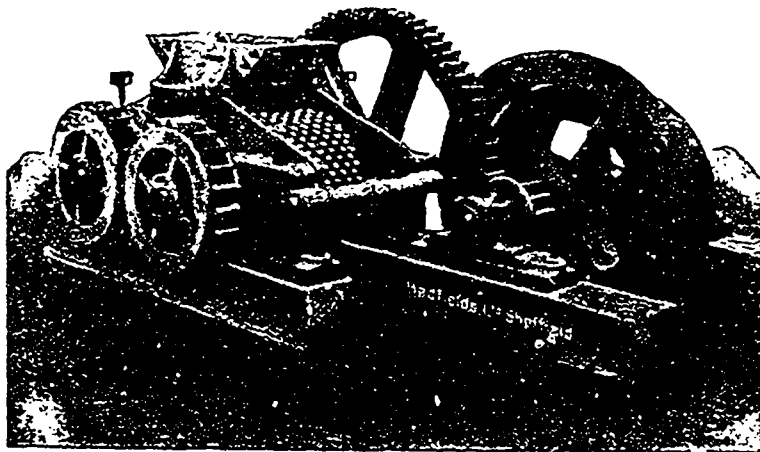


Fig. 3.

Figure 3 illustrates a type of roll crusher now largely used for breaking partly crushed material. The machine is gear-driven and is intended to receive the flat spalls or slivers in macadam-making plants, and to reduce the same to cubical product. The special feature again in this machine is the improvement in the metal used in construction. The rolls are strengthened by the use of cast steel, where hitherto cast iron has been used, and the side frames are entirely of steel castings. The rolls themselves are provided with renewable shells of "Era" manganese steel. The illustration shows toothed rolls, for which the "Era" manganese steel is particularly satisfactory, as this metal enables the teeth to be made longer and of a form more satisfactory for crushing. Prior to the introduction of the "Era" manganese steel, chilled cast iron was the only metal sufficiently hard to resist the wear, but, as it lacked toughness, the teeth had to be made either very heavy or very short. With "Era" manganese steel it is possible to adopt longer teeth, and thus give longer life to the roll shells.

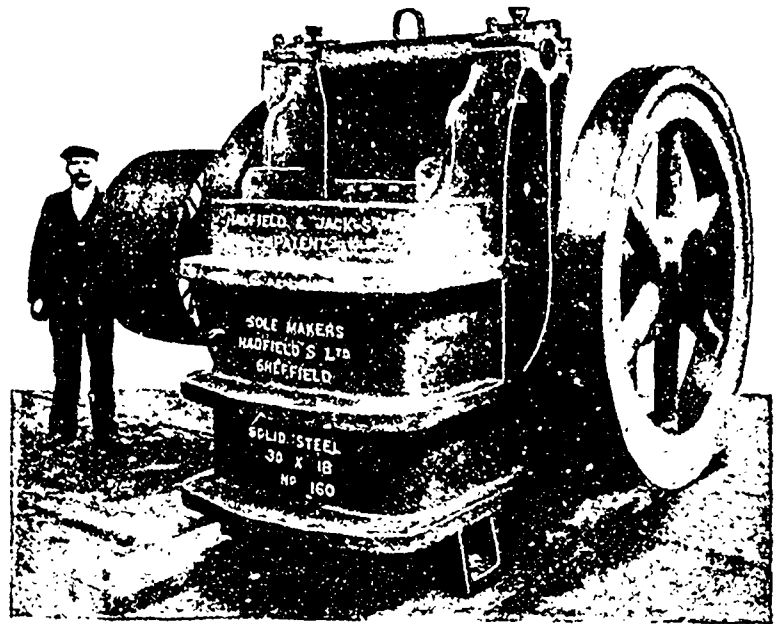
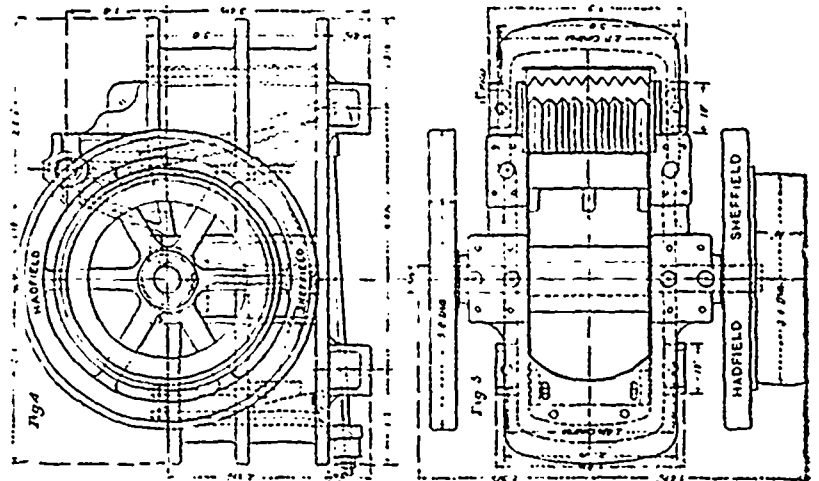


Fig. 6.



The other figures represent the reciprocating stone breaker as made by the Hadfield Company, and which has also been improved by the introduction of the special metals already spoken of. The body is made of cast steel, the stiffness being imparted by ribs, as shown in the figure. The "pitman" and swinging jaw-stock are also made of cast steel, and, showing a reduction of weight, lessen somewhat the motive power required. The toothed front of the jaw-face (as shown in the cut) is of "Era" manganese steel, while the back has V-grooves to reduce the amount of metal required. These grooves are filled with a special mixture of hard spelter, the surface being left perfectly true, so as to give a satisfactory contact with the steel, of which the main frame and jaw-stock are made. Jaw-faces thus made can safely be reduced in weight to one-quarter of the weight necessary when chilled iron is used. This arrangement also facilitates transport and repair, and decreases somewhat the overall dimensions of the machine. All toggle-plates and toggle-bearings are also made of "Era" manganese steel. This class of crusher is made by the firm in eight sizes, ranging up to 30 in. by 18 in., as shown in Fig. 6.

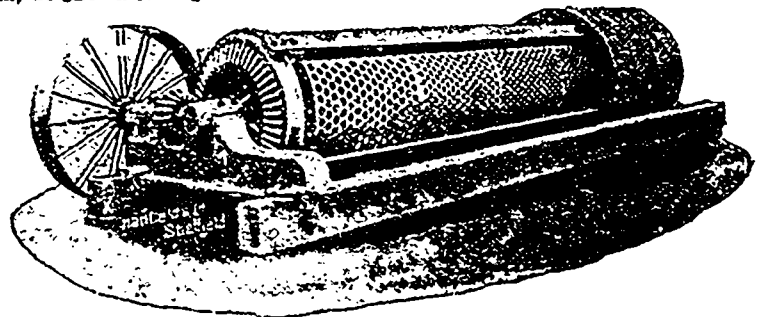
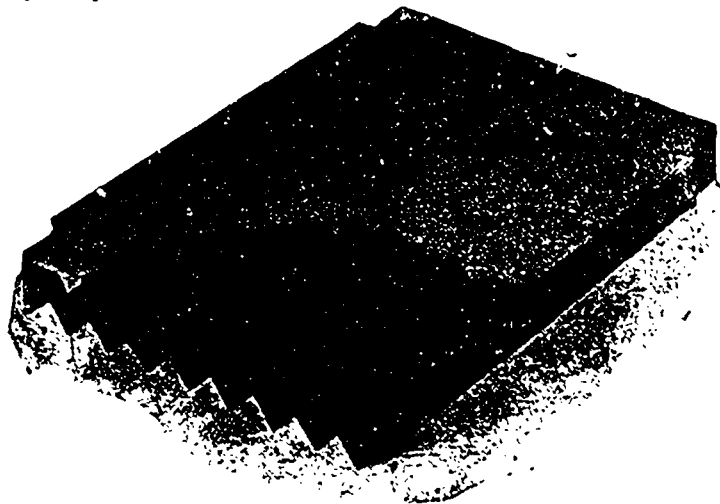


Fig. 8.

Fig. 8 illustrates a special type of revolving screen designed by the Hadfield Company, the main purpose of which is to prevent rapid wear. The screen is formed of steel, and is supported on friction bearers at

one end, and on trunnion bearings at the other, so that the whole of the interior is free for the passage of stone, there being no spider arms or other projections. The perforated plates are held in place simply by four angle-bars, running from end to end; they are not, therefore, bolted or riveted in position. Where the bar comes in contact with the screen, thin strips of "Era" manganese steel are bolted to it for protection against the action of broken stones. Each barrel, of different mesh, is not connected circumferentially to its neighbour, but is simply held in position by the grip of the four angle-bars. In the machine shown there is an outside ring for fine sifting. The arrangement is such that, while the screens are of durable metal, they can be instantly removed by unscrewing the bolt securing the angle-bars,—an operation which only occupies a few minutes.



Messrs. Hadfield are also manufacturing elevators and conveyors, and are using "Era" manganese steel for the links, pins, sprocket wheels, and other parts subject to great wear and abrasive action. They have made a large extension of their machine-shops for dealing exclusively with crushing machinery, conveyors, etc.; and the illustration below gives a view of one of the two bays devoted to this work. It accommodates a very complete installation of machine tools, the special feature, perhaps, being the large amount of grinding which is undertaken in connection with the application of "Era" manganese steel to the working parts of the machines. All the tools are driven by electric power. The illustration shows the erecting-shop, and suggests by the number of gyrating crushers, reciprocating machines, and screens, as well as conveyors, the extensive character of the production of the Hadfield Company in this new branch. It may be added that the well-known firm of gold-mining machinery makers, Messrs. Fraser & Chalmers, have adopted Hadfield's jaw-crushers and "Heclon" gyratory breakers for all their South African requirements.

The Hadfield Steel Foundry Co., Ltd., are among our valued advertisers and should do a satisfactory business through their Canadian agents, Messrs. Peacock Bros., of Montreal.

PERSONALS.

Mr. F. J. Thorpe, chemist to the Canadian Copper Co., has resigned his position.

C. J. Coll, manager of the Acadia Coal Co., has gone to England on a business trip. He will return about May 15th.

Mr. David Stewart, has been appointed assistant to general manager Cowans, of the Cumberland Coal and Railway Co.

Mr. H. L. Frank, president of the Canadian American Coal Co., has returned to Butte after spending some time at the mines.

Mr. R. E. Harris, the well known K.C., of Halifax, has been elected to the presidency of the Nova Scotia Steel & Coal Co. in succession to the late John F. Stairs.

Mr. John H. Plummer, president of the Dominion Iron & Steel Co., has much improved in health, and expects to be able to leave his sick room for a trip to France within a few weeks.

Mr. Alex. Dick, the general sales agent of the Dominion Iron & Steel Company, has been giving instruction and entertainment to the people of Sydney by a lecture on Scandinavia, with which he is well acquainted.

Mr. Horace Mayhew and Mrs. Mayhew arrived in Halifax on April 7th, on their way to Cape Breton. Mr. Mayhew is the president of the Cape Breton Coal, Iron and Railway Company, which is opening collieries at Broughton, C.B.

Mr. G. H. Duggan, 3rd vice-president of the Dominion Coal Co., was recently in Montreal in conference with President Jas. Ross. It is rumored that Mr. Duggan has been offered the general managership of the Mexican Light, Heat and Power Co. in Mexico City.

Mr. R. E. Chambers, manager of the Wabana Mines of the N.S. Steel and Coal Co., has gone to Cuba to look into the matter of leasing iron lands for the company. He is accompanied by two experienced subordinates whom he will leave in charge of exploratory work.

Mr. S. W. Gebo, of Frank, Alberta, has resigned from the management of the Canadian American Coal Co. and accepted the management of a coal property at Lewiston, Montana. Mr. Gebo is the pioneer coal operator of the Blairmore field, having been identified with the Frank Coal Company since its inception.

BOOK NOTICES.

Lake Superior Copper Mines.

The editor of the Daily Mining Gazette, of Houghton, Mich., has compiled a very interesting pamphlet, detailing the developments in the copper mining industries of Lake Superior during 1904. Mr. A. I. Carnahan begins at the south western end of the Keweenaw peninsula and (seriatim) enumerates the properties at which operations have been active during that year. The first mine mentioned is the "Bohemian," and the last "The Copper Crown." The pamphlet is most valuable to shareholders and to those specially interested in the metal.

The Investigation of Mine Air.

Messrs. Charles Griffin & Co., Ltd., London, have just brought out a neat volume on this topic which embraces four papers by well known authorities on the subject of mine air.

Dr. Otto Brunck, of Freiberg, introduces the matter by a concise and well illustrated paper on the analysis of mine air by simple methods. M. Léon Poussigne, of the Ronchamp collieries, follows with a paper on the measurement of air currents and estimation of fire damp at his collieries by a method little known outside of France. Dr. Haldane has a valuable paper on the examination of the air in mines, and his chapter on "Interpretation of Mine Air Analyses," which forms the bulk of his paper, supplies a want long felt by chemists who have the knowledge to make the analyses, but rarely the experience to interpret them. The final chapter is contributed by the late Sir Clement Le Neve Foster, and deals with the effects of the carbonic oxide which was liberated at the Snaefell Mine, in Wales, in May, 1897.

The editor is Dr. J. S. Haldane, who has done his work faithfully and well.

Ohio State Bulletins.

The State of Ohio has published recently three interesting bulletins dealing with the work of the topographical and geological surveys. The topographical mining is described by Mr. C. E. Sherman, inspector, while the geological branch is represented by Bulletins No. 2 and No. 3 on the use and manufacture of cement. The latter Bulletin (No. 3) is really a handbook, so complete and authoritative are its contents.

Department of Mines, Nova Scotia.

The Annual Report of the Department of Mines of Nova Scotia has grown very much in bulk during the last half dozen years, reaching for 1904 about two hundred pages. We are glad to also be able to say that it has also very much improved in quality and interest. The introduction of line drawings and illustrations has made the reports more valuable to professional men, and more understandable by the miner. If there is a point upon which criticism may be expressed it is that the inspection reports are too much in the nature of mere catalogues of what has been done, and too chary of comment upon the same. Upon this question, however, there may be a diversity of opinion as to the propriety of governmental criticism, but there should be no question as to the value of such criticism to the province. The supplementary papers of Mr. D'Arcy Weatherbee, the Engineer of the Department, lend additional interest and are of value.

Manual of Mining.

Messrs. John Wiley & Sons, New York, have brought out a fourth edition of Magnus C. Ihseng's "Manual of Mining," which has about 150 pp. and 75 illustrations more than the third edition. Four editions in fourteen years is not a bad criterion by which to estimate the value of a technical work, and we wish that we could say that the quality of the publisher's work had kept pace with the demand from the reader. But in looking carefully through the work, the antiquity and worn character of some of the illustrative cuts is only too apparent; this is more particularly noted in those illustrations which have been used in catalogues of mining machinery manufacturers.

In Part II, which occupies 193 pp. out of 737, "Practical Mining" is considered, and the bulk of this part is accredited to Mr. E. B. Wilson. As a "Manual—for Students and Mining Men," it is noticeable that there is no chapter nor reference to methods of alluvial mining, hydraulicking or dredging, with which the western United States are so much concerned. It is an omission which is a serious one, in view of the title of the book.

The bulk of the work, some 400 pages, is really devoted to the engineering portion of mining work, the methods of generating and utilizing power for the various necessities of rock mines, and as such is a most valuable book for the young engineer. For the more experienced engineer it is worthy of a place in his library for reference, but it will not be used as much as other books which should be on his shelves.

The Mechanical Engineering of Collieries.

The Colliery Guardian Co., of London, have published in book form the articles on mechanical engineering of collieries, by J. Campbell Futers, which have already appeared serially in the columns of that paper. The present book, which is Volume I., contains the chapters on Boring, Sinking, Surface Plant, Headgears and Shafts, which have been printed, and the chapters now appearing on Winding, Heapsteads, Screening and Washing will constitute Volume II. It is proposed to include the subjects of Pumping, Haulage, Coking, Locomotives, Railways, Shipping Machinery, Electricity, Boilers, etc., etc., in the additional volumes which are promised by Mr. Futers.

The work is an endeavor to rewrite and bring up to date the late Mr. C. M. Percy's work on the same subject. The presswork, cuts, type, etc., of this volume is most excellent, reflecting great credit on the capacity of the printers (The Chichester Press), and the price asked, seven shillings and sixpence per volume, equivalent to \$1.80, is remarkably low for so thoroughly illustrated a book. The difference in the quality of the work between this volume and Mr. M. C. Ihseng's Manual of Mining is noteworthy.

INDUSTRIAL NOTES.

The Dominion Coal Company recently placed an order with Allis-Chalmers-Bullock, Limited, Montreal, for eleven New Ingersoll Coal Cutters. The company had already 175 of these machines in operation.

The Sullivan Machinery Company, of Chicago, announces the establishment of a new branch office in Salt Lake City, Utah, Room 128, Keith Building, Mr. John C. Taylor, formerly of the Denver office, manager.

The South Side Elevated Railway Company, of Chicago, has contracted with the Westinghouse Electric & Manufacturing Company for complete equipments for seventy cars, which includes one hundred and forty 75 h.p. motors, and multiple control apparatus. The motors are of special design and are in line with the re-equipment of this system. The cars will be operated in trains of five, three of which will be motor cars.

The Allis-Chalmers-Bullock Co., of Montreal, have issued a new catalogue (No. 81) of rock drills and mining machinery built in Canada by that firm. The typographical work is of a most excellent quality, and the contents valuable to the practising engineer and purchaser. Each year notes improvements in trade catalogues, until now such literature constitutes one of the assets of an engineer's library, this catalogue is in every way worthy of a place in such a library.

The authorities of McGill University, Montreal, are aware of the importance of keeping their students in the Science Courses informed upon the latest advances in the manufacturing world. For that purpose the leading specialists in different branches are invited from time to time to address the students. Mr. H. A. Burson, B.A., Sc., Chief Electrical Engineer of Allis-Chalmers-Bullock, Limited, has just completed a series of addresses upon Induction Motors, of which the Company makes a specialty.

The Wellman-Seaver-Morgan Company, with main office and works at Cleveland, Ohio, announces that Mr. Geo. B. Damon, who has been manager of their New York office, has been transferred to an important position in connection with the Engineering and Sales Department at Cleveland, Ohio, and that Mr. W. A. Stadelman, for the past ten years manager of the eastern office of The Brown Hoisting Machinery Company, has become the manager of the general eastern office of The Wellman-Seaver-Morgan Company, with offices at No. 42 Broadway, New York City.

The Westinghouse Electric and Manufacturing Company have recently had the following orders: The Alliance Machine Company and the Morgan Engineering Company, both of Alliance, Ohio, last week placed orders for a total of 120 crane motors with an aggregate of 2,000 horse-power. They vary in size from 1 to 100 horse-power. The Pennsylvania Railroad Company on the same day contracted for 20 induction motors to be added to their present motor equipment, and the Bethlehem Steel Company entered an order for direct current motors to be used in their mills.

The Morris Machine Co. has issued its 1905 catalogue. This well-established corporation has had for forty years an enviable reputation for the quality of its pumping machinery and engines. Its works at

Baldwinsville, New York, cover a very large extent of ground, and every machine sent out is guaranteed by a guarantee which has value behind it. Of special interest to the mining fraternity are the horizontal centrifugal pumps for high lifts, and the dredging pumps for handling sands and gravel, auriferous or otherwise. The catalogue is recommended to engineers having need of pumps.

The number of orders received by the Westinghouse companies for steam turbines and turbo-generators is convincing evidence of the firm belief which engineers place in this class of apparatus as a source of power.

Three of these outfits have recently been ordered by the Public Service Corporation of New Jersey, one having an output of 500 kw., and two with ratings of 1,000 kw. each. There is also a 1,000 kw. turbo-generator building for the Indian Orchard Company, and a 400 h.p. induction motor with starting device, and two 300 kw. transformers. Westinghouse, Church, Kerr & Company are the designers and engineers for this station.

The Canadian Rand Drill Company has favored the Review with its catalogue C on air and gas compressors, which is, like the Allis-Chalmers-Bullock publication, worthy of place in every engineer's library. This booklet on compressors epitomizes a treatise on the compression of gases, and the construction of the machine, which is most valuable for ready reference. The matters of valves, both inlet and outlet for air, the gear for the same, of frames, intercoolers, and governors are clearly dealt with. There is also an exceedingly clear and valuable chapter on foundations for air compressors and on their erection. A chapter which will be of value to our Western friends deals with the question of air compression at great altitudes, a matter of which many engineers are heedless. The get-up of the book is most creditable, and it will be furnished to any engineer upon request to S. W. Duggan, advertising manager, Montreal.

The Allis-Chalmers-Bullock Co., of Montreal, have recently built and put into successful operation at Maisonneuve the largest frequency changer ever built. This is to transform the current sent to Montreal by the Shawinigan Water & Power Company, as the current from the Shawinigan Falls is a 30 cycle current, and it is necessary to change this to 60 cycles for the use of the city. The total length of the frequency changer is 30 feet, and the motor and generator each stand 15 feet high; the total weight is half a million pounds, the motor and generator together have 30 poles, which have a gross weight of 48,000 pounds, and revolve 300 revolutions per minute. The work of erecting this heavy machinery was entrusted to Mr. Thos. J. Mullin, the Constructing Superintendent of Allis-Chalmers-Bullock, Limited, and the total time consumed was only thirty-one days.

Mining Share Market.

The only mining shares for which there is any demand are St. Eugene, Canadian Gold Fields Syndicate, Centre Star and War Eagle. The two former are being quietly bought on the reported good showing being made by the first, and many people think the position of the two latter will be improved after the amalgamation with the Le Roi companies.

Industrials continue active, and all show gains. Prospects for these companies are bright, the money market is easy, and speculation on the increase.

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

Par value of shares	Asked.	Bid.
.10 Canadian Gold Fields Syndicate . . . . .	.05 1/4	.05
5.00 Cariboo Hydraulic	—	—
1.00 Centre Star . . . . .	.23 1/2	.22
1.00 Deer Trail Consolidated . . . . .	.02	—
1.00 Giant . . . . .	.03 1/2	.01
10.00 Granby Consolidated	6.50	6.00
10.00 Montreal and Boston	1.00	.87 1/2
1.00 North Star . . . . .	.02	—
1.00 Payne . . . . .	.02	.01
1.00 Rambler Cariboo . . . . .	.15	.12
1.00 Republic . . . . .	.03 1/2	—
1.00 St. Eugene . . . . .	.48	.47
1.00 War Eagle . . . . .	.13	.12
1.00 White Bear . . . . .	.04	—
100.00 Nova Scotia Steel (common)	64.50	64.25
100.00 Ditto ditto (preferred)	—	—
100.00 Dominion Coal (common)	80.50	79.25
100.00 Ditto ditto (preferred)	—	—
100.00 Dominion Iron and Steel (common)	24.25	24.00
100.00 Ditto ditto (preferred)	69.50	69.00
— Ditto ditto ditto (bonds)	85.75	85.25

MINING NOTES.

NOVA SCOTIA.

The March shipments from the collieries of the Cumberland Railway and Coal Company at Springhill, N.S., amounted to 37,443 tons.

The yield of the Nova Scotia and Mexican Co., operating in Sherbrooke district, was \$3,568 for the month of February.

The temporary troubles at Springhill, which at first threatened to be serious, have been satisfactorily adjusted by manager J. R. Cowans.

The Dominion Coal Co. will double-shift No. 5 colliery, and probably two others, this month in order to increase the output.

The Joggins mine and property, sold last month to Mr. Stuart Jenks, is to be reorganized and reopened.

The blast furnace at Londonderry which was blown out for repairs on March 8th is to go in blast again on May 1st.

The price paid for the Coxheath copper mines, sold in March to Joseph A. Gillies, was \$30,000. Over \$200,000 had been expended on the property by the old Coxheath Copper Co.

The Dominion Iron and Steel Company have submitted tenders to the Intercolonial Railway for 10,000 tons of steel rails, which will be required during this year.

The Royal Oak Mining Co., of Goldenville, N.S., produced 288 ounces of gold, valued at \$5,472, from 615 tons during January and February, an average return of about \$9.00 per ton.

Several large tourist parties are to visit Cape Breton this summer, being attracted by the tremendous increase in business which has facilitated conveniences for travelling.

The offering of new stock in the Robb Engineering Co., in Nova Scotia, has been very largely over subscribed. Shares in this company are a preferred investment among Nova Scotians.

Negotiations are under way with the Standard Chemical Co., of Toronto, for the establishment of a branch of that concern in Halifax to manufacture wood alcohol, acetate of lime, creosote, etc.

Springhill, N.S., reports that on the night of March 30th, thousands of small fish (minnows) were found in the snow on the Park, and ascribes the occurrence to a cloud coming from southern seas.

The Dominion Coal Co. began its shipments to the St. Lawrence, through the port of Portland, Me., and the Grand Trunk Railway, on the 23rd of March with the SS. Louisburg, which carried 2,100 tons.

The district of Seal Harbour, near Isaac's Harbour, in Guysboro' County, is experiencing renewed interest. A lode, locally called "Donkins," has been uncovered, which shows a width of 16 feet, and a payable value.

The Nova Scotia legislature has struck out from the bill regarding the transfer of the Joggins mine a clause providing that arrears of wages to workmen, amounting to \$5,000, shall be a lien on the property under its new owners.

Mr. Alex. Dick, general sales agent of the Dominion Coal Co., reports prospects for the year 1906 as very promising, the demand is strong and prices are good. The season opens April 15th and the large fleet of steamers will be very busy until close of navigation.

The iron deposits of the Nictaux region, round Torbrook, N.S., are receiving attention from both the Londonderry Iron Co. and the Nova Scotia Steel and Coal Co., both of which corporations have men in the field prospecting the ground upon which they hold options.

The billet mill of the Dominion Iron & Steel Co. closed down on the 23rd of March for a week to make repairs to the foundation which had settled out of line. The business of the company is steadily increasing, and there is no doubt as to the steady output of rails beginning with June 1st.

The Nova Scotia Steel and Coal Co. are putting in a double-decked cage at No. 1 colliery, and are making additions to the plant at other collieries with the intention of raising 650,000 tons of coal during 1905. This would be an increase of nearly fifty per cent. over the output of 1904. The market and conditions justify the expectations of the management.

The Nova Scotia Steel and Coal Company will remove some of the blast furnaces at Trenton to North Sydney during the summer, but there will be no curtailment of the steel capacity at Trenton. The move is dictated for reasons of economy in handling the iron ore from Newfoundland, and in anticipation of the large increase in business which is steadily coming in.

The Cape Breton Coal, Iron and Railway Company is pushing work at the Broughton colliery. Two large compressors have arrived from Walker Bros., of Wigan, England, and two Capell fans. The foundations for the batteries of Babcock & Wilcox boilers are down, and houses are erecting for the workmen. The steel bankhead and revolving tipplers are being put in by a Pittsburg firm. The mine is working double shift, and two slopes are being opened.

Dominion No. 3 colliery closed on April 1st for two weeks to make improvements on the plant. The colliery will resume again on April 17th. The haulage is to be extended for 400 feet, the bankhead is to be lowered ten feet and a new haulage engine is being installed. New roads are also being railed, and a new picking belt and weigh scales will be put in. The new equipment will provide for an output of 1,800 tons a day, which, in view of the long haulage system at that colliery, will be a large output.

The Sydney Cement Company, with a capital of \$500,000, has selected ground for the site of its works close to the Dominion Iron and Steel Company's blast furnaces. The proposal is to make cement from iron slag. Mr. C. J. Curtis, of New York, has received the contract for the construction works, and has already broken ground; under contract conditions the plant is to be finished by August 1st. The rated capacity is 500 bbls. a day. The company has been granted exemption from local taxes, and a bonus of \$10,000 by the City of Sydney.

The March output of the Dominion Coal Co. was as follows:—

Dominion No. 1.	83,277 tons.
" No. 2.	65,850 "
" No. 3.	21,748 "
" No. 4.	45,081 "
" No. 5.	46,552 "
" No. 7.	8,565 "
" No. 8.	7,692 "
Total	228,765 "

NEW BRUNSWICK.

At a shareholders' meeting, held at Moncton on the 6th of April, the sale of the property of the Petroleum Oil Co. to an English syndicate was confirmed. The capital of the new company will be £650,000, of which £168,000 (in shares) will be paid for the property and £200,000 put in the treasury for development; of this £200,000, £100,000 is to be sold at once for cash working capital. The sum of \$50,000 in cash has been put up as a forfeit.

QUEBEC.

Mr. Peter McKenzie, of the McKenzie Trading Co., left about March 25th, with a force of twenty-five men, to begin mining work on Lake Chibougamoo, in northern Quebec. Mr. McKenzie took in a complete outfit for prospecting and assaying, and is accompanied by his sons, one of whom is a competent assayer.

ONTARIO.

The Grace mine has completed the installation of its plant.

The Canadian Copper Co. has appointed Mr. George Silvester to the position of chief engineer.

The Copper Cliff equipment is to be supplied with current from the Huronian Co. at High Falls.

The Honor Bright Company, in the Eagle River district, has let a contract for the development of its property.

The matte shipments of the Canadian Copper Company for March were the largest in the history of the company.

Mr. M. A. Meyers has offered to compromise, or settle the suit of Charles Bollensen by returning Mr. Bollensen's notes.

During the month of February the United States received from Ontario mines 64,506 pounds of copper and 54 tons of ore.

The Eldorado mine of the Northern Light Mining Co., reports the discovery of an additional body of high grade ore at the 133 foot level.

The Creighton mine is to be equipped with a new machinery plant, all of which is to be driven by electric power supplied from turbine.

The Canadian Northern Coal and Ore Dock Co., Ltd., has been incorporated to do a general coal trade, transportation, lumber and grain business.

The new boiler for the Little Master property on Summit Lake has been successfully transported from Wabigoon across the ice to its destination. It weighed six tons.

The Soo Company is now turning out daily over five hundred tons of rails. The largest output of any one day was during the first week in April, when the amount reached 567 tons.

The new manager of the Black Eagle mine on the Lake of the Woods is Mr. C. E. Hillary, who is not to be confused with Mr. N. T. Hillary, of Sudbury. Both are Englishmen.

Mr. D. D. Mann is authority for the statement that the James Bay Railway will be completed to Parry Sound by the first of September, and will be in Sudbury by the first of January, 1906.

Mr. Adams Dawson of the Canadian Copper Company, who has had charge of the construction work at Turbine, where the new power houses are located, has completed that work and returned to Copper Cliff.

Construction work on the coal dock of MacKenzie & Mann, located between Fort William and Port Arthur, has begun and the dock will be completed by September. The capacity of the dock will be about 200,000 tons of coal.

The Trethewey property on J. B. 7 in the new Cobalt-Silver district, recently afforded a mass of metallic silver weighing 80 lbs., of which 700 ozs. are metallic silver worth \$350. The mass measures 25 inches by 12 inches by 2 inches.

The No. 2 mine of the Canadian Copper Co., after being closed for two years, has again been opened, and is now being equipped with electric machinery for pumping and hoisting. The allotted capacity of the mine has been put at 300 tons per diem.

The Union Drawn Steel Co., of Beaver Falls, Pa., has established a branch works at Hamilton. The branch has been incorporated under Canadian laws and will have a capital of \$150,000. It will operate under the name of the "Canadian Drawn Steel Co."

The Sultana mine continues its weekly shipments of bullion to the Imperial Bank at Rat Portage. The clean up for the week ending April 1st amounted to 126 ounces. This sum was obtained from quartz met with in development and no stoping is, as yet, doing.

Rumours are stronger every day that the United States Steel Corporation will locate a plant somewhere in Ontario. The position of the works will be either on Lake Erie or on the Detroit River. Both Sarnia and Port Colborne are mentioned as likely places.

Reports from the Canadian Northern Railway state that plans for the iron furnace at Port Arthur are being prepared by Chicago engineers. It is expected that work of construction will shortly begin, and as soon as that starts the deposits at Atkocan will be opened up.

The Baden-Powell property, owned by the Northern Light Mining Co. has recently had a stamp mill erected on its property. Air compressors have also been installed, and the company propose to push work vigorously as soon as the damage occasioned by the recent fire has been repaired.

A deputation of gentlemen interested in the new Temiscamingue country and headed by Major R. G. Leckie, of Sudbury, waited on Premier Whitney last week to request that East Nipissing be created a mining district, that better enforcement of the mining regulations might be had.

The Laurentian mine in the Manitou district is to have a summer road, and be independent of water communication. The 20-stamp mill on the 20th Century property is to be moved to the Laurentian. The Laurentian is on H W 371, about one mile from the town of Gold Rock on Manitou Lake.

An Italian employed by the Massey Station Mining Co., Ltd., was recently killed in an inexplicable manner. He was working on the fourth level, but in some way unknown he fell into the skip road and dropped a distance of eighty feet. His body was wedged between the skip and the foot wall, and after its recovery death ensued.

Messrs. McKenzie & Mann have purchased from Messrs. Bolckow, Vaughan & Co., of Middlesboro, England, 20,000 tons of rail for delivery to the James Bay Railway. The delivery is to begin in May. The reason assigned for this importation is that the Canadian mills rolling rails are unable to supply on such short delivery notice.

The district round Eagle Lake will have considerable activity this season. The Baden-Powell property, which suffered the loss of its mine buildings through fire in February, has rebuilt the structures and will resume sinking. The Eldorado mine will install a compressed air plant, and the Pioneer Island mine will sink by contract work.

The Rathbun Co., of Deseronto, Ont., is selling out its various branches in Ontario. This company for years has been one of the largest marketers of American coal and has done a very large and profitable business. The object is stated to be, not retrenchment but devotion to the larger interests of the company in their iron and steel works, cement plants and transportation companies.

The extension of the Ontario Northern Railway to the north towards Lake Abitibi is attended with fresh discoveries of rich ores near Tom's Town, the end of construction at the present time, which is about twenty-five miles north of Halleybury; a deposit of cobalt-silver has been met, and to the east of this town, a distance of about seven miles from it, marcasite richly impregnated with gold is reported.

An echo of the old Bullion Mining Company, promoted some six or seven years ago in Montreal and Toronto by the Honourable Robert Rogers, has been noted in a judgment recently given out by Justice Tectzel. The company brought action against Sir Richard Cartwright on a bill of exchange accepted by the defendant, but the Justice dismissed the claim on the ground that the second company formed from the first incorporation had never worked the mine, and that, therefore, there was no real consideration for the amount paid.

The annual report of the Bureau of Mines was presented to the Ontario Legislature on Friday, the 7th inst. From it are taken the following figures.

The total value of the metallic production for 1904 was \$5,321,677; of the non-metallic production, \$6,665,970. The metallic production was as follows:—

Gold	\$40,000
Silver	111,837
Platinum	10,452
Palladium	18,564
Cobalt	36,620
Copper	297,126
Nickel	1,516,747
Iron (ore)	273,068
Iron (pig)	1,811,664
Steel	1,188,849
Lead (ore)	11,000
Lead (pig)	2,500
Zinc (ore)	3,700
	<hr/>
	\$5,321,677

BRITISH COLUMBIA.

The Providence mine has cut the vein on the 400 feet level.

The Golconda in Dearwood Camp has started operations.

It is reported in Slocan Lake that the old Galena Farm property is to be reopened.

Mr. W. S. McDonald has resumed work on the Moonshine claim, near Anaconda.

The output of the Boundary mines for the first quarter of 1905 was 225,000 tons of ore.

The total shipments from Rossland for the first quarter of the present year amounted to 88,026 tons.

The Granby Company is now charging four furnaces by the aid of the new automatic electrical charger.

The trail to the Spy Glass property is still blocked, and operations cannot be resumed until it is opened.

The shipment records for the week ending March 25th, were the largest in the history of the Boundary district.

The winze from the ninth level in the Centre Star has encountered ore of a good grade, but its extent has not yet been determined.

D. J. McNally, of Nelson, B.C., has installed at the Wilcox mine the ten stamp mill, which was formerly on Lemon Creek, Slocan Lake Division.

The Fulton Iron Works, of San Francisco, have received the contract for the erection of a hot blast furnace for the Iron Mask mine, at Kamloops.

The Reco mine in the Slocan declared a March dividend of \$19,164, amounting to two per cent. The total dividends paid by the Reco to date amount to \$326,246.

The Le Roi No. 2 has decided to lengthen its shaft from the present depth of 900 feet to the depth of 1,450 feet, so as to connect with the workings of the Le Roi mine.

Late reports from the Tye Copper mines are not very encouraging, the developments below the 200 foot level having failed to prove the existence of new ore bodies.

The outputs of the Hewitt and of the Emily Edith mines, in the Slocan, are being shipped to the Hall smelter. The ore is a zinciferous galena requiring concentration.

The Velvet-Portland has resumed operations to the extent of pumping out the mine. When the mine is free of water, about fifty men will be employed for the present.

The smelting works of the Granby Consolidated Mining and Smelting Company reduced 596,253 tons of ore during 1904. Of this amount 549,703 tons came from the company's mines.

Representative Gallihier reports that Dr. Robert Bell intends to secure the services of Prof. R. W. Brock for the making of a structural geology map of Roseland this season.

Machinery for the enlargement of the plant at the Granby works has arrived, and it is hoped by the company that two new furnaces will be in operation in the month of July.

The Granby mines are shipping an average of 1,000 tons a day to the smelting works. When the two new furnaces are completed it is expected that the output will reach 1,500 tons.

The gold veins of Forty-nine Creek have again received the attention of inexperienced capitalists, in the shape of some United States people who have purchased three claims owned by Joseph Duhamel.

Some owners of property in Lardeau are endeavoring to secure eastern capital with which to utilize the water power of the Fish River, about one and a half miles from Camborne, for electric power purposes.

During the night of March 11th the tipples, stable and one power house of the Coal Creek colliery of the Crow's Nest Company were destroyed by fire. The loss in money is put at \$200,000 and in time at four months.

The "Boston News Bureau" is authority for the statement that the Granby Company is producing its copper for eight cents a pound. We fancy that some of our western smelter men will take issue with that statement.

The Canadian Smelting Works, at Trail, have demolished the last of the furnaces built by Mr. F. A. Heinze for smelting copper-gold ores. The furnace to be erected in its stead will have a capacity of 350 tons of ore per diem.

The Yankee Girl mine, in Ymir district, claims a discovery of nickel ore of commercial importance, and reports that a trial shipment will be made to the Canadian Copper Co. at Sudbury. The ore is reported to average five per cent.

The returns on Arlington mine ore sent to the Hall smelter, at Nelson, during the month of February, amounted to 837 ounces of gold, 1,635 ounces of silver, and 19,000 pounds of lead; the average value in gold was \$57; in silver, \$2.80 per ton.

Development work going on at the coal mines near Enderby, in the Okanagan Valley, is very encouraging. The seam has been found to be twenty feet thick, interseamed with small layers of fire-clay running from two to three inches in thickness.

The Wellington Colliery Company, of Vancouver Island, was obliged to close in March for a short time, because of having no space in which to put the coal which had been mined. There has been a deficiency of hulls for the transportation of coal for some time.

Superintendent Stewart, of the Centre Star and War Eagle mines, is earning a well merited reputation as an economist; he has cut down the expense of mining, and lopped off unnecessary labor to such an extent that the mine profits should be largely increased.

During the month of March the St. Eugene mine, in East Kootenay, shipped the largest amount of ore in its history. 3,700 tons of concentrates were shipped, from nearly 15,000 tons of ore mined. Of the production, 3,100 tons were shipped abroad, and 600 tons were sent to the home smelters.

The gold district centering round Camborne, in the Lardeau, promises considerable development during this season. The Imperial Mining & Development Company, in driving a cross cut, have opened up fifteen feet of mineralized material, one wall of which is reported to show free gold in large amounts.

The Bonnington Falls Company, known as the West Kootenay Power & Light Company, have made large contracts with Boundary consumers for the supply of electricity. The Power Company will develop an additional 20,000 horse-power from the upper rapid at Bonnington Falls. It is proposed to have the new power carried to Boundary at a voltage of 60,000.

The Ottawa mine, in the Slovan district, has developed a new ore chute during the last few weeks. This new chute contains six inches of high grade silver-lead ore, and it was found on the west vein, which is now called the "Noble" vein. The chute was cut at a depth of about 100 feet from the surface, and assay values are reported to run as high as 850 ounces of silver to the ton.

The St. Eugene Consolidated Mining Company has a deficiency of air compressors in its plant, and has therefore ordered a 30-drill compressor from the Jenckes Machine Company, Sherbrooke, Quebec. This

machine is to be shipped, installed and in running order by the first of August. This additional equipment will provide air for 50 drills, there being now in use compressor capacity for 20 rock drills.

The Coal Creek Colliery of the Crow's Nest Pass Coal Co. has erected a temporary tittle to replace the one burned on the 11th of March. It is hoped that the regular output will be resumed by means of temporary tipples before the close of the present month. The new tittle will probably be constructed of steel, and the total amount of estimated expenditure required to replace the structure burned will come to the sum of \$200,000.

The Consolidated Montreal & Boston Company's affairs are still under discussion by the shareholders. Mr. Samuel Newhouse, of Colorado fame, is reported to have sent his expert to the property to make an exhaustive examination, with the intention of securing control. Since publicity was given to the affairs of this corporation by the court proceedings in New York City, the original underwriting syndicate has evinced no desire to continue in control of the property, but has shown a willingness to surrender, if necessary, the large block of stock which it holds.

The Skylark Development Company took over the Skylark mine in November, 1904, and since that date has operated the property so successfully that all expenses of mining and marketing have been met, payments amounting to \$6,000 have been made, and there remains a substantial cash balance in the treasury. The ore of the Skylark is high grade; in 1893 shipments returned from 150 to 300 ounces of silver and three-quarters to one ounce in gold per ton. To-day the first-class ore yields from \$125 to \$140 per ton; second-class, from \$35 to \$40 per ton. The Granby and Nelson furnaces get the output.

A new company has been organized to operate in the Atlin district by the use of the steam shovel for mining operations, which will be known as the Northern Mines, Limited. Owing to the scarcity of water in Atlin for the operation of hydraulic works, the promoters of the company have believed that equivalent effects can be obtained by the use of the steam shovel. The operations will be commenced on Spruce Creek, upon which it is now claimed returns have been obtained, running from \$2 to \$10 per cubic yard. The prospectus states that the estimated cost of the first steam shovel, installed and ready for operation, will be \$16,000, but it is doubtful if this sum will provide for the complete outfit. The company is unique in its modest capital, which is only \$50,000. Its managing director is Mr. A. H. Bromly, an engineer who is well known in British Columbia, and it also has the services of Mr. R. D. Fetherstonhaugh as superintendent.

NORTH-WEST TERRITORIES.

McLeod Bros., of Blairmore, have secured the contract for supplying mine timbers to the Canadian American Coal Co.

The mines at Bellevue are shipping about three hundred tons of coal daily. Two tipples have been completed with tracks for forty cars. Almost the whole output is taken by the C. P. R.

The Lille collieries are installing a large tittle at No. 1 mine. It is to handle 2,000 tons of coal a day, and will therefore be one of the large tipples of Canada. The shaking screens, picking tables and automatic dumps are now being put in place.

Reports from Frank, Alberta, are to the effect that the new zinc furnaces, now under construction by the Canadian Metal Company, will be of quite a different type to the gas-fired furnaces used in Belgium. The stacks are low in height, and will be notable as the first of their kind in this country.

YUKON.

The total amount of dust from 40 Mile in 1904, amounted to 13,071 ounces, or about \$270,000.

The Syndicat de Lyonnais has ordered a dredge from the Risdon Iron Works, San Francisco, to be placed on Sixty Mile River.

Some 80 to 100 men are at work on Chicken Creek, a tributary of 40 Mile River, and an equal number on Wade Creek. These two creeks put out \$200,000 last year.

The great activity on Quartz Creek, which has previously been noted in these columns, is still maintained. There are from 300 to 350 men at work on the creek.

A ledge of gold-bearing quartz is reported to have been found on Woodchopper Creek, twenty miles below Charley River. Some of the quartz has been taken to the Government mill at Dawson for testing.

Claim 71 A below, on Hunker Creek, has suffered damage through the burning of its surface works. The claim was equipped with a large boiler and pump, and a 15 H.P. hoist. The fire occurred through carelessness.

The Canadian-Klondike Company, one of the largest holders of territory in the Yukon (having acquired the celebrated Boyle Concession), has ordered a large dredge, to be built in sections, on the "Knock-down" plan. This is to be put together on arrival in the northern territory. This order has been placed with the Marlon Steam Shovel Company, of Marlon, Ohio, and it is hoped that the dredge will be in place and ready for operation some time in August.

The new member for the Yukon, Dr. Thomson, is urging a number of propositions upon the Government, looking to the furtherance of mining interests in the Yukon. Among the matters suggested are, a reduction on free miners' licenses; a remission of royalties for ten years on copper and gold obtained from quartz mines; enlargement of discovery claims from 500 to 1,000 feet, and of ordinary placer claims from 250 to 500 feet. An hydrographic survey of the Indian and Klondike Rivers has also been asked for.

Officials of the White Pass and Yukon Railway report that they are likely to have as much business as the road can handle during the season of 1905. The very large amount of material needed for the Klondike Mines Railway will be brought in by the White Pass Road, also the large dredges and heavy tonnage hydraulic piping which have been contracted for by the Detroit-Yukon Company, and several other companies, who are expecting to complete their plants during the present season. The railway will build a number of large barges this year for the towage of freight.

ASBESTOS NOTES.

The following tables show the shipments of crude asbestos, fibre and "asbestic" and sand over the line of the Quebec Central Railway for the years 1903 and 1904:—

	1903.	1904.	Increase.	Decrease.
	Tons.	Tons.	Tons.	Tons.
Crude asbestos	2,928	3,990	1,062	...
Fibre asbestos	21,939	21,526	.....	414
Sand and asbestic	5,132	7,577	2,455	...
Totals	29,999	33,092	3,517	414

COAL NOTES.

The International (Dom. No. 6) has put in a new hoisting engine.

The Dominion Coal Co. is erecting a general store and twenty-five dwellings at Dominion No. 6.

The Dominion Coal Co. is extending its Halifax wharf to permit of the erection of coal pockets thereon.

The winter shipments from Louisburg Pier have been steadily maintained. During the first week in March four steamers (for Halifax, St. John and Boston) were loaded and despatched.

The year 1905 promises to be the best that the Crow's Nest Pass district has ever seen. The demand for both steaming and coking coals is steadily increasing and is inducing the present companies to provide for largely increased outputs.

The proposed reorganization of the finances of the Dominion Coal Co. is meeting with approbation on all sides. In addition to reducing the yearly amount of fixed charges, the plan proposed will provide sufficient surplus to clear off the company's floating debt.

The Gowrie and Blockhouse Co. have repaired its pier, pushed work ahead of the narrow places in the seam and is now in good shape to supply coal at the opening of navigation. The six foot seam has been cut by the borehole at a depth of about two hundred feet; a new hole will be started nearer the crop of the seam.

The output and shipments made by the Dominion Coal Company, Ltd. for the month of March, 1905, were:—

Colliery.	Tons.
Dominion No. 1.....	33,277
" No. 2.....	42,450
" No. 3.....	21,748
" No. 4.....	45,081
" No. 5.....	46,552
" No. 7.....	8,565
" No. 8.....	7,892
" No. 9.....	23,400
	228,765

Total shipments for the month of March..173,595

The Dominion Coal Co. have decided to install a number of shearing machines with the object of securing larger coal. The shearers are of English make, and are known as "Little Hardys"; they cut a slot about three inches in width from roof to floor after the under cut has been made, thus requiring a smaller amount of powder for the blast and ensuring a less amount of "smalls."

The enormous growth of the business in coal is illustrated by some figures obtainable from the records kept in the United States. From 1885 to 1895 there was an increase in production of 81,000,000 tons, from 1895 to 1905 the increase was 177,000,000 tons. Should this increase be maintained during the coming decade, the year 1915 will see the enormous output of 542,000,000 tons of coal. These figures take one's breath away.

THE WORLD'S PRODUCTION OF COAL.

	Total World's production.	By United States.	Per cent.
	Million tons.	million tons.	
1870	213.1	32.9	15.4
1875	275.4	46.7	17.0
1880	330.3	68.0	20.6
1885	399.8	99.2	24.8
1890	503.3	140.9	28.0
1895	575.1	172.4	30.0
1900	755.4	240.8	31.9
1901	777.4	261.9	33.7
1902	788.9	269.3	33.9
1903	864.1	319.1	36.9

—Coal Trade Journal.

Annual Report of the British Columbia Copper Company.

At the general meeting of the company, held in New York, in February, the report of the directors and the balance sheet as at the close of business, November 30, 1904, were submitted. The audited statement of accounts was for two years. The directors' report was as hereunder:

Since your last annual meeting your company has operated its two furnaces with fair regularity with ore from your own mines and with some custom ores from neighboring mines valuable to our own as fluxes.

The development of your mines has been favorable, and you have quite as much more in sight and proven as at the time of the last report submitted to you.

Up to this time the net earnings have been variable, but, barring accidents, we anticipate more regular and improving results.

Our converter plant has been in operation for some time, and has proven to be of material benefit in enabling us to ship blister copper 99 per cent. fine instead of matte carrying 45 per cent. copper.

The large accumulation of flue dust made a briquetting plant absolutely essential, and is now being installed, and will be in operation shortly. The extraordinary cold weather prevailing has delayed its completion.

We have equipped our whole plant for operation by electricity as motive power, and we have also installed an electric locomotive and system for the economical handling of our slags.

We have had some serious obstacles to continuous operation of our plant, besides some unavoidable accidents during the past two years, yet we believe that our costs of mining, smelting and converting will compare with any similar plant.

The company has disposed of 73,259 shares of treasury stock during the two years aforesaid, and has expended upon additions to the plant and in acquiring new mining interests in the same period, \$320,780.

The company has also recently obtained interests in options on important properties in our region believed to carry good copper values, the ores of which can be cheaply mined and reduced.

We purpose doubling immediately our blast furnace capacity.

The statement of assets and liabilities is as under:

Assets.	
Mining property, mines, smelter building, machinery, real estate, etc.	\$1,580,780.90
Greenwood City debenture bonds	3,600.00
Accounts receivable	53,282.25
Finished products, supplies, ores, etc., on hand	122,947.69
Cash on hand and in banks	18,817.82
Total	\$1,779,428.56
Liabilities.	
Capital stock, authorized issue, \$2,000,000.00, issued.....	\$1,576,750.00
Accounts payable	110,106.76
Bills payable	3,650.00
Surplus earnings for two years	88,921.80
Total	\$1,779,428.56

Digest of Recent Patents; Mining and Metallurgical.

CANADIAN.

March 7, 1905.

784,502.—Magnetic Ore-Separator. Lewis G. Rowand, Camden, N.J., assignor to Wetherill Separating Company, a corporation of New Jersey. The combination of a conveyor-belt adapted to convey the material to be treated, of magnets above and below said belt, the pole-pieces of opposite magnets being in proximity to the conveyor-belt, the upper magnet having the stronger magnetic field.

784,105.—Dumping-Car. Walter R. Cliffe, Harrisburg, Pa. The combination of a car, a tilting car-box, having a discharge-opening, a movable door closing and opening, arms pivoted to the car-box and connected with said door, a bell-crank lever connected to the car-box and co-acting with the door, whereby the movement of the car-box opens the door, a hand-lever suitably supported, and pivoted connections between said hand-lever and the car-box, whereby the movement of the hand-lever tilts the car-box to dump the same and simultaneously open the door.

784,146.—Machine for Concentrating Mineral Ores. Gaylen R. Duncan, Three Rivers, Canada, assignor of three-fourths to Drummond, McCall & Co., a firm. The combination of a pulp-feed, a wash-water supply and a dropping-pan adapted to supply a shower of drops of water upon the stream of wash-water and the material which has settled on the surface of the machine beneath the stream of wash-water.

784,083.—Briquet-Press. John Treadwell, San Francisco, Cal. A briquet-press, an open-bottomed feed-hopper, a wheel having a peripheral feed-groove and rotating beneath said hopper, transverse moulds formed in the rim and opening from said groove, oppositely-acting plungers movable in the rim of the wheel, and means for obstructing the feed-groove and so regulating the delivery of material from the feed-groove to the moulds formed in the rim.

March 14, 1905.

785,067.—Ore-Roasting Furnace. Horace M. Heath, Newton, Mass., and George Morrice, Sonora, and Robert L. J. Gruss, Genesee, Cal., assigned by direct and mesne assignments, to Frank W. McAleer, Newton, Mass. In an ore-roasting furnace an oxidizing-flue having non-perforated sides and open to the atmosphere only at the upper end where it receives the ore to be treated, means to heat said flue externally, a plurality of air-tight chambers beneath said flue, means to connect the lower end of said flue with either end of said chambers, and means to deliver oxygen to the lower end of the flue above said chambers.

784,956.—Furnace for Treating Metal. Jacques Morat, New York, N.Y. A vessel for treatment of molten metal, having a restricted upper opening, and mounted with its longitudinal axis at an angle to a vertical line, and rotatable as an entirety at will about said axis, and having in its side an aperture for the passage of metal.

784,598.—Cyanid Agitator. Eugene Stevens, Leadville, Colo. The combination of a containing vessel provided with a substantially frusto-conical portion, a basin engaging said frusto-conical portion, said basin being provided with a bearing, a tubular member disposed within said containing vessel, and a revoluble shaft provided with a carrier-thread disposed within said tubular member, said revoluble shaft being provided with a journal engaging said bearing within said basin.

785,002.—Manufacture of Iron and Steel. James J. Hudson, Philadelphia, Pa. The improvement in the art of manufacturing iron and steel, which consists in placing a combined charge of charcoal and the material to form such metal upon the hearth or bottom of a furnace, melting said metals with the charcoal, and maintaining a molten bath of the metal in contact with the charcoal until the completion of the heat.

March 21, 1905.

785,525.—Dust-Collector. George Simpson, Richmond, near Melbourne, and William J. Burton, Richmond, Victoria, Australia. A dust-collector involving a casing having a V-shaped partition provided with openings closed by flap-valves and forming a pump-chamber, a horizontally extending partition arranged in said casing and forming in connection with one side of said V-shaped partition a dust-expansion chamber, an inlet for said expansion chamber, said horizontally extending partition in connection with the other side of said V-shaped partition forming a dust-settling chamber within said casing, an outlet for said settling-chamber, a cylinder communicating with said

outlet and containing a body of water in the lower portion thereof, diaphragms arranged in said cylinder at the upper portion thereof, a spraying device arranged in the upper portion of said cylinder, and means communicating with said spraying device and the liquid at the lower portion of said cylinder for forcing said liquid through said spraying device.

785,565.—Amalgamator. Patrick McEntee, Spokane, Wash. An amalgamator, comprising a sluice having amalgamating-plates, means for feeding material to be treated, together with water and mercury, to the sluice, a collector into which the sluice discharges, said collector having means for separating the water and tailings from the amalgam, and the free mercury from the latter, and means to return the recovered mercury to the sluice for reuse therein.

785,214.—Apparatus for Extracting Metals from their Ores. Wilbur A. Hendryx, Los Angeles, Cal. In an apparatus a tank having a conical bottom and constructed to hold a supply of ore-pulp, a vertical independent passage-way for said ore-pulp through the body of said tank to the atmosphere, channeled spaces in said passage-way, an aerating-plate surrounding the top of said passage-way, a rotating shaft connected to said tank, and means connected with said shaft for moving said supply of ore-pulp up said passage-way and channeled spaces and over said aerating-plate and down through said tank in a continuous, endless stream.

785,585.—Electric Furnace. William C. Arsem, Schenectady, N.Y., assignor to General Electric Company, a corporation of New York. An electric furnace having an air-tight chamber, a refractory heater therein, means for supporting material to be heated in close proximity to said refractory heater, and means for exhausting the air from said chamber.

March 28, 1905.

786,121.—Smelting-Furnace. Patrick Healey, Cambird, Colo., assignor of one-half to James D. Ireland and Avery Buckingham, Cambird, Colo. The combination of a double-walled blast-furnace, of an air-pipe for introducing air between the walls, and a spraying device in the air-pipe located at a point outside of the point where the air-pipe enters the outer wall of the furnace for charging the air with an atomized spray of water and cooling the inner wall thereby.

786,048.—Process of Purifying Pig Metals. John B. Nau, New York, N. Y. A process which consists of pouring liquid metal upon a mass of broken pieces of solid oxidizing material in such manner that the liquid metal will be broken up and descend in small streams through the spaces between and in contact with the pieces of oxidizing material, causing a bath of the liquid metal to accumulate, maintaining immersion of the oxidizing material in the bath, so that the bath fills the spaces in the immersed mass of oxidizing material, for the period desired, and then separating the liquid purified metal from the oxidizing material.

786,200.—Gas-Producer. Alfred B. Duff, Pittsburg, Pa. In combination, a gas-producer, a water-sealed ash-trough therefor, an air-receiving casing in the ash-trough, substantially vertical gratings carried on the casing and distributed over a large area, a free space for the fall of ashes between the air-casing and producer walls, a louvered cone superimposed on the gratings, said cone consisting of a louvered cone superimposed on the casing, and a cover superimposed thereon so as to leave air-space in the wall of the cone, said air-spaces in the cone and grating being so proportioned that a sufficient quantity of air is made to act on the upper part of the fuel and light that part up to incandescence, while the lower grating causes the air to act upon such ignited fuel as it descends with a finer distribution and without raising the temperature at any point too high.

786,051.—Process of Reducing Ores. Dennis R. Robertson, Leadville, Colo. A process which consists in subjecting the finely-divided material in the presence of water to the action of sodium salt and a potassium salt, heating and agitating the mixture, adding salts of iron and an acid and again agitating, allowing the mixture to rest, and removing the separated values.

786,185.—Process of Producing Metals and Alloys. Henry S. Blackmore, Mount Vernon, N.Y. A process which consists in fusing an oxy compound of a metal or metals having greater affinity for oxygen than the metal desired, adding thereto an oxy compound of the metal desired with another metal an alloy with which is sought, and subjecting the mass to the action of an electrolytic current capable of liberating the metals desired and replenishing the mass with more metal oxy compound from time to time as the bath is depleted therefor by reduction.

PROVINCE OF QUEBEC

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

GREAT MINERAL TERRITORY

Open for investment in the Province of Quebec.

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

ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

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

Mining concessions are divided into three classes :—

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

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

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

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

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

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

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

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

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; zinblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

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

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

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

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

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

The Canadian Pacific Railway runs through the entire mineral belt.

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

HONORABLE E. J. DAVIS,

Commissioner of Crown Lands,

or

THOS. W. GIBSON,

Director Bureau of Mines,

Toronto, Ontario.



Dominion of Canada

SYNOPSIS OF REGULATIONS

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

COAL.

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

QUARTZ.

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

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

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

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

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

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

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

PLACER MINING.

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

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

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

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

DREDGING IN THE YUKON TERRITORY.

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

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

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

PLACER MINING IN THE YUKON TERRITORY.

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

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

The person or company staking a claim must hold a free miner's certificate.

The discoverer of a new mine is entitled to a claim of 1,000 feet in length, and if the party consists of two, 1,500 feet altogether, on the output of which no royalty shall be charged, the rest of the party ordinary claims only.

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

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

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

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

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.



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, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquire promptly, either by arrangement with the owner or by arbitration, all land required for their mining works.

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

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

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

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

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

THE HON. A. DRYSDALE,

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.

DIAMOND

DEEP DRILLING

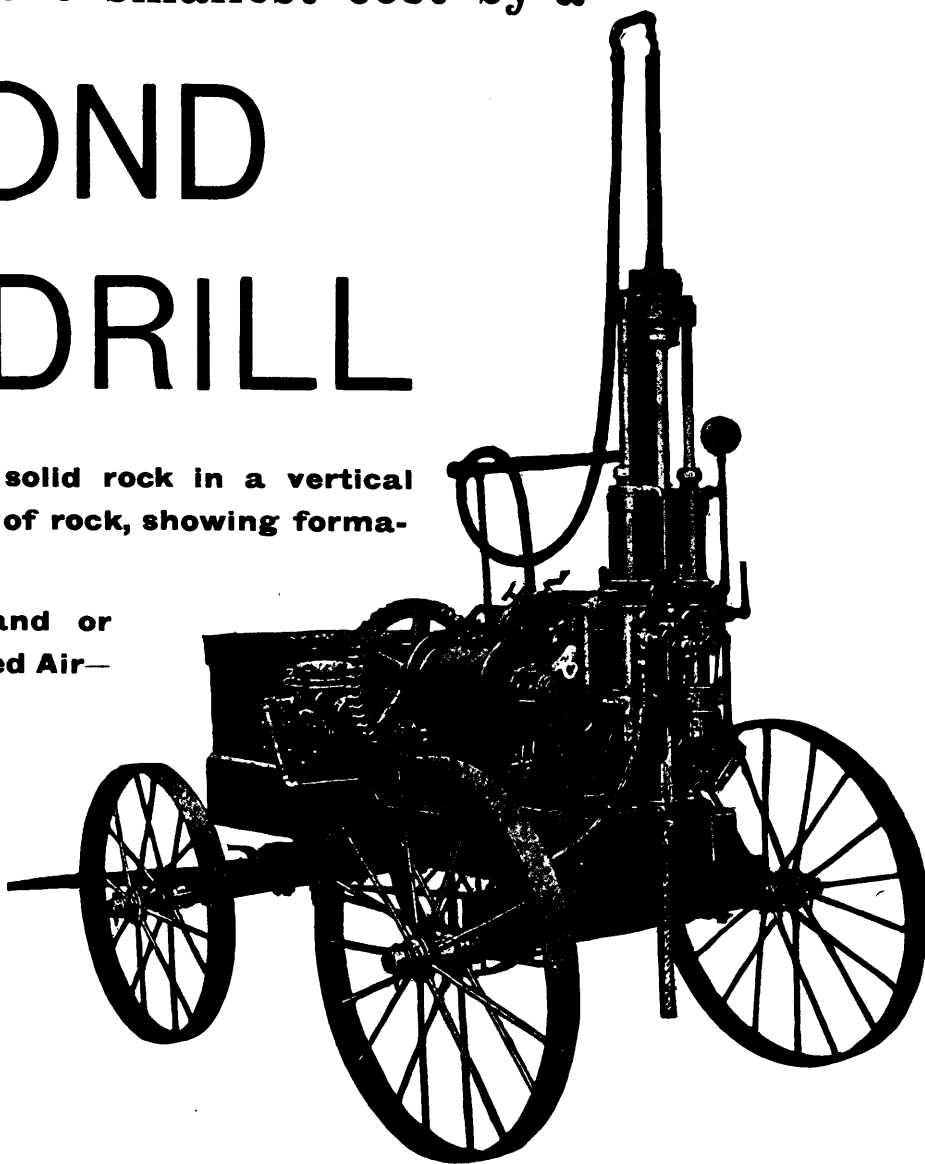
makes economical mining and the deepest hole can be drilled at the smallest cost by a

DIAMOND ROCK DRILL

It can cut through 2,500 feet of solid rock in a vertical line. It brings up solid cylinders of rock, showing formation and character.

Made in all capacities, for Hand or Horse-power, Steam or Compressed Air—mounted or unmounted.

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The Only Perfect Gyrotory Stone-Crusher

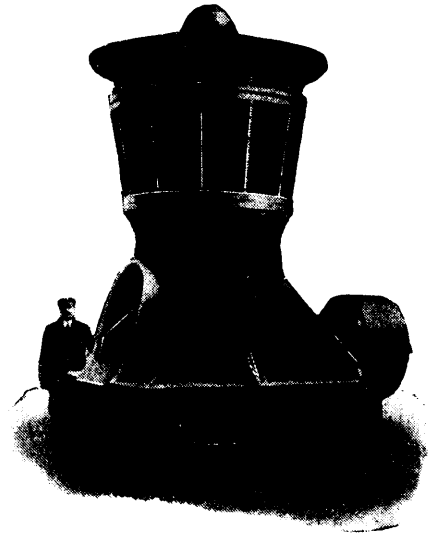
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Sole Representatives of the Hadfield Steel Foundry Co., Ltd., Sheffield, for Canada

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A Thing to Remember!

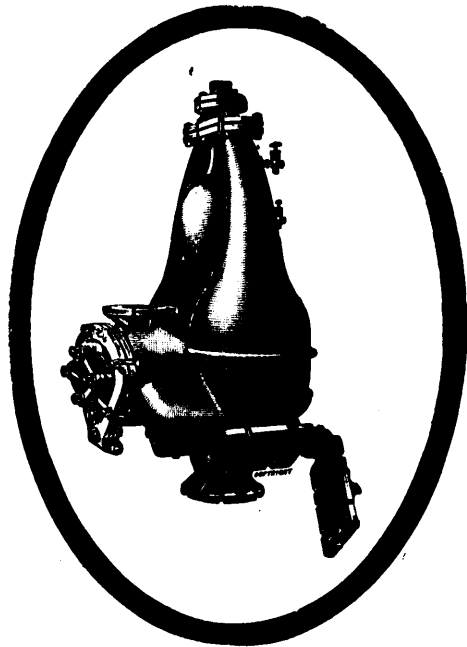
The water can often be got out and the job finished by means of

Trade **The Pulsometer** Mark Steam Pump

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The Pulsometer Engineering Co. Ltd., Reading, England. |

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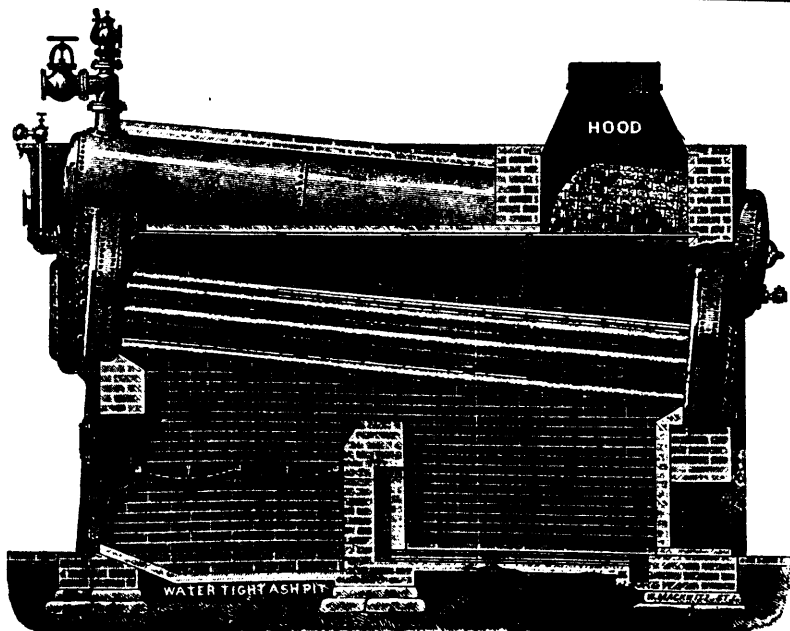


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THE HEINE SAFETY BOILER—Made in units of 100 to 500 h.p., and can be set in batteries of any number. Suitable for Mines, Pulp Mills, Water and Electric Installations, and large plants generally. The best and most economical boiler made.



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WIRE ROPES for Collieries, Mines, Aerial Tramways

Transmission of Power, Logging and general Hauling and Hoisting Purposes.

Wire specially selected for own exclusive use.

We have made many records with our Winding, Haulage and Crane Ropes.

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to Kenneil Collieries, Bolness, Scot., which gave a record life of 6 years and 2 months. Showing condition when taken off.

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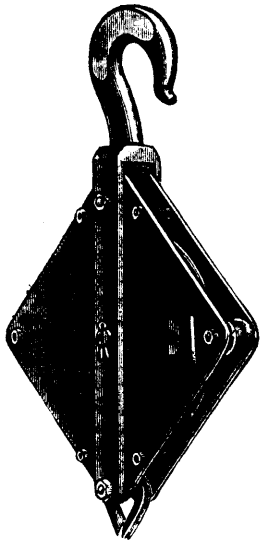
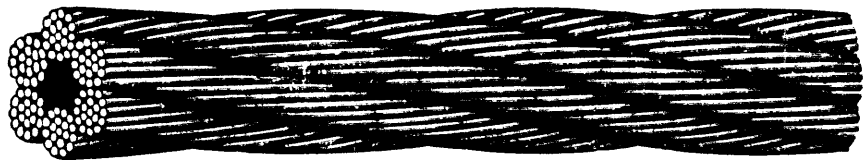
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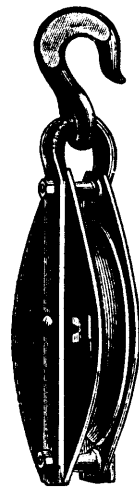
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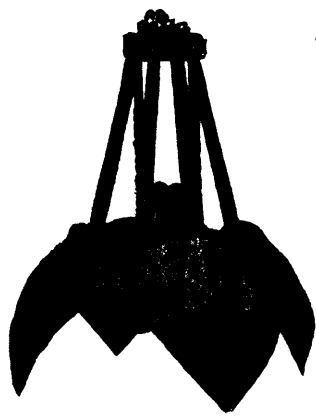
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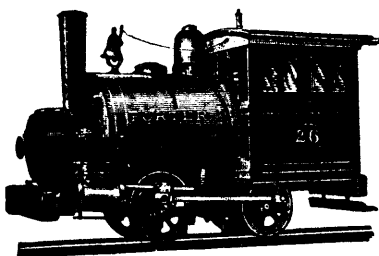
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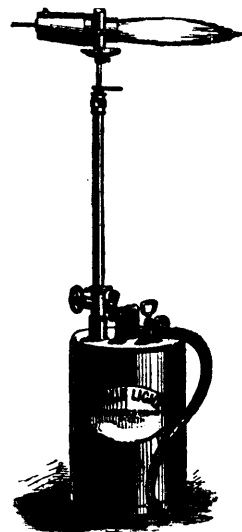
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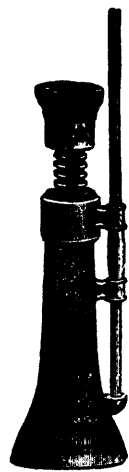


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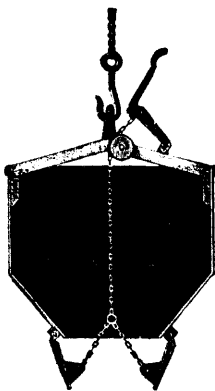
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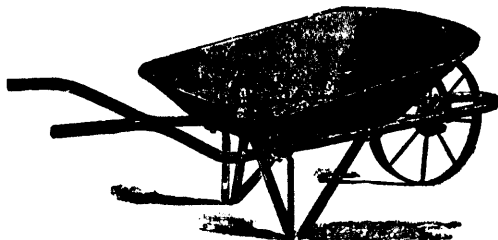
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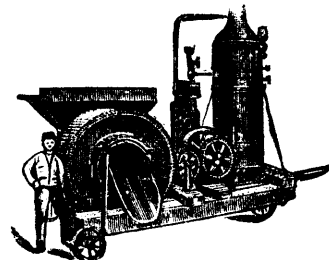
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