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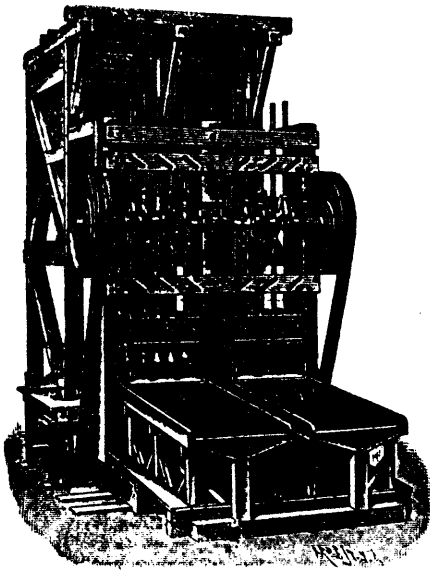
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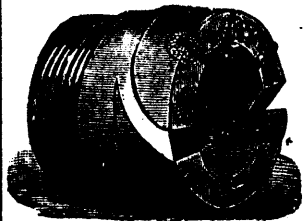
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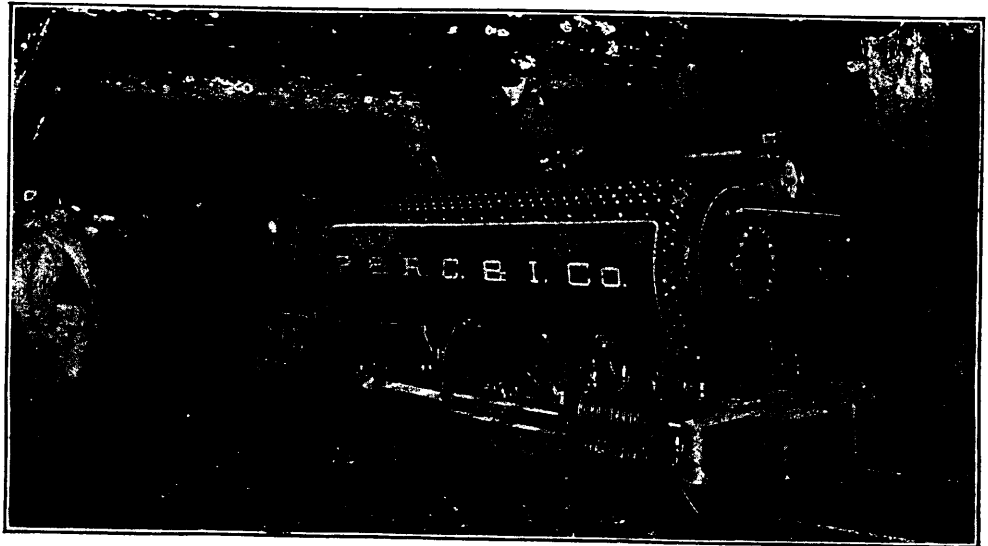
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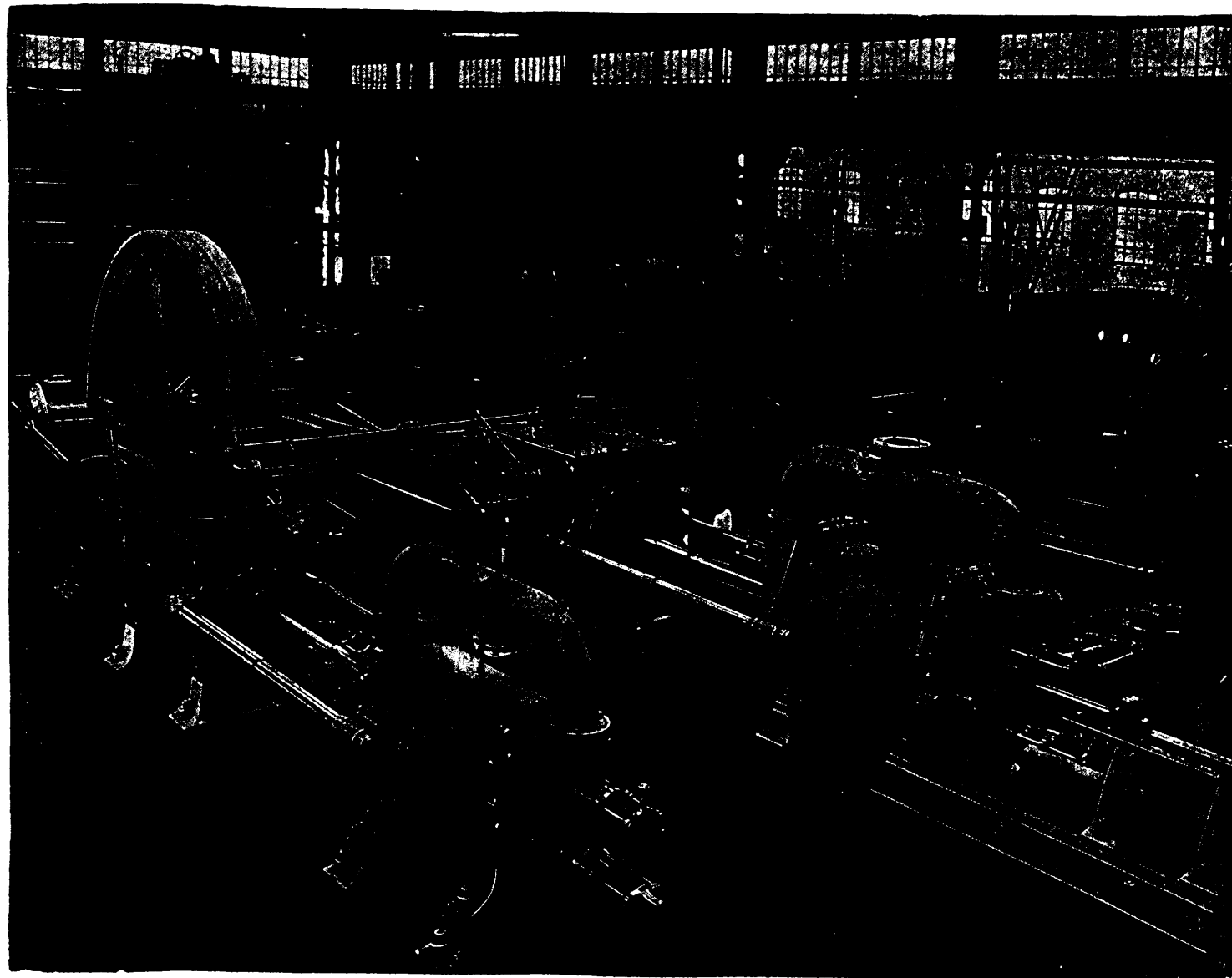
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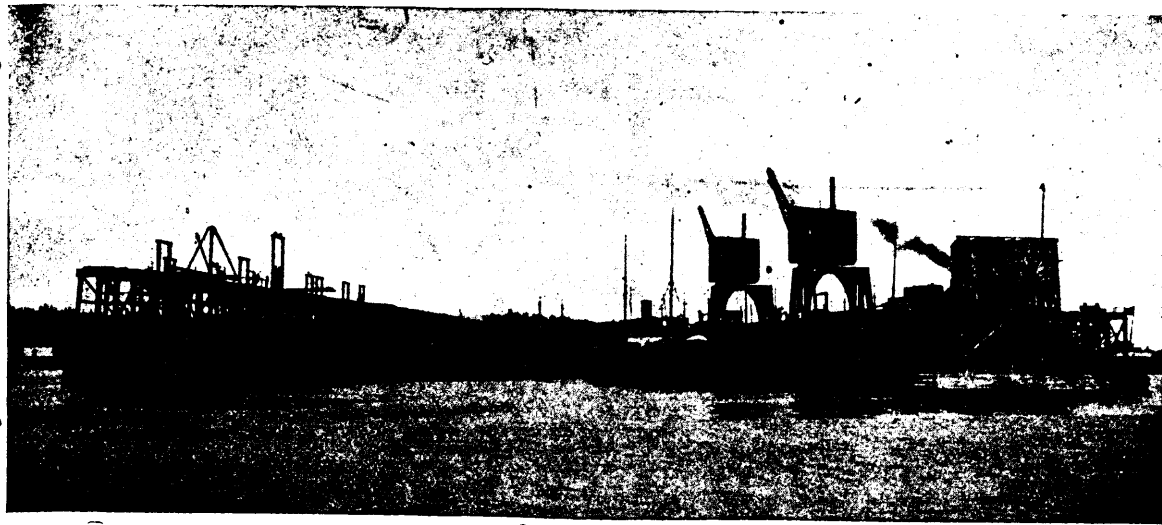
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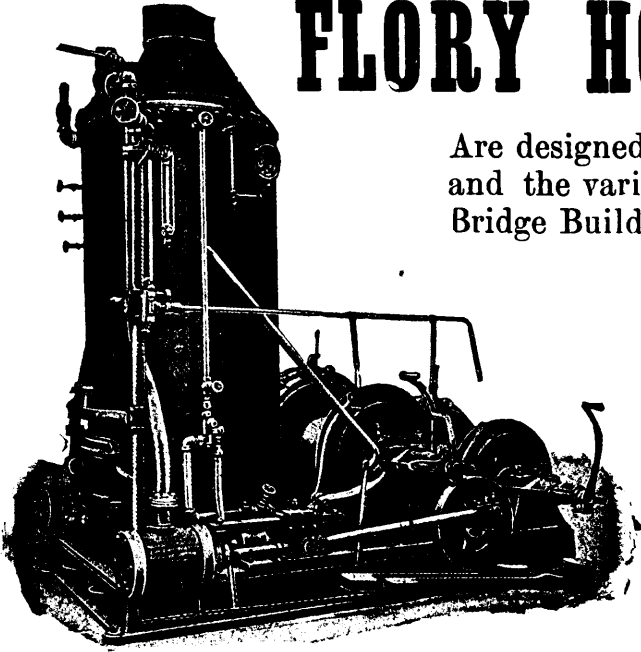
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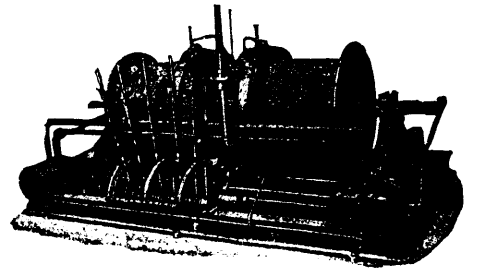


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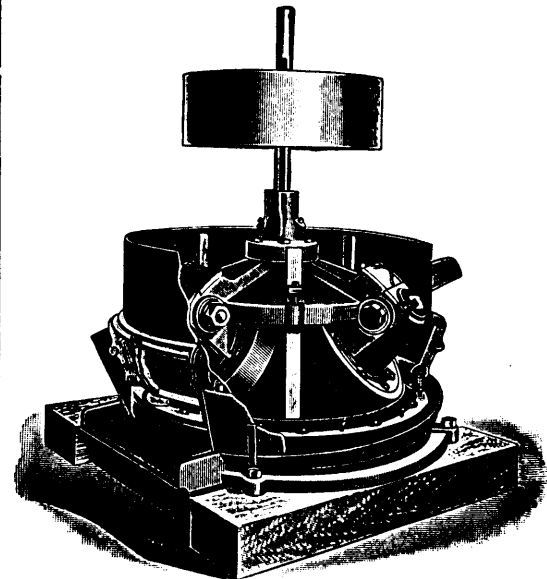


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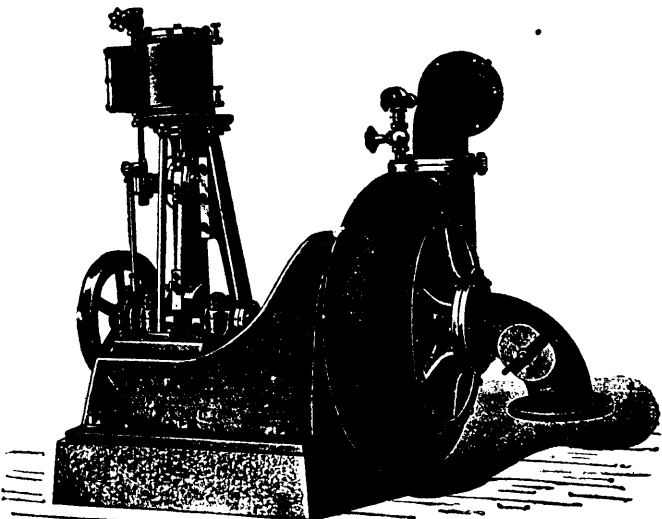


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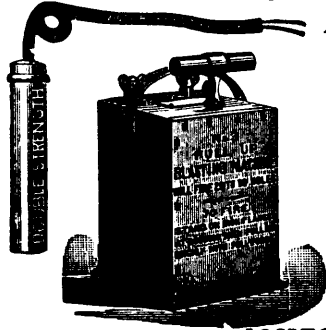
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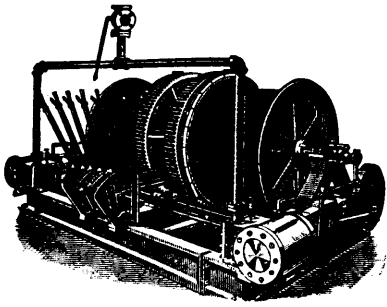
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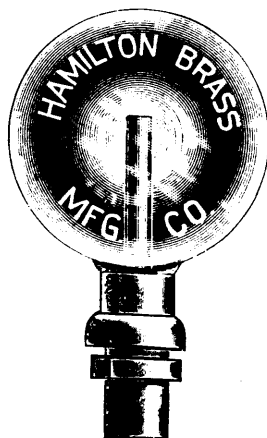
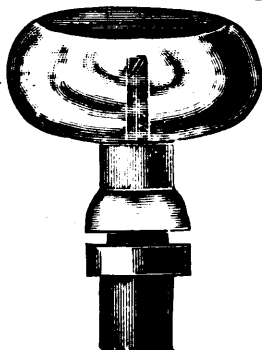
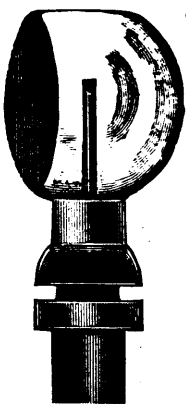
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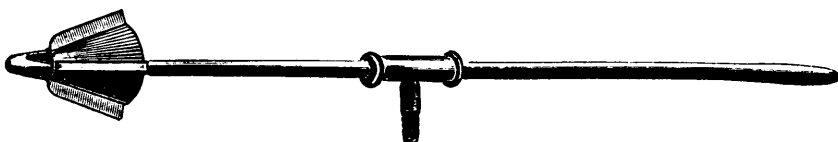
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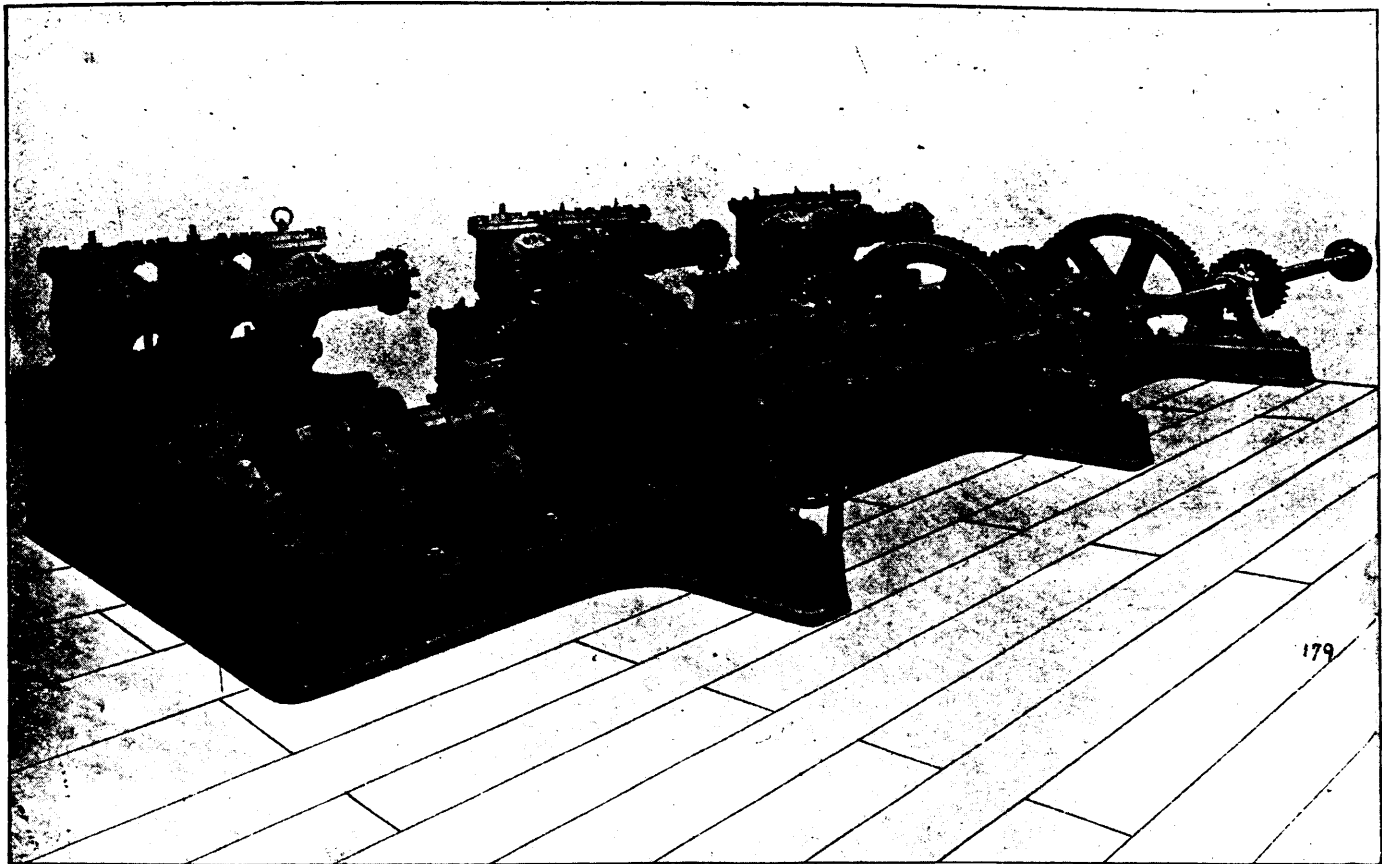
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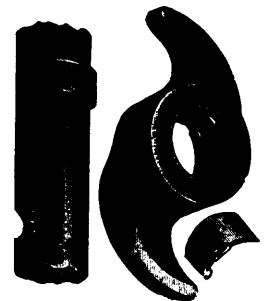
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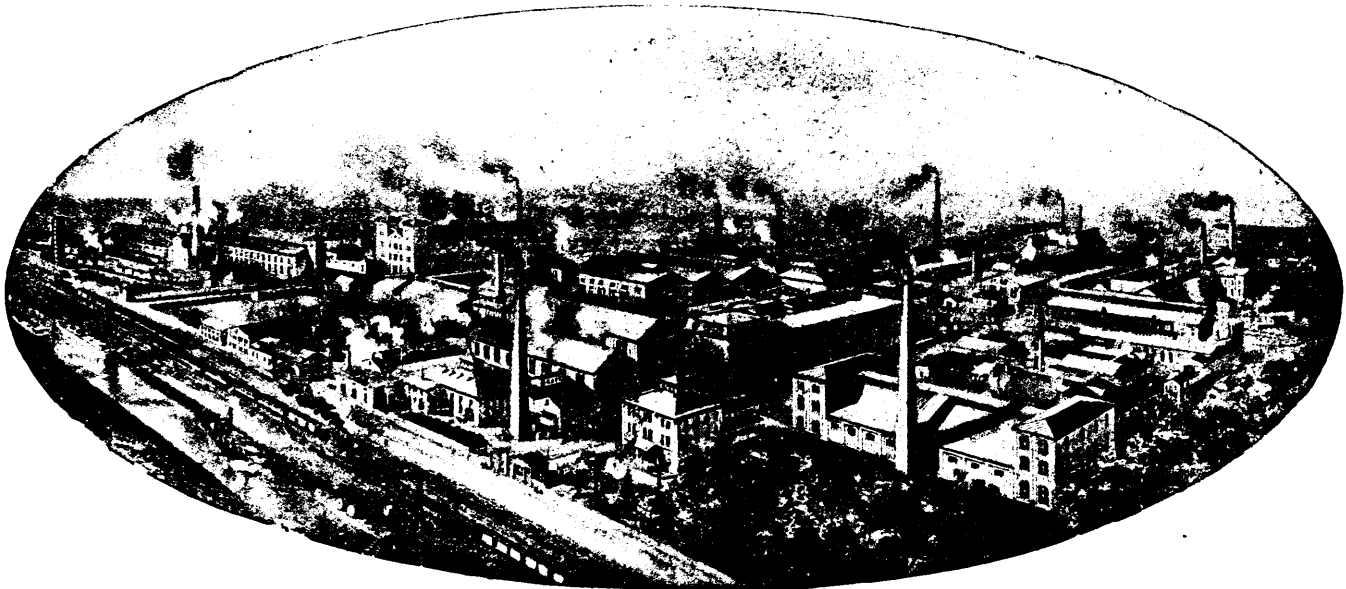
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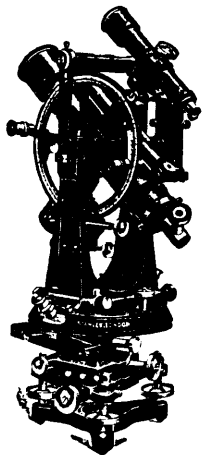
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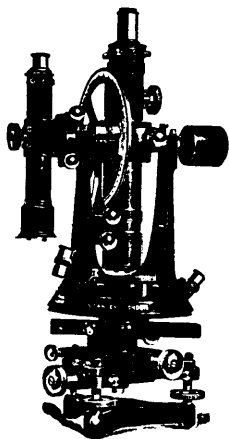
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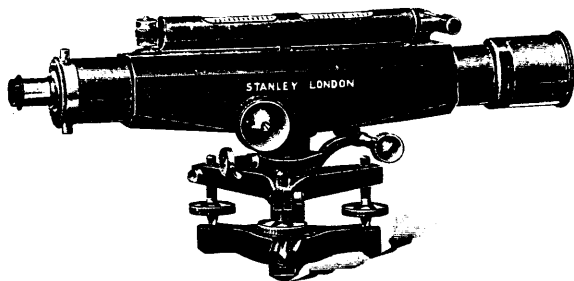
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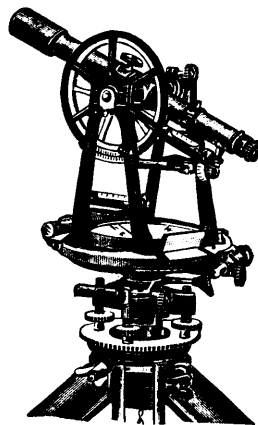
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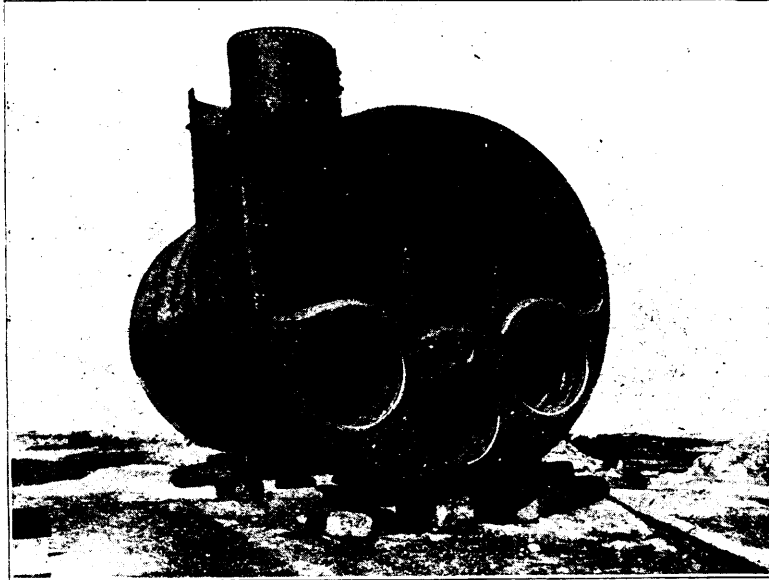
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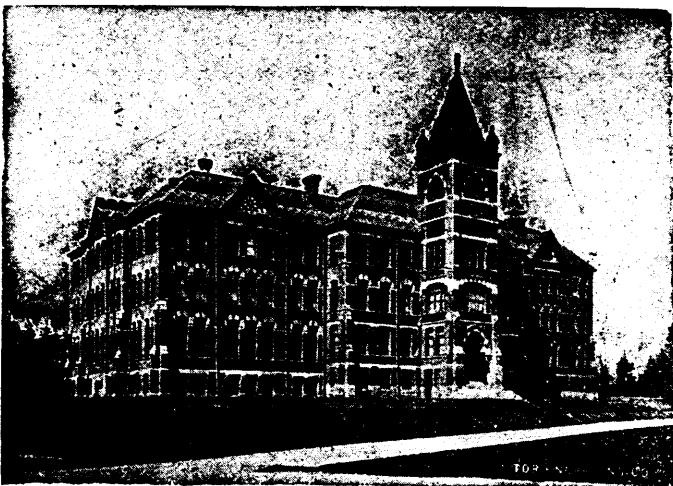
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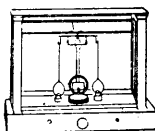
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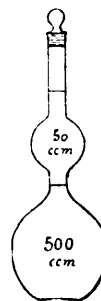
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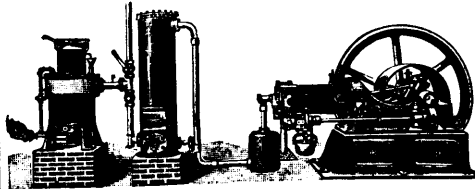
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Competitors must advise the titles of their subjects to the Acting Secretary of the Institute not later than the 15th February next and MSS. must be sent to him on or before the opening session of the meeting on the 1st of March.

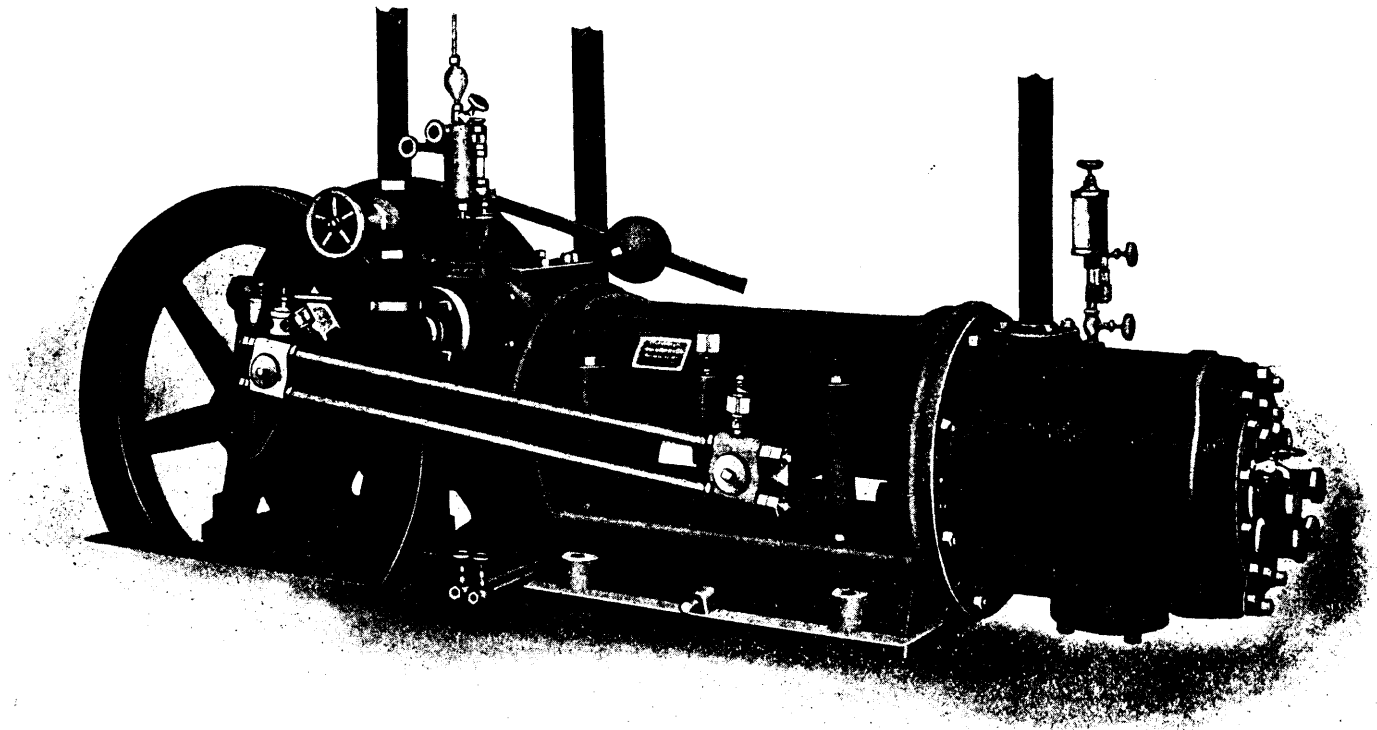
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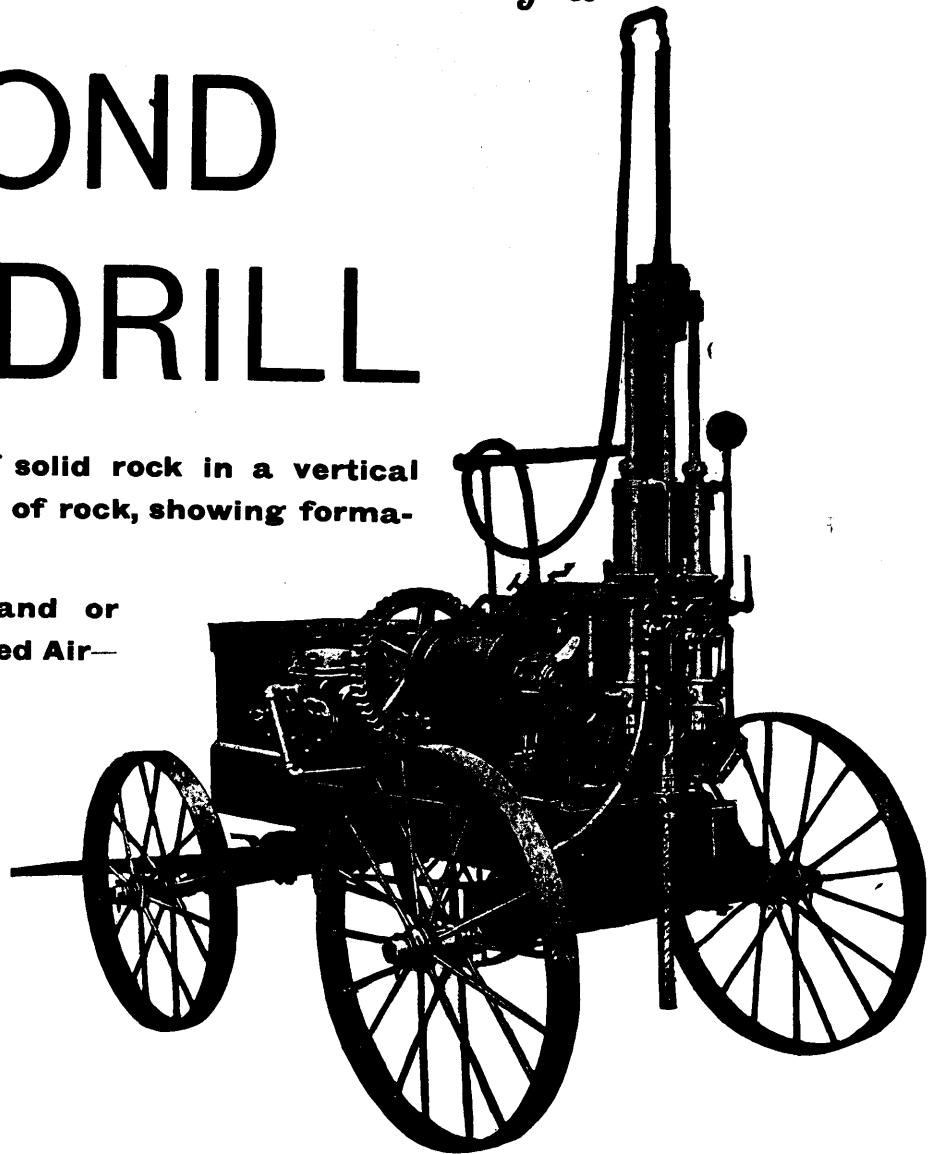
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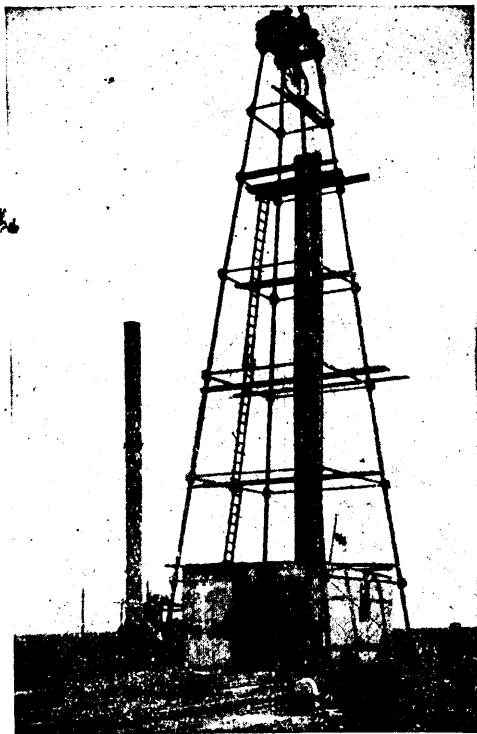
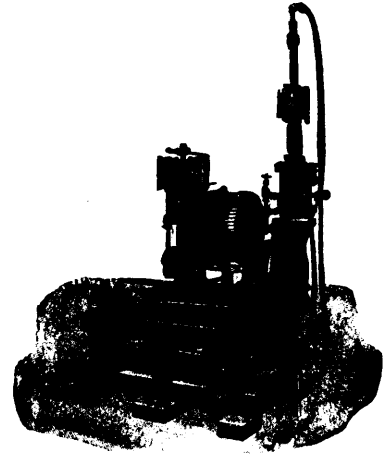
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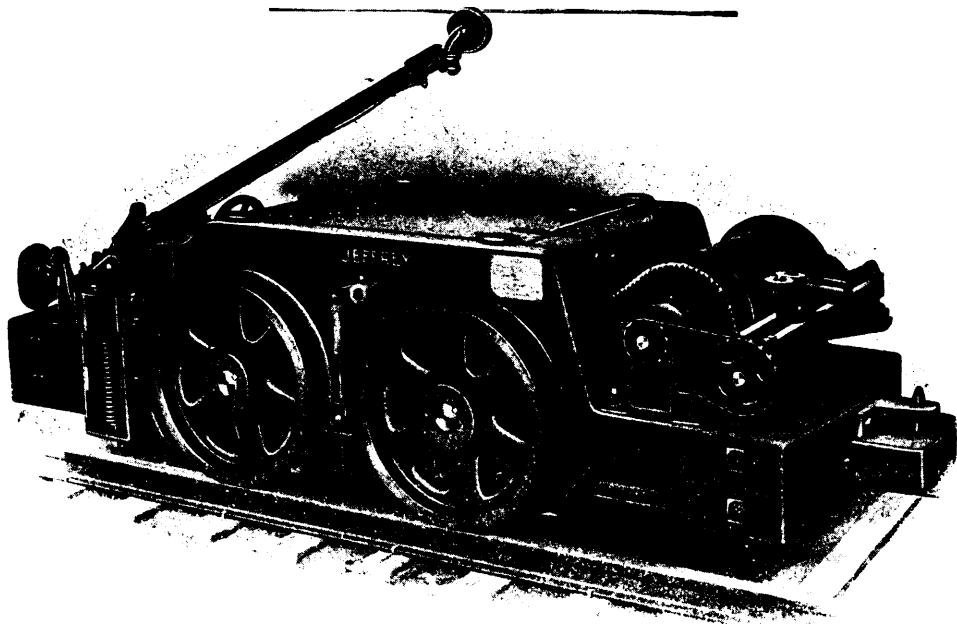
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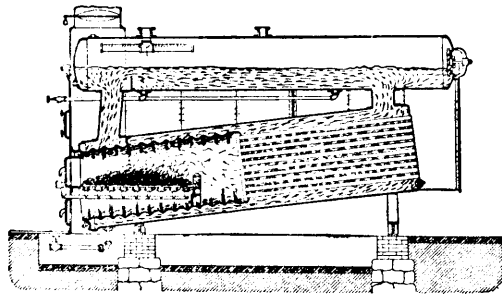
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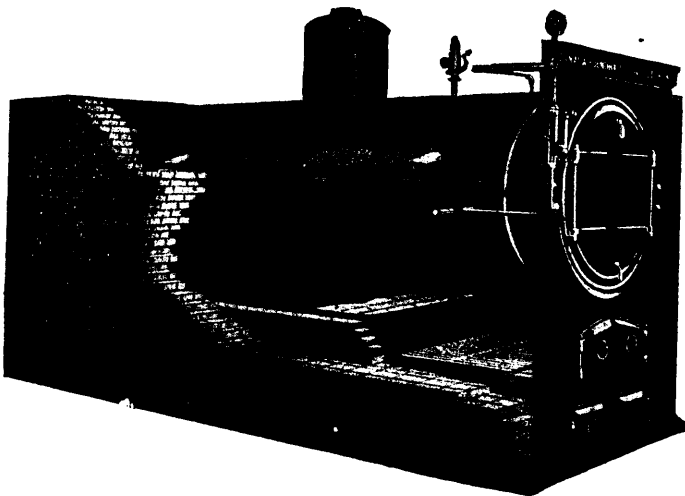
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JOHN E. HARDMAN, EDITOR.

E. GEOFF. STAIRS, BUSINESS MANAGER

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With the January issue of the British Columbia Mining Record, Mr. H. Mortimer Lamb says *Vale* to his readers. In bespeaking for his successor, Mr. E. Jacobs, an equal measure of success, both Mr. Lamb and the British Columbia press do but justice to Mr. Jacobs' proved qualities.

Mr. Lamb has not parted with his whole interest in the *Record*, but by reason of indifferent health, and acquisition of interests in other matters, has decided upon retiring, temporarily, at least, from the confining duties of the editorial chair. The REVIEW'S best wishes are tendered to Mr. Lamb, and its congratulations to Mr. Jacobs, who, it has no doubt, will continue the *Record* on the previous lines of honesty, reliability and fearlessness. *Salutamus.*

Mr. F. T. Snyder, Oak Park, Illinois, writing from Vancouver, under date of January 31st, says that he finds himself unable to prepare a paper on "Electric Furnace Construction," which he had promised for the annual meeting of the Canadian Mining Institute, on March 1st, 2nd and 3rd, owing to matters connected with foreign patent applications, which make it impracticable to publish the details which he intended. He has therefore changed the title of his paper to "Electrical Smelting of Zinc Ores."

The Institution of Mining and Metallurgy has appointed Messrs. R. W. Raymond, James Douglass and T. A. Rickard, of New York, and Dr. John B. Porter, of Montreal, as advisory members of the Central Committee on Standardization. The chief topics in which standardization is sought are (1) Weights and measures in Mining and Metallurgy, (2) Bullion and Assay Values, (3) Mesh of Screens, etc., (4) Mine and Assay plans, (5) Accounts and Cost Sheets, (6) Unification of Mining and Metallurgical terms.

A letter from London and some telegrams from the West advise the REVIEW that the long expected Rossland merging of the Le Roi, Centre Star, War Eagle, Le Roi No 2, Snowshoe and Oro Denoro Mines with the Trail Smelter is to become a fact. Details are not yet arranged, but the main facts are accepted. It is difficult to see bright prospects for the new corporation with the capital which will probably represent the merged properties. The Trail Smelting Works are profit earners, and the Centre Star and Le Roi may be, under new management, but the rest of the combination have no prospect of becoming profit earners.

The Colonial Secretary has recently supplied some data relative to the employment in the Transvaal of imported Asiatic labour, from which some interesting information has been deduced. It appears that the first importation of Chinese appeared at Johannesburg about the middle of June, 1904, at which time the Kaffirs were beginning to leave for their homes in order to avoid the winter of the Rand.

The Kaffirs returned earlier than usual, making their appearance again in large numbers in the month of September so that in October there were 78,491 natives at work. The Chinese numbered about 1,000 in June, but had increased to 13,000 in October.

The most interesting feature of the labour statistics thus furnished is the percentage of Europeans since the advent of the Orientals. Instead of the Chinaman driving out the European, the latter have come in larger ratio. In 1903 there were eight natives to one white man on the pay rolls of the mining companies; in October, 1904, there were only five coloured workmen (Kaffirs and Chinese combined) to one white man. The displacement of the white man by the Celestial is not yet apparent in the Rand.

The Nova Scotia Coal Trade for 1904.

The coal trade of Nova Scotia for the year 1904 disappointed the hopes of those sanguine optimists who predicted an output of five and one-half million tons. The record shows that there was slight, if any, difference from the output of 1903. The shipments to the St. Lawrence very greatly increased as noted in our December issue, and amounted to 1,454,365 tons, an increase of 211,000 tons, but the exports to the United States fell off some 200,000 tons from those of 1903.

One of the reasons adduced for the failure to increase shipments was the severe weather of the spring of 1904, when shipments fell off over 300,000 tons as against the same period in 1903. Another reason given is the tranquil state of the United States market owing to there having been no strikes, and, therefore, no shortage, in Atlantic ports.

All mainland companies, except the Joggins and Acadia, are expected to increase shipments during 1905, while the Cape Breton mines should undoubtedly show large increases. The output of the Dominion Coal Co., which aggregated nearly 2,800,000 tons during the past year, may reasonably be expected to attain figures in excess of 3,000,000 tons this year, and the output of the Nova Scotia Steel & Coal Co. will largely exceed the half million tons of 1904.

The coal trade of Nova Scotia has now reached the point where new markets must be had if increase in shipments is to be expected; what the results of seeking distant foreign markets, now being tested by the Dominion Coal Company, will be cannot be predicted at this time.

Below is given a table of the relative amounts shipped from each colliery during 1904:—

	1904.	1903.	Increase or Decrease.
Dominion Coal Co.	2,780,038	2,802,134	*22,096
Nova Scotia Steel & Coal Co.	496,751	451,993	45,000
Cumberland Ry. & Coal Co.	433,858	435,716	*1,818
Acadia Coal Co.	255,135	337,223	*82,090
Intercolonial Coal Co.	242,144	232,056	10,088
Inverness Ry. & Coal Co.	167,894	165,738	2,156
Port Hood Coal Co.	62,335	77,981	*15,646
Maritime Coal Co.	43,700	19,700	24,000
Minudie Coal Co.	34,500	29,000	5,500
Gowrie & Blockhouse, Ltd.	31,470	24,420	7,050
Sydney Coal Co. (appx.)	10,000	10,000	.....
Other small collieries.	65,000	.....	.....
* Decrease.	4,622,823	4,586,649	

The Outlook on the Rand.

The London Critic of Jan. 14th has a short article on the present condition of mining in the Transvaal which is optimistic, and, we believe, deservedly so. Apart from the so-called Kaffir market, or the vagaries of the brokers dealing in Kaffir stocks, the fact that, the value of the output from the Rand mines during the year 1904 has been the largest on record

since discovery, does not seem to have had the effect of restoring that confidence which might have been expected.

Beginning with the small production first recorded by the Chamber of Mines in 1887, some seventeen years ago, the production for 1904 amounted to over £16,000,000 sterling, and in December had reached a monthly figure of £1,500,000 sterling, or at the annual rate of £18,000,000 sterling. The number of producing mines in December was 60, and the number of stamps dropping was 5,300 out of a total of 7,145.

With the supply of unskilled labour up to the standard obtaining before the war (100,000), the introduction of Chinese labour without disturbance, and the increase in development of the newer companies, our esteemed contemporary's optimistic views seem to be well founded, and to be justified by the record and the facts.

The Critic also gives a short history of the Rand which is worth summarizing. In the sixties gold was found on the Tati field, and in 1869 in the Klein Letaba district by Mr. E. Button; in 1872 the burghers passed what has been known as the Transvaal Gold Law, at which time the possibilities of the country seemed to be confined to Lydenburg and De Kaap fields. The notorious Sheba mine was started in 1885, but in 1884 a man named Arnold found gold on the Geldenhuis Farm, near the site of the present city of Johannesburg, and in the same year the Banket was proved auriferous and extensive. Johannesburg was first set apart as a township in September, 1886, and in June, 1887, the first return of the Chamber of Mines was published, which was a yield of 887 ounces from the Wemmer mine; this was followed by the boom which occurred in 1888-'89. After a period of re-action the industry again grew and seven years later (in 1895) there were some forty producing companies. About this time Mr. Hamilton Smith made his famous report to the Rothschilds that the Rand fields contained at least £215,000,000 sterling of gold, and production to date accounts for more than one-half of this figure. The later calculations of Dr. Hatch and John Hays Hammond are familiar to our readers.

The Mining Section of the Canadian Society of Civil Engineers.

The Mining Section of the Canadian Society of Civil Engineers held its regular meeting on the evening of February 9th, at the Society House, when the paper of the evening on "The Mine Fire at Dominion No. 1 Colliery, Glace Bay, N.S.," was read. The paper was the joint production of Messrs. Shirley Davidson and Norman McKenzie, both on the staff of the Dominion Coal Co.

Dr. Porter, president of the Mining Section, read the paper in the absence of the authors, and prefaced its reading with a brief description of the topography and geology of the Sydney coal field, illustrated with some capital lantern slides of the region. After the paper had been read and discussed some further lantern views were shown by Dr. Porter illustrating many of the points alluded to in the paper.

The paper itself dealt with the history of Dominion Colliery No. 1, its mechanical equipment and surface structures, and its development by means of the shafts sunk for coal-winning, ventilation, and for sending down material.

The dip, flow and roof were explained, and the method of handling the drainage water which amounted (before the fire) to 500 gallons a minute. The authors then gave a clear and succinct account of the origin of the fire and of the various steps taken to quench it, and of the final resort to letting in the sea water. This work was described in detail, as was also the method of unwatering the mine after the fire had been entirely put out.

The REVIEW will print this paper, with its illustrations, in its next issue.

The Seventh Annual Meeting of the Crow's Nest Pass Coal Co., Limited.

The seventh annual meeting of the Crow's Nest Pass Coal Co. was held on the 10th of February, when the report for 1904 was submitted to the shareholders.

The Profit and Loss account showed net profits of \$406,049, an increase of \$95,557 over the profits for 1903, or better than 11 per cent. upon the total capital stock of the company.

The report shows that the company has thriven during the past year. Its tonnage of coal mined increased by 81,000 tons, and the coke exported increased by 78,000 tons.

The credit balance at December 31, 1903, was \$1,870,813, which was largely due to the premiums obtained by the sale of new shares; during 1904 the sum of \$38,865 was obtained in the same manner.

On December 31st, 1904, there was carried to rest account the sum of \$1,764,600, and \$347,870 were distributed as dividends during the year.

During the company's year, the sum of \$254,000 was spent on improvement account. The sum of \$203,320 has been carried forward to the credit of the profit and loss account.

The shareholders must feel very well pleased with the year 1904, and the outlook for 1905 is fully as encouraging.

Iron Production.

The London *Iron and Coal Trades Review* puts the world's output of pig iron in 1904 at 44,575,000 tons, distributed as to production as follows:—

	—Tons—	
	1903.	1904.
Great Britain	8,811,204	8,400,000
United States	18,009,252	16,600,000
Germany	10,085,634	10,150,000
France	2,827,668	2,800,000
Russia (1902)	2,592,282	2,300,000
Austria-Hungary (1902) ..	1,470	1,600,000
Belgium	1,216,500	1,300,000
Sweden	506,825	500,000
Spain	380,284	350,000
Italy (1903)	43,355	75,279
Canada	265,418	300,000
Other countries	210,898	200,000
Totals	46,420,000	44,575,000

These figures show a decrease of 845,000 tons.

To show how the trade is opening in 1905, the following is excerpted from the *Iron Age*:—

The production in the United States for January, 1905, was the largest monthly production ever recorded. 1,776,500 tons (exclusive of charcoal iron, which amounted to 20,000 tons) of pig iron were produced, the highest previous monthly

record being for the month of May, 1903, when the output was 1,713,614 tons. The record for December, 1904, was 1,614,349 tons; January's record, therefore, is 162,151 tons in excess of December's, and is 62,686 tons ahead of the biggest previous record.

This rate of production is in excess of 20,000,000 tons per annum, or double the quantity manufactured by any other country in 1904. The *Iron Age* points out that the record does not represent a full month's output at full capacity, since the weekly output increased from 377,879 tons in the first week to 440,292 in the last week of the month. In addition to this tremendous output, the stocks of the merchant furnaces decreased some 31,000 tons during the month.

The Cons. Cariboo Hydraulic Mining Co., Ltd.

The seventh annual meeting of the Consolidated Cariboo Hydraulic Mining Co., Ltd., was held in Toronto on the 26th of January last, at which the report of the directors and of the manager and auditor were submitted.

The profit and loss account shows that the increase in debt for the season's work amounts to \$27,172.08, the balance at debit being \$51,707.90 against \$24,535.82 on Dec. 31st, 1903. The operating expenses per manager's report were \$88,423.75 and the total value of bullion obtained was \$85,935.30, making a direct loss in operating account of \$2,487.45. The accrued interest on the bonds amounted to \$24,000.

From Manager Hobson's report the total operating season was only 89 days, and the reasons of scanty precipitations and adverse conditions respecting the melting of the winter snows are again adduced.

The total water used amounted to 184,889 inches, which washed 1,327,817 cubic yards of dirt, an average duty of 7 1-5 yards per inch. The total gold recovered from this yardage amounted to \$84,866.21, or an average yield of 6 38-100 cents per cubic yard. The average cost per cubic yard was 6 65-100 cents, making the loss per cubic yard on working alone about three mills.

Since 1894, the first year in which the former Cariboo Hydraulic Mining Co., Ltd., produced gold, until the close of 1904, a period of eleven years, the yield of this property annually has been as follows, according to the Company's annual reports:—

Cubic Yards Washed.	Yield.
1894 and 1895..	210,000 \$ 65,467.00
1896..	737,940 (Estimated, not given), 124,026.86
1897..	840,130 138,559.74
1898..	385,670 105,141.36
1899..	1,952,535 92,678.93
1900..	1,843,938 350,085.77
1901..	2,420,288 142,273.41
1902..	690,442 61,395.19
1903..	373,000 44,943.70
1904..	1,461,341 85,936.30
	10,915,282 \$1,210,503.26

The yardage of 1896 is estimated on the basis of the number of inches of water used, as in the annual report for that year it does not appear. The average value of the gravel for the last eleven years is, therefore, approximately eleven cents (\$0.11.09). In the manager's report account is taken of the older Chinese workings, the yield from which is assumed at \$900,000, and the average computed at 16 8-10 cents per cubic yard.

More water is asked for, and estimates are given for a supply of 5,000 inches to be taken, one-half from the west slope of the Morehead Range, and one-half from Spanish Lake, the total cost of which is estimated at \$490,000. As the Company already has the very large capital of \$4,000,000 issued, and has been eleven years without realizing a dividend out of a total production of one and a quarter million dollars, it is difficult to see in what shape inducement can be made for the investment of another half million dollars.

The half dozen millionaires who have hitherto paid out of their own pockets the bulk of the money required, are amply able to continue, but they must be different to other men if they do not require some more definite inducement than the promises which hitherto they have been taking at par.

What strikes the ordinary shareholder is the incongruity between the annual optimistic reports (of the manager and of nearly a dozen experts during the last ten years) and the continued failure to meet fixed charges. Some shareholders have desired a separation of technical from financial control, but have been told the idea was impossible; just why, the REVIEW is unable to see.

CORRESPONDENCE.

The Two Per Cent. Tax in B.C.

To the Editor.

Sir,—For at least four years the mine owners in British Columbia, and of the Kootenays in particular, have been at war on the subject of the two per cent. tax. The matter has been freely discussed, and at times much recrimination has been indulged in, but as yet no satisfactory settlement has been reached. One of the first acts of the McBride government, which came into power early in 1904, was to pass a new bill known as the Assessment Act, which did not in any way deal with the objectionable two per cent. tax. In consequence of general complaints as to the working of the new Assessment Act, a committee was appointed to enquire into its operation, and the order appointing this commission made no reference to the tax, nor to any matters outside of the scope of the Assessment Act. In spite of this deficiency the commissioners took evidence from two gentlemen who were connected with the mining industry, and whose testimony was favourable to the tax and to its continuance in its present form. When this evidence appeared in print the British Columbia Mining Association called meetings of its various branches and decided to lay before the Government some evidence which was adverse to the tax and its operation. Whether the Association's course will benefit the mining industry, or obtain the redress sought for, may reasonably be doubted, but certainly it has again raised the whole question, and it may lead to its final settlement in one form or another.

The tax as at present imposed yields to the Government of British Columbia two per cent. upon the gross value, less cost of freight and treatment, of ores extracted from British Columbia mines, and the revenue from this source amounted to \$65,000 in 1904, a sum which cannot for one moment be considered as an onerous tax upon the industry. The chief objection to the tax, however, is to its incidence, which undoubtedly causes it to press unduly upon small mines producing ores of low grade. It is doubtful whether it is more unequal in this respect than the majority of taxes, since it is impossible to adopt methods of taxation which will be absolutely uniform in their pressure. For instance, in the case of a low

grade mine producing from 50 to 100 tons a day at a very small margin of profit, the tax may appear to be heavy, yet in the case of the lowest grade mines in the Kootenay country (those belonging to the Granby Company) which three years ago paid but \$600, under this tax law, the amount can only be regarded as trivial for a concern capitalized at \$15,000,000, and with \$1,000,000 actually expended in plant. There is the further consideration that nothing is more calculated to prejudice outside investors against coming to the Province of British Columbia than the fact that mine owners from time to time raise a hub-bub about a tax which yields such a small amount; it is the poorest kind of advertisement.

A strong objection of those who wish to abolish the tax is that it is levied upon mines which are not making a profit, and, in the resolution which has been endorsed by the Provincial Mining Association and forwarded to the Government, a suggestion is embodied that, before estimating the value of the ore upon which the tax is to be calculated a deduction should be permitted equal in amount to the cost of producing the ore in addition to the cost of freight and treatment, so that the tax should be levied upon *net* instead of gross values.

The Association has expressed itself as willing to have the percentage increased if the incidence is altered in the manner suggested. Taking the total amount of profit reported by the various mining companies in the province for last year, it is found that, for the Government to realize as much under the tax method suggested by the Mining Association as under the old method, the percentage would have to be raised from two per cent. to five per cent., and it is understood that this increase is not objected to by the Association. The Government has had such a recommendation before it previously and has rejected it, for the reason that it would be difficult, if not impossible, to ascertain a fair charge for the cost of production, and it contended that such method of levying the tax would open the door for so much dispute that the Government would always be in litigation with the mine owners. While there may be some truth in this, I cannot consider it as a valid objection. This same difficulty already exists in connection with assessment of every kind and would have to be overcome by employing competent expert assessors. However, there is one contention of the Government which is entitled to consideration, and that is, that the exigencies of finance demand that the mining industry should contribute definite amounts to the revenue of the province and if, under the new method suggested, the income fell considerably below the amount at present realized, it would become necessary for the province to increase taxation in other directions, which would then have the effect of taxing other industries and capital for the benefit of the mines. At present the Provincial Mining Association has not explained how it proposes to overcome such an objection; the most practical suggestion offered was made in the House last session by the member from Nelson, who proposed to tax the mining industry in British Columbia on the same basis as is done in the adjoining Western United States and the same as in the Old Country, viz.: to levy the tax of mining companies on the real estate occupied and on all permanent improvements on the same, such as plant, machinery and buildings, and at the same time to maintain a two per cent. tax levied upon *net* instead of upon gross value as at present. The strong objection urged against this is that it would involve large payments by mining companies which had extensive and expensive plants, which plants might never pass beyond the experimental stage and become profitable, and that such a tax would be even more detrimental in discouraging capital than the present one.

These are the only two practical suggestions that have been made which are likely to reconcile the objections of the mining companies and the financial exigencies of the Government. Of the two suggestions the former involves the least difficulty, and, as the Mining Association has expressed itself as favourable to the scheme, it is to be hoped that this much vexed and talked of question may be settled, and that at the next session of the Provincial Parliament the necessary changes in the law may be made, and one of the most fruitful topics of dispute in British Columbia mining circles may be removed.

WILLIAM BLAKEMORE.

Nelson, B.C., 20th Jan., 1905.

[The REVIEW regrets that it cannot endorse the suggestion above stated by our correspondent. The suggestion is that the tax be assessed upon the *net* value of the ore, i.e., upon the value remaining after costs of production (mining, management, freight and treatment) have been deducted from the gross value of the ore. All efforts to assess on the *profits* of mining companies have hitherto proved futile and embarrassing. The Government of British Columbia has, as our correspondent points out, already delivered itself upon the very points we mention—"it would be difficult if not impossible to ascertain" *not* "a fair charge for cost" applicable to all mines, but, *what the actual cost is in each producing mine*. No one of our British Columbia friends would undertake to say that the costs of production in the Boundary country are as high as in Rossland, or that costs in the Slocan and in East Kootenay are on a parity. Therefore, we disagree with our correspondent in his statement that "this can hardly be a valid objection." It is the most valid of *all* the objections. Nor could the objection be overcome in any "usual manner," nor by "expert assessors." In all cases of taxation the courts are open for the man who considers his tax oppressive, and it requires no long experience in this world to recognize the probability of the courts being so overwhelmed with disputed cases and appeals as to deplete, rather than to fill, the treasury. If the financial needs of the B. C. Government demand an increase of the amounts at present paid in to the treasury, the change suggested by our correspondent and the Association will not, for years if ever, produce that increase.

Taxation of mines has, by experience, been found to be best based upon the area and value of the mining lands owned, such value being dependent upon the annual *gross* production, cost and value of improvements made (which includes all buildings, machinery and plant) and value of franchises exercised, such as water powers, etc. Departure from these safe lines has hitherto brought disaster; we do not believe British Columbia is an exception.—Ed.]

Mining Schools.

To the Editor:

Dear Sir:—The articles on the practical side of mining teaching in two or three of your recent issues bring up an old yet ever new subject of the utmost importance to our engineering schools and to the mining profession at large. The mining laboratory and the summer school in their present form are distinctly American devices, and both have been in use in some of the older colleges in the United States for almost a generation. It is only within a very few years that certain otherwise admirable institutions of learning have ceased to turn out mining graduates who had never seen a mine, and whose knowledge of mining and ore dressing was based solely

on such ideas as could be conveyed by diagrams and lantern slides and much lecturing.

Scores of young men, with no more practical training than that outlined above, have ultimately achieved success in professional life, and the fact goes far to prove the paramount importance of theoretical teaching. Success for such men has, however, been reached only through great difficulties. The theoretical graduate had to begin his practical work too late, and he often got little help and no sympathy from his fellow-workmen. Even managers were often disinclined to help college men, and thus the way to success was made slow and arduous. In face of these difficulties many of the men who entered the field were forced to give up the fight and turn to other lines of engineering work, and thus the mineral industry lost hundreds of men who, under happier conditions, would have ultimately proved of great use.

Now our conditions are very much better, and every mining school possesses laboratories, and has some scheme for giving the students practical experience in the field. Furthermore, the sentiment of mine managers and even of miners has changed very much for the better, and any student or young graduate who is willing to work is now sure of receiving every reasonable help in beginning his practical career. More remains to be done, however, towards perfecting our methods, and it may be profitable briefly to discuss these methods as they are now employed by some of the best schools.

The work of the mining department of a university may be divided into four parts:—

1st. *Elementary work in Mathematics, Physics, Chemistry, etc.* This pure science is a foundation on which all the rest must stand, and must be taught well and thoroughly. In general, pure science teaching should be the same for all branches of engineering, and it is usually undesirable for a student to decide definitely which branch he will follow until the divergence of the courses in the latter years of his university life forces him to make a choice.

2nd. *Advanced theoretical work in the special subjects of mining, ore dressing, geology, metallurgy, assaying, etc.* This work to be effective must be carried on in connection with the help of laboratories, and must be supplemented by experience in the field. The teachers should be, so far as possible, men who have had practical experience. The opinion is occasionally expressed that purely practical or professional men should be engaged to do this teaching, but, aside from the actual difficulty in the way of getting such men to give the necessary time, there is the further trouble that thoroughly practical men are seldom sufficiently experienced in teaching to do effective work with boys whose training thus far has been purely academic. Occasional lectures by such men are of immense value in stimulating students, but in general the best results are obtained when the professors are men who have had some experience in the field, and who keep in close touch with the profession by means of travel and occasional work.

3rd. *Laboratories.* Those in such mining schools as Columbia, McGill, the Institute of Technology, etc., are now magnificently equipped. At McGill there are facilities for experimenting both on a large scale and in a small way with every important ore dressing and metallurgical process, and with almost every type of machine or furnace. The difficulty now is not that the students have no opportunities to study the processes and to use machines, but that they are tempted to try and do too much, and so run the risk of losing fundamental principles in their effort to master details. One of the most important and difficult parts of a professor's work is to decide just what operations should be conducted on a large

scale by his class, what may be done in a small way on small machines, and where to stop this demonstrating and to start his men off on individual work. This latter is, after all, the best means we have for thoroughly interesting students, and my own experience is leading me to give less time than heretofore to set tests and even to large scale operations, but to get each man at work as early as possible on some individual problem—some ore to concentrate, or cyanide, or smelt—and in the same connection to require him to work out general designs of a plant for his process, with estimates of costs and running expenses. This extension of individual work, combining theory and practice, is, in my opinion, one of the most important developments of modern education.

4th. *Practical Work.* A mine owned or operated by the school is often spoken of as a desirable addition to the "laboratory" equipment, and such mines have actually been tried in several cases, notably at Camborne in Cornwall, in certain German government schools, and recently at Birmingham and elsewhere. A mine to be worth studying must be a practical example of mining, worked by miners and operated at a profit or in expectation of a profit. A few students or even a professor in such a mine need do no harm, and conceivably might even might be of some use, but probably very few mining men will seriously advocate the operation of mines by professors and students, with the assistance of a few miners, as a means of showing students the real thing.

Probably a better system is that inaugurated many years ago by Columbia, and now used in modified form by McGill and no doubt by other schools. As developed by McGill, the college course consists of four academic periods of eight months each, with intervals of four months each devoted in part to recreation but largely to obligatory work. In each of these so-called vacations the students are required to attend summer schools, first of surveying for two years, and then of mining for at least one year. In the first, the students work all day and every day for a month in actual field surveying, under a proper staff of instructors; in the second, they are required to spend a month or six weeks in some important mining region, and mines and mills are visited and studied in accordance with a scheme systematically laid out in advance by the professor, who, with his assistants, remains with the party for the whole period, and thus sees that the observations of the students are made as intelligently as possible and are properly recorded.

These obligatory summer schools are not all that is expected of the men. Nearly three months of each summer remain, and every effort is made to persuade the students to undertake actual work for part or all of this time each year. No visits to mines, however carefully planned and carried out, can put the men in actual touch with their future profession, and these periods of real work, with real miners, and of living in miners' boarding houses, are probably worth more than any other single factor in making the teaching effective. It is therefore very satisfactory to be able to report that, for several years, the managers of the mines visited in British Columbia, Nova Scotia, Michigan, etc., have provided places at more than living wages for all men in our classes, and that no less than ninety per cent. of our students have taken advantage of the opportunity, and, for the time, have become real miners.

The above outline of our methods has been given, not because I consider it ideally perfect, but because I wish to interest our mining men. They could aid us, and, in the end, benefit themselves by helping us find our students summer work where they can at once get good experience and earn money. I am confident that every considerable mine, mill and

smelter could well afford, as a mere matter of business, to place with the heads of one or two mining schools definite offers of "jobs" for the summer for one or more students. Several companies have already done this with me, and in this way have not only aided greatly in the work of technical education, but have got in touch with a certain number of young men who can afterwards be considered in connection with any permanent position that may be offered.

J. B. PORTER.

McGill University, Department of Mining Engineering,
Montreal, February 14th, 1905.

Flues and Flue Dust at Anaconda.*

By C. H. McDougall.

The problem of recovering the solid matter from the gases emitted by furnaces is one that, during past years, has received a great deal of attention at Anaconda, and more especially since the erection of the new smelter in 1902, as then the effects of the arsenic liberated in the smelting process became more apparent.

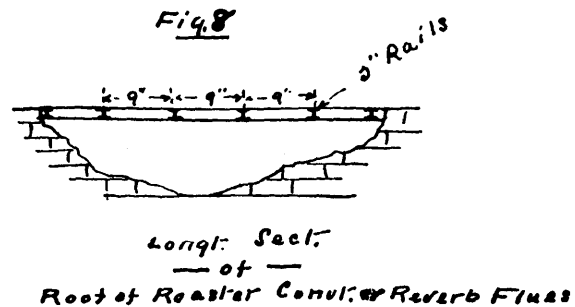
At the time of construction it was thought that the height of the hill on which the plant was placed, together with steel stacks 200 feet high for the reverberatories, roasters, blast furnaces and converters, would lift the smoke to such an elevation as to prevent it doing any injury in the adjacent valley. However, on commencing operations it was found that the prevailing winds more than counter-balanced the benefits thus obtained and the deposition of poisonous matter on the neighbouring farm lands gave rise to much litigation.

To remedy this, as well as to save the solid matter containing a high per cent. of copper, the plan used at the old works of building a brick flue from the furnaces to the top of one of the surrounding hills, and there erecting a stack, was adopted and improved upon with the result that, at present a flue giving the largest settling area and a stack with the greatest capacity yet attained, are giving the most satisfactory results and the old trouble with the arsenic has been completely overcome.

Fig. 1 in the accompanying sketches shows the arrangement of the various parts of the plant and the flues carrying the gases to the stack. Lengths given for the different parts are horizontal measurements, and do not denote the true distances the gases flow before entering the stack, on account of the slope on which the flues are built.

Blast Furnace Flue.

Commencing at the blast furnaces and following the gases as they escape they are conveyed from the upper part of each



furnace (a Fig. 2) to the dust chamber (b) by means of a flue (c). Seven of these flues enter the dust chamber, one from each

* A paper read before the December meeting of the Mining Section of the Canadian Society of Civil Engineers.

furnace, and they are all provided with hoppers, as shown at d, d2, d3, to allow for the drawing off of any flue dust that may accumulate. These hoppers are opened once every week and the dust found is returned to the furnaces.

The dust chamber itself is 38 feet wide and 275 feet long; the walls are brick with steel framing, and the roof at the present time is constructed of steel rails, placed 9 inch centres, with bricks between as shown in the construction of the roaster flue (Fig. 8). Cement and expanded metal have been tried with poor results, the former being acted on by the sulphuric acid in the gases to such an extent that in a short time the roof became unsafe. In all cases the latter method of construction has been replaced with rails, bricks and mortar. The chamber proper is built about 9 feet from the ground, thus admitting of a means of drawing off the flue dust into

cars; the hoppers (g, g2, g3, g4), are arranged in four rows lengthwise of the chamber; the roof and floor are supported by four rows of 6 inch columns equally spaced across the chamber and placed 8 feet centres for the length of the structure.

Formerly there was a partition at right angles to the flow of the gases and extending the full length of the dust chamber—save for the openings at the ends—thus compelling the gases to traverse a considerable distance before entering the flue. On examination it was found that practically all the dust was deposited on the side next the inlet, so that at the time of the construction of the flues this partition was removed and the gases now pass directly to the flue.

Flue dust accumulates at the rate of from 60 to 70 tons in 24 hours, and is the coarsest material thus obtained, pieces of

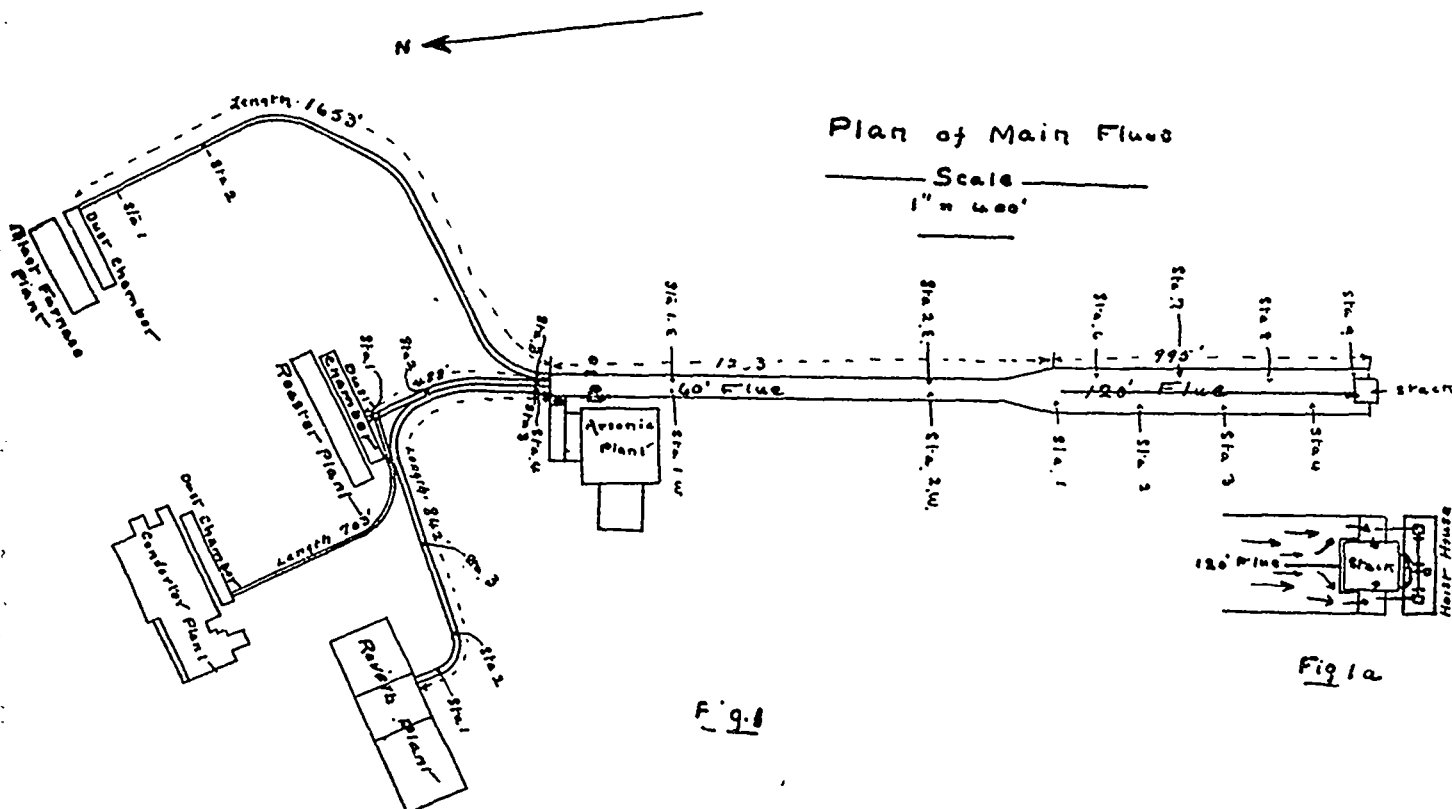
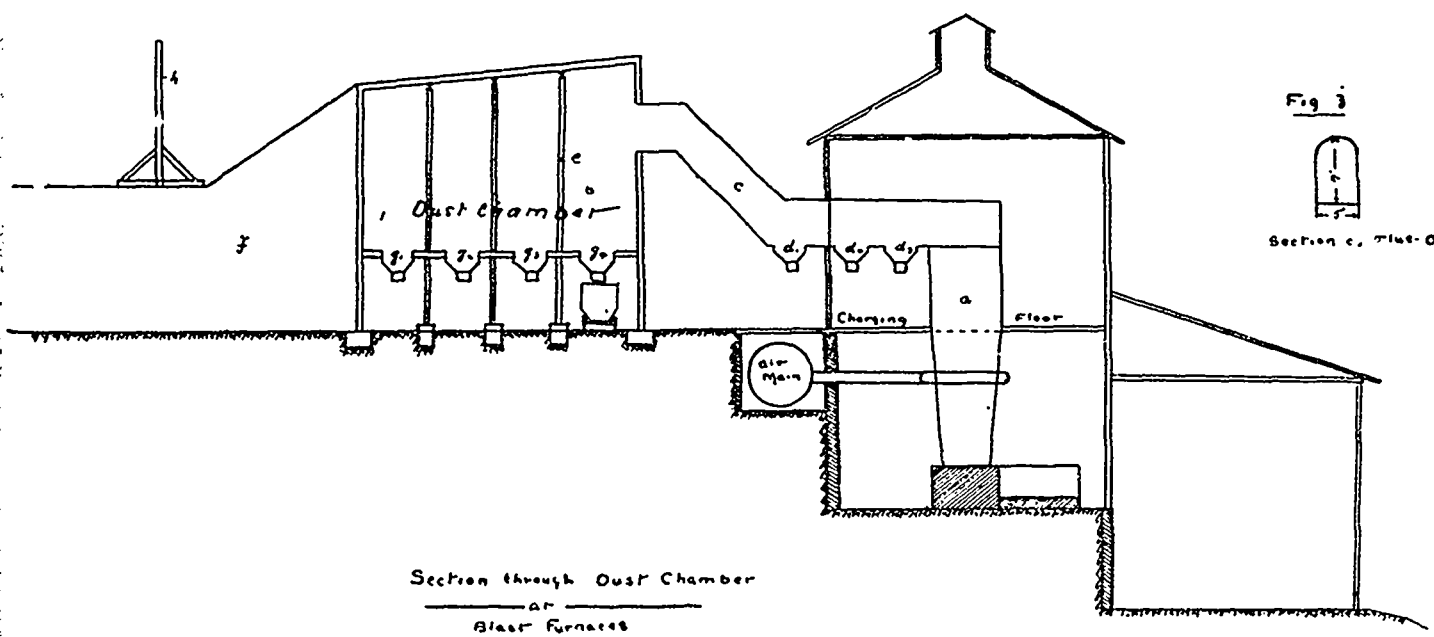
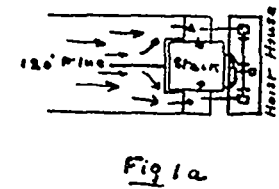
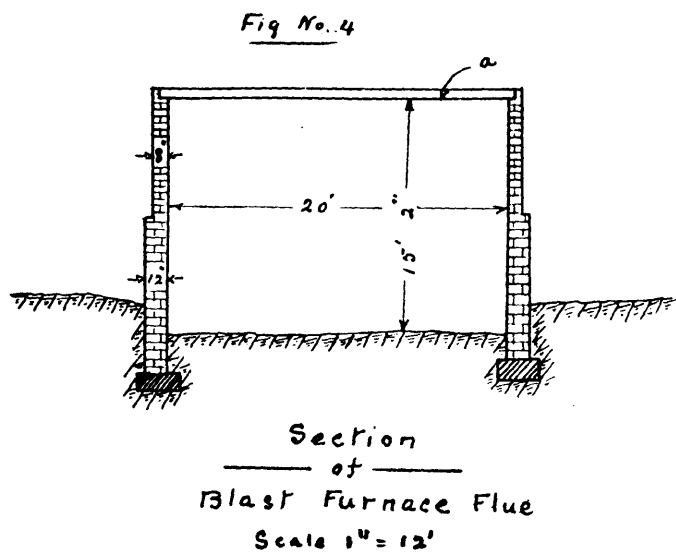


Fig. 1

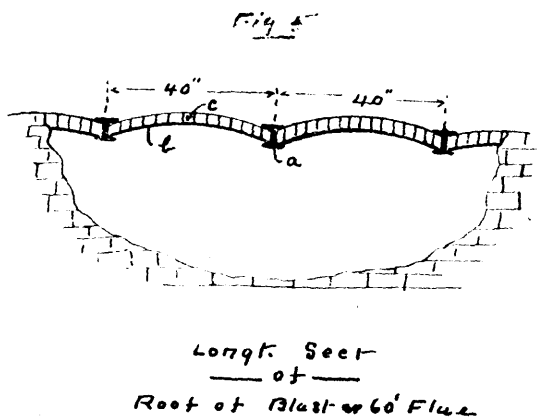
Fig. 2



Section through Dust Chamber or Blast Furnaces



limestone and coke being abundant. Assays show it to be lower in copper and arsenic values than the dust from the other chambers.



The dust drawn off is sent to the reverberatories. The flue commences at the north-east corner of the chamber and has a total length of 1,653 feet to its point of juncture with the reverberatories and roaster flues. This extreme length is due to the necessity (in construction) of passing around the end of

the ore bins; in the first half the sides are exposed, but in the latter part the roof alone is uncovered. A cross section is shown in Fig. 4, the walls are brick, 8 inches in thickness at the top and 12 inches at the bottom, the inside height is 15 feet 2 inches and the width 20 feet.

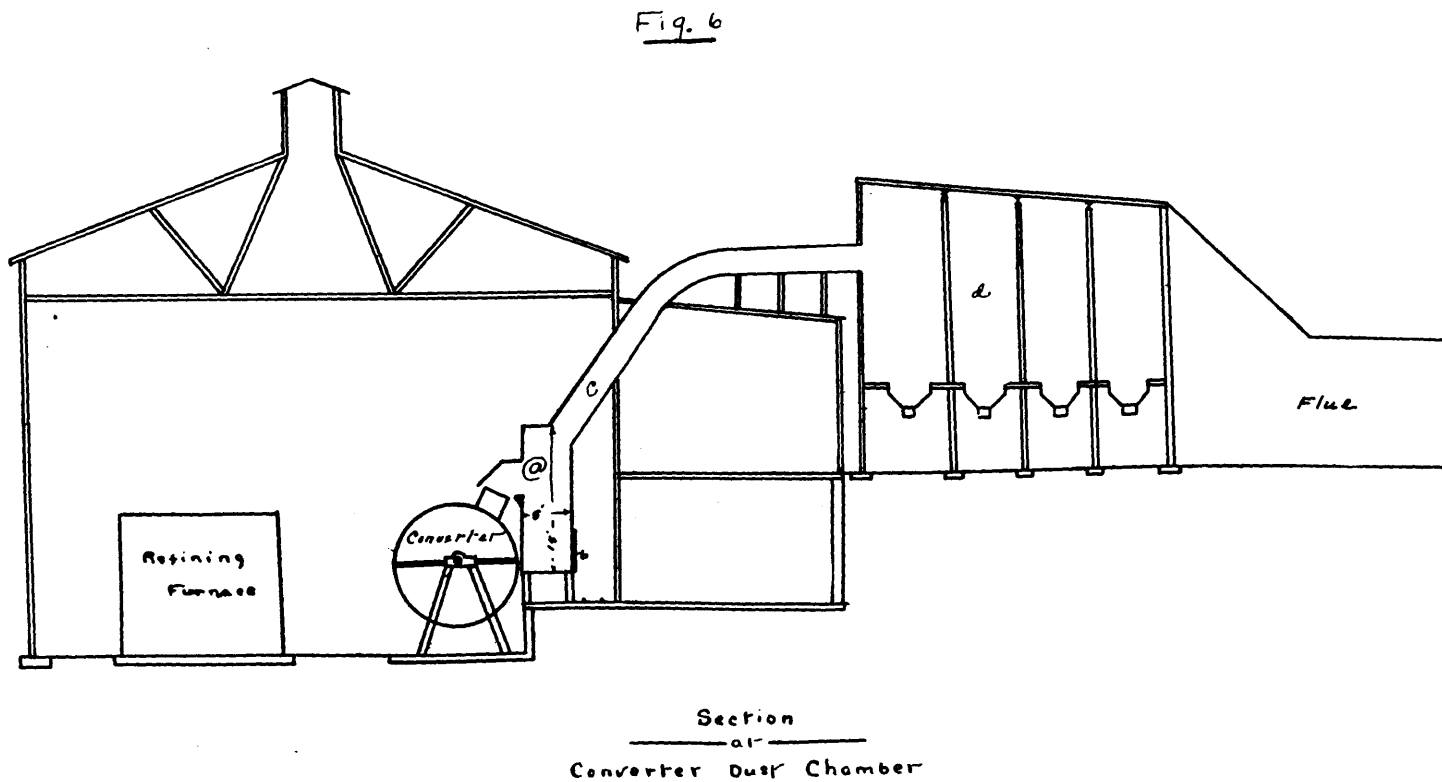
The roof is constructed of 5 inch I beams, placed 40 inch centres (see a, Fig. 5), between these corrugated iron roofing (b), is fitted in the form of an arch 4 inches high at the centre, the ends of the arch resting on the lower flanges of the I beams; on top of this sheeting the bricks are laid as shown at (c).

The inside area is 303 sq. ft. Blind doors are built in the sides in this as also in the other flues, every one hundred feet, for the purpose of removing any flue dust that may become an obstruction, but, so far, these doors have not been used, and at present there is little or no dust in the flue. This was ascertained last June when openings were made in the roofs of all the flues at intervals of 200 feet; three in each section for the blast furnace, reverberatory and roaster, two for the converter, five for 60 ft. and ten for the 120 ft. flues. The depth of dust was found at each opening by means of a greased iron rod and a sample was taken out with a long handled scoop. The average depth for the blast flue was two inches, and the greatest was at the bends where the dust had drifted. All the samples were of coarse material, coke and limestone being very abundant, as in the dust chamber. The estimated total quantity was 773 tons with an assay as follows:—

Arsenious oxide	1.6 per cent.
Copper	7.4 " "
Silver	6.8 oz. per ton
Gold	0.035 " " "

The velocity of the gases was 2,542 feet per minute, and the volume 771,060 cubic feet per minute.

Drafts and temperatures are given on Sheet A. Inconsistencies in the temperatures are not uncommon and are due to the varying number of charging doors open, and to the changing conditions of the furnaces. Plots, as in the accompanying sheet, have been made showing the relation of draft



and temperature in the flue to the number of charging doors open.

As a means of regulating the current in the flue two doors of $\frac{3}{8}$ inch boiler plate, each half the width of the flue, are hung to a frame at (h) Fig. 2, these can be loosened at once to cut down the cross sectional area, but at present are kept well drawn out.

Converter Flue.

Although the amount of solid matter escaping from the converters is large, only a small part of it is carried into the flue; a large part being caught in the boxes placed at (a) Fig. 6, from these it is shovelled into cars through a door and recharged into the converters.

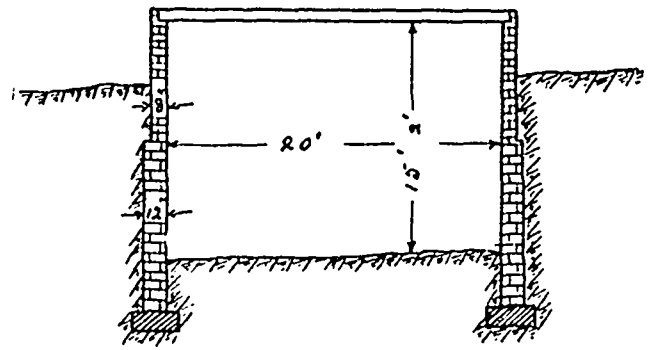
From each of the nine boxes (one to each converter) steel flues lead to the dust chamber, (size 36 feet by 38 feet). The latter is constructed on the same plan as the one before described, and the dust that collects here is drawn off at the rate of from 40 to 50 tons per day and sent to the reverberatories.

The flue, Fig. 7, is the smallest of the ones described, being only 8 feet wide by 8 feet high. For the greater part of its length the roof alone is exposed, this is constructed of steel rails placed 9 inch centres with bricks between. A sectional view is shown in Fig. 8.

The drafts and temperatures are extremely variable and the relation of the former to the number of converters blowing is shown on an accompanying sheet; the readings plotted were taken in the flue just beyond the dust chamber and show a range of temperature of 263 degrees F. The inconsistency

building 98 feet wide; across the top of each row of four furnaces extends a steel flue (a Fig. 9) connected by two pipes as at (b) and (c) to each of the furnaces, at (d) and (e) hop-

Fig No. 10

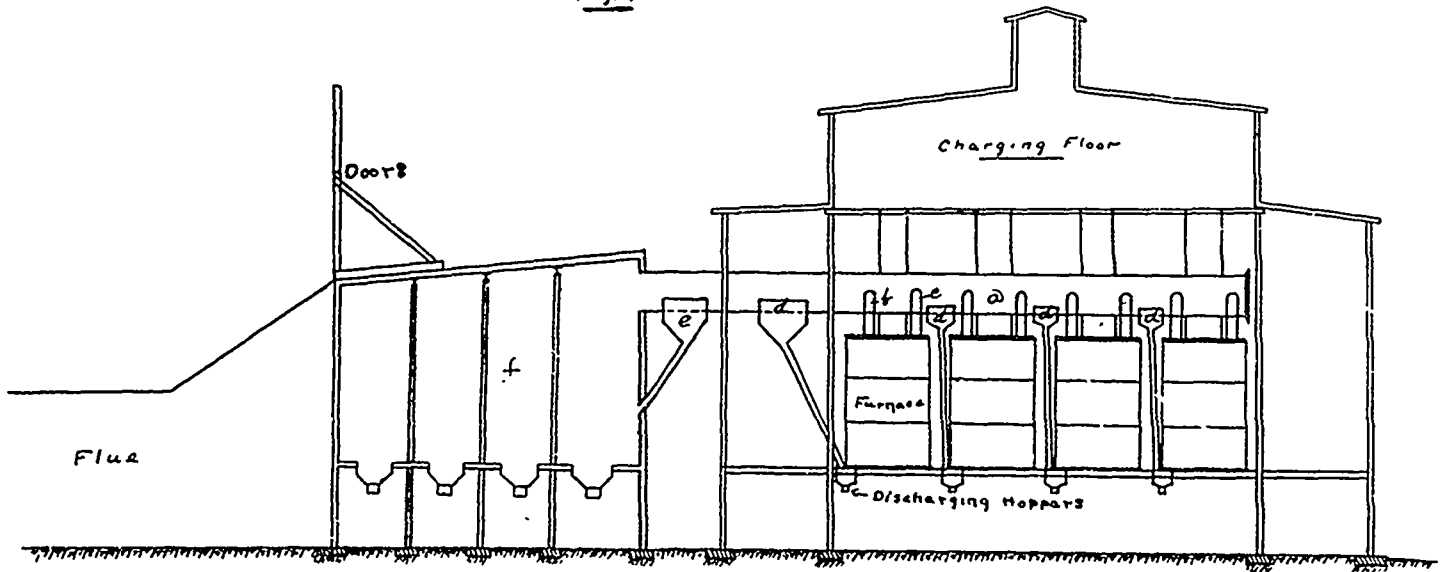


Section of Roaster Flue
Scale 1" = 12'

pers are placed; the ones marked (d) drain the dust into the discharging hoppers of the furnaces, and the ones at (e) drain into the dust chamber (f). The latter is 264 feet long and 38 feet wide and is constructed like that of the blast flue.

The amount of material taken out per day and sent to the briquetting plant is between 40 and 50 tons.

Fig. 9



Section of Roaster Plant & Dust Chamber

shown at the time 4-22 is due to the fact that the two converters blowing had not time to warm up after receiving a fresh charge. The temperature of the converter flame does not materially increase for about ten minutes after the blowing begins, but from then till the time of skimming it gradually rises. The length of the flue to its point of juncture with that from the roasters is 703 feet and at no place on its bottom could enough dust be found to admit of taking a sample.

Steel doors are hung at the top of the downtake from the dust chamber as in the case of the blast furnace.

Roaster Flue.

The roasting at Anaconda is done in 48 McDougall furnaces, Klepetko and Evans design, placed four abreast in a

The roaster flue has the same cross sectional area as the blast flue (Fig. 10) and differs from the latter only in the construction of the roof, which is the same as is described under the converter flue, the latter joins the roaster flue at a distance of 60 feet from the dust chamber.

Owing to the fineness of the feed, and the nature of the treatment, a great deal of material escapes from the furnaces.

The depths of dust found in the flue varied from 6 inches to 4 feet, and the total quantity was estimated as being 590 tons, the assay in copper and arsenic being higher than that given in the dust from the blast flue. The total length of the flue is 488 feet, the velocity of the gases 3,582 feet per min., and the volume in cu. ft. per min. is 943,208. These quantities include the gases from the converter flue.

Reverberatory Flue.

This differs from the ones previously described in having no dust chamber at the beginning; the gases pass from the different furnaces, arranged as in Fig. 11, by the passages marked (a) to the Stirling boilers at (b) and (c) and from the boilers into the flue (d.) This plan of using the heated gases for the purpose of generating steam has proved a decided success; one furnace giving off enough heat to generate 800 H.P. (700 H.P. in b and 100 in c.) The boiler tubes are not coated to any great extent by the solid matter present, so the cleaning of tubes is not a serious drawback to this method of utilizing the waste heat. During this operation the gases are sent directly into the flue through the downtake (e). The average temperature of the gases when they leave the boilers is 357 deg. C. This is at least 300 deg. C. lower than that of the gases when sent direct into the flue.

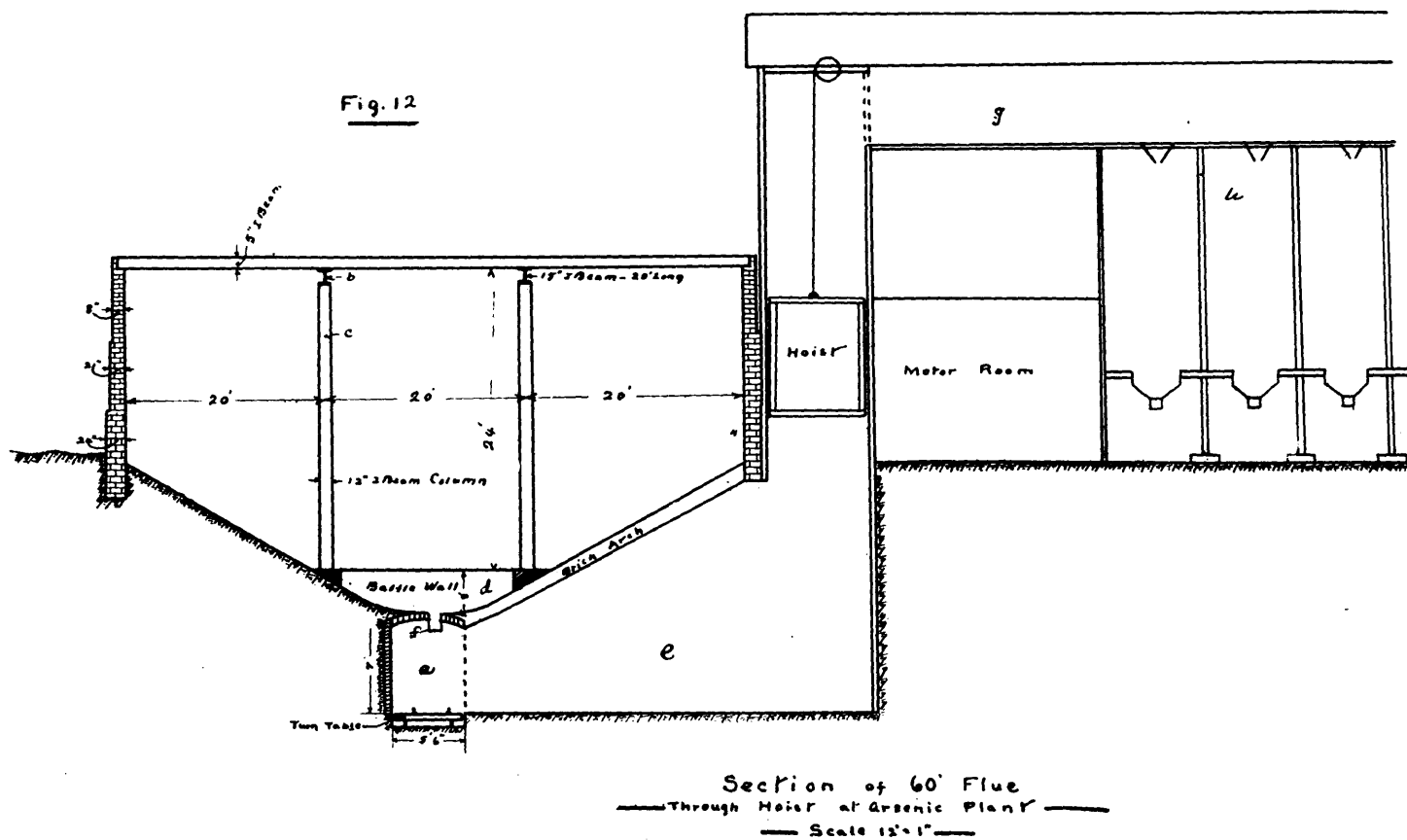
The reverberatory flue is the same in cross sectional area and construction as the roaster (Fig. 10), and at the time of examination it contained no flue dust. The velocity of the gases was 2,483 feet per minute.

square feet and the total length 1,233 feet. The sides of the hopper bottom are bedrock, sloped to 30 degrees, this giving a depth of 37 feet in the flue over the tunnel; baffle walls (d) 8 feet high at the middle are built every 20 feet to aid in catching the dust.

The tunnel is 5½ feet wide by 7 feet high and has brick side walls and an arched brick roof; at intervals of about 12 feet spouts (f) are placed for the purpose of drawing off the flue dust into cars, the latter have closed tops and an inlet through a bag or nozzle that can be fitted over the spouts. This method of loading prevents the dust from escaping into the tunnel.

The operation of the car is described under the One Hundred and Twenty Foot Flue.

At the north end of the Sixty Foot Flue is the hoist into the arsenic plant, (a Fig. 1), this is shown in section in Fig. 12. The cars are dropped down to the turn table, disconnected and run on to the hoist, through the passage (e). The hoist is operated by a motor in the motor room and conveys the cars to the floor (g), there the dust from the Sixty Foot Flue is



Sixty Foot Flue.

At the commencement of this part of the flue the reverberatory blast and roaster flues meet and merge into one, and it is then called the Sixty Foot Flue from its inside width. This differs from the ones previously described in that besides acting as a passage for the gases it also, on account of a greater cross sectional area, lessens the velocity and thus gives the solid matter a chance to settle. For this reason the flue is built with a hopper shaped bottom (Fig. 12); beneath the flue is a tunnel (a) for the purpose of removing the fine dust.

The walls are brick, 20 feet high and vary in thickness from 18 inches at the top to 24 inches at the bottom. The roof is built in the same way as that of the blast flue, but on account of its width it is supported by two rows of 15 inch I beams (b) resting on 12 inch columns C. The latter are 20 feet from the sides and 20 feet apart lengthwise of the flue. The area of the cross section is 1,717

stored in bins (h) preparatory to being drawn off and taken to the briquetting plant. The dust from the One Hundred and Seventy Foot Flue is run direct to bins and then to the charging floor of the arsenic plant, here it is roasted in Bruckner furnaces that communicate with condensing chambers, the waste gases passing through into the Sixty Foot Flue.

Varying depths of from six inches to six feet of dust were found in the flue, the average assay being eight per cent. arsenious oxide and ten per cent. copper.

Velocity of gases in the flue is about 1,300 feet per minute and the volume 211,268 cubic feet per minute.

Cold air is admitted into the flue through openings at e and e Fig. 1 as a means of regulating the temperature.

One Hundred and Twenty Foot Flue.

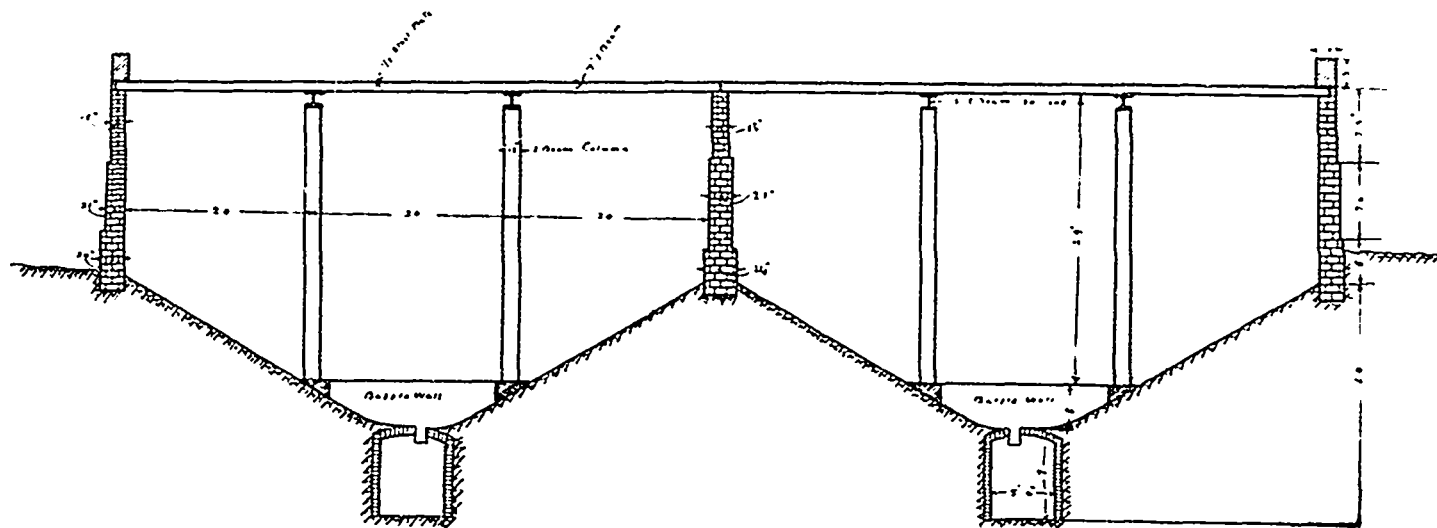
In this part of the flue the area of the 60 ft. flue is doubled and it is really a flue formed by building two sixty foot flues

side by side; the outside walls are of the same thickness, and the partition between the east and the west side is built as shown in Fig. 14. In the construction of the roof, however, there is a decided difference, as in this part, to permit of greater heat radiation, instead of bricks the covering is $\frac{1}{8}$ inch steel plate riveted to 7 inch I beams spaced 40 inch centres. These are supported by 15 inch I beam columns. The tunnels and baffle walls are constructed as before described; the length of the flue measured horizontally is 995 feet but, owing to the difference in elevation of the ends (350 feet), the actual length is about 1050 feet. The velocity of the gases is about one-half that given for the sixty foot flue.

The flue dust here is nearly all deposited in the part next the furnaces, and as the stack is approached the depth decreases until on the last few sections enough could not be obtained to form a sample. Usually the copper assay is lower and the arsenious oxide slightly higher than from the Sixty Foot Flue.

The two tunnels shown in Fig. 14 merge into one just below the contraction of the flue to sixty feet. The cars are worked by cables attached to drums in the hoist house just

Fig. 14.

Section of 120' Flue
Scale 12' = 1"

south of the stack (Fig. 10a). The cables are wound on the drums in opposite directions so that when the shaft revolves one car goes down and the other up. The power is supplied by a small electric motor, but gravity does most of the work. The hoist is run either 8 or 16 hours per day, with an average removal of five cars of dust per hour.

At the south end of the flue is the three hundred foot stack on a 44 ft. square base; details of the construction can be found in the Engineering and Mining Journal of Sept., 1903. Every month samples of the smoke are taken to make sure that no solid matter is escaping; these samples are taken by means of a line of pipe and a fan sending the smoke through a tightly woven asbestos bag.

Flue Leaks.

In February, 1904, it became apparent that a large volume of air was leaking into the flue through the sides and the roof; to determine the amount the following test was carried out:—A wooden frame $12\frac{1}{2}$ feet long and 4 feet wide was covered with stout painted canvas, a hole $2\frac{1}{2}$ inches in diameter surrounded by a wooden ring being left at (b) for the purpose of holding an anemometer. This frame was set up at intervals

on the walls and roofs of the different flues, air being prevented from getting inside in any other way than through (b) by cementing the edge of the frame to the wall as at (c). When set up it can be seen that all the air that would leak into the flue through the fifty square feet covered must pass through the anemometer, the latter being wedged and put into the hole (b). Readings were taken for five minute periods until the velocity of the flow was determined. From this result the amount of air passing into the flue per square foot at each set up was determined. One hundred and fifty different places were tried, and from the results thus obtained and the area of the exposed walls the total amount of cold air leaking in was estimated.

Before this test had been undertaken an experiment on flue leaks had been carried on as described in the appendix. From the results thus obtained it was seen that too much air was being let into the flues, so to remedy this the whole of the exposed parts were given a coat of cement, with the result that when again tested it was found that the leaks had been reduced nearly five per cent. The draft at the furnaces was in this way materially increased. To remedy the rise in temper-

ature in the flues, resulting from the exclusion of cold air, openings were made in the sides of the sixty foot flue, and at the present time sufficient cold air is let in at these places to keep the temperature of the one hundred and twenty foot flue down to the required point.

Flue Velocities.

The matter of obtaining correct flue velocities was one that for some time offered considerable difficulty, as an anemometer could not be used on account of the temperature and dust. Finally, by checking the pilot tube against the displacement of the blowers its reliability was established. Since then an exhaustive set of tests on the different flues has been carried out and the results obtained have been very satisfactory. The ones given in the foregoing are from the first set obtained.

In this sketch of the flue system at Anaconda, I have not attempted to give any figures for costs as these can be obtained from the Engineering and Mining Journal of Sept., 1903, along with the methods used in constructing the flues and stack.

Appendix.

Effect of Leaks on Chimney and Furnace Draft.

To determine the effect of leaks in a flue upon the quantity and velocity of gas passing through the furnace, and also up the chimney, an experimental plant was made of iron pipe. A number of 1 inch and of ¼ inch holes were drilled in the flue. A kerosene lamp with Argand burner served for a furnace and was so enclosed that all the air passing the lamp had to go through a 2½ inch Biram anemometer, as did also all the gas discharged from the top of the chimney. The conditions as to the lamp, the area of the intake and the discharge area from the chimney were the same for all tests. The results are as follows:—

	Velocity in feet per minute.		Temperatures.			
	Intake.	Discharge.	Near Lamp.	Base of Chimney.	Top of Chimney.	External Air.
All holes in flue closed	140	..	311°F	172°F	97°F	72°F
Total area of flue leaks 16.3 p.c. of flue area	92	..	318°	179°	99°	72°
Total area of flue leaks 32.6 p.c. of flue area	86	..	303°	120°	88°	..
Total area of flue leaks 48.9 p.c. of flue area	83	..	275°	110°	84°	69°
	..	194	321°	122°	88°	..
	..	207	300°	114°	88°	..
	..	194	283°	108°	85°	69°

These figures show that, up to a certain point, when openings are made in the flue, the velocity in the chimney increases, but beyond that point it decreases again. Every opening in the flue, however, decreases the quantity of air passing through the furnace.

The apparent explanation is that, with a tight flue the openings through the furnace are too restricted to pass the quantity of air of which the temperature conditions are capable with a *free* opening. With a certain amount of leak the temperature conditions are still sufficient to carry more air than can pass through the lamp, and the excess is taken in at the leaks. A point is finally reached, however, where the temperature in the chimney is too low to carry the quantity of gas previously passed, and beyond this point the flow decreases.

The results with all the holes in the flue closed show that even then there was a slight leak, amounting (when corrected for temperature) to approximately four per cent.

The temperatures given above were observed at about two inches from the top of the iron flue. At the bottom the temperatures were 10 to 20 degrees less.

[At the time that Mr. McDougall's paper was read before the Mining Section of the Can. Society of Civil Engineers there was published in The Mining World an excellent description of the new "Washoe Reduction Works," at Ana-



THE WASHOE REDUCTION WORKS, ANACONDA, MONTANA, THE LARGEST OF ITS KIND IN THE WORLD.

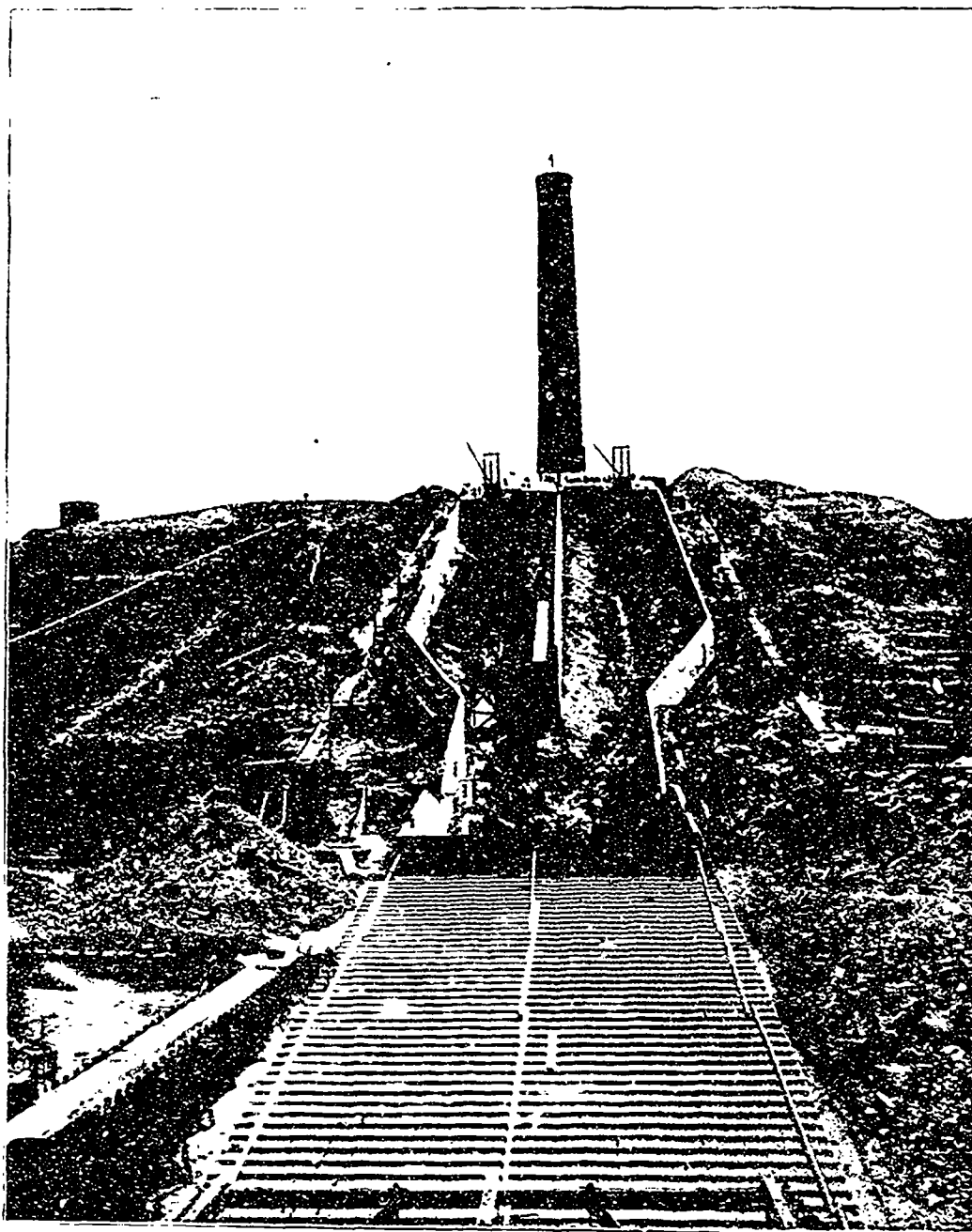
conda. By courtesy of that paper we reproduce one or two photographs of the works, and an abstract of its article.]

THE WASHOE REDUCTION WORKS, ANACONDA, MONT.

This plant, which is the largest of its kind in the world, lies some 25 miles north-west from Butte in the Warm Springs valley. The works include a sampling mill, concentrators,

900 tons daily, giving a total tonnage capacity of over 7,000 tons when all sections are in operation. After crushing the ore is screened to four sizes, viz.: diameters of 22mm, 7mm, 5mm, and 2½mm. The coarser sizes go to Harz jigs, the finer to Evans jigs, and the undersize is fed to hydraulic classifiers which return their classification to other Evans jigs.

The middlings from all jigs is re-sized or re-ground as is necessary, and re-fed; the process closely resembling that of



VIEW OF THE 60 FT AND 120 FT. FLUES DURING CONSTRUCTION, AND OF THE LARGE CHIMNEY WHICH HAS INSIDE DIAMETER OF 30 FT., WITH WALLS 5 FT. 8 INCHES THICK AT THE BASE, TAPERING TO 13½ INCHES NEAR THE TOP.

roasting furnaces, reverberatory melting furnaces, blast furnaces, a briquetting mill, converters and a refinery. The number of employees varies from 1,500 to 2,000.

The sampling mill is used as well for the ores from the Anaconda Mines as for custom ores, all the first class ore going through, and every fifth car of second class ore. The great bulk of material handled is second class ore.

The concentrating plant has the power house in the centre, with four independent sections on either side. The frame is steel, and each section has a capacity to treat between 800 and

the Lake district in the large amount of middlings constantly re-handled. For the overflows from the classifiers Willey tables are used, and the final slimes are briquetted with fine ore.

Each section of the concentrator consumes 300 H.P., for which two triple expansion Corliss engines, rated at 1,500 H.P. each, are required.

The roasting furnaces are of the McDougall pattern, containing 6 superposed circular hearths; each furnace has a capacity of about 40 tons of concentrates in 24 hours.

The smelting reverberatories each take a charge of 20 tons, and approximate a capacity of 300 tons in 24 hours; their fuel consumption is about 1 ton of coal (Wyoming) for 3.5 to 4.2 tons of ore and flux. The furnaces are 102 ft. long by 20 ft. wide; the slag is skimmed into running water, granulated and carried off; the matte is run into ladles which are hauled to the converters.

The blast furnaces are each 180 inches long by 56 inches wide at the tuyeres, and 13½ feet deep from tuyere holes to top of jacket. The capacity averages from 400 to 500 tons of charge per diem. The matte and slag run together into fore-hearths or settlers, 14 feet in diameter and 4 feet deep, from which the slag overflows and is granulated, and the matte is periodically tapped into ladles which are conveyed to the converters. There are seven of these water jacketed furnaces.

The converters are of the horizontal, or barrel, type and are nine in number, the charge for each varying from seven to twelve tons of matte according to the condition of the converter lining, which is siliceous. The first blow oxidises most of the iron and the second removes the sulphur; each blow averages an hour in duration, after which the hot metal is transferred to one of three refining furnaces where oxidation of impurities is effected by blowing in air through a pipe plunged into the bath. After this partial refining the metal is cast into anodes for electrolytic refining which now is all done in the East.

The Mines of Ontario.

By W. E. H. CARTER, B.A.Sc.*

(Continued.)

Outside of these areas bordering the north shore of Lake Huron the only important known occurrences of copper to the west, until western Ontario is reached, are those in the small areas of Nipigon rocks at Point Mamainse, Michipicoton Island, and on the islands and shores around Thunder and Black Bays, in all of which it exists in the native state. At Mamainse it is found in the form of straggling masses and thin sheets in calcspar veins, and at Michipicoton as grains in an arenaceous ash-bed. Amygdaloidal traps and conglomerates comprise the copper-bearing rocks of the Black Bay area, the native grains usually filling amygdaloidal cavities and small fissures.

Considerable mining for copper has been done at all these places and, judging from the statements of those who worked there, extravagance in operation and maintenance were the chief reasons the work did not longer continue. At Mamainse development was confined mainly to sinking shafts, the deepest being about 300 feet. The copper content of the ore varied considerably, but is said to have averaged about 0.75 per cent. A complete and large mining plant was installed, and an ore dressing mill of 180 tons daily capacity. This work progressed from 1883 to 1884.

Development of the Michipicoton deposits has gone on intermittently from the year 1860, and most energetically from 1880 to 1887, the work then largely confined to one location at the west end of the island where, out of the several sunk, one shaft reached a depth of 520 feet and another 360 feet. The drifting aggregated about 1,500 feet, said to be largely in stoping ground.

*Paper read at the Sixth Annual Meeting of the Canadian Mining Institute.

It may be mentioned in connection with these Ontario mines that several of the native copper mines on the south shore of the lake in Michigan are profitably mining ores that run on the average as low as 0.6 per cent. copper.

At Black Bay the amygdaloids have been tested in a small way during the past several years, the work going on at one mine at the present time. No definite results as to the value of the field as a copper producer have yet been obtained.

Farther west, however, at Round Lake, near Kashabowie, on the new O. & R. R. section of the C. N. Ry., and about 80 miles beyond Port Arthur, one of the pioneer mines of the area, the Tip-Top, has been under active and systematic development for the past two years or more. Four levels have been opened and stoping ground prepared, the output during the past year of ore, mainly from development work, amounting to a little over 4,000 tons, carrying by assay about 8 per cent. copper. If suitable arrangements can be made the company, I believe, intend erecting a small furnace either at the mine or at Port Arthur to smelt the Tip-Top ore and any other that may be raised from the other copper properties in the area, some of which (although unknown quantities as yet) were prospected recently. The silver ores, with their calcitic gangue, may also be purchased for flux and for their silver content, while coal or coke is to be obtained from the C.P.R. bins at Fort William. The project is not new; but up to the present no mine or mines has had enough ore in sight to warrant the venture.

NICKEL MINES.

A great deal has been written, in one shape or another, on the nickel areas surrounding Sudbury, which makes it unnecessary to say more than a few words here, and that with regard only to the present situation and the condition of the mines. There have been latterly but two operators in the field, the Canadian Copper Company, subsidiary to the International Nickel Company, and the Mond Nickel Company. The operations of the former far exceed all others in the business, both in the mining and the smelting departments, and are even now being magnified; while Dr. Mond's works have closed down for the present with a large stock of matte on hand.

The old Copper Cliff mine of the Canadian Copper Company, still the richest in copper of any in the district, has produced latterly about 1,000 tons per month from the bottom levels, at between 1,000 feet and 1,100 feet depth. The ore has there broken up into irregular bodies, making diamond drilling necessary in their location. Another substantial shoot of ore was recently found in this way and is now being mined. The ore averages about 12 per cent. combined metallic content (10 per cent. copper and 2 per cent. nickel).

No. 2 mine holds good as ever in the bottom levels, at about 400 feet depth, the ore averaging about 3 per cent. nickel and 2 per cent. copper. The now abandoned open pit, measuring 217 feet in depth with an average diameter of about 120 feet and nearly vertical walls, far exceeds in size any other of these open workings at the present time. The mine is now in shape to produce 400 tons or so of ore per day with its one shaft and double skip road.

Mines Nos. 3, 4 and 5 and the Stobie are in shape to produce in large quantities, especially the first and last, when that particular class of ore in each becomes needed at the smelter.

The output of ore for a while back has come chiefly from the Creighton mine, the most recent and valuable acquisition of the company, the present rate of mining there giving over 800 tons per day. The main unbroken ore body contains, by esti-

mate from the findings of thorough diamond drill exploration, over 3,000,000 tons of ore of a 6.5 per cent. or better nickel-copper content (about 2 of nickel to 1 of copper). There are extensions to this ore body which will considerably increase the total quantity. This estimate accounts for the ore body to a depth of but 300 feet, this being the maximum vertical depth bored by the drill, at which the width of the deposit was about 225 feet.

In order to economize in the roasting and smelting operations the entire surface works have been re-arranged, not at once but gradually during the past two years, and now a new or third smelter plant is about completed to replace both the others and also the Ontario Smelting Works near by, where the low grade matte is at present partially refined. There will be only two blast furnaces, but they will have a combined capacity of at least 1,100 tons of charge per day, and from them the molten matte will run direct to the bessemer converters in the same building and be raised to a content of about 80 per cent. nickel-copper. The accessory plant, the buildings and the new power generating station and, in fact, the general arrangement of the whole, is all after the most approved ideas, regardless of any necessary expense. Detailed descriptions of this new smelter plant appeared at the first of the year in several of the engineering periodicals and may also be referred to in the Thirteenth Report of the Bureau of Mines of Ontario.

With the completion of the new works all ore will be roasted in the one new or No. 3 yard. This has already grown to such an extent that it covers a distance of a mile or so from end to end, with heaps piled two deep and close together. Instead of the old dimensions of 40 feet by 80 feet plan by 10 feet high, the size of the heap has been reduced to about 25 by 40 feet plan by 6 feet high, with the expectation that it will roast better and in about one-third the time, that is, in from one; to one and a half months.

The Victoria nickel mine before closing down reached a depth of 500 feet, after which diamond drill holes were bored from the bottom and from the two stopes on either side of the shaft, and the ore found to continue down to still greater depths. At some future date we may hope to see this mine again figuring in the list of producers. Since the commencement of smelting at the company's plant near the mine something over 5,000 tons of bessemerized matte containing about 80 per cent. combined nickel and copper has been produced; but only a part of this has so far been refined into the pure metals at the company's refining works in Wales. The Mond Nickel Company mined and raised ore from the North Star mine also during the past two years, shipping the same to its furnaces at Victoria.

All other mining on the nickel range has latterly been curtailed simply to exploring for other ore bodies, the work no longer limited to the vicinity of the Sudbury area but reaching out to the boundaries of the field.

With such immense and valuable ore bodies as exist in these nickel mines, producing considerably more than half the world's supply of the metal, it seems unfortunate that we Canadians should derive so little benefit from it in its final utilization. Why not have at least one of our pieces of money coined out of nickel? This, besides enlarging the limited market for nickel, would help pay due tribute to the splendid mineral resources of the Province.

IRON MINES.

Iron mines are in operation in scattered localities from one end of the Province to the other. The numerous occurrences

of both magnetic and hematite in the Archean rocks of Eastern Ontario have already been brought to the notice of this Society, and as only a few of the mines have recently produced any ore, not much information can be added. The difficulty in the way of working these iron bodies is largely a matter of price, too low a margin of profit accruing at the present value of the abundant supply of ore from the Minnesota and Michigan mines, in competition with which ours must enter. When mined for its own consumption by a blast furnace company, as in the case of the Radnor mines in Renfrew, the property of the Canadian Iron Furnace Company, a satisfactory profit arises over buying foreign iron. The Radnor mines have produced over 25,000 tons of magnetic ore of good quality since the beginning in 1902. The ore body occurs in and is somewhat banded with a formation of mica-ceous gneiss. Its strike and dip are well defined.

Amongst the other mines in the eastern counties which have been doing anything of account towards raising ore may be mentioned the Moore at Eldorado, the Calabogie, the St. Charles and the Mineral Range Iron Company's properties. These last show some of the finest and largest iron ore bodies in this whole area; but for reasons mentioned above, and for lack as yet of satisfactorily cheap railway connections, steady operation and ore shipment has been delayed for the past two or more years.

The mining industry throughout eastern Ontario is not a little handicapped by this lack of adequate transportation facilities. In western Ontario the number of railroads is considerably less than here, but the want is not so greatly felt since most of the mines are of gold or silver, the product of which is easily handled. Here, however, most of the mining is for ores which have to be shipped in the crude state, and, therefore, require railroads right to the mine if possible. The needs of the mines appear at last to be forcing themselves on the powers that be, both railway companies and the Government, with the result that certain badly needed connections and extensions of present roads, such as the C. O. Ry. and the I. B. & O. Ry., are about to be constructed, and possibly a new road or two may be laid out.

The magnetic iron deposits or veins in the Laurentian gneiss and in the eruptive greenstone dikes in the gneiss of the Parry Sound district have within the last year received considerable attention by diamond drill exploration and a little mining. Magnetic surveys have frequently indicated ample quantity, but so far the necessary development has been deferred. The veins although of good quality have been found of somewhat irregular size and continuity.

About 25 miles north of Sault Ste. Marie two mines, the Loon Lake and the Williams, are being opened up on an iron range in which specular iron of excellent quality occurs. At the former there has already been raised 1,500 tons or more of ore averaging about 50 per cent. iron with almost no sulphur or phosphorus.

The ores of the Temagami Lake and Hutton township areas, consisting mainly of banded magnetite and silicious material have not been mined to any extent yet. A railroad to them is a first necessity, and this the Temiscaming & Northern Ontario Railway now under construction will supply to the former area.

In the Michipicoton area iron mining ceased in the summer on account of the financial troubles of the Consolidated Lake Superior Company of Sault Ste. Marie. The Helen mine alone has produced ore; but exploratory mining and drilling on other parts of the range give promise of finding

other merchantable ore bodies. The Helen has produced to date about 850,000 tons of ore. Much has already been written concerning this mine (7) making further mention unnecessary here.

Along the P.A.D. & W. Ry. west of Port Arthur, on Hunter's Island and vicinity; along the Atikokan River and Steep Rock Lake; along the Mattawin River; at Loon Siding, C.P.R., 20 miles northeast of Port Arthur; and in the vicinity of Nipigon Lake, iron ore, both magnetite and hematite, occurs, and has during the several years past undergone rather extensive explorations by drilling and surface stripping at all these places without, however, any mines as yet opening up. Descriptive reports of these areas may be found in the different recent volumes of the Bureau of Mines, wherein also the different schemes of exploitation and the carrying out of the same are recounted. As will there be seen diamond drilling was favored and wherever possible adopted. The spasmodic energy, more or less characteristic of the work, did not provide for any extended periods of unproductive exploration so that, the first attempts not exposing any very large bodies of ore, not much has to date been accomplished towards proving the value of the outlying ranges. During the latter end of this winter the Wiley Bros. of Port Arthur, sent their drill north of the C.P.R. to explore their iron claims on the range which runs northeasterly past the lower end of Black Sturgeon Lake, just southwest of Nipigon Lake. This is good work. When the Nipigon & St. Joe Railway makes connections with these lakes no doubt the iron ranges extending easterly from Nipigon Lake will also be again explored, but on that occasion with a little more permanency than formerly, it is hoped.

The four blast furnaces, one at Hamilton and the others at Deseronto, Midland and Sault Ste. Marie, give market for the ore in our own country. The furnaces at Radnor, Quebec, have also taken a good deal of Ontario ore. There was a project on foot during the winter to erect another furnace at Port Arthur, Ont., to smelt iron from the Atikokan magnetite deposits together with any hematite which might be found on the various other ranges, and if necessary a certain amount of Mesabi ore, to make a foundry pig iron for the growing Canadian market farther west. No doubt such a plant will be erected sooner or later.

LEAD AND ZINC MINES.

These two metals complete the list of economic metalliferous products of western Ontario. Their important occurrences are confined to two areas, one that of Dorion township and vicinity and the other farther east along Lake Superior, a few miles north of Rosspport. In the former both galena and blende are found, separately and intermixed in califerous veins, and from one carrying principally blende the Ontario Lead & Zinc Company, of Superior, Wis., has during the past year raised and shipped several hundred tons of ore. One of the old veins first mined 20 years or more ago for lead only was also worked again. The veins form a prominent feature of the country on account of their usually great width of from 10 feet to 30 feet. They traverse the Animikie rocks in connection with eruptive granites and diorites or other green schists which are well developed in bosses through the former system of rocks.

In the zinc-bearing area northeast of Rosspport protracted mining work has progressed on one property only, the Zenith

mine, where blende was discovered in 1881. The very intermittent development produced several thousand tons of ore averaging about 45 per cent. zinc, which was from time to time shipped to Belgium for treatment. The zinc refineries in the United States though much nearer gave a smaller profit. The ore has simply been gouged out with no attempt at systematic development of other possible bodies. A not very extensive eruption of coarse diorite probably of Huronian age interrupts at this point the Laurentian gneisses and granites of the north shore, the clean blende ore filling fissures as lenticular masses in the diorite. This and the other similar prospects in the area comprise the only known occurrences of merchantable sized bodies of blende in the Huronian system in Canada, for which reason it has a pointed value as indicating the possible existence of similar lodes in these rocks where elsewhere developed.

In eastern Ontario, about 30 miles north of Kingston, a vein of blende in the crystalline limestones was found about two years ago as a new economic mineral of that part of the Province, and has been mined since from the surface down profitably, on, however, the comparatively small scale of 1,000 tons or so of 46 per cent. zinc ore a year.

One of the old lead mines, the Hollandia, in Hastings county, has during the past year been re-opened after an idle period of a number of years. Complete new mining equipment has been installed and a concentrator; the old lead smelter will be made to answer the purpose for a while longer. The galena occurs in a matrix of calcspar as an ore body typical of a great number of other galena deposits throughout a belt from Lanark and Frontenac counties west to Haliburton; but on account of the irregularity of occurrence of the galena in lenzes and pockets in the matrix of the veins they have hitherto not been mined at all continuously or systematically. This Hollandia mine is the first one to erect a lead concentrator in the Province. With the additional low grade ore which may now be profitably mined, and with the Dominion Government's bounty of $\frac{3}{4}$ -cent per pound of lead in the pig on all lead ore mined and smelted into pig in Canada, it should in the same way be possible to make paying propositions out of others of these deposits of galena.

IRON PYRITES MINES.

The occurrence of large deposits of iron pyrites (8) in lenzes, chimneys and veins in the talcose (chloritic) schists of Hastings county has become well known, for the past three years mining having progressed steadily on one or more of the bodies with a total production in the neighborhood of 15,000 tons of ore, averaging between 40 per cent. and 43 per cent. sulphur. All of this has been shipped to the United States for use in the manufacture of sulphuric acid. Recently mining commenced on several additional deposits in the same area in and about Madoc township, and might profitably be extended to any of the numerous other known occurrences in this part of the Province which lie near one or other of the railroads, since the ore brings at the mine from \$3.00 to \$3.50 per ton.

In the Michipicoton Mining Division a deposit of pyrite of apparently considerable proportions, also associated with soft chloritic schists, was bored through by diamond drill below the bed of the unwatered Boyer Lake at the Helen iron mine, while hunting for extensions of the hematite ore body. The weathering and oxidation of the pyrite by which the Helen hematite resulted had not proceeded to this depth, the original

(7) Bureau of Mines, Vol. XI.

(8) Bur. Mines, Vol. XI., pp. 199, 295-296; Vol. XII., p. 139.

mineral remaining unaltered. This pyrite may prove to be a greater asset to the owners, the Lake Superior Power Company, than its secondary hematite product might have been, providing a source of sulphur for the manufacture at Sault Ste. Marie of the sulphurous acid used in the sulphite pulp works. Ton for ton at the mine it is worth about a dollar more than the hematite ore.

In the vicinities of Rosspport and Schreiber, along the north shore of Lake Superior, pyrite has been found (9) at a number of points and mined, but at only one property near the latter place was ore raised and shipped. Pyrrhotite is associated with it occasionally, as also small values in gold. It occurs as veins with lenticular characteristics in the diorite areas which pierce the Laurentian gneiss of this north shore region, and therein differs from most of the other deposits in the Province, of which the country rock is a talcose or chloritic schist.

In the western end of Ontario, beyond Lake Superior, massive veins or bodies of pyrite are frequent, confined as a rule to these green hornblende and chlorite schists and altered trap schists. Practically only exploratory mining has been done on any of them so far, the ore raised at a few not amounting in all to a good shipment. The better known occurrences are on Brule Creek (10), a tributary of the Kaministiquia River; near Dryden, C.P.R.; at Nickel Lake (11), C. N. Ry., Watten township; and at Steep Rock Lake (11), C. N. Ry. The most recent finds were made in the vicinity of this last lake during 1903 while boring with the diamond drill for iron ore. One body at a small lake called Straw Hat measures, according to the statement of Mr. R. H. Flaherty, who did the drilling, about 175 feet in width, ¼-mile in length, and contains on the average about 23 per cent. sulphur, with, however, a central lenticular band varying in width from a few feet to 20 feet, and assaying 41 per cent. sulphur, which could be profitably mined. The ore consists of pyrite interbanded with cherts in a country of green hornblende and chlorite schists.

The banded iron ores of magnetite and hematite of the northern range in the vicinity of Lake Temagami appear to have originated from deposits of pyrite similarly to the Michipicoton and other iron ores of western Ontario, and, if so, development of the iron will in time, no doubt, disclose merchantable pyrite ores in this area also. Quite a number of undeveloped prospects for pyrite unconnected with any iron ore are already known in this most interesting and rich mineral district, and one of them on Net Lake, along the line of the T. & N. O. Ry., is now being mined. Another on James Lake assays from 42 per cent. to 44 per cent. sulphur.

(To be continued.)

New Coal Mining Regulations for the North-West Territories.

A series of regulations relating to coal mining in the North-West Territories, recently issued by the Department of the Interior, Canada, are of importance. The regulations relate to the disposal of coal lands on that portion of the Blackfoot Indian reserve which lies south of the Bow River, and set forth in detail the conditions upon which coal-mining leases may be obtained in that section. Briefly, the effect of the new regulations is as follows:—

The sanction of the Superintendent-General of Indian Affairs is required before an applicant for a coal-mining lease on the territory in question may make a survey, and in no case may a survey indicate a surface area of more than fifteen sections of land, containing in all not more than 9,600 acres. All surveys are expressly subject to the approval of the Superintendent-General. A lease must not be for a term exceed-

ing twenty years, and not more than 640 acres may be occupied in surface operations during that term. The right to construct roads, building, bridges, etc., is included. A sum not less than \$3,000 must be paid by the applicant to the Superintendent-General on or before the execution of the lease. In the case of there being two or more applicants for the same location, the location will be leased to the applicant who tenders the highest fee therefor. In addition, an annual rental of fifty cents per acre for all land used or occupied in surface operations must be paid, together with a royalty of fifteen cents for every ton of marketable coal raised. All pits, shafts, roads, etc., must be kept fenced off. Mine operations must be begun within one year from the date of the lease on penalty of cancellation. Cancellation will also ensue, if at the end of the third year from the issue of lease the royalty on the coal mined does not amount to at least \$500. It is further required that no injury to surface, fences, crops, etc., must be done in carrying on mining operations, without proper compensation, the amount to be settled by arbitration in cases of dispute. A breach of agreement in any particular is made punishable by forfeiture of the lease, in which case no compensation for works, buildings or improvements is to be allowed to the lessee.

No mine now or heretofore worked by the Indians may be included in a demise, and lessees are required to purchase all marketable coal delivered at the mouth of the shaft, being the output of Indians' mines, at a rate of \$1.50 per ton. The bonus payable to the Superintendent-General prior to the execution of the lease is to be held in trust for the Blackfoot Indians. The provision relating to the fencing of pits, roads, etc., is also designed with the object of preserving the Indians of the reserve from damage. It is added that no one may be employed by the lessee of a coal mine location whose drunkenness, immorality, gambling, etc., may render him undesirable as an associate with the Indians.

An important provision affecting the rights of settlers is that which enables actual settlers to buy at the pit mouth whatever coal they may require for their own use, though not for purposes of barter or sale, at a price not to exceed \$1.75 per ton.

According to the January issue of the Labour Gazette, there were in 1904 a total number of 894 fatal accidents in industrial labor in Canada, of which 106 are charged to mining. The greatest number (273) are charged to "Railway Service," and agriculture beats mining with a total record of 110. There were during the same year 2,095 accidents which were not fatal, of which only 117 are charged to mining. Mining ranks third in the list of fatal accidents, and tenth in the list of non-fatal accidents. In percentage, 11.8 per cent. of all the fatal accidents are chargeable to mining, and 5.5 per cent. of the non-fatal. These figures do not bear out the usual conception of the extra hazardous occupation of the miner.

Mining Share Market.

Mining stocks have been very dull during the past months, and prices are practically unchanged. Transactions are few; the only sales worth recording being in Centre Star, which, after selling at 19, recovered its normal price of 21. In the Industrials, there has been limited trading, but the result of the month's business shows little change in prices. In the opinion of the "street" the public is not in the market, and speculation is reduced to trading amongst "room operators."

The following list shows the quotations for the week ending Monday, February 20, 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	.04
5.00	Cariboo Hydraulic	—	—
1.00	Centre Star . . . . .	.22	.20
1.00	Deer Trail Consolidated . . . . .	.02	—
1.00	Giant	03½	.01
10.00	Granby Consolidated	5.12½	5.00
10.00	Montreal and Boston	1.25	1.37½
1.00	North Star . . . . .	.02	—
1.00	Payne . . . . .	.02	.01
1.00	Rambler Cariboo . . . . .	.15	.12
1.00	Republic . . . . .	.03½	—
1.00	St. Eugene . . . . .	.45	.40
1.00	War Eagle . . . . .	.11½	.10
1.00	White Bear . . . . .	.04	—
100.00	Nova Scotia Steel (common)	67.12½	66.75
100.00	Ditto ditto (preferred)	—	—
100.00	Dominion Coal (common)	66.00	64.75
100.00	Ditto ditto (preferred)	—	—
100.00	Dominion Iron and Steel (common)	18.25	18.00
100.00	Ditto ditto ditto (preferred)	65.00	64.00
—	Ditto ditto ditto (bonds)	82.37½	82.25

(9) Bur. Mines, Vol. VII., p. 78; Vol. X., pp. 89, 109.

(10) Bur. Mines, Vol. X., pp. 107-108.

(11) Bur. Mines, Vol. XI., pp. 296, 308-309.

PERSONALS.

The estate of the late Sir Isaac Lowthian Bell has been assessed at £768,676, of which £674,317 is net personality.

Mr. James McEvoy, geologist of the Crow's Nest Pass Coal Company, has also been appointed its land commissioner.

Major Duncan Stewart is visiting his former home at Hamilton, Ont. Major Stewart is now Registrar of Mining at Johannesburg, South Africa.

Mr. George Gillies, of Toronto, a director of the Athabasca-Venus Company, was in British Columbia during January to look after his mining affairs.

Mr. J. H. Plummer, president of the Dominion Iron & Steel Co., has been seriously ill at Sydney, C.B., but is now recovering.

Mr. C. V. Wetmore, of Sydney, C.B., has been elected president of the New Brunswick Iron Co., Limited.

It is announced from Toronto that James Cronin has been appointed to succeed E. B. Kirby as the general manager of the War Eagle and Centre Star mines, at Rossland.

The Hon. Wm. Ross and Mr. Alf. Morrison have asked the County Council of Port Hood for a free right-of-way for the railway of the Margaree Coal & Railway Co.

Mr. Chas. Putnam, of Dawson City, formerly of Nova Scotia, was a visitor to Montreal in January. Mr. Putnam is interested in the Gold Hill properties which were organized into a corporation by the Palmer Bros.

Lieut.-General Sir Henry C. Wilkinson arrived in Montreal on February 11th, and will remain in that city for a week or ten days. General Wilkinson is perfecting his arrangements for the re-opening of the Regina mine, and will commence sinking as soon as the mine has been unwatered.

J. B. Tyrrell, M.E., of Dawson, and formerly of the Geological Survey, is spending a few weeks in Ottawa with his family. When Mr. Tyrrell went into the Yukon some seven years ago, his wife and children did not accompany him, hence his home coming has been a joyous event for himself and family.

Lord Strathcona has been elected an honorary member of the Institute of Civil Engineers of London. This is an honor which is only accorded very distinguished citizens of the world, and the eminent High Commissioner for Canada is accorded the honor because of his services in that position and as Chancellor of McGill University.

Mr. G. S. C. Lindsay, managing director of the Crow's Nest Pass Coal Co., and Mr. J. McEvoy, geologist of the same company, have been in Victoria, B.C., where Mr. Lindsay testified before the Assessment Commission to the injustice of the tax in its present incidence. The provincial tax of five per cent. he stated to be excessive; the coal company is already paying a triple tax, and he suggested that coal lands should be placed in a class by themselves, and taxed less heavily than at present.

Dr. Wm. G. Mitchell, a native of Quebec, died in January at the Jubilee Hospital in Victoria, at the age of forty. Dr. Mitchell was born in the city of Quebec, and received his education and degree from Edinburgh University. As a football athlete his reputation was unexcelled. He came out as physician on the C. P. R. boats at the time of the Klondike excitement, and was the first Canadian to make locations in Atlin Camp. It is due to his energy that the British-American Company was formed to hydraulic and dredge ground in Atlin district.

Dr. John B. Porter, Professor of Mining and Metallurgy at McGill University, has received an invitation from the British Association for the Advancement of Science to deliver an address before the meeting of the Association which is to be held at Johannesburg, South Africa, in August next. If the university work will permit, Dr. Porter will accept the invitation, which is not only a due and pleasing compliment to Dr. Porter, but is also a tribute to McGill's increasing reputation in the world of science.

At the annual general meeting of shareholders of the British Columbia Record, Limited, held at Victoria, British Columbia, on February 1, inst., Mr. E. Jacobs was appointed managing director of the company in succession to Mr. H. Mortimer Lamb, who, for health reasons, voluntarily retired from the management of the British Columbia Mining Record with which he has been actively associated for about seven years. By arrangement with Mr. Lamb, Mr. Jacobs had already relieved him of the duties of editor of that journal.

Mr. Robert H. Stewart has been appointed to be superintendent of the Centre Star and War Eagle mines at Rossland. Mr. Stewart is a graduate of McGill, in the class of '96, and was gold medallist for that year.

Mr. E. T. Corkill has been appointed an Inspector of Mines for Ontario, vice Mr. W. E. H. Carter, resigned. Mr. Corkill is a graduate of Kingston's university, and has had some practical experience since graduation. His qualifications are good.

BOOK NOTICES.

Bulletin No. 2 of the Geological Survey of Ohio, on the Uses of Hydraulic Cement, is a valuable monograph on an article which is now greatly interesting all classes of constructors, mining and otherwise. The book has been written for the mass of the people, and is guiltless of chemical or engineering formulae, but is none the less sound, reliable and authoritative. Prof. F. H. Eno, by whose pen the book is written, has personally studied his subject, and travelled widely to visit in person the examples he describes and illustrates. The Bulletin serves the admirable purpose of enclosing within its covers the substance of what hitherto has been scattered through a vast mass of miscellaneous literature. As a careful and critical presentation of the modern uses to which cement may be put it stands alone at present.

The Bulletin briefly summarizes the history of cement, and then gives concise information upon its general uses. The subject of mortars, stucco and mouldings, of its use in concrete for foundations, fortifications, houses, sea walls and railway work; of its uses in reinforcing or casing metal work, and its adaptabilities to all architectural purposes is treated in a manner well calculated to inform the educated as well as the uneducated.

The Review has noted before the commendable methods used by Prof. Edward Orton, Jr., the State Geologist of Ohio, in the conduct of the Ohio State Survey; the preface to this small volume relates some of them, and they are models for our own Government to follow.

The Geological Survey of Canada has begun the publication of an excellent system of bulletins on the Economic Minerals of Canada. These are issued in pamphlet form, and have been made up from existing information scattered through some six hundred publications of the Survey, extending over a period of sixty years. The information contained in these older reports has been in some cases correlated and rewritten to the year 1902, in other cases taken verbatim from older volumes and not brought within five or six years of date of publication. It is about the only matter for criticism that data for all the issues are not brought up to January 1st, 1904. The list is as follows:—

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|--|-----------------------|
| 818. Platinum..... | by E. D. Ingall. |
| 851. Coal..... | by E. D. Ingall. |
| 854. Asbestos..... | by Dr. R. W. Ells. |
| 857. Infusional Earth..... | by E. D. Ingall. |
| 858. Manganese..... | by E. D. Ingall. |
| 859. Salt..... | by E. D. Ingall. |
| 860. Zinc..... | by E. D. Ingall. |
| 869. Mica..... | by Dr. R. W. Ells. |
| 872. Molybdenum and Tungsten..... | by R. A. A. Johnston. |
| 873. Nickel and Copper of the Sudbury Mining District..... | by Dr. A. E. Barlow. |
| 877. Graphite..... | by Dr. R. W. Ells. |
| 880. Peat..... | by Dr. R. Chalmers. |
| 881. Apatite..... | by Dr. R. W. Ells. |
| 882. Copper in Nova Scotia, New Brunswick and Quebec..... | by Dr. R. W. Ells. |

There has also been issued a small pamphlet on Marl Deposits in Ontario, Quebec, New Brunswick and Nova Scotia.

The pamphlets are unequal in value, owing doubtless to the different ideas of the various compilers, for it is evident that no formulated rules have been laid down as to the scope and character of the information to be contained. Some of them contain the definite figures and ideas which investors and investigators desire, and others are purely geological in expression and deficient in commercial data. This is noticeable in the bulletins on Mica and Graphite more particularly. The deficiency of not bringing the subject matter up to date is noticeable in both the Asbestos and Zinc bulletins, and the latter is particularly regrettable in view of the great importance which the latter metal has assumed during the last two years in the Province of British Columbia.

The bulletins on Coal and Peat are specially to be commended; Dr. Chalmers has treated his subject thoroughly, and there is little about Peat in Canada which is not included in his bulletin.

The admirable monograph by Dr. A. E. Barlow on the Nickel and Copper Deposits of the Sudbury District deserves and will have special mention in our next issue.

Dr. Robert Bell, the Acting Director of the Survey, has done good service in having the scattered facts and reports brought together, condensed and issued in their present form. If recast from year to year and new information be included, the Survey will have earned for itself the gratitude of every individual interested in the mineral development of Canada.

INDUSTRIAL NOTES.

The Ottumwa Box Car Loader Co., of Ottumwa, Iowa, is doing a good Canadian business, their loaders having rapidly gotten into favor with Canadian shippers. The last shipments have been made to the International Coal & Coke Co., of Alberta, and to the Souris Coal Mining Co., of Manitoba.

The Westinghouse Electric & Manufacturing Company has closed a contract with the United Railways and Electric Company, of Baltimore, Maryland, for an alternating current generator to be rated at 5,000 kilowatts. It will be of the flywheel type, with 32 poles, and will run at 94 revolutions per minute. The generator will be wound for 13,000 volts, three-phase, with a frequency of 25 cycles.

The 5,000 kilowatt generator now on order is to run in parallel with the five 2,000 kilowatt generators which the Westinghouse Company has already installed in the Pratt Street Station in Baltimore.

The same company has sold to the La Belle Iron Works, at Steubenville, Ohio, a direct current engine-type generator, to be rated at 1,000 kilowatts, the voltage to be 250.

The Hamilton Cataract Power, Light & Traction Company recently started the two 5,000-kilowatt Westinghouse generators in their De Cew Fall power station in Ontario. Power is supplied from feeders to the Welland Canal, which, at the station give a head of 267 feet. The generators are of the two-bearing type, direct connected to Escher-Wyss water-wheels, and run at a speed of 286 revolutions per minute. They generate a 3-phase current at a frequency of 66 cycles, and an intensity of 2,400 volts. The power is transmitted to the city of Hamilton, Ontario, where it is used for lighting, street railway and manufacturing purposes. A reserve steam-driven station is located at Hamilton, which contains two 1,000 k.w. Westinghouse generators. The entire station and high tension apparatus are of Westinghouse design. The high tension apparatus is designed for a pressure of 40,000 volts, but will be operated for a time at 20,000 volts.

The Allis-Chalmers-Bullock Company have been celebrating in both Milwaukee and Montreal. At the former place some sixty-six of the officers, heads of departments and salesmen dined and were photographed. At Montreal, on the 17th of January, the directors gave a banquet at the Canada Club, at which over fifty representatives were present. The president, Mr. Geo. Bullock, of Cincinnati, spoke optimistically of his personal observations in British Columbia. Mr. B. H. Warren, president of the parent company, (Allis-Chalmers), spoke of the importance of the position which the salesmen held, and gave some sound advice from his own large experience. Other officials present contributed speeches.

Then the members of the Canadian Society of Civil Engineers, to the number of 150, visited the works on Jan. 25. They expressed surprise at the progress of the company, and at the amount and character of electrical work under construction. They were given an interesting demonstration on the construction and operation of drills, coal cutters and compressors. On leaving, each member was presented with a handsome leather card-case as a souvenir of the visit. Now the same corporation has extended to the members of the Canadian Mining Institute a most courteous invitation to visit and inspect their factories and to lunch on Friday, the 30th of March.

MINING NOTES.

NEWFOUNDLAND.

The Tilt Cove Copper Company, Limited, declared a dividend on January 17th of one shilling per share, free of income tax.

The output of iron ore from Wabana, Bell Island, 1904, was the second largest since mining began. The plans for 1905 promise the biggest output yet achieved.

The copper mines at Baie Verte, Tilt Cove, and northern ports, report an exceptionally good year and a large output of ore. The Colony's yield of copper ore promises to be much increased by the results of the York Harbor mine's shipments. This mine is on the West Shore, and is the only shipping mine on that shore.

NEW BRUNSWICK.

The New Brunswick Iron Company, Limited, have about a dozen men at work at Lepreaux locating seams of ore and boring to test the thickness and dip of the same. No sinking of shafts will be attempted until spring. The company has been incorporated with a capital of \$1,000,000. The ore is magnetite.

NOVA SCOTIA.

The workings of Dominion No. 1 Colliery are to be extended under the sea.

The Dominion Colliery of the Intercolonial Coal Co. is averaging a daily output of 950 to 1,000 tons.

Wages paid to coal men in Nova Scotia during the year 1904 amounted to \$6,680,000.

The Brookfield Gold Mining Co. is averaging an output of about 900 tons of ore monthly, yielding about \$8 per ton.

The year's output for 1904 of the Dominion Iron & Steel Company is reported at 143,113 tons of steel in various shapes and forms.

John Scott, of Millvale, N.S., was crushed to death at Springhill in January by being caught between two cars which he was coupling up.

The Dominion Iron & Steel Co. in 1904 used 170,000 tons of coke (388,500 tons of coal), 290,000 tons of iron ore and 17,000 tons of limestone (dolomite).

The output of No. 2 blast furnace of the Dominion Iron & Steel Co. for January was 9,000 tons. The product of the rod mill for one week in the same month amounted to 264 tons.

The length of the slope at the Drummond Colliery of the Intercolonial Coal Co. is said to be the longest on the North American continent; it is now slightly over 6,700 feet.

A consolidation of the properties of the Maritime Coal Co., the Minudie Coal Co., and the old Joggins is rumored from Chignecto. Montreal capital is said to be behind the scheme.

The daily earnings of coal cutters at the Springhill Collieries averaged \$2.98 for the year 1904, the highest wages earned since 1885, and the highest of any colliery in Nova Scotia.

The Boston Tangier Mining Co. is the name of the new concern which has taken over the property of the Tangier Amalgamated Co. The superintendent of the new company is Mr. E. N. Higley, of Boston.

The Sterling gold property at Oldham, which has been bought, and is now controlled by Mr. John B. Forster and associates, is turning out some rich ore. The last clean-up gave a return of 4 7-10 ozs. per ton.

The Inverness Railway and Coal Co. report that the quality of the coal is much improved to the deep; a second picking table and another tiple are to be constructed to give facilities for larger shipments in 1905.

The North Sydney Herald is authority for the statement that the Nova Scotia Steel & Coal Company will erect a second blast furnace in the spring. The construction of the open hearth furnaces is proceeding rapidly.

The company which is working the Debert seam of coal, the Colchester Coal and Railway Company, reports that the quality and size of the seam continues with work to the deep. The railway will be connected with I. C. R. rails by early summer, when shipping will commence.

The oft-asked question as to when a dividend on Dominion Iron & Steel may be expected has been answered by President Plummer to the following effect, that earnings and market must be increased and expanded before an answer can take definite shape.

The financial position of the Nova Scotia Steel & Coal Co. appears to be in as sound condition as ever before. The company has had a good year, its output of coal reaching the half million mark; its new furnace at Sydney is earning well, and the mills at Trenton are filled with orders.

The estimated values of the mineral products of Nova Scotia (as given in the Industrial Advocate) were as follows:—

Coal	\$13,000,000
Pig Iron	3,100,000
Steel	2,730,000
Gold	500,000
Other Minerals (Gypsum, Manganese, Copper, etc.)	605,800

The record of the Dominion Iron & Steel Company for 1904 is represented by the following items:—

Total production of pig (basic and foundry), tons..	76,601
Steel Ingots, tons	62,842
Blooms, Shafts, etc., tons.....	54,873
Billets and Wire Rods, tons.....	31,598
Tar, galls.	1,650,153
Sulphate of Ammonia, galls.....	3,546,557
Sulphuric Acid, galls.	2,631
Output of Ore (Wabana), tons	625,000
Used at Sydney	220,000
Imports of Ore, tons	70,000
Coal consumed (including coal for coke), tons.....	385,000
Limestone quarried, tons.....	160,000

The collapse, or shut-down, of the Dolliver Mountain Mining and Milling Company is regarded as a great surprise. Boston capitalists have expended some \$250,000 on this property in development and plant, and the equipment is regarded as the best in Nova Scotia. The owners are reticent as to the cause of the shut-down, but rumor says returns were less than \$1.00 per ton of ore.

ONTARIO.

The Bully Boy mine in Camp Bay has been purchased by a corporation known as the Arizona Camp Bay Gold Mining Co.

It is reported that the Laurentian property (371) is turning out some good ore containing much visible gold. It is expected the diamond drill will arrive shortly to assist in the work of exploring the depths of this rich property.

The Bureau of Mines has received a report that a five-stamp mill has gone into successful operation at the Star of the East gold mine, in Kaladar township, Addington county. The first clean-up after fourteen hours' run gave \$300 worth of gold. The shaft is down 150 feet, and the vein is strong and promising.

Steele's property, in the Sturgeon Lake district, is reported as producing richer ore than ever. Since the ten-stamp mill has been in commission several gold bricks have been shipped east from Ignace.

Development work at the mine owned by D. Garrison of Sturgeon Falls, near Warren, reveals better showings at each level. The mineral assays very high in copper, gold and silver.

The estate of Cornelius Shields, former manager of the Sault Ste. Marie companies, totalled \$115,413, including \$68,864 cash in banks. The estate is divided among the widow and five children.

Two furnaces are at present working full time at the smelter of the Canadian Copper Company, at Copper Cliff, and the output has considerably increased. Three new converters for the Bessemer plant have arrived, and will be immediately installed at the smelter. President Wood, of the International Nickel Company, recently paid a visit of inspection to the works.

Mr. C. E. Hilary, of Rat Portage, has received instruction from Sir Henry Wilkinson to prepare the Black Eagle mine for operation again after a three years' disuse. During this time the large thirty-stamp mill has been kept in working order, and the rest of the machinery being in shape, it is expected that the mine will be in operation towards the end of March, after the arrival of Sir Henry, who left London about the first of the month.

Hon. J. P. Whitney, on assuming office as Premier, announced in an interview that "there will be a Department of Mines created in due course, which will have a Minister."

The Sudbury Journal puts forward the name of Mr. Frank Cochrane, of that town, for the position of Minister of the new Mines Department which Premier Whitney has announced his intention of creating.

Mr. T. J. Drummond, of the Lake Superior Corporation, in an interview recently, stated that the showing made by the various plants is entirely satisfactory to the executive. A decision had been reached to place both the veneer mill and the saw mill in operation, and there is sufficient raw material to keep the mills in continual operation.

The efforts of the management of the Giant mine, at Manitou, in the direction of exploring their property on H. W. 74, are progressing favorably, the shaft having now reached a depth of 100 feet, the results obtained under Supt. Polson being, it is said, very satisfactory.

Advices from Webbwood say that the Shakespeare Gold Mining Company has its stamp mill about completed, and in a short time expects to be turning out gold bricks.

One of the last announcements made by the late Ross Ministry before resigning office was to the effect that every dollar of the advance made by the Government to the Sault Ste. Marie Companies in the fall of 1903 had been repaid, and that the Ontario Government has been entirely relieved of its guarantee.

Captain J. H. Triggs, who organized and operated the Triggs Mining Company in the Rat Portage district from 1897 to 1900, and who has been residing in Duluth for the past few years, died at his home there on the 31st ult.

The Toronto Globe says that Messrs. Mackenzie & Mann have contracted for the erection of a pig iron furnace at Port Arthur. The smelter will have a capacity of from 150 to 200 tons of iron ore per day, and must be completed by October 1st next. The purpose is the development of the iron ore properties owned by them in the neighborhood of the Atikokan and Mattawan ranges, which lie along the Canadian Northern Railway. The enterprise will probably mean the employment of about 1,000 men.

The shaft of the Paymaster mine is now past the 130 feet mark, and very encouraging values have been obtained at that depth under the charge of J. Joy, who has recently succeeded John McLeod, who left after completing his contract.

H. J. Tharle, of the Redding Mining Co., has returned to Fort William from the east, where he conducted negotiations for machinery for a stamp mill to be erected at the company's mine in the Atikokan district. Construction will begin almost immediately, and Mr. Dolphin, of Montreal, will have charge of the installation of the machinery. It is thought that the new mill will be in working order before next fall.

BRITISH COLUMBIA.

The Slocan Star shipped 253 tons of silver-lead ore in January.

The Rambler - Cariboo mine has increased its share capital by \$500,000.

During 1904 the Ottawa mine (Slocan) shipped 13,000 tons of ore.

During January the Whitewater lessees shipped out 22 tons of galena.

The daily output of the coal mine at Frank, Alberta, is now 650 tons.

The Idaho mine sent twenty tons of lead ore to the Trail smelter in January.

The Queen mine, at Salmo, reports a new find of galena ore worth \$50 a ton.

In January the Ivanhoe mine shipped ninety-seven tons of galena and 137 tons of zinc ore.

The dry ore mine, the Home Run, has recently shipped twenty tons of dry ore to the smelter.

The Kamloops Coal and Development Co. are entertaining a proposition to sell the entire property.

No. 4 shaft of the Surprise mine in the Lardeau is taking out high grade ore.

The Hunter V. mine, producing flux, is shipping about seventy-five tons a day to the Trail smelter.

The Ymir and Queen mines are shipping concentrates to the Hall smelter.

The meeting of the Associated Boards of Trade has been fixed for February 22nd, at Nelson.

The Payne mine, under its lessees, made a shipment of ninety tons of ore in the first month of the year.

The lessees of the Antoine mine have shipped one carload this year and have another nearly ready.

The Bismarck mine has shipped twenty tons of lead ore this year and is now rawhiding forty tons more.

The agitation over the question of mine taxation is present in every camp in British Columbia.

The Brooklyn, Rawhide and Athelstan mines are shipping regularly to Montreal and Boston smelter.

The streak of high grade ore recently found in the Triune mine has proved to be continuous thus far.

The option on the Van Anda mine, given to the Chamberlain-Syndicate, of England, has been abandoned.

It is rumored that the free-gold property of the Cariboo-Camp McKinney Company will be re-opened in March.

The Lucky Jim mine shipped sixty-three tons of ore in January, and during that month also disbursed a dividend amounting to \$8,000.

The Slocan Star mine is now shipping an average of 300 tons a month to the smelter at Trail. Forty men have steady work.

The 2,500 tons of zinc ore sold last month by the Slocan Star Co. will go to the United States Zinc Company at Pueblo, Colorado.

The Last Chance mine in the Slocan sent forty tons of galena to Trail and twenty tons of zinc ore to Pueblo in the month of January.

The Providence mine continues its record as a good property. On the first of the month the 400 foot level cut into a strong and rich ore body.

The St. Eugene mine reports its new pumping plant in successful operation, and the monthly output of ore to be now averaging 2,500 tons.

During January the Reco mine used 100 head of horses to rawhide ore from the mine to the railway. The amount shipped averaged fifteen tons a day.

The West Canadian Collieries at Frank, Alberta, has made a large contract with the C. P. R., to satisfy which will require the present output to be doubled. The collieries, therefore, may be expected to produce 6,500 ton daily during the next few months.

The Tacoma Steel Company, owning the Marble Bay mine, are prosecuting work vigorously, having struck good ore at a depth of 570 feet.

A premature explosion of a blast on the Senator Group, North Fork of Kettle River, on the 31st of January, killed one man and seriously injured two others.

The Nettle L. mine, owned by the Silver Cup Mines, Limited, opened up in a band of high grade ore, some five feet in thickness, the last week in January.

Several carloads of zinc ore have been sent to Iola, Kansas, from the American Boy. The mine also shipped forty tons of silver-lead ore during January.

Revised figures for the ore tonnage of the Granby Co., at Phoenix, B.C., give a total of 549,703 tons, as against 293,718 tons for 1903, an increase of forty per cent.

The old trick of selling "fake" locations has again been successfully practised in Spokane and vicinity; this time the bait was East Kootenay Coal and Oil Lands.

The Iron Mask mine, Kamloops, is to enlarge its present concentrator at a cost of about \$7,500. This mine has a considerable amount of English capital interested in it.

The shares of the Morrison mine have been deposited in trust with the Spokane and Eastern Trust Co., to be exchanged on the basis of one share of Consolidated Montreal and Boston for thirty of Morrison.

American capital from the State of Washington has become interested in the Strathmore mine, near Greenwood. A sample taken across the vein by the new investors is said to have shown a value of \$147 per ton.

The bricks made from the fireclay deposit at Matsqui, which were sent to the Trill smelter for trial have turned out well; they stood the heat and the action of the fluxes as well as the imported brick.

The work at the Chapeau mine, Slocan Lake country, which began about October 1st, has been unproductive, and the mine has been closed down. There is no pay ore in sight, and three months' work has failed to find any new bodies.

The Mother Lode property of the British Columbia Copper Company has uncovered a new deposit of ore of better grade than the ordinary ore of the mine. The deposit is 130 feet wide, and carries good values in both gold and copper.

Mr. C. Cameron, lessee of the Yankee Girl claim, reports the finding of two feet of good ore seventy feet from the supposed line of the pay streak.

The town of Ymir has been experiencing an unusual spell of cold weather; for ten days the thermometer did not register above zero.

From the detailed returns of December, 1904, lead ore shipments, it appears that the St. Eugene mine produced more lead than all of the West Kootenay mines put together. Its product was 995.2 tons of ore, carrying sixty-three per cent. of lead.

The Surprise, on Surprise Creek, in the Lardeau, has been opened with the view of selling to Nova Scotia parties, represented by R. P. Fraser, druggist, of Pictou. Large stories are in order, and some of them are being circulated by the press.

Owners of the stock of the Great Northern Mines, Limited, are again busy in the press of British Columbia with boom paragraphs respecting the Lardeau district. Results have been fairly satisfactory during 1904, but another year's work is necessary before any boom is justified.

The bonding of the Queen and Kootenay Bell mines, at Salmo, in the Ymir country, by Mr. Patsey Clark of Spokane, in the month of January, has given the camp quite an impetus. The leasing system, on which we had a recent editorial, is responsible for this option.

The commission which was appointed to investigate certain charges against Coal Mine Inspector Dick regarding the manner in which his department was being conducted, has exonerated him on every count. He has been reinstated in office, having been suspended temporarily while the hearing was pending.

Rossland reports that work is to be resumed on the Crown Point mine, owned by the War Eagle Company. This property was extensively prospected and explored by J. B. Hastings when he was the manager of the War Eagle, but his work did not reveal any values in the vein, nor was he successful in locating the vein beyond the fault which cut it off.

The Associated Boards of Trade of British Columbia are discussing the necessity of a Dominion Department of Mines, with a Minister from British Columbia at the head of that Department. It is proposed to send a delegation to the capital to urge the creation of this new portfolio upon the Government.

The Pioneer Mining Company, owning the Two Friends, Black Prince and other locations on Lemon Creek, Slocan Lake Division, is now shipping monthly to the Canadian Smelting Works at Trill. The ore is "dry," but maintains a high average in silver with a small amount in gold.

The chief town of the Crow's Nest Pass region is Fernie, B.C., which now has a population of 3,000 people. There are 1,128 coke ovens here, which produce over 1,000 tons of coke per day. Fernie is the distributing point for Coal Creek, Michel and Carbonade, which latter is the new name for the old town of Morrisey.

The coal strike at Coleman at the mines of the Intercolonial Company was occasioned by the demands of the union for a very much higher scale of wages than obtains at Fernie. The union asked \$4 for fire-boss, 65c and \$4.00 for ton and yard, and \$4.00 for timbering, as against \$3.75, 55c and \$1.00 respectively paid by the Crow's Nest Pass Coal Co.

The town of Silverton, B.C. had an excitement in January, due to the fact that a rifle bullet was fired through the window of the Victoria Hotel bar, and came very near hitting Mr. M. S. Davys, of Nelson. Mr. Davys is the lessee of the Emily Edith, Cumstock and Hewitt mines, near Silverton, and the local press incline to the belief that the trouble arose from Mr. Davys supplying the cookhouses with Chinese cooks instead of with white ones.

The U. S. Zinc Company, operating at Pueblo, Col., has had its general agent, Mr. Edwin Anderson, in British Columbia during January making investigation of the probable reliable output of zinc ores from that province. Mr. Anderson, when interviewed, said that he thought the quality and quantity of the ores were satisfactory as to zinc contents, but his company wished to get ores with higher values in silver. The ideal ore, he stated, would be thirty-five per cent. of zinc with high silver values. His company would not pay for lead contents, as freight and duties would eat up all values in lead.

At the annual meeting of the Rossland-Kootenay Mining Co., Ltd., held at Salisbury House, London, E.C., the chairman, Mr. C. W. Milne, stated that all work would be confined to the Kootenay mine; that previous work had failed to locate higher values in the ore bodies, and that diamond-drilling had not yet been successful in finding ore of value. He also said that Mr. Thompson, their manager, had endeavored to find a suitable concentration process, but without success, and therefore the only thing to do has been to shut down the mine and conserve their remaining funds.

The Granby Consolidated Mining, Smelting and Power Co. has bought the Monarch, Tamarack and the Tamarack Fraction claims at Phoenix, B.C., for \$130,000, and the Missing Link Fraction for \$30,000. These claims carry low-grade gold-copper ore, similar in character to the Knob Hill and Old Ironsides.

In the settlement of the bankruptcy suits brought against Munroe & Munroe, New York, agents for the Cons. Montreal and Boston Co., the brokers who became creditors of the firm on the day of the failure have had set apart as their security shares of the company taken at the rate of \$1.00 per share.

A syndicate will advance the \$90,000 cash needed to discharge the urgent payments in the Mann and McKenzie properties, and shares sufficient to provide for payments not yet due on these properties have been set aside as a fund to meet the payments.

Munroe & Munroe will no longer represent the corporation, and are left to settle with their other creditors as best they may with any assets they may have other than Montreal and Boston shares.

YUKON.

The force of ten mining inspectors in the Yukon is to be reduced to two, and the recorders to four.

Dawson is excited by the projected visit of the American Institute of Mining Engineers in July next.

The estimate of the gold output from the Yukon Territory for 1904 as made by ex-Governor F. T. Congdon, is \$10,000,000.

Major Z. T. Wood is Acting Commissioner for the Yukon Territory pending the appointment of a successor to F. D. Congdon, resigned.

Reports from the Tanana field confirm previous items in this column as to high prices and scarcity of food. Gold dust is but little in evidence this winter, but belief in its abundance next summer is universal.

The Gold Commissioner has been busy in the matter of adjudicating water rights. In the case of the Bonanza Creek Concession Co. vs. Cameron & Tyrrell, the Commissioner has ruled in favor of the plaintiff company.

Mr. J. W. Astley, a well-known D. L. S., reports that Lower Dominion Creek is busier than it has ever before been. The pay dirt is not of high grade but is uniform and of large extent. From the mouth of Gold Run for two miles down Dominion there is a very busy scene.

Dublin Gulch, on Haggart Creek, a tributary of the McQuesten River flowing into the Stewart, has been deemed not placer ground, and an hydraulic concession has been given to James Haddock. Several Dawson men are behind Haddock, and believe that both water and gold are present in good pay quantities.

Dawson papers in January reported the discovery on Skookum Hill, opposite the town of Bonanza, of a paying quartz deposit. The deposit was found in driving a length of fifty-six feet from the bottom of the shaft 150 feet deep. No values per ton are reported, neither are any data as to width of the deposit.

The somewhat notorious "Boyle Concession," on the Klondyke River and Hunker Creek has been sold to the Detroit-Yukon Mining Company, and the first payment of \$250,000 is reported to have been made. The Detroit-Yukon Mining Co. already owns the Williams Concession in Hunker. The concession on Quartz Creek, held by Boyle Bros., is not in the transfer.

An amendment to the regulations permitting the diverting of water for mining purposes has been made in the shape of imposing fees, as follows:—For 60 inches or less, a fee of \$10.00; for 60 to 200 inches, a fee of \$25.00. The regulations provided for quantities of 200 inches or over. This amendment provides for quantities of less than 200 inches.

The New York Co which has possession of all the ground from Discovery to 84 below on Bullion Creek, Alsek District, is sending in large quantities of supplies; oats, lumber and provisions have been sent from Vancouver, as well as a saw mill and about 100 tons of machinery. Mr. Breeze, the manager, will own his own teams and do his own freighting from Whitehorse to Bullion Creek.

Enthusiasts from Portland are having a dredge built by the Hammond Mfg. Co. to dredge the bottom of Behring Sea, some thirty-five miles west of Cape Nome. The region there is shallow, and one J. H. Allheldt is reported to have obtained \$48.00 from two wheelbarrow loads of sand and gravel scooped up in twenty-five feet of water.

A lady, Miss Kate Ryan by name, enjoys the distinction of being the only female official of the Dominion Government in the Yukon. Miss Ryan is employed as an inspector of gold dust in the baggage or on the person of the female traveller between Whitehorse and the boundary. She is at present absent from service visiting her relatives in New Brunswick.

The Governor-in-Council has amended par. 30 of the Regulations to read as follows:—

"Every entry made in the Mining Recorder's books shall show the date upon which such entry is made. No fees shall be charged for obtaining information from the Mining Recorder with respect to mining claims; documents filed shall be open to public inspection, but for copies of any documents a fee of \$2.50 shall be charged up to two hundred words, and an additional fee of fifty cents for each extra hundred words."

COAL NOTES

The January output of the Dominion Coal Co.'s Collieries was 160,618 tons, with total shipments of 130,649 during the same period.

Japan mined 9,650,000 tons of coal in 1904; in 1894 the total product of that country did not exceed 3,000,000 tons.

The annual meeting of the Dominion Coal Company will be held at twelve o'clock on the 2nd of March, at the offices of the company.

The shipments from the Springhill Collieries of the Cumberland Railway and Coal Company for the month of January amounted to 24,676 tons.

The No. 2 Slope of the Springhill Collieries of the Cumberland Coal and Railway Co. is practically idle owing to lack of shipping facilities. The West Slope is working as usual.

The fleet of coal-carriers plying between the Dunsmuir mines, on Vancouver Island, and San Francisco, has been augmented by the steamship Tricolor, of 6,500 tons. The five vessels now engaged in this service have a monthly capacity of between 40,000 and 50,000 tons.

The Crow's Nest Pass Coal Company put out for the week ending January 7th the largest amount of coal yet recorded by that company, viz., 16,945 tons. Of this amount, Coal Creek produced 8,902 tons, Michel 6,438 tons, and Carbonado 1,605 tons.

Practically no coal has yet been banked by the Dominion Coal Co., as the company has shipped or used all that has been raised. The opening of new faces has been so well advanced that next summer the mines will be able to ship fresh mined coal as fast as it can be taken away.

The experiment made in December by the Dominion Coal Co. of sending a vessel loaded with coal to Montreal in the wake of the ice-breaker *Montcalm*, is not likely to be repeated. The struggles of the ice-breaker to keep the gorge just above Quebec free from ice are sufficient evidence for vessel owners.

The coal production of Colorado for 1904 decreased some fifteen per cent. from that of 1903. This was due to labor troubles in the spring of the year. The total production amounted to 6,776,551. Of this 4,738,389 tons were bituminous, 1,238,187 were lignitic, 744,571 semi-bituminous and 55,404 anthracite.

The Cumberland Railway & Coal Co. held its annual meeting recently, at which the old board of directors was re-elected. Sir George A. Drummond was re-elected president, and Mr. J. R. Cowans, general manager. The output of the company's collieries was 505,804 tons, the largest in the history of the company.

Governor Pennypacker of Pennsylvania has given utterance, in his annual message, to a doctrine which involves the vexed question of taxes on the product of an industry. His suggestion is that a tax, or royalty, be placed on every ton of coal mined, the proceeds to be devoted to the maintenance of roads and upkeep of the school funds. As Pennsylvania has an annual production of about 200,000,000 tons, if this thin edge of the wedge gets in the politician will have a joyful source of revenue to play with and handle.

The report of the Royal Commission on the Coal Supplies of the United Kingdom puts the quantity of coal remaining in the known coal fields of the kingdom at 100,000,000,000 tons, or a supply for 450 years at the present rate of consumption. The report states the belief of the Commission that the hitherto rapid rate of increase will not continue, but will become stationary and then decrease. The factors of increasing costs and foreign competition are not dealt with, but will be all powerful in their influence on the rate of production. The Commission notes the very great increase in production on the North American continent, and alludes to the probability of a large export coal trade from this side affecting the home production.

Digest of Recent Patents; Mining and Metallurgical.

Jan. 3rd, 1905.

12,301.—Process of Electrolytically Refining Lead. Anson G. Betts, Lansingbury, N.Y. A process which consists in subjecting to electrolysis an electrolyte containing a lead salt of a fluorin acid, and an agent capable of restraining the crystallization of the electro-deposited lead.

778,847.—Concentrator. Frederick M. Dillon and Wylie G. Wilson, Denver, Colo. A concentrating-table provided with riffles running the whole length of the table, the table having a motion to cause the concentrates to travel in the direction of the riffles and being open to permit the discharge of the concentrates at the rear extremities of the riffles, the said riffles being arranged in groups, the space between the groups of riffles being greater than the space between the riffles in any group.

779,365.—Gold Saving Apparatus. Edward S. Kelley, St. Joseph, Mich., assignor of one-half to Willis W. Cooper, Kenosha, Wis. In combination, a bucket having an outlet-opening in its side above its lower end, said bucket being adapted to contain a quantity of mercury; a funnel in said bucket having an elongated narrow discharge-opening facing away from said outlet-opening and arranged to be submerged in the mercury in said bucket; and an inclined amalgamated plate extending from said funnel to said outlet-opening, the lower edge of said plate being raised above the bottom of said bucket.

778,901.—Process of Reducing Lead Ores. Pedro G. Salom, Philadelphia, Pa. A process which consists in continuously spreading the ore in a finely-ground condition upon the surface of a suitable cathode, in the presence of a suitable electrolyte and a suitable anode; maintaining the ore upon the cathode until complete reduction has occurred; and then continuously removing the resultant mass of spongy lead from the cathode-plate at a rate corresponding to the rate at which the ore is spread.

- 779,091.—Process of Making Silicofluorid of Lead. Walter Mills, London, England, assignor to A. O. Granger, Cartersville, Ga. A process which consists in subjecting galena and cerusite to the action of hydrofluosilicic acid and blowing air through the mixture during the reaction.
- 779,810.—Process of Obtaining Metals from their Ores. Samuel Peacock, Chicago, Ill. A process which consists in treating ores containing iron and zinc and in roasting the same, reducing the iron to a metallic state at a temperature too low to reduce the zinc to a metallic state, separating the iron from the mass and then reducing the zinc to a metallic state.
- 779,037.—Method of Smelting Ore. James Gayley, New York, N.Y. A method which consists in subjecting the ore with carbonaceous fuel to a blast of dried air, the burden of fuel being less than the normal burden by an amount materially greater than that which would be required to dissipate the eliminated moisture.
- Jan. 10, 1905.
- 779,344.—Electric Furnace. David R. S. Galsbrath, Auckland, New Zealand, assignor of one-half to William Steuart, Auckland, New Zealand. An electric furnace for treating iron-sand and other refractory ores and substances, comprising an enclosed furnace recessed to accommodate electric connections in circuit with a source of electric energy and having the sides of its fusing zone stepped internally with inclined chutes, a plurality of non-conducting interceptors mounted within the furnace at the stepped fusing zone and arranged in superposed relation and adapted together with such stepped parts of the furnace to deflect the material under treatment successively to the next lower interceptors, and with electric conductors leading into the fusing zone at the ends of each interceptor, and a plurality of V-shaped troughs perforated at their bottoms and serving to direct the material in thin streams longitudinally central of the under series of interceptors and conductors, whereby the shower charge of material will be caused at the time of each of its interceptions to complete and act as part of the electric circuit.
- 779,953.—Smelting Furnace. Alfred E. Manchester, Newburgh, N.Y. The combination with a furnace and a forehearth of a cut-off valve comprising two members, each member having an open portion and a closed portion and means for removably securing the open portion or the closed portion of each member to its respective furnace or forehearth.
- 779,566.—Roll Crushing Mill. Thomas L. Sturtevant, Quincy, and Thomas J. Sturtevant, Wellesley, Mass., assignors to the Sturtevant Mill Company, Portland, Me., a corporation of Maine. The combination with a pair of crushing-rolls and shafts by which said rolls are carried, of bearing supports or carriers, the rear portions of which are suitably recessed, bearing-boxes movably mounted in said supports or carriers, and nests of coil-springs housed in the rear recessed portions of said supports or carriers and yieldingly holding the said boxes in working position, said bearing supports or carriers being provided with tie-caps hooked over ribbed portions thereof.
- 780,002.—Amalgamating Apparatus. Julius, Jean and William C. Schmitt, Denver, Colorado. The combination of a bottom receptacle having outwardly flared walls, and amalgamated tray located in the receptacle and also having outwardly flared walls, a bottomless casing projecting into the tray, and having its lower edges supported above the bottom of the tray, a feed-receptacle mounted on the casing, a rearwardly extending downwardly-curved conduit connected with the feed-receptacle, and depending open-ended tubes also connected with the feed receptacle, their lower extremities terminating in the forward part of the tray.
- Jan. 17, 1905.
- 780,237.—Furnace for Burning Ore Briquets. Gustaf Grondal, Djursholm, Sweden. A furnace of the channel type for burning, by gas-heating, ore briquets carried on trucks, and consisting of a compartment for preliminary heating, a cooling compartment and a burning chamber of a somewhat greater height situated between these compartments, such furnace having channels in the walls and roof for passage of a part of the air for combustion, these channels being connected with each other and with one or more openings in the wall of the inlet of the gas to the burning-chamber, the compartments of the furnace for preliminary heating being of greater height than the cooling compartment.
- 780,191.—Electro-chemical Separation of Metals. Woolsey M. Johnson, Hartford, Conn. A process which includes immersing an electrode in an acid solution of ferrous ammonium chloride, subjecting it to electrolytic action and depositing upon another electrode, the electrolytic solution being from time to time subjected to a cementation process.
- 380,887.—Furnace for Roasting Ores, etc. William W. Tobey, Iola, Kansas. The combination of a furnace, travelling mechanism disposed adjacent thereto, rake-carrying bars connected with said travelling mechanism, and shields secured to and encircling the portions of said rake-bars that enter the furnace whereby the said bars are protected from excessive heat.
- 780,203.—Charging Device for Coke Ovens. James B. Ladd, Wayne, Pa. The combination of a longitudinally movable peel, a threaded shaft rotatably mounted diagonally across the longitudinal extension of the peel, and means connected with the peel for co-operating with the shaft to cause the movement of the peel upon the rotation of the shaft.
- Jan. 24, 1905.
- 780,716.—Method of Agglomerating Magnetic Ore. Elmer Gates, Chevy Chase, Md., assignor to Theodore J. Mayer, Washington, D.C. A method which consists in establishing an electric arc between opposing surfaces, feeding opposing streams of sand over said surfaces, and causing said streams of sand to fall freely from said surfaces so as to break the arc originally formed and establishing arcing from one of the falling streams to the other, thereby fusing and agglomerating the sand into small lumps of a size varying substantially from that of a wheat-grain to that of a bean.
- 780,520.—Amalgamator. John B. Rossman, St. Paul, Minn. An amalgamator-bowl having a circular concaved bottom, rubbers pivotally mounted within said bowl, and means for imparting to the rubbers an oscillatory motion about its centre and over a segment of the bottom thereof, whereby successive areas of agitated and dead water are produced within the bowl when in operation.
- 780,870.—Magnetic Separator for Ores or Similar Materials. John T. Dawes, Liverpool, England. The combination of a moving conveyor for receiving material, a second moving conveyor above the first moving conveyor, a magnet-pole above the second moving conveyor, and a shield disposed under the second moving conveyor between the outer extremity of the magnet-pole and the first moving conveyor and parallel to and in contact with the side of the first moving conveyor, part of the top of the shield under the magnet-pole being level with the first moving conveyor.
- Jan. 31, 1905.
- 781,133.—Process of Treating Zinc-Sulphide Ores containing Iron. Chauncey E. Dewey, Denver, Colo., assignor to the American Zinc and Chemical Company, Denver, Colo. A process consisting first in roasting the ore, whereby the zinc is converted into zinc sulphate and zinc oxide, and the iron present into ferric oxide as far as practicable; second, placing the ore thus prepared in water; and, third, maintaining the ore in suspension in the solution by the introduction of sulphurous gas, whereby the zinc oxide present is formed into zinc sulphite, and the latter into zinc sulphate by reaction with the ferric oxide.
- 781,450.—Automatic Dumping Ore-Elevator. Daniel R. McTaggart, Butte, Mont., assignor of one-half to John P. O'Neill, Butte, Mont. The combination of a frame, a car movable therein, said car having an opening in the side thereof, an apron pivoted to said car for closing said opening, projections mounted on the side of the apron, and a latching device pivoted to the car and designed to engage with the projections for locking the apron against movement.
- 781,077.—Electro-magnetic Ore Separator. Erich Langguth, Eyskirchen, Germany. The combination with pole-pieces of an armature rotating between said pole-pieces, and having windings, a shield of magnetic material mounted directly on said armature and rotating therewith, means for feeding the material to be separated to said armature, and means for collecting the separated material.
- 781,175.—Dumping-Car. Charles Barrett, Somerville, Mass. A dumping-car comprising in its construction a truck, a truck-plate fast to said truck, an intermediate plate swivelled to said truck-plate, trunnions fast to said intermediate plate upon opposite sides thereof, respectively, a dumping car-body, and brackets fast to the under side of said body, each of said brackets provided, respectively, with a vertical slot opening through the under side thereof and adapted to receive one of the said trunnions, whereby said body is removably attached to said intermediate plate.
- 781,520.—Method of Treating Ores. Hascal A. Hogel and Herbert A. Hogel, New York, N.Y., assignors to said Hascal A. Hogel and David Wallace, New York, N.Y. A method which consists in subjecting the ore to the action of a solution containing certain chemicals, and intensifying the solvent action of said solution upon said ore by atomizing the mixed mass.



PROVINCE OF NOVA SCOTIA.

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

—AND—

PRECIOUS STONES.

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

GOLD AND SILVER.

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

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

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

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

MINES OTHER THAN GOLD AND SILVER.

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

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

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

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

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

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

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

THE HON. A. DRYSDALE,

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.

PROVINCE OF QUEBEC

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

GREAT MINERAL TERRITORY

Open for investment in the Province of Quebec.

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

ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

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

Mining concessions are divided into three classes:—

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

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

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

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

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

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

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

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

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

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

HADFIELD'S STEEL FOUNDRY CO LIMITED SHEFFIELD

Heclon Rock and Ore Breaker

HADFIELD AND JACK'S PATENT

The Only Perfect Gyrotory Stone-Crusher

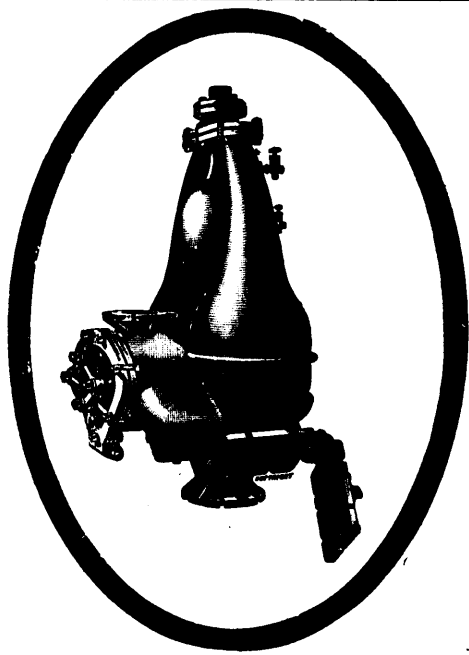
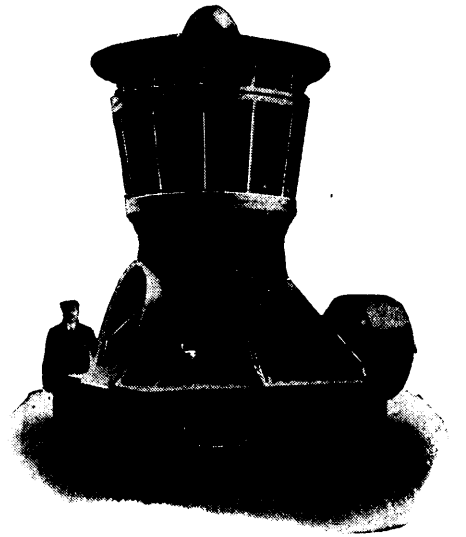
THE PARTS THAT ARE SUBJECT TO EXCESSIVE WEAR ARE MADE OF

Hadfield's Patent "Era" Manganese Steel

WE MANUFACTURE JAW BREAKERS, CRUSHING ROLLS, ELEVATORS, BIN GATES, AND GOLD MINING REQUISITES.

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

PEACOCK BROTHERS, Canada Life Building, Montreal.



A Thing to Remember!

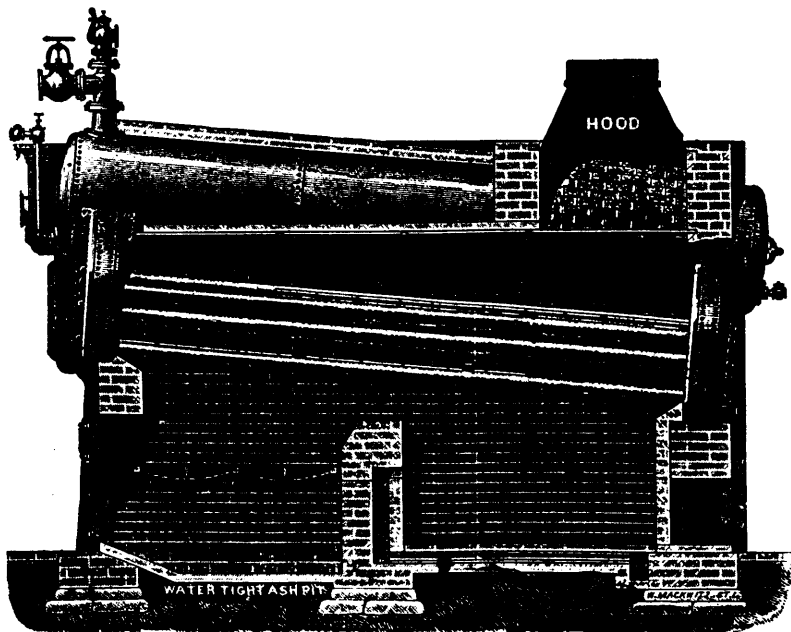
The water can often be got out and the job finished by means of

Trade **The Pulsometer** Mark **Steam Pump**

whilst you would be collecting the necessary tackle for ordinary pumps.

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

CANADIAN REPRESENTATIVES **PEACOCK BROTHERS** CANADA LIFE BUILDING **Montreal**



HEINE SAFETY BOILER

MANUFACTURED BY

The Canadian Heine Safety Boiler Co
TORONTO, ONT.

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.

CONTRACTORS TO H. M. GOVERNMENT

Allan, Whyte & Co.

CLYDE PATENT WIRE ROPE WORKS
Rutherglen, Glasgow, Scotland

MANUFACTURERS OF

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.

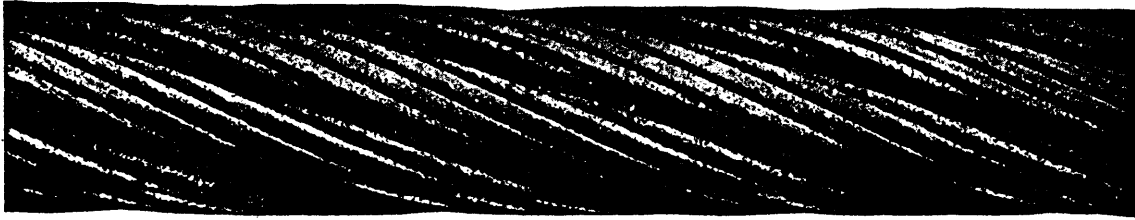


Illustration of Winding Rope, 240 fms long x 3 1/4 circ. Galvanized Special Improved Patent Steel, Compound Make, supplied

to Kennell Collieries Bo'ness, Scot., which gave a record life of 6 years and months. Showing condition when taken off.

TELEGRAMS—"Ropery Rutherglen." A B C, A I and Lieber's Codes used.

AGENTS IN CANADA:

Wm. Stairs, Son & Morrow, Ltd., Halifax, N.S.
W. H. Thorne & Co., Ltd., Saint John, N.B.

Drummond, McCall & Co., Montreal
John Burns, Vancouver, B.C.

DRUMMOND, MCGALL & CO.

IRON, STEEL AND GENERAL METAL MERCHANTS

GENERAL SALES AGENTS

Algoma Steel Co. Ltd., Sault Ste. Marie, Ont.

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