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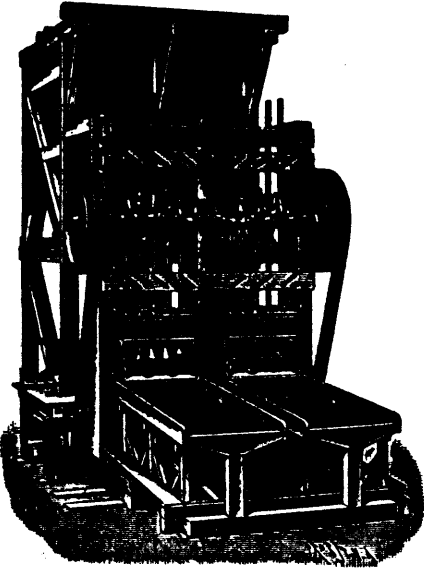
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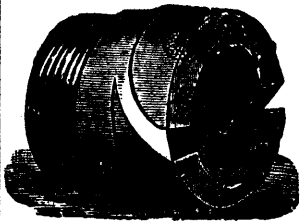
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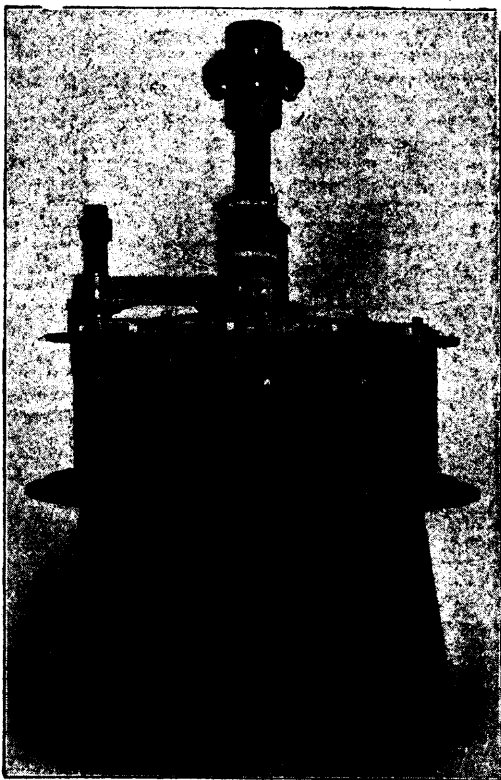
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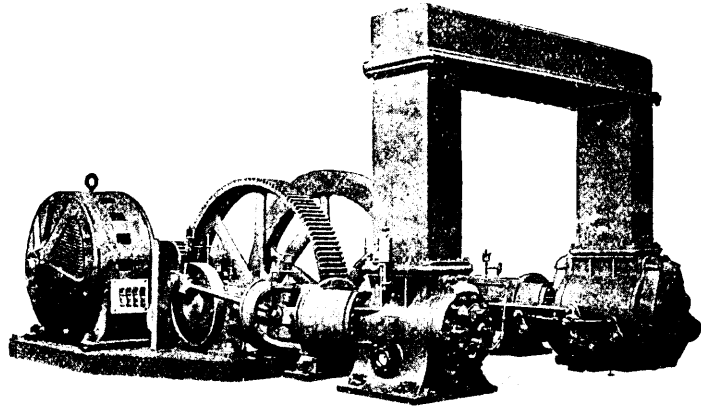
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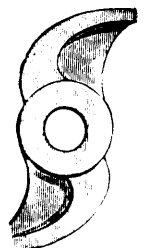
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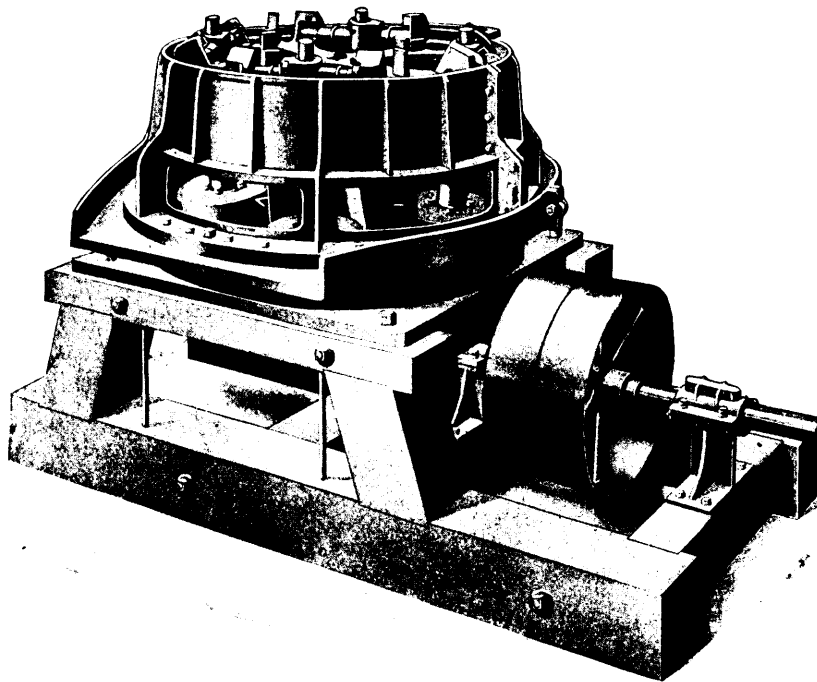
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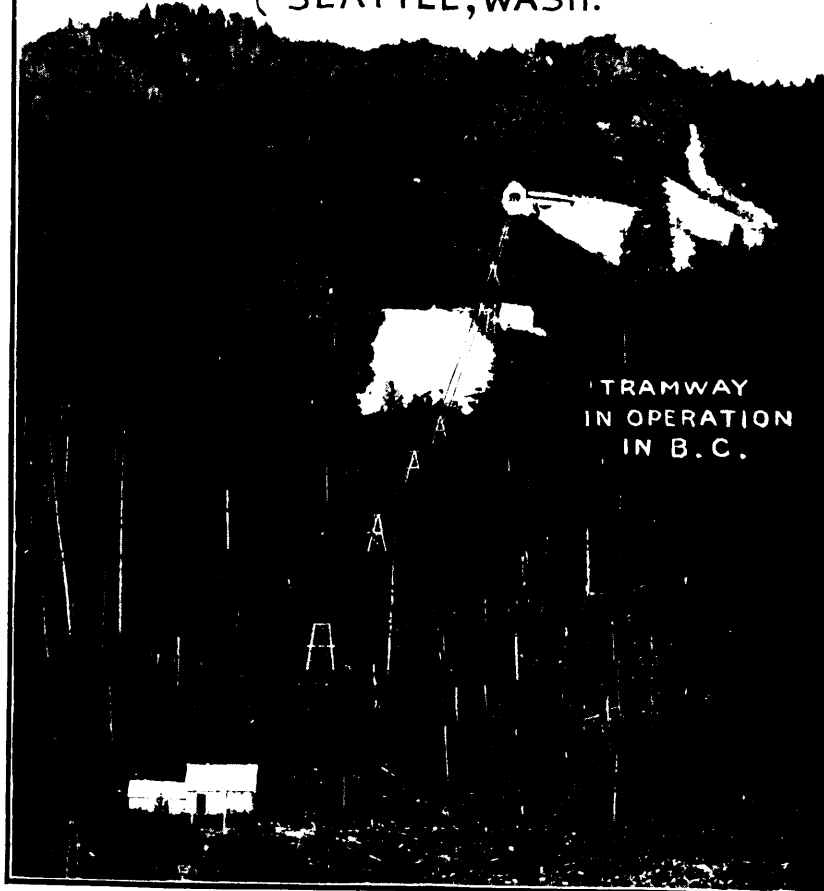
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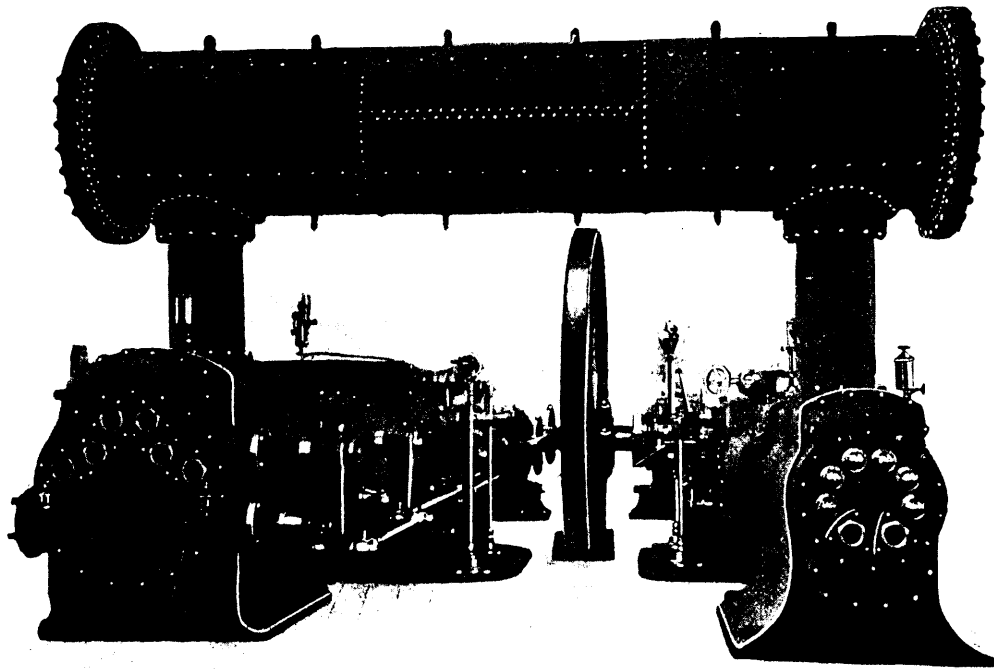
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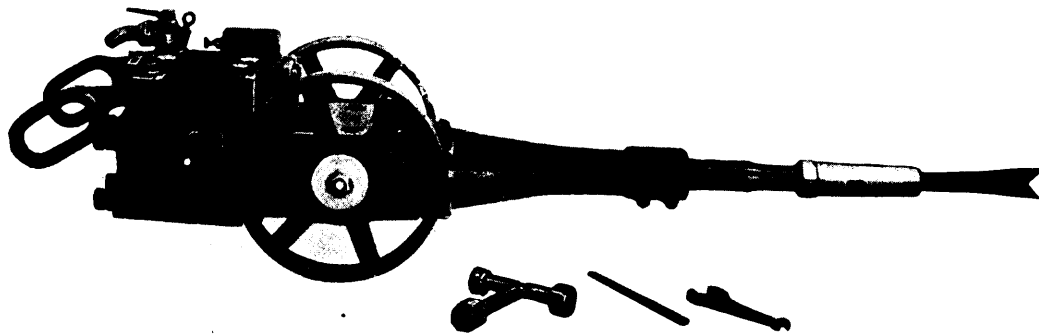
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Rock Drills  
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The I-S COAL CUTTER

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Is the most popular and extensively used  
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It is easy on the operator, yet does the work. Light and strong.  
 The economy of repairs is its recommendation with the superin-  
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## WIGAN, ENGLAND

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The Low-pressure Steam Cylinders are 64 in. diameter, the Low-pressure Air Cylinders are 58 in. diameter. Steam Pressure, 140 lb. per square inch; Air Pressure, 100 lb. per square inch.

### EXTRACTED FROM CATALOGUE.

Messrs. WALKER BROS.,  
Loftus Mines, Loftus in Cleveland, R.S.O.,  
3rd December, 1901.

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

The valves of the air cylinders are remarkably good, and have never given any trouble or needed repairs. The compressor is a double horizontal compound engine, steam cylinders, 28 in. and 48 in. diameters, air cylinders, 40 in. diameters by 72 in. stroke.

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

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

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

Messrs. WALKER BROS., Pagefield Ironworks, Wigan.

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

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

We consider that the arrangement of the "Walker" valves on the compressor cylinders is a valuable one, possessing the merit of simplicity and efficiency, while giving a large throughway with a small clearance space.—Yours faithfully,  
For the United Alkali Co.,  
EDWARD J. DUFF, Chief Engineer.

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

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

Messrs. WALKER BROS., Pagefield Ironworks, Wigan.

Dear Sirs,—I have much pleasure in stating that after a long experience of your Bessemer blowing cylinders, extending over 15 years, we find the valves perform their work most satisfactorily, and they are most enduring; indeed, we cannot speak too highly of their performance or life.—Yours faithfully,  
For Barrow Hæmatite Steel Company, Limited,  
J. M. WHILE, General Manager.

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

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

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S. PEARSON AND SON, Contractors.

Blackwall Tunnell Works, East Greenwich, S.E.,  
May 10th, 1897.

Messrs. WALKER BROS., Pagefield Ironworks, Wigan.

Dear Sirs,—We are pleased to confirm what we told you verbally the other day, viz., that we consider the air cylinders and valves of your compressors to be the best for such work as we have been carrying out on the above contract. One of your engines ran for almost a year without stopping, and it gives us great pleasure to thus testify to the good qualities of the plant which we purchased from you.—We are, Dear Sirs, yours faithfully,  
(Signed) pro S. Pearson and Son, E. W. MOIR.

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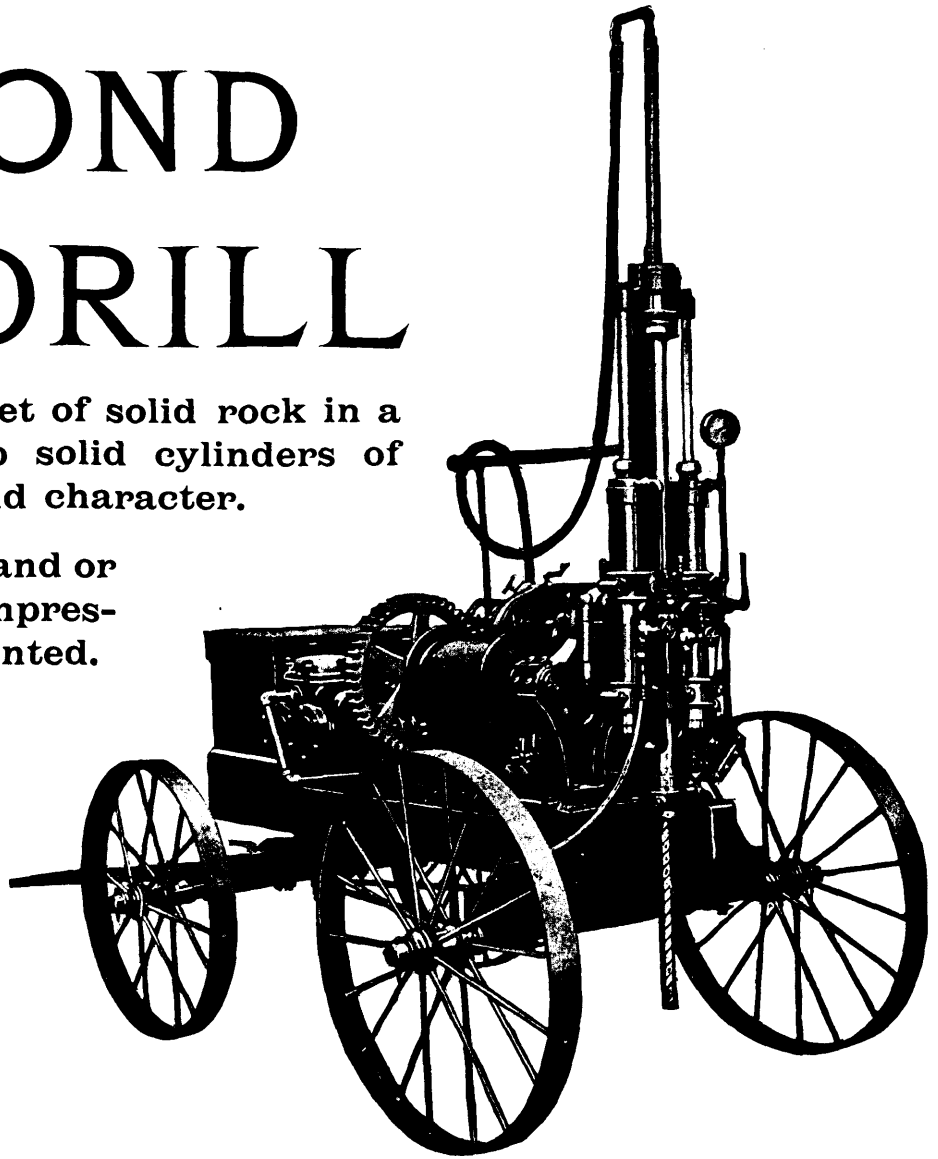
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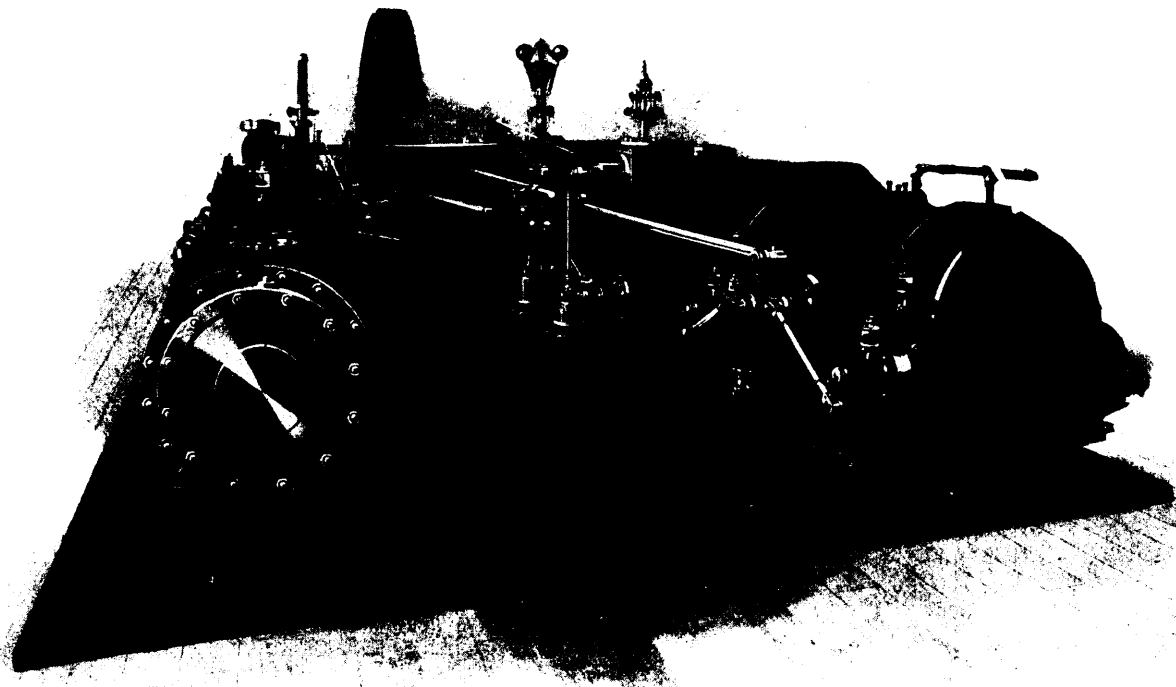
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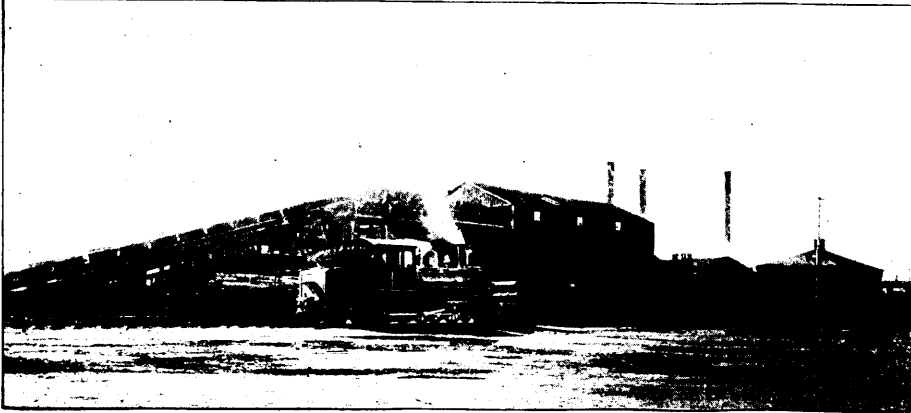
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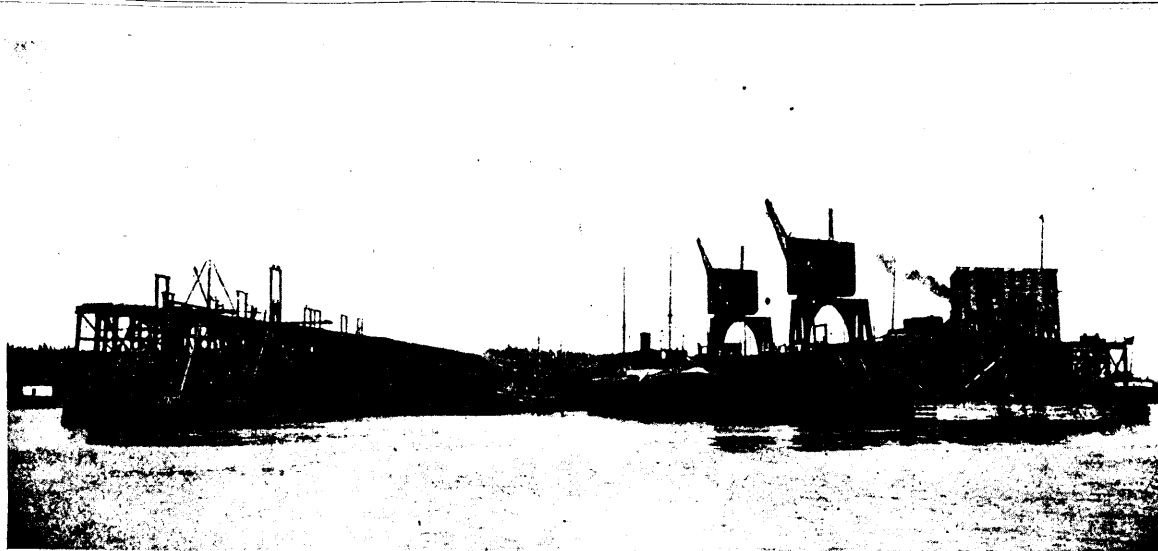
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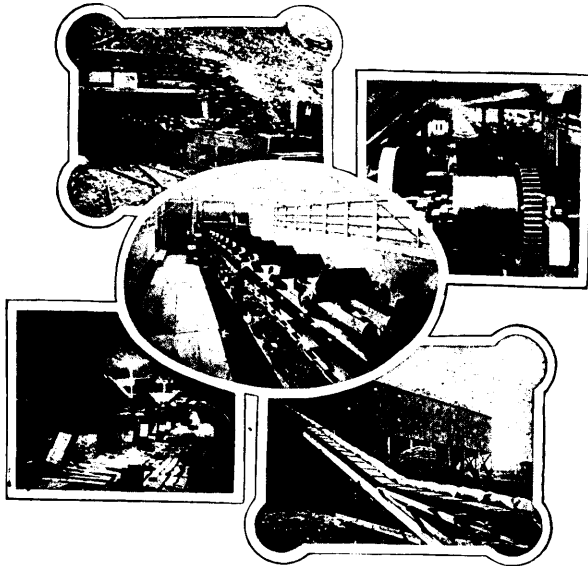
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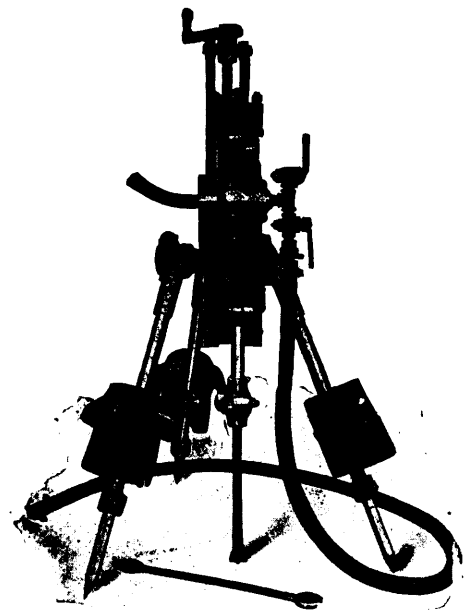
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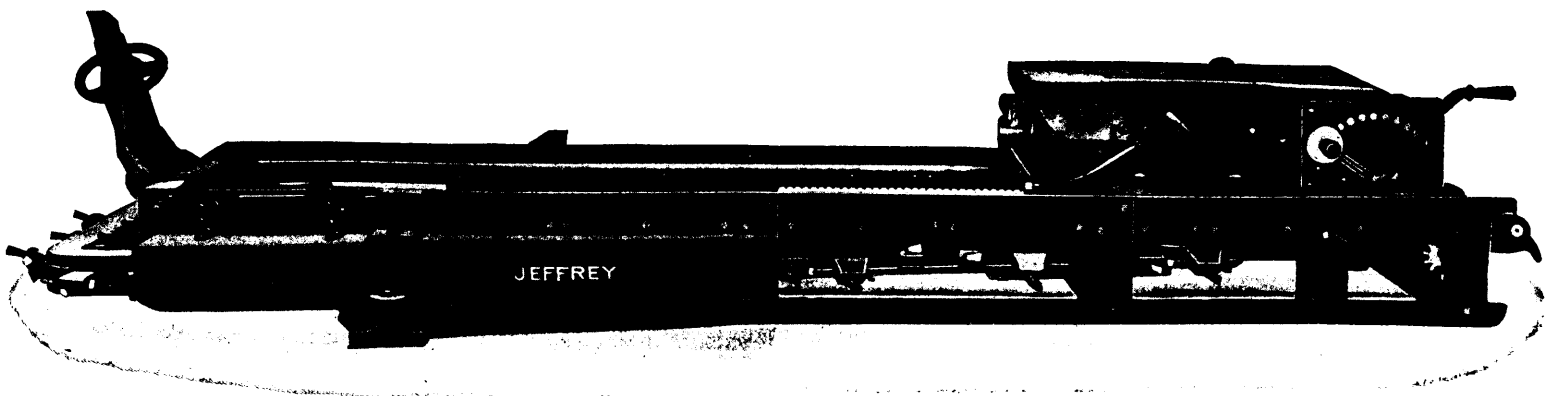
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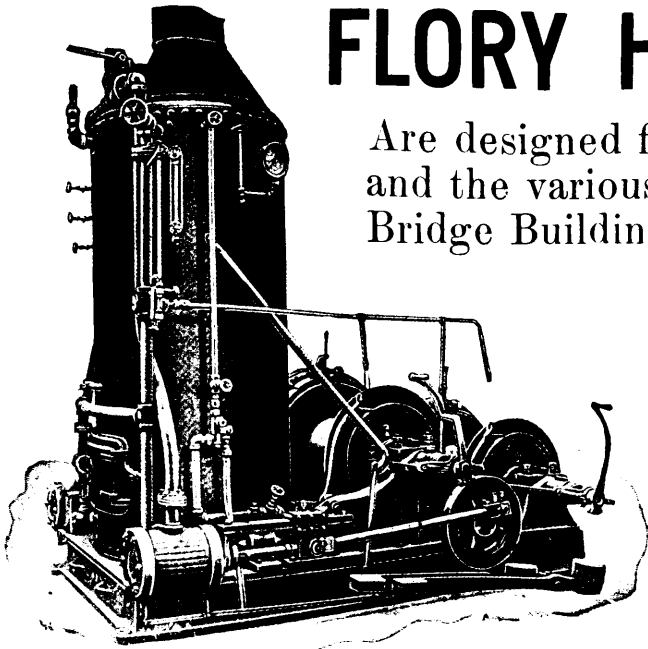
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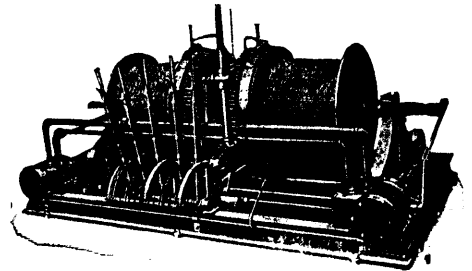
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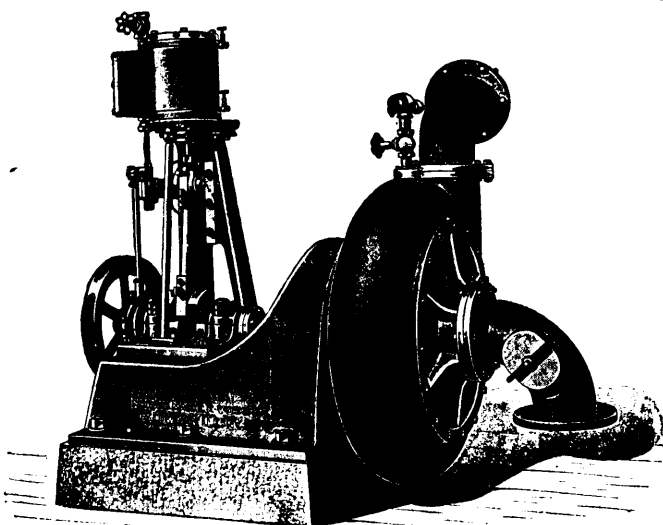
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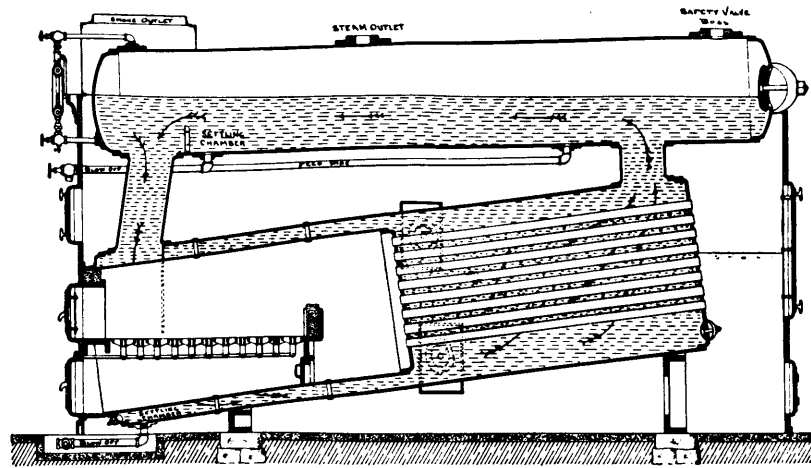
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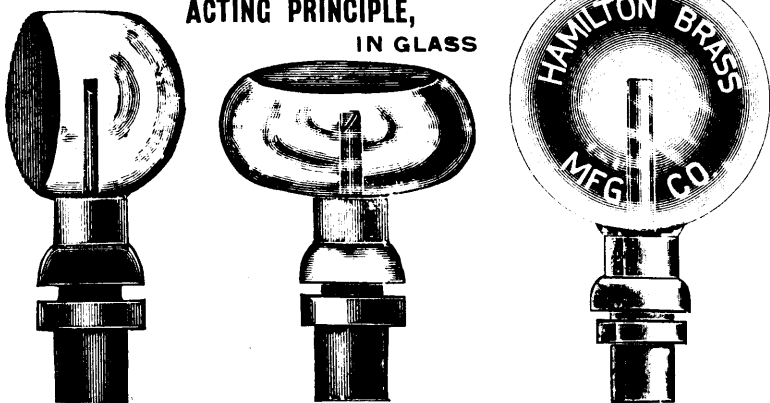


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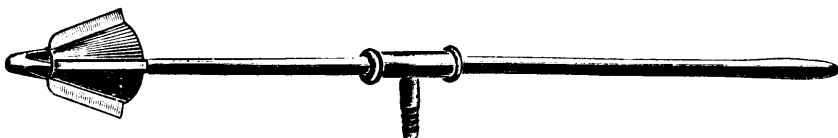
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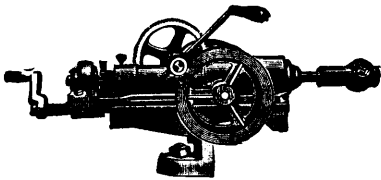
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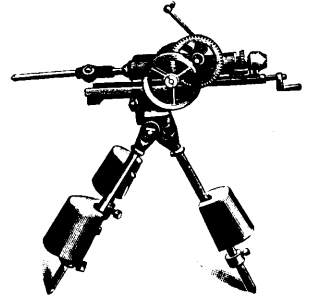
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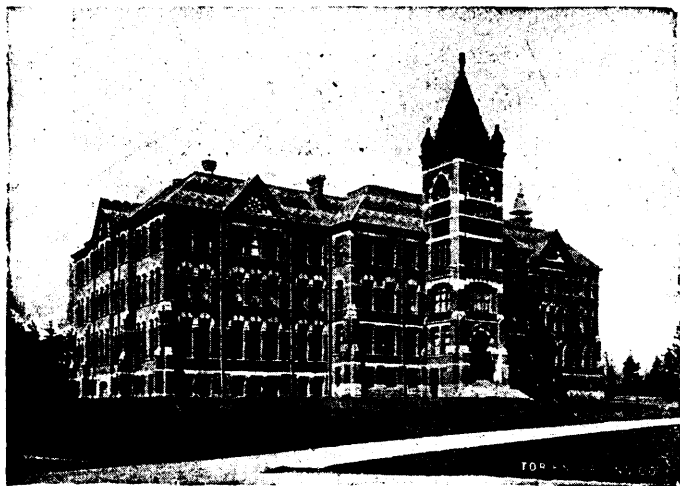


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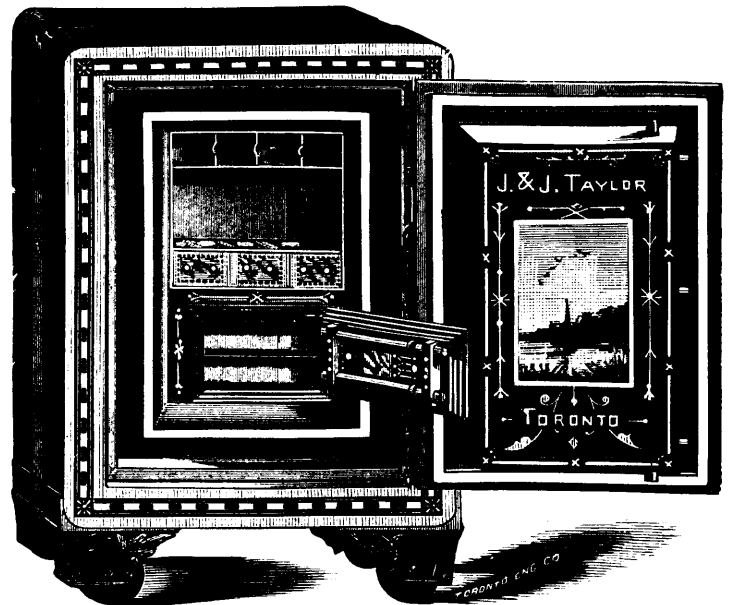
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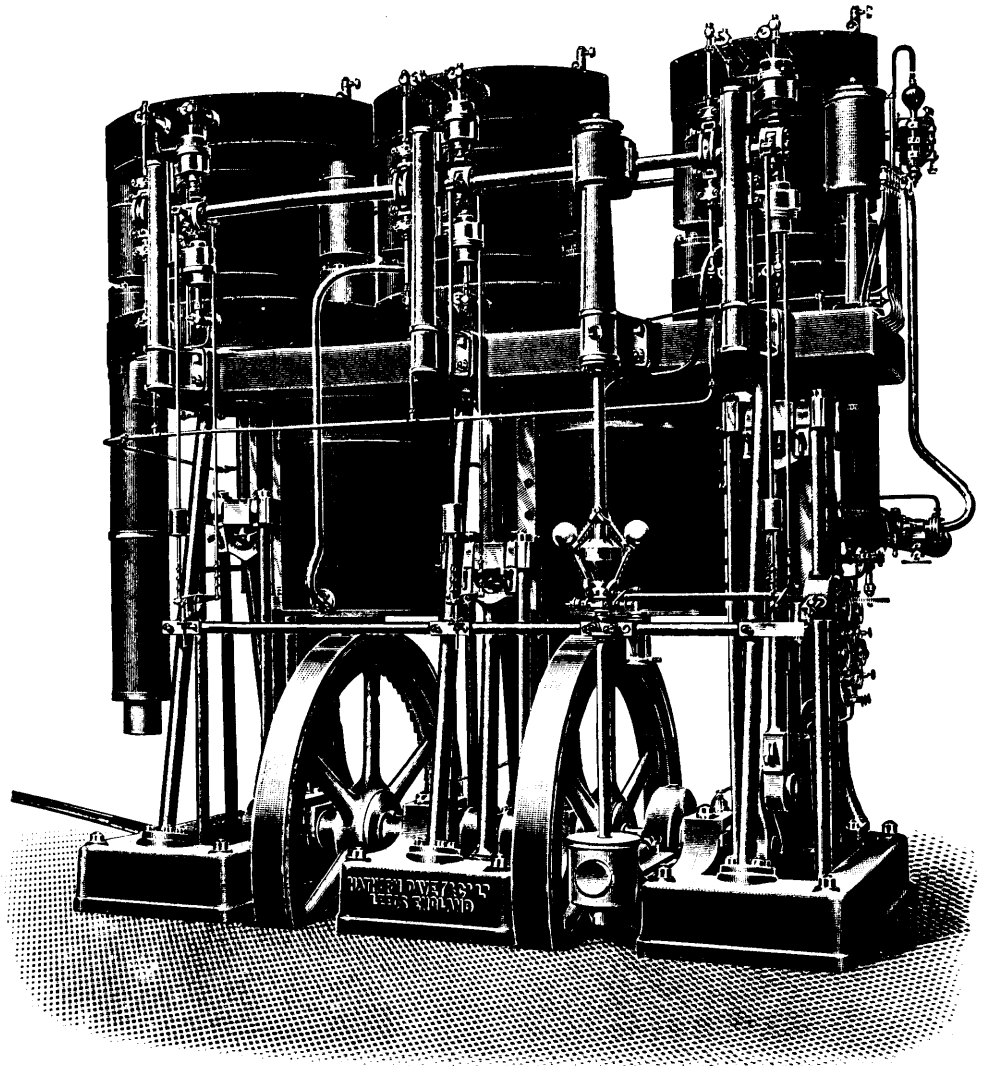
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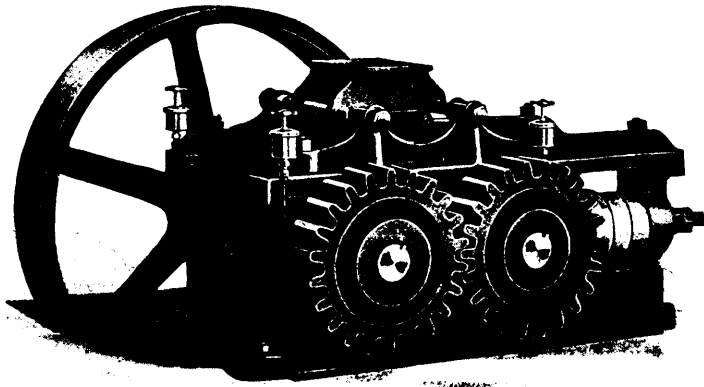
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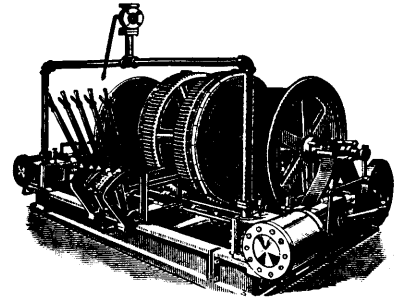
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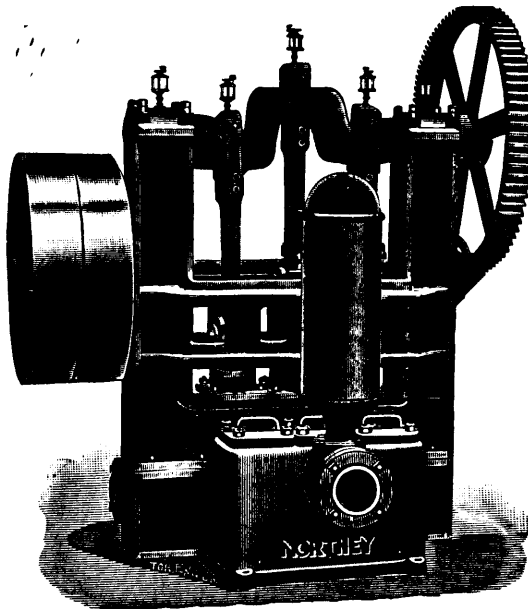
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VOL. XXIII., No. 1.

JANUARY, 1904.

VOL. XXIII., No. 1.

### The Coal Trade in 1903.

Now that the full details are to hand, showing the output of coal and coke in the Dominion during 1903, we are able to note the satisfactory development of an industry, which is the basis of nearly all our manufactures. It is only necessary to state here that the total output of coal in the Dominion will reach 7,500,000 tons, an increase over 1902 of 1,000,000 tons. According to the most reliable estimates the price at the pit-mouth will be approximately 25 cents less than the previous year and as wages are about 10% higher, it is obvious that the margin of profit must be somewhat less, probably 35 cents.

The greatest development during the year has been in the Maritime Provinces to which the capital has been attracted by the prominence given to the operations of the Dominion Coal Company. The latter has been unfortunate in several respects, the principal one being the fire in Dominion No. 1, which reduced the output of that mine for the year at least five hundred thousand tons, and effectually discounted the increase in the other mines. The fire broke out in March, and in spite of the positive assertions made at time that in two or three months it would be extinguished and the mine producing as large a tonnage as ever, we find during the month of December, after the lapse of nearly ten months, that the output is only 18,936 tons, or about one-fourth of the normal capacity of the mine. A recognized expert who is familiar with the conditions, immediately after the fire broke out said it would take at least a year to repair the damage and would involve the loss of one million dollars. This information was given in our columns, and it is now certain that the estimate was a conservative one, as in the lower levels, which were flooded, the water still remains, and it is doubtful whether it will be all pumped out for many months to come. The principal offset of this disaster is the development of Dominion No. 2, which bids fair to be a large producer, but there is reason to believe that the present management will not attempt to realize the intentions of those who designed this enormous mine in the expectation of the output ranging from 5,000 to 10,000 tons per day. The enormous cost of equipment, which already stands at more than \$2,500,000, compared with the comparatively moderate results achieved, has no doubt served to convince the company's present advisers that an increased number of smaller mines is preferable to one of such gigantic proportions, where a single catastrophe might lay the whole idle, and have a serious effect upon the fortunes of the company. It has also been clearly demonstrated that coal cannot be produced as cheaply in a mine of this extent as in one of more moderate output, ranging from 2,000 to 3,000 tons a day.

The most notable feature in the coal industry of the Maritime Provinces is the very large increase in the production of the Nova Scotia Steel and Coal Company. Under the enterprising management of Mr. Graham Fraser, and his confreres, old Sydney Mine has indeed taken on a new lease of life, and the output of 480,000 tons, must be gratifying to the company. Incidentally we may remark that the Dominion Iron and Steel Company is to be highly congratulated on securing the services of Mr. Fraser, who is beyond peradventure the strongest and the most practical man in his line in the Dominion, and if the tide of success, which has attended his efforts during the last twenty-five years in building up the magnificent reputation of the Nova Scotia Steel and Coal Company attends him in his new venture the result will go far to counteract the regime of mismanagement and incompetency which has preceded him. In a quiet way, and without much blowing of trumpets, the Inverness Railway and Coal Co., at Broad Cove, has made splendid progress, and obtained an output of 1,000 tons a day. We have always expected this property to develop into one of the most important coal producers on the Island of Cape Breton, and if it had fallen into the more competent hands, which are now guiding its destinies, instead of having been exploited ten years ago by our volatile friend Penn Hussey, it would long ago have established a record, and we have no doubt that in the next five years it will be one of the largest and most profitable concerns in the trade. The coal areas in Mabou and Port Hood are slowly but surely developing and the same may be said of those at Port Morien, although the latter are moving somewhat slower owing to engineering difficulties. If the operations were conducted from South Head instead of from the Mainland this mine would become a large and successful mining proposition. With a total output of 5,000,000 tons for the year, the old mining district of the Maritime Provinces has done well, and the increase is only a faint earnest of what may be expected in the near future. Conditions for 1904 are in some respects not as favourable as last year notably in the decrease of American demand and the fall in selling prices. Now that the demand in the United States has fallen off so greatly it will be difficult for Canadian coal to find a market until trade improves. It is probable that the exports will fall at least five hundred thousand tons this year. The St. Lawrence will pay less for coal, and contracts will shortly be concluded at a reduction ranging from 25 to 50 cents per ton; the outlook therefore calls for rigid economy in production, and we believe that producers will be well advised if they call a halt in development, except such as is necessary to maintain the mine in an efficient condition, and content themselves with the profit to be realized upon a more moderate output. Any attempt to

force production in 1904 and 1905 will only result in increased competition and diminishing profits.

In British Columbia the year has been the most prosperous on record. The Coast mines, in the aggregate, are still the largest producers, having attained an output of 1,200,000 tons. At the end of the year conditions were very much more favourable than at the beginning. The somewhat pessimistic views expressed as to the effect of fuel oil upon the coal trade have not been realized and it looks as if the industries of the Pacific Coast are on the threshold of a development which will surpass all expectations. At the present time the demand for coal is far greater than the supply, and the Western Fuel Company which purchased the mines of the New Vancouver Coal Mining and Land Company have realized handsome profits in the first year.

The greatest increase, however, stands to the credit of the Crows Nest Pass Coal Company, which has an output of coal for the year of 661,118 tons, an increase over the previous year of 219,882 tons, or 50 per cent. But for the unfortunate strike, which closed their mines for two months, the output would have been about seven hundred and fifty thousand tons. It is satisfactory to know that the output of coke shows an increase of 39 per cent, having reached the respectable figure of 167,734 tons. There are now in operation nearly 1,000 ovens, which, with those under construction, will raise the total number to 1,200, having a capacity of nearly 2,000 tons of coke per day; there is no reason why British Columbia smelters should have to complain about lack of fuel supply especially as the tonnage will be largely increased during the coming year. A reasonable estimate for 1904 will be one million tons of coal and two hundred and fifty thousand tons of coke.

The most striking feature of the coal trade in British Columbia and the adjoining areas in Alberta is the large number of Companies which have commenced operations during 1903 and the still larger number which are being organized for the present year. The most extensive of these consist of a series of five mining properties consolidated under the control of a French Syndicate of which Mr. J. Fleutot is the managing director. This group is situated from 10 to 15 miles east of the Crows Nest summit in the neighbourhood of Blairmore. At present the output is 600 tons daily, the whole of which is taken by the C.P.R. for steam purposes. The International Coal and Coke Co., is opening up a mine three miles west of Blairmore, from which they purpose supplying the fuel required for the Granby Smelter. In addition the C.P.R. have commenced to operate a coal property on the north branch of Michel Creek and three companies are being formed to develop the enormous areas on the Elk River, where the extension of the Fernie seams has been discovered. It is altogether likely that by the end of the present year the output of coal in this district will be doubled as there is an unlimited market both in British Columbia, the Territories, and over the line in Montana, there is no reason why for some years to come handsome profits should not be realized and satisfactory dividends earned.

It is also a matter of interest to note that extensive deposits have been discovered by the C.P.R. in the Cascade Mountains near to Banff and development is proceeding at a great pace as in view of the rapidly diminishing output from the Canmore and Anthracite mines a supply of steam coal is a matter of great importance. The same reason will lead in the near future to the building of a branch line from Spence's Bridge to Nicola, where there are extensive deposits of good steam coal. The Dominion Government subsidized this at its last session and it will undoubtedly be constructed during the present year. This will, for the first time, give a local coal supply to the extensive district lying between Banff and the coast.

This brief review would not be complete without reference to the

terrible catastrophe which occurred at Frank, in April last, when a mountain slide containing, according to the best authorities, not less than one hundred million tons, crashed into the valley beneath—covering four square miles to an average depth of thirty feet, destroying two miles of railway, with all the mine buildings, plant and machinery of the Canadian American Coal and Coke Company and sacrificing over eighty lives. The opinion of experts, who examined the location of the mine subsequently, attributed the catastrophe mainly to the fact of the mining operations in loosening the side of the mountain, and Messrs. McConnell and Brock the Government geologists, who reported specially on the matter, confirmed this view. A very ill advised attempt to continue operations by the company was made and ultimately abandoned in December. In view of the general opinion that the western peak of the mountain, which is deeply fissured, will yet fall and that the spring thaw will be sure to bring it down, undoubtedly the wise course was to abandon operations, which should never have been permitted after the catastrophe in March last.

Altogether the year's work in "black diamonds" has been of a most progressive and profitable character and the prospects for the future are bright. There is probably no Canadian industry which offers better inducements or which rests upon a sounder basis.

#### Crown Land Grants in Nova Scotia.

The history of the land grants in Canada leads to the regret that the mining engineer had not been evolved at an earlier date. While there have always been bold miners who dared, and did, the utmost the science of mining allowed, before the beginning of the last century, there were few if any who were competent in matters mineral.

Had the early claimants of this continent founded a continuity of policy, and had their descendants been able to maintain it, then we might have seen in the descended representative of an illustrious grandee a monopoly of its minerals far surpassing the steel, and all other combines united.

In the case of Nova Scotia, however, the general grants of the region, known as Acadia, came to an end with the capture of Annapolis in 1710. The titles granted by the French and the English Governments previous to that date being ignored except on certain conditions of possession and allegiance. The titles of the French settlers, which do not appear to have included minerals, were finally forfeited in 1755. The English Government proposed to settle the province with settlers from England; but the pressure of continental wars postponed consideration of the project.

The province being administered by parties favoring the New England Colonies the best lands of the province were peopled from that source. Numerous townships were laid off and gradually settled. From 1731 to 1763 the royal metals, precious stones, and lapis lazuli were reserved. After that date the reservations were increased by coal, lead, and copper, down to 1808. Some undiscovered system, or want of system, governed all these grants, granting or receiving certain minerals apparently at the whim of some irresponsible official. From 1808 to 1827 iron ore was added to the list of reservations.

In 1827 the Government of England granted to the Duke of York, all ungranted mines and minerals in the province. He transferred his grant to the General Mining Association of London, who devoted their attention exclusively to the mining of coal. This grant effectually damped all interest in matters mining. Finally after much public agitation the company surrendered their monopoly, retaining only several tracts of coal land. After wresting this valuable franchise from the company, the government having ownership of the minerals under large tracts of land, might have made provision for leasing them, etc.





MR. THOMAS CANTLEY, NEW GLASGOW, N.S.

Who succeeds Mr. Graham Fraser as Managing  
Director of the N.S. Steel and Coal Co. Limited.

Instead of this they immediately vested all minerals in the grants issued between 1827 and 1858 except gold, silver, coal, lead, tin, copper, iron, and precious stones. This uncalled for benevolence would not have taken place had they had the benefit of proper professional advice. It was not until 1892 that the government of the province awoke to the fact that there were in addition to the minerals reserved in 1858, others of value, and capable of contributing to the public revenue. Since that date all minerals are reserved except limestone, gypsum, and building material.

The result of this variegated granting of minerals has been baneful in the private grants. In the case of the township, and other large consolidated individual grants, it would not have given rise to much difficulty had the grants been all divided and settled on. As many grantees did not occupy their lots, and vacant lands in the grants have been occupied by squatters and relocated under later grants the procuring of title to minerals, the presumed property of the owner of the land is attended with much difficulty. Imperfect surveys and descriptions, non-division of property, squatters' titles, etc., all unite to make the task of searching titles one of much difficulty and doubt.

Legislation is needed to give investors proper titles from the Crown, while protecting any rights acquired by the ancient grantees.

Similar difficulties have arisen in the other older provinces of the Dominion. In Ontario these difficulties have been met with and have been more or less removed. The experience of Nova Scotia should however be of interest to the newer and future additions to the federation of the Dominion.

Full and careful expert advice should be taken and legislation so framed as to preserve to the Crown those minerals which may be of value. The system of Crown mineral leases secures in perpetuity the issue of good and unimpeachable titles. The title to minerals held by owners of the soil becomes in time as indefinite as the land titles. This is more specially felt in comparatively new countries, when small lots of land are granted to people, who in a few years are liable to move to more promising sections and leave titles that can be cleared only after much trouble.

The dimensions of grants in many cases do not coincide with the limits necessary for a proper mining investment. This can be effected most satisfactorily when the mineral title is controlled by only one authority or ownership.

#### **The Canadian Copper Company's Plant at Copper Cliff, Ontario.\***

The drawings shown herewith are plan and sectional elevations of a 1,000-ton smelter designed by the Engineering Company of America, New York, and erected at Copper Cliff, Ontario, for the Canadian Copper Company, a subsidiary corporation of the International Nickel Company of New York.

There were several objects that had to be borne in mind, among them the cheap handling of a large tonnage of ore, the storage during the winter months of materials, such as coke and coal, which can be received by boat during summer, the elimination of all needless manual labor, and the thorough efficiency of the power department. The plant was designed to be erected on two levels; the large amount of slag produced had to be taken into consideration, and the disposition of this slag was an important factor in determining the site. The plant, as it now stands, was built along the face of a cliff on the northern side of the deep valley in which the town of Copper Cliff stands.

The problem was to take the roasted pyrrhotite from roast heaps

and convert it into 80 per cent. matte, the presence of nickel precluding the advisability of a higher concentration.

On the upper edge of the cliff a system of bins has been constructed for storage purposes. The smelter building proper is situated parallel to these bins with the power-house at the eastern end. A trestle was built on the grade level of the bottom of the bins, which is also the grade level of the charging floor connecting the charging floor with the bins and also with the power-house, making a circular track, without switches, running on both sides of the furnaces and passing the coal chute in front of the power-house, which leads directly into the boiler room.

The scheme of operation is as follows: Three miles from the plant is the largest mine. The ore is taken from this mine to the roasting-beds, which are about one-half mile from the smelter. After roasting, the ore is loaded into hopper-bottom cars and drawn up to the top of the bins. The track leading to the top of the trestle is on an easy grade all the way, and is also connected with the main track leading to the Canadian Pacific Railway.

All ore, flux, coke, coal, etc., is handled on these tracks and dumped directly into the bins. Running on the circular track underneath the bins and into the smelter building and past the power house is an electric railroad, with side-dumping cars drawn by electric locomotives. The ore, coke, etc., is loaded into these cars, weighed on the end of the trestle and dumped into the coal chute next to the power-house. All trains are kept moving in one direction, and there is no switching or cross-over.

As shown by the sectional elevations, the site consists of two levels with a difference of 35 ft. in elevation. The upper level is the same elevation as the feed-floor, and is occupied by a double-track pocket trestle 32 by 34 by 600 ft. The storage pockets were made to hold enough coal to last over the period of closed navigation; coal being received by boat at a near-by port on Georgian Bay, as well as coke, ore, silica and clay.

On the lower level are located the power-house, 156 by 102 ft.; the blast-furnace building, 84 by 283 ft.; the foundations for the trestle carrying the electric tramway, connecting the storage pockets with the feed floor; the coal-bins of the boiler-room; the dust chamber 16 ft. wide, 18 ft. high and 444 ft. long; the stack, 15 ft. inside diameter, 210 ft. high; together with the necessary slag tracks, sunken track for loading metal for shipment, tracks to storehouse, etc.

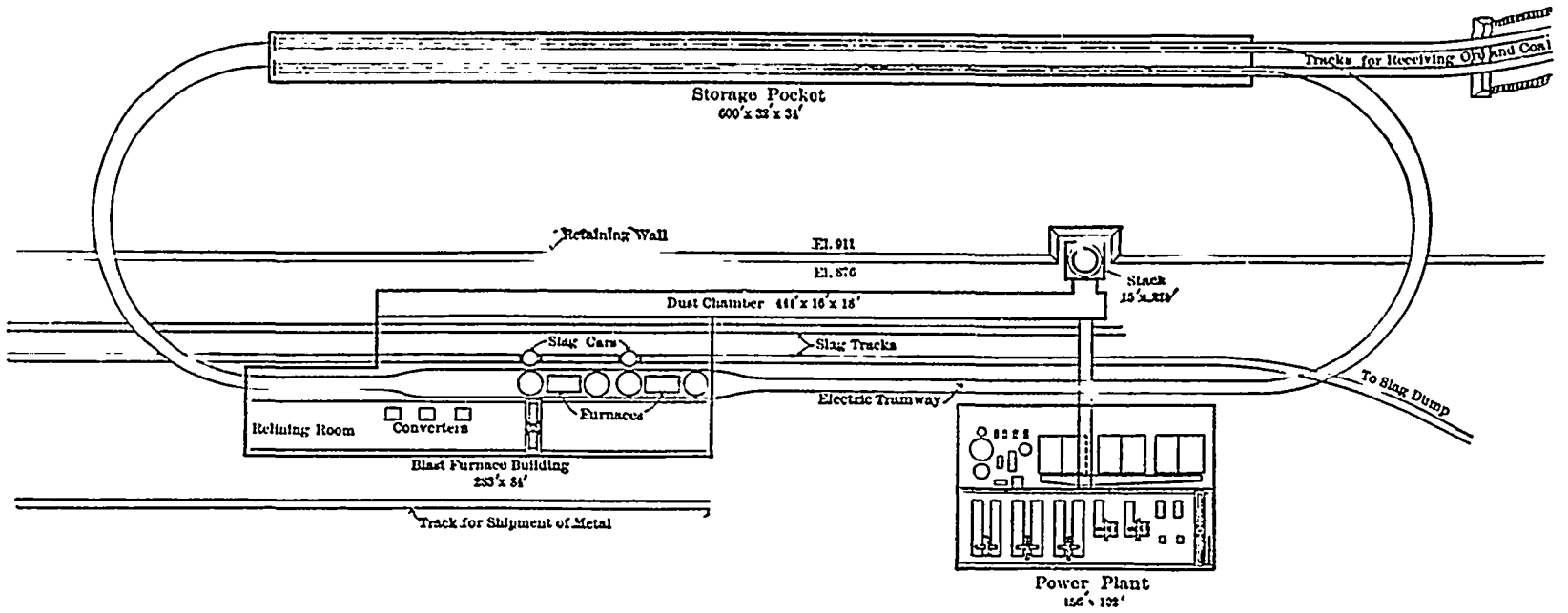
The power-house is equipped with two Nordberg Manufacturing Company's horizontal, cross-compound, condensing blowing engines with steam cylinders 13 in. and 24 in. by 42 in. and air cylinders 57 in. and 57 in. by 42 in. When operating under usual working conditions these engines will deliver 20,000 cu. ft. of free air per minute against a pressure of 40 oz. for use in the blast furnaces. One Nordberg Manufacturing Company's horizontal, cross-compound, condensing blowing engine, with steam cylinders 15 in. and 30 in. by 42 in. and air cylinders 40 in. and 40 in. by 42 in. This engine will deliver 10,000 cu. ft. of free air per minute against a pressure of 15 lb. for use in the converters. Two 13 in. and 26 in. by 20 in. horizontal compound condensing engines built by the Robb Engineering Company, to each of which is directly connected one 200 kw. 600-volt 3-phase alternating current generator built by the Canadian General Electric Company, each generator having its own exciter of 11 kw. capacity belt driven from generator shaft. The electrical energy thus generated is used for hoisting and pumping at the mines, operating the electric tramway for charging cars, turning the converters, and operating the traveling crane in furnace building. The station is also equipped with one 25 kw. motor driven generator set, for furnishing direct current to the electric locomotives. A travelling crane of ample capa-

\*Reproduced by courtesy of the Engineering and Mining Journal.



DR. EUGENE HAANEL

Dominion Superintendent of Mines, now *en route* for Europe on a Commission to investigate the application of electro-metallurgy to Canadian iron ores.



PLAN OF WORKS AT COPPER CLIFF.

city is installed in the engine-room for handling all this apparatus. A gravity oiling and oil filtration system is installed on all engines.

In the boiler room the present installation of boilers consists of four 400-h.p., 150-lb. pressure, horizontal water-tube boilers built by the Aultman & Taylor Machinery Company, of Mansfield, Ohio, and space is provided for two more boilers of the same size. The boiler furnaces are equipped with Tread-Kill shaking grates. The ashes are removed from the boiler ash-pit by opening a grate in the bottom, which permits them to fall into a bucket resting on a small flat car, which runs on a track in the ash tunnel under the boilers. The car is then run outside of the building and a hoist lifts the bucket and dumps the ashes into an ash-bin, from which it runs into cinder car.

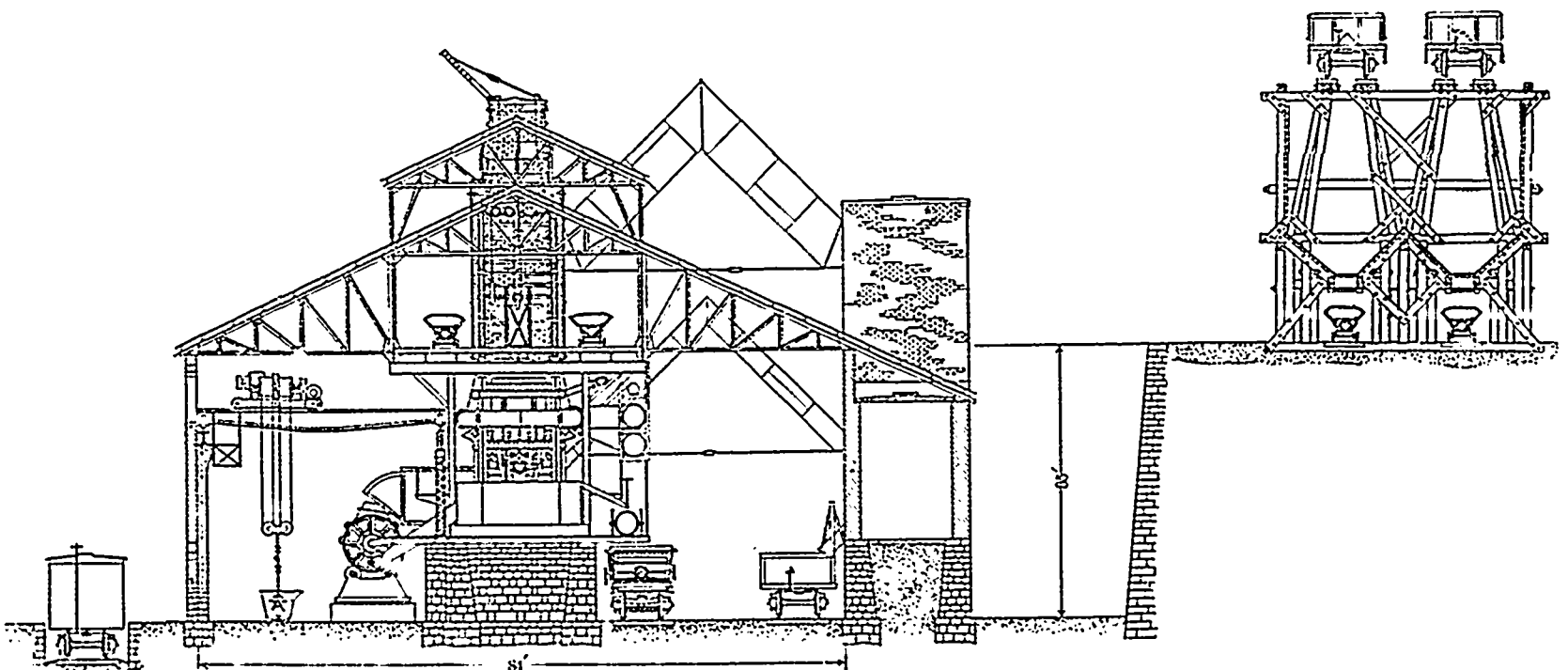
Coal is brought to the power plant by the electric locomotive train above referred to and dumped into bins built in trestle along the west side of building. Then it runs through coal chutes to one-half-ton coal cars in boiler room, from which cars it is shoveled into boiler furnaces.

The only available water for boiler use contains considerable sulphuric acid and scale-forming elements, and, to eliminate these, the

water is subjected to a chemical treatment and precipitation in a water purifying system built by the Industrial Water Company, of New-York. In this way the acid is neutralized and the scale-forming material is removed before the water enters the boilers. The condenser is of the elevated barometric type, built by the Alberger Condenser Company, of New-York.

The blast-furnace building contains two Holthoff copper blast-furnaces; three stands for Holthoff converters; one 40-ton electric crane; the necessary matte-settlers, clay mills, silica and clay storage bins, etc. Room is provided for expansion.

In operation the ore, coke and flux for blast-furnaces, silica and clay for lining converters, and coal for boilers is delivered into the top of the trestle pockets by standard-gauge cars—Ingoldsby side-dumping in the case of ore—and drawn from the bottom of the pockets into trains of six 2 ton, 36-in. gauge, side-dump Koppel cars, which are hauled to the blast-furnace, silica and clay storage bins or coal bins by 25 h.p. Canadian General Electric Company's electric locomotives. When feeding the blast-furnaces, a train of six cars will be made up of



SECTION OF SMELTER AT COPPER CLIFF.

four cars containing two tons of smelting mixture and two cars each containing the proper amount of coke to go with four tons of charge.

The slag and matte runs from the blast-furnace into 16-in. settlers, the slag overflowing into 225 cu. ft. capacity Pollock cinder cars, which are hauled to the dump by standard-gauge locomotives. The matte is tapped into 10-ton cast-steel ladles and taken to the converter by a 40-ton Case Manufacturing Company's electric crane. The same crane removes the converter shells for re-lining, and takes care of the converter slag and white metal, pouring them into moulds for return into the pocket trestle, or for shipment to the refinery. The coal bins at the boilers and the silica and clay bins at the clay mills are kept full by six-car train-loads of material.

The flue dust is drawn from the dust chamber into a standard-gauge, bottom-dump gondola especially fitted for the service, and this car is hauled to the top of the pocket trestle on the upper level and the dust drawn into a pocket fitted for the purpose, whence it is drawn to a briquetting machine, pressed into briquettes and added to the charge.

The electric tramway consists of two parallel 30-in. gauge tracks running under two lines of grates under the pocket trestle, then over suspension scales to opposite sides of the furnaces on the feed-floor level, passing over the top of the boiler room, coal bins and converter

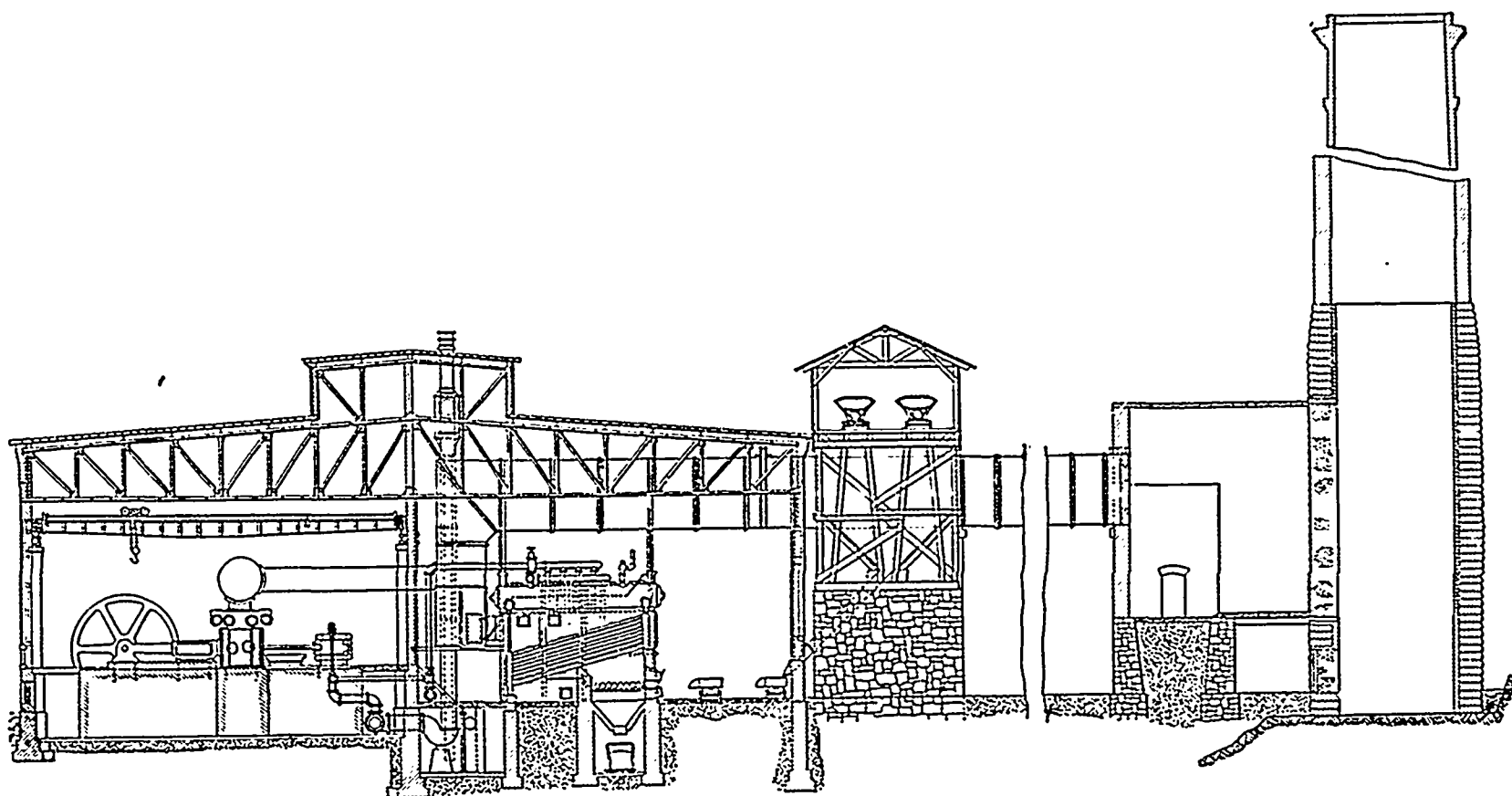
running from a dam situated about 5,000 ft. from the plant itself. The water is run by gravity into the jackets, and when drawn out is pumped into a tank above the smelting plant for fire purposes, or into the reservoir, which is near the foot of the plant, and the hot water is also used in the boilers in order to economize at that point.

#### On the Manufacture of Sulphuric Acid at Sydney, C.B.

By C. A. MEISSNER, Sydney, Cape Breton.\*

The manufacture of sulphuric acid for the purpose of making sulphate of ammonia, or the uses in the sulphite wood pulp industry, is one of the branches of the coke department where coke is made in patent ovens and the by-products are saved. Ammonium sulphate is made from the ammonia in the gas from the ovens, which is washed out and the resulting gas liquor is mixed with milk of lime which liberates the fixed ammonia and passes through suitable stills where it comes into contact with steam. By this means the free and combined, or fixed, ammonia is given off in gaseous form, and then passed into sulphuric acid contained in lead lined tanks. This acid is the ordinary chamber acid of 54° to 55° Beaume diluted down to about 42° Be.

Usually the sulphuric acid is made near the by-products plant in



SECTION OF WORKS AT COPPER CLIFF.

lining house, silica and clay bins. The two tracks have cross-over connections but under normal working conditions each track carries a train entirely independent of the other.

The blast-furnaces are 50-in. by 204 in. at the tuyeres; 14 ft. 9 in. from center of tuyeres to the feed-floor, and have on each side four lower jackets each 51 in. wide and 8 ft. 6 in. high and two upper jackets 8 ft. 6 in. wide and 6 ft. high. Each lower side-jacket carries four 6-in. tuyeres. Both ends of the furnace are made alike, so that either end can be used for removing matte and slag. There is no brick work under the deck beams. The converters are 84 in. by 126 in. and are tilted by a train of gears and a worm, driven by electric motor.

The water for the plant is supplied by a 16-in. diameter pipe

which it is to be used, unless commercial acid is readily and economically available, and distances from acid factories and subsequent freight rates are not too high.

Sulphuric acid is made largely out of iron or copper pyrites,— $\text{FeS}_2$  and  $(\text{Cu}_2\text{S})$  ( $\text{Fe}_2\text{S}_3$ )—also from native sulphur. In some cases the nickeliferous pyrites are roasted and the nickel subsequently extracted, as well as the copper. Arsenical and auriferous pyrites are used in some cases and the arsenic and gold extracted. Zinciferous sulphur ores are beginning to be largely used for this purpose, and are liable to become an important factor. Native sulphur running

\* Paper to be presented at the ensuing annual meetings of The Canadian Mining Institute.

from \$17 to \$20 per ton is, as a rule, too expensive against the price of pyrites containing 50% sulphur at \$4.50 to \$6.50 per ton and is used when not too far from source of supply. In this country it is largely used in the manufacture of the sulphite wood pulp process. Strong efforts have been made to find additional native sulphur deposits besides those now well known, but so far no new large deposits have been brought into the markets and the price of native sulphur has not been reduced much in late years. The deposits in some of the West Indian Islands, and also some of the Alaskan group of Islands, are not yet figuring in the market to any extent.

So far, in the States, the importation is nearly double the home production.\* In Canada comparatively small amounts of pyrites are mined, something over 35,000 tons being the total production for 1902. This comes largely from the mines at Eustis and Capelton in the Eastern Townships of the Province of Quebec. As yet no iron pyrites mines have been discovered that are of any extent, although the whole country, especially in the Lower Provinces, is heavily impregnated with pyrites in small particles, seams, or pockets, in practically all classes of rock. New locations in Lower Canada have been examined, but so far without direct economic success.

Newfoundland has produced some large deposits, some of which have already stood the test of time. Others, however, are still in the development stage, and later I will describe some of the deposits in the Labrador Districts which give promise of being large producers after being properly developed. The Pilley Island deposits in Notre Dame Bay, Newfoundland, are again producers, after having been idle for a number of years. At one time it was a well known deposit, having produced over 400,000 tons before being shut down. It, like nearly all Newfoundland pyrites, is very pure as far as arsenic is concerned, and usually high in sulphur.

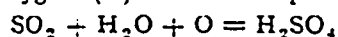
Physically, these Newfoundland ores are largely hard and fairly compact, some exceedingly so, as for instance the Labrador varieties, and with care the amount of fines is not excessive.

Copper pyrites are worked on a paying basis in several locations in Newfoundland, and such mines as Tilt Cove and York Harbour are, and promise to be, steady producers. York Harbour in the Bay of Islands, particularly, promises to be a large and steady producer. Along the Labrador Coast pyrites deposits have been reported, of which the Rowsell's Harbour deposit is, so far, the only one that has been carefully investigated. This is the one that I will describe fully later.

From this preliminary sketch on the sources of supply, we will now turn to the manufacture of sulphuric acid at the Dominion & Steel Company's Acid Plant, in Sydney, Nova Scotia, as described by Mr. C. Carter, Superintendent of the Plant.

The manufacture of sulphuric acid, as at present carried out by means of what is known as the chamber process, is the result of many years of study and observation, combined with the application and adaptation of materials and methods to the circumstances existing from time to time. Whilst other processes for the manufacture of acid have been brought out and developed, the chamber process remains to this day the most important of them all.

The object to be attained in this and other processes is to bring about the combustion of sulphur dioxide gas ( $\text{SO}_2$ ) derived from the combustion of sulphur with the elements of water ( $\text{H}_2\text{O}$ ) and an additional atom of oxygen (O) to form sulphuric acid ( $\text{H}_2\text{SO}_4$ )



As a chemical equation, this reaction appears to be of the simplest kind, but as a matter of fact and practice, the combination does not occur in quite such an easy manner, for, whilst the first part of the

reaction, viz., the combination of the sulphur dioxide with the water, is readily brought about with the formation of sulphurous acid ( $\text{H}_2\text{SO}_3$ ), the greatest difficulty is experienced in getting this sulphurous acid ( $\text{H}_2\text{SO}_3$ ) to combine with the extra atom of oxygen to form sulphuric acid ( $\text{H}_2\text{SO}_4$ ).

The principal sources of supply of sulphur for the manufacture of acid are (1) brimstone, (2) iron and copper pyrites, and (3) spent oxide from the purifiers of gas works. Of these the pyrites are by far the most important sources, most of the acid at the present day being made from these substances.

It may here be convenient to give a brief outline of the process, returning afterward to discuss more closely each stage of the process in detail. Broadly speaking, the pyrites are burnt in suitable kilns or burners, and sulphur dioxide gas given off. This gas passes along through a flue into the nitre oven where a mixture of nitrate of soda and sulphuric acid is decomposed by the heat of the burner gas, and nitric acid vapours given off which travel on with the burner gas into what is known as the Glover tower, the object and working of which will be described later. The gas rises through this tower and passes from the top through a flue into a series of leaden chambers, where it comes into contact with water vapour in the form of steam introduced through the sides or tops of the chambers. In these chambers the reaction between the gases and steam takes place, resulting in the formation of sulphuric acid which falls to the bottom of the chambers as a fine mist, where it accumulates as a liquid known as chamber acid. From the last of the series of chambers, the residual gas passes through another flue into the bottom of the Gay-Lussac tower, up which it rises, and in which the greater part of the nitrogen acid gases derived from the nitrate of soda are recovered and made available for being used over again. From the top of the Gay-Lussac tower the remaining portion of gas, which consists almost entirely of air, passes out into the surrounding atmosphere.

Having given this very brief sketch of the process, it may now be convenient to discuss each step more in detail.

The kilns, or burners, in which the pyrites are burnt are usually built in sets, back to back, of 12 to 24, or more, burners, and are constructed of brick lined inside with firebrick. The internal dimensions are about 8 feet high, by 4 ft. 6 ins. wide, by 5 ft. to 6 ft. deep. About 2 feet from the ground is placed a set of grate bars, each bar being free to move around its axis, so as to allow the burnt cinders from the pyrites to pass through. The front of the burner consists of a cast iron plate fitted with three tiers of doors, the lower one being placed convenient for removing cinders from below the grate bars; the next higher on a level with the grate bars so as to enable the men in charge to get at and turn around from time to time. The upper door is placed about three feet higher, and through this the charging is done. It is fitted with a small sliding door to enable the interior of the burner to be observed without having to open the larger door. In the roof of the burner is a square hole about 12 inches square communicating with a flue passing along the whole length of the set of burners, and into which every separate burner discharges the gas from its pyrites.

In starting up a set of such burners, a layer of cinders is placed on the grates about 18 inches in depth, on which the pyrites is ignited by suitable means, the charge of ore being about 700 lbs. for every twenty-four hours. Each burner in a set receives attention in rotation every twenty-four hours, the cinders being shaken down into the ash pits, and a fresh charge being put in on top, the new charge being ignited by the heat of the previous charge. In the ash pit door are some small doors capable of being regulated, through which the air required for combustion of the sulphur is allowed to enter.

The heated gas from these burners, which consists essentially of a

\*See Mineral Industry.

mixture of sulphur dioxide and air, passes through the flues into the nitre oven. This is an enlargement in the flue containing two cast iron pans set in such a manner that the heated gases can play well over and around them. These pans are about 7 ft. long by 2 ft. wide and 1 ft. deep. Through an iron door in the wall of the oven charges of nitrate of soda, together with sufficient sulphuric acid to completely decompose the nitrate, are introduced at regular intervals. The heated gases warm up this mixture and keep the reaction going. Nitric acid gas being given off, which is carried off along with the burner gases into the next stage of the process. The sodium sulphate ( $\text{NaHSO}_4$ ) resulting from the action of the sulphuric acid on the nitrate of soda is withdrawn from time to time through a channel in the bottom of the pan, and is allowed to cool and solidify. In some cases this substance is utilized by working it up with common salt into salt cake in the manufacture of carbonate of soda, and also in glass making, but in many places it is useless and simply thrown away.

The gases which leave the nitre oven next pass into a tower called after the name of its inventor, the Glover Tower. This tower consists of a hollow column of sheet lead, from 20 to 30 ft. high, and 9 or 10 ft. square, held in an upright position by a strong timber at each corner carrying joists to which the lead is attached by straps of the same metal. The lower end of the lead tower stands in a saucer made of the same material, about 1 ft. wider every way than the lead column, and about 1 ft. deep. This saucer is provided with a lip on one side to carry off the acid which runs through the tower and out at the bottom. The interior of the tower is lined with a glazed metallic brick, such as will resist the action of the acid. This brick is built up into the form of an arch over the pipe which brings the gas from the burners, the roof of the arch being arranged as a grating to break up the gas into a number of streams. The walls of the tower are then lined with the same brick up to the top, the lining being graded upwards from a brick and a half thick at the base to half a brick at the top. These bricks are all laid dry without mortar or cement of any kind. The space within the brick work is then filled in with quartz or flints, graded in size from the largest pieces at the bottom to the smallest sizes at the top, the packing being filled in to within about 4 ft. of the top of the brick lining. The top of the tower is covered in with a sheet of lead which is perforated with a number of holes placed about 2 ft. apart over its surface and fitted with funnels and lutes in such a way that acid can flow down into the tower without allowing the gas to pass up through the lutes.

Above the top of the tower is erected a chamber containing two distributors and storage tanks of lead for holding and delivering the acids which are allowed to run down the tower. The distributors are of many kinds, the main idea being to divide up the stream of acid from the storage tank into a number of fine streams of uniform amount and deliver these at the different holes in the top of the tower. In the side of the tower above the brick work, and below the top sheet, a leaden flue is affixed to convey the gas from the top of the tower into the first of a series of chambers. The objects of the Glover Tower are two-fold: (1) to denitrate the nitrous acid obtained from the Gay-Lussac tower in a later stage of the process, and restore the nitrous gases to the system; and (2) to concentrate the acid running down the tower. These objects are attained as follows:—

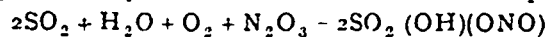
Strong sulphuric acid, containing nitrous acid gases in solution, possesses the property of giving off these gases as reddish fumes when it is diluted with water or a weaker acid. Advantage is taken of this property in the Glover tower by having two tanks at the top, one containing the nitrous sulphuric acid and the other water or weak acid from one of the chambers. Various names are given to this nitrous sulphuric acid. By some it is known as nitroso-sulphuric acid, whilst

in the trade it is usually termed nitrated acid or nitrous vitriol, the last name being used hereafter. A pipe from each tank leads to one of the distributors, the nitrous vitriol being piped to one, and the water or weak acid to another. A stream of water or acid is started, and both mix at the funnels leading into the tower. The acid on dilution gives up its nitrous gases which are carried into the chambers again by the ascending column of gas. The mixed liquids fall down on to the quartz packing and are divided up into countless little streamlets descending the tower, and cooling the gases as they rise through the interstices of the packing. Lower down the gases are hotter, having just left the burners, and here the heat is sufficient to drive off the water from the descending shower of acid and returns it as steam to the chambers, whilst the acid runs out into the saucer at the base of the tower, and from there into the storage tank, as strong as it was before dilution at the top of the tower, and at the same time deprived of the nitrous acid which it formerly contained. The degree of denitration and concentration is regulated by varying the supply of water or weak acid at the top of the tower, the acid running away from the base of the tower, being tested frequently for strength and nitrous acid. If this shows a high test for nitrous acid, more water or weak acid is required, whilst if the strength is below the normal, some water or weak acid must be cut off. The acid which runs off from the base of the tower is passed through a cooling arrangement to reduce the temperature as much as possible, and is then in a suitable condition to be used over again in the other tower or Gay-Lussac tower in a stage to be described later.

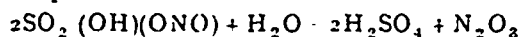
The mixture of gases which reaches the top of the Glover tower and which consists of sulphur dioxide, nitrous acid gas ( $\text{N}_2\text{O}_3$ ), steam and air pass through the flue into the first set of chambers, the temperature of the entering gases being about 140° F., though it sometimes falls as low as 100° F. in very cold weather, such as we occasionally experience in Sydney.

The chambers, which have been mentioned previously, are enormous receptacles constructed of sheet lead. They are usually built in sets of 3, 4, or more, according to the capacity of the plant. Sometimes all the chambers are of the same size, about 90 ft. long by 24 ft. wide and 24 ft. high, containing about some 50,000 cubic feet of space each inside. In other plants, as at the Dominion Iron and Steel Company's plant the chambers are of varying sizes, the first chamber being the smallest and the last one the largest. There is not, however, any distinct advantage apparent of one plan over the other. The Steel Company's plant consists of three chambers, the first one being 36 ft. long, 25 ft. wide and 20 ft. high, having a capacity of 18,000 cu. ft.; the second being 117 ft. long, 25 ft. wide and 20 ft. high, with a capacity of 58,500 cu. ft.; and the third being 150 ft. long, 20 ft. wide, and 20 ft. high, with a capacity of 60,000 cu. ft.; the total contents of the three chambers being 136,500 cu. ft. In the construction of these chambers, the base of each chamber is essentially an immense lead tank, with sides two feet high. Into this the leaden sheets forming the sides of the chamber hang almost touching the bottom of the tank, the acid formed in the tank acting as a lute around the lower edge of the sheet to prevent the gas from escaping. The top of the chamber is a lead sheet. The sheets are joined together by burning, a blow pipe, using oxy-hydrogen gas, being used to melt the edges of the sheets sufficiently for the metal from the two sheets to run together and solidify. Solder would be of no use, as it would not resist the action of the acid gases. The leadwork is held up by a strong wooden framing, built up all round outside, to which the sides and top of the chambers are attached by lead straps burnt to the sheet lead and nailed to the joists. A set of chambers is usually raised some ten or more feet above the ground to allow for a natural fall of the acid when

drawing it off from the chambers for use. The chambers are connected one with the other by means of leaden flues about 2 to 3 ft. in diameter through which the gases travel from one chamber into the other. Each chamber has several fittings. First of all one or two steam jets are inserted in the sides or top connected outside with a steam supply and valves so that the admission of steam can be controlled. On one side of the chamber at intervals of 20 ft. or so, a tray 10 ft. long by 1 ft. wide is attached inside the chamber about 5 ft. from the bottom. This tray is placed on a slope of about 1 in 12, and at the lower end a tube of about 1-in. bore communicates with the tray and the outside of the chamber by passing through the side. When the chamber is working, some of the condensed acid collects on this tray and runs out by the tube where it is received in a hydrometer glass and tested for specific gravity at regular intervals, by means of which it is known whether too little or too much steam is being admitted. Thermometers are also inserted through holes in the side to indicate the temperature of the interior and a place is made at each chamber either by means of a manhole or by pressing back some of the leadwork for obtaining samples of the acid standing in the bottom. In these chambers, the formation of the sulphuric acid takes place. Various theories have been advanced for explaining the formation, none of which, however, can be accepted with absolute certainty. The most generally accepted theory, however, is that the sulphur dioxide (SO<sub>2</sub>), the nitrous acid from the nitre ovens (N<sub>2</sub>O<sub>3</sub>), the oxygen from the atmosphere, and the steam generated in the Glover tower react in the first chamber producing nitroso-sulphuric acid in accordance with the equation—



This nitroso-sulphuric Acid floats about the chambers as a mist, and on coming into contact with more water vapor from the steam jets is decomposed with the production of sulphuric acid, which sinks to the bottom of the chamber, and nitrous acid gas (N<sub>2</sub>O<sub>3</sub>) which is available for further reaction, this reaction being capable of representation by the equation—



Thus the nitrous acid gas acts as a carrier of oxygen, bringing about the combination of the sulphur dioxide with the extra atom of oxygen required to form sulphuric acid. This reaction goes on over and over again right through the set of chambers, the action of the first chamber being the most energetic, as shown by the higher temperature of that chamber, which in the other chambers gradually falls until at the outlet from the last one it is about the same as that of the atmosphere. It is the duty of the chamber attendant to go round the chambers every hour and observe the specific gravity of the samples obtained from the test tables inside or the "drips" as they are called, and from these observations he judges whether more or less steam is to be admitted. The liquid acid, as it is formed, settles in the bottoms of the chambers, from which it can be syphoned off, whenever required, for any purpose for which it is made.

By the time the gases have reached the end of the set of chambers, the reaction should be theoretically completed, the residual gases consisting of nitrous acid gas (N<sub>2</sub>O<sub>3</sub>) and air only. In practice, however, this is never the case, there being always traces of unaltered sulphur dioxide in the gases leaving the chambers. In the early days of the chamber process, these gases were at once allowed to go out into the atmosphere, which meant that a large amount of nitrous acid gas was continually escaping and so being lost. Thanks, however, to the invention of the French chemist, Gay-Lussac, it has been found possible to recover the greater amount of this nitrous acid gas and render it capable of being used over and over again, and so economizing to an enormous extent the quantity of nitrate of soda formerly used.

(TO BE CONTINUED)

### The Year's Mining in British Columbia.\*

The mining of gold and silver-bearing ores in British Columbia continues to be done chiefly in a very small part of the province, namely, the southeastern corner, comprising the district of Kootenay and a portion of Yale, all of it being south of the Canadian Pacific Railway.

The following table represents approximately the output of the year 1903:

	Ore, tons.	Gold, oz.	Silver, oz.	Copper, tons.	Lead, tons.
Boundary district..	684,000	48,000	247,000	8,245	.....
Rossland.....	406,200	164,700	467,000	4,125	.....
Nelson.....	84,000	24,300	207,000	195	550
Slocan and East Kootenay .....	22,100	3,400	2,375,000	.....	9,295
Miscellaneous .....	13,700	7,600	4,000	.....	.....
Total .....	1,210,000	248,000	3,300,000	12,965	9,845

As compared with the output of 1902 there is an increase of over 200,000 tons, of ore, an increase of about 17,000 oz. gold, and a decrease of 600,000 oz. silver. The ultimate reasons explaining these changes are to be found under the headings 'Copper' and 'Lead.' It is to be noted, however, that the tonnage mined in the extremely low-grade district of the Boundary is 56.4 per cent of the total. The average ores of the Boundary are found to yield about .07 oz. gold, 0.35 oz. silver and 1.2 per cent copper. The precious metals are therefore less in value than the base.

A few small mines of this Boundary district, all in the vicinity of Greenwood, are producing quartz ores with about 4 to 5 oz. gold and 50 to 60 oz. silver per ton. Allowance for such material makes the profitable mining of the copper-bearing ores all the more remarkable.

In the Rossland district there has been a radical increase of tonnage and metal recovery. Here the main value is in gold, the ores averaging, as now mined, about 0.45 oz. gold, 1.1 oz. silver, and 1.1 per cent copper. Continuance of operation at the more important mines, therefore, indicates a greatly decreased cost of either mining or smelting, or both, as compared with that which prevailed only five or six years ago, when freight and smelting charges amounted to from \$9 to \$11 per ton.

The year 1903 has witnessed the apparently successful introduction of the Elmore process, and its success in concentrating the low-grade ores of the Le Roi No. 2 mine is leading to its application elsewhere.

The Rossland Water Power Company, affiliated with the Centre Star and War Eagle mines, is now building a large concentrating plant at Trail. The completion of this will undoubtedly lead to a much increased tonnage output in the coming year.

In the Nelson district, the old Silver King mine has been successfully operated in a small way under lease, whilst the milling of free gold ores and the mining of sulphide gold ores at the smaller properties has resulted in an increased tonnage and metal output from them as compared with 1902. The net output of gold is about the same as that of 1902, but that of silver has decreased considerably.

At various outlying camps several 10-stamp gold mills have been built, but they began operations too late in the year to have any marked effect on the output. Including these plants and the older ones, the free milling properties have crushed during 1903 about 95,000 tons of quartz, yielding in bullion 25,000 oz. gold and about 17,000 oz. silver.

Slocan, East Kootenay and the Lardeau are producers of the greater part of the silver and practically all of the lead of the province. This lead country has, for various reasons, been far from prosperous,

\* By Mr. S. S. Fowler, S.B., E.M., in the *Engineering and Mining Journal*.



with a consequent considerable decrease in the output of dry silver ores; the net result being that the silver output from these districts will be about 600,000 oz. less than in 1902.

In the Similkameen river country, on the eastern slopes of the Cascades, and near Hedley City, the Nickel Plate mine, belonging to the representatives of the late Marcus Daly, has about finished a 40-stamp mill with concentrating and cyanide plants. The ore is quartz carrying arsenical pyrite and, in gold tenor, is said to be much above the average milling ores of the country. This property may be looked to for a large output during the coming year.

Aside from the gold-milling center about Cambourne, in the upper Lardeau and Fish river, the only other district which has attracted much notice during the year is what is now known as Poplar. This camp is situated on the Lardeau river northwest of Kootenay lake, and, although it has not yet reached the stage of commercial production, it has caused much local excitement because of the extraordinary richness of the large quantity of specimens sent out. Development is being prosecuted on several of the more prominent claims, and the coming year doubtless will have added much to our knowledge of this district, which bears the promise of becoming important.

An interesting feature of progress during 1903 has been the construction of a 20-stamp chloridizing mill for the treatment of concentrator tailings from the ore of the Silver Cup mine in Lardeau district. The outcome of this return to an old process will be watched keenly.

Another important undertaking is the preparation for work on an extensive scale of the Hunter V. property near Ymir, 20 miles south of Nelson. This mine carries a belt of limestone about 200 ft. wide, which at many points is impregnated with silver minerals to such an extent as to yield about 15 to 20 oz. silver per ton, with small amounts of gold. The rock itself has a large excess of lime and is thus desirable to the local smelters. A tramway of 25 miles length has been built to the Great Northern railway and shipments will begin early in 1904.

*Copper.*—The production of copper in southeastern British Columbia for 1903 has amounted to 12,965 tons (2,000 lb.), of which 8,245 tons is the result of smelting about 684,000 tons from the mines of the Boundary district near Phoenix and Greenwood, whilst about 4,525 was derived from 406,000 tons produced from the mines of Rossland and its vicinity.

Most of the Boundary ores are smelted at the three local plants of the Granby Company, the British Columbia Copper Company, and the Montreal & Boston Company, none of which are more than 25 miles from the mines. These three plants now have in operation ten large furnaces, whose joint daily capacity may be put at 3,000 tons. Concentration to matte proceeds in the ratio of about 40 tons into one, and the resulting matte averages about 45 per cent copper. All of the matte is converted to blister copper at the works of the Granby Company at Grand Forks, and the products are shipped to New York for refining.

The British Columbia Copper Company is now installing two stands of converters, and it is said to be preparing to double its smelting capacity. These works are being equipped for operation by electric power derived from the plant of the Cascade Water, Power & Light Company, at Cascade, on the Kettle river.

The essentially low grade character of these Boundary mines renders operation on a large scale necessary to success, and as the mines become further developed, the extension of mining and smelting equipment seem certain of justification. The latest announcement of important development work is of that to be undertaken by the Granby Company; this involves the driving of a two-mile adit intended to tap the Phoenix mines at about 1,700 ft. depth. The company also contemplates the erection of another smelting plant near the mouth of

this adit, with the ultimate object of doubling the present output.

Two or more properties in this district have been added to the list of shippers during the year, namely, the Oro Denoro and the Athelstane, but the supply of ores sufficiently high in sulphur still seems to be insufficient to permit other than the high ratio of ore to matte above mentioned.

In 1902 the Boundary produced about 520,000 tons of ore and 7,480 tons of copper. The development and advancement of this region is therefore evident. The Granby Company has been placed upon the dividend list.

At Rossland, beside an increase of tonnage amounting to 75,000 tons as compared with 1902, an important and interesting phase of the progress of the district has been the successful application of the Elmore process to the concentration of the lower grade of ores. A 50-ton plant at the Le Roi No. 2 property was finished about the middle of September, and it is stated that its success has already resulted in arrangements for two other plants. Near the smelting town of Trail a concentration plant is being erected, essentially for the benefit of the Centre Star and War Eagle mines. The tailings will be re-treated by a process, the details of which have, I believe, not yet been made public, and also, in part, by the application of the Elmore process.

About 60 per cent. of the Rossland output is smelted at Northport, Wash., and the remainder chiefly at Trail, although latterly a small part has been sent to Greenwood, where the Rossland ore is desirable on account of its greater content of sulphur. The haul of 140 miles and the heavy grade of railway, however, prevent any great part of Rossland ores being smelted at points so far away. At Trail much of the low grade Rossland ore has been smelted with lead ores.

The general reduction of costs at Rossland, with lower freight and treatment rates, has afforded this district an opportunity of regaining its former strength, and now that concentration has become an efficient factor there appears to be an excellent future for the town.

In 1902 Rossland and the Boundary produced 92 per cent. of all British Columbia copper. The balance came from the mines of Vancouver Island, for which the Tyee and Northwestern companies both built well-equipped smelting plants. I regret to say that I have not received figures of output for the year 1903.

No new copper districts have been discovered during 1903, but more or less quiet development is proceeding in the Similkameen, Nicola and Kamloops districts. Kamloops has shipped small quantities, and it is reported that arrangements are being made for the establishment of a smelting plant at that point. As far as development has proceeded in the Similkameen and upper Upper Nicola camps, the several important properties have proved to be remarkable, both on account of their size and high copper contents. This country is still waiting for the advent of the railway, when that takes place there will be greater stimulus to production.

*Lead.*—Until the recently, and for two years past, the conditions surrounding the lead-silver mining industry in British Columbia have been distinctly unsatisfactory. The only available market within easy reach has been in the United States, but free access to it has been precluded by the tariff. The low prices obtainable by the miner for his lead (at present \$1.40 per 100 lb.), and the low value of silver, brought the British Columbia lead mines a year ago to a point at which profits vanished and the industry was fast expiring, this was evidenced by a decrease from about 36,600 tons in 1900 to 11,000 tons in 1902. An appeal for assistance was made to the Dominion government last spring; a radical change in the Canadian tariff was asked; but instead of this, the miner had to be content with a bounty of \$15 per ton for five years and limited to \$500,000 in any one year, on ore mined and smelted in Canada. The decision was reached by the government in

July last, and in December arrangements were finally perfected for the payment of any bounty earned.

Meantime, although silver prices became somewhat better than they were a year ago, the mines, for one reason or another, have not been very actively worked, and the result is that the year 1903 will show a total production of lead of not much over 9,800 tons. Some of this is practically a by-product and would have been produced at any price, from gold ores.

The production of lead-silver ores, as such, will amount to about 22,100 tons, containing about 9,300 tons of lead and 2,375,000 oz. silver, all figures including a rather liberal allowance of output for December. These compare very unfavorably with the figures of 1902, when 31,700 tons of ore containing 10,400 tons of lead and 2,928,000 oz. silver were marketed. It is noticeable that the decrease of silver is very much greater, proportionately, than that of the lead. This is mainly because of the great falling off in the production of the dry silver ores from the Slocan Lake mines. The low prices of silver and a smaller demand for these ores consequent on the decreased production of lead, is responsible for this important change.

During the period of depression, which has lasted so long, some of the lead properties unfortunately, and possibly unavoidably, permitted development work to get very far behind, and it is now undoubtedly a fact that these properties are face to face with depleted treasuries and exhausted ore reserves. Although this remark cannot be applied to more than a few of the mines, it is, still, a condition which together with uncertainty as to when the lead-bounty was to be available, and some professed dissatisfaction as to smelting rates or attempts at having them lessened, has produced a very gloomy year in the lead districts.

Under such circumstances, mine-owners have naturally begun to think more of the possibility of deriving some revenue from the zinc contents of their mines, instead of longer permitting that metal to be a burden on their operations. Considerable interest in the zinc-producing capabilities of the Slocan has been manifest not only on the part of the owners, but, as well, on the part of zinc-ore buyers and the sellers of the various makes of magnetic separators. The net result of this interest in a comparatively new phase of the lead-mining business, is that about 2,000 tons of zinc ore or concentrates have been marketed, and at least one magnetic separating plant has been put in successful operation. Success in turning this hitherto baneful element to account certainly seems to be nearer, for the whole of the Slocan, than it was a few months ago. Most of the product of this class has gone to Iola, in Kansas, at a freight cost of \$11 per ton. This charge is greater than the product can well stand, and the feeling is growing that ultimate success is to be reached only by the means of a reduction plant erected in the country, or else a very moderate freight rate to tide-water.

It is interesting to note that, as the result of zinc-milling, in some instances at least, the higher the grade of zinc in the concentrate, the lower the silver values become. This is of importance because of the fact that in the earlier zinc shipments, containing from 40 to 45 per cent. the silver was sold at far too great a sacrifice. Effort towards as perfect a concentration as possible is to be made, therefore, and it is satisfactory to note that at the mill of the Payne mine, a product of 55 per cent. is now being made, with only a very low silver content. The silver minerals are supposed to accompany the magnetic tailings, which may be found to command a ready sale to the lead smelter.

At the close of the year there is found a decidedly better feeling in the lead camps, and it may be expected that, what with artificial assistance of the lead-bounty, the better utilization of the ores, the new

'finds' and any improvement in the prices of silver, 1904 will witness a return of former prosperity.

Excepting about 2,900 tons, all of the product of the lead mines was sold either to the Hall Mining & Smelting Company, at Nelson, or to the Canadian Smelting Works at Trail. At the latter point a new electrolytic lead-refining plant of 20 tons daily capacity was erected during the year.

## CARIBOO HYDRAULIC.

### Manager Hobson's Report Shows a Poor Year Owing to Lack of Water.

At the Annual Meeting of the Shareholders of the Consolidated Cariboo Hydraulic Mining Company, held in Toronto on 7th January, Mr. John B. Hobson, M.E., Manager of the Company reviewed this work during the season of 1903, as follows :—

The past season turned out a most disappointing one, for the reason that the 26 inches of well-settled snow that laid on the watershed at the end of March, went off mainly by evaporation under the influence of the cold frosty weather, accompanied by the northerly winds that prevailed during the months of April and May; and afforded barely sufficient water to operate the mines 53 days and 7 hours, with a quantity of water varying from 2,000 to 2,500 miner's inches, being 12 days and 8 hours short of the time run during the season of 1902, 50 days and 18 hours short of the washing time reported for season 1901, and 118 days and 6 hours short of the washing time reported for season of 1900.

The season's mining operations were divided into two runs as follows :—

Washing was commenced on the 3rd bench in Pit No. 1 on the 21st day of April, was continued for a period of 45 days and 7 hours, ending July 15th. During the progress of the run 111,083 miner's inches of water were used to wash out a slide of indurated volcanic mud, containing about 68,000 cubic yards, that came into the excavation from the North-West rim on the big bend of the channel north of Dancing Bill Gulch, and 248,000 cubic yards of the rocky deposits of the 3rd Bench, making a total of 316,000 cubic yards for the run, from which was recovered 2,115,750 ounces of gold, valued at \$36,032.94, an average yield of 14.73 cents per cubic yard for the 248,000 cubic yards of gravel and slide rock washed from the 3rd Bench, which was carried up to the face of the Main Bank.

About half the washing time was applied to the excavation of the rocky cuts required to accommodate the right and left branches of Sluice No. 1, which were advanced 740 feet on the right and 704 feet on the left side of the excavation.

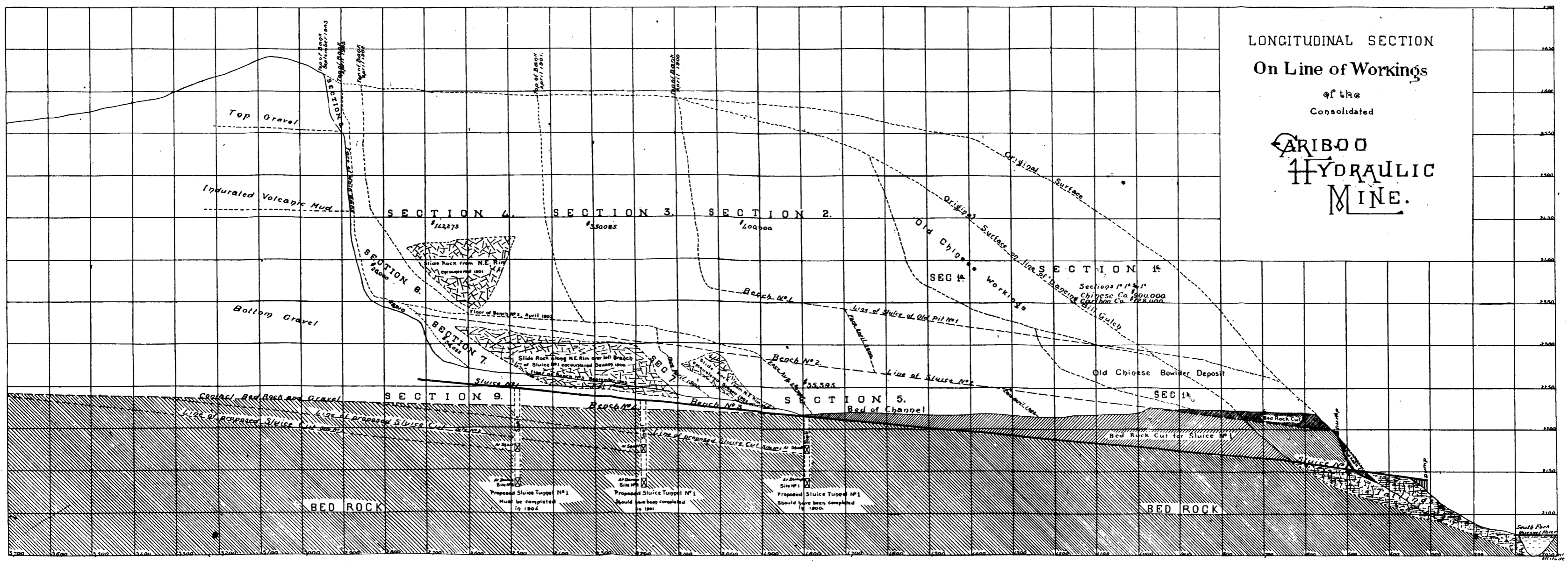
The second run, commenced on the 21st day of July, included a period of 8 days, ending with the exhaustion of the water supply on the 1st day of August. During the progress of the run 16,000 miner's inches were used to wash out about 12,000 cubic yards of slide rock that came into the excavation from the South-West rim, and 44,000 cubic yards of gravel from the main bank, making a total of 56,000 cubic yards for the run, from which was recovered 523,750 ounces of gold, valued at \$8,910.76, an average yield of 20.75 cents per cubic yard for the 44,000 cubic yards of gravel washed from the Main Bank. The right-hand branch of Sluice No. 1 was advanced 45 feet, making the advancement of Sluices amount to a total of 1,489 feet for the season.

The grade of the deposits of the 3rd Bench increased gradually as the workings were carried up channel towards the Main Bank, but the immense deposits of slide rock, found lying next to the North-East rim on line of left branch of Sluice No. 1, replaced a large area of the pay strata, and caused a material reduction in the average yield of the ground worked. The removal of this immense deposit of broken, angular rock retarded the progress of the work, and added materially to the cost of mining, and the excavation of cuts required for the advancement of left branch of Sluice No. 1.

The results of the second run is encouraging, and indicates a continuation of the high-grade deposits that gave such satisfactory results prior to the season of 1901, when enormous deposits of slide rock from the rims were found replacing large areas of the high-grade strata composing the Main Body of the fill found between the rims of the ancient river, (see cross and longitudinal sections accompanying reports).

LONGITUDINAL SECTION  
 On Line of Workings  
 of the  
 Consolidated

**CARIBOO**  
**HYDRAULIC**  
**MINE.**



The light gold output may be laid to the short water supply, the working time lost in removing large masses of slide rock, encountered while carrying the workings up stream, and excavating cuts for advancement of sluice branches.

SUMMARY OF THE SEASON'S MINING OPERATIONS.

Total time occupied in washing in Pit No. 1.....	53 days, 7 hours
Total quantity of water used.....	127,083 miner's inches
Quantity of gravel, clay and rock washed :	
Gravel from Third Bench.....	248,000 cubic yards.
Gravel from Main Bank.....	44,000 " "
Slides from rims of old workings and Indurated Volcanic Mud.....	68,000 " "
Bed Rock Slide.....	12,000 " "
Total quantity washed.....	372,000
Average duty of water per miner's inch.....	2.78% cubic yards
Gold product for season.....	2,639.09 Troy ounces
Value of Gold.....	\$44,943.70

The receipts and expenditures attending the operation of the company's mines for the season will be found distributed in detail in the following statements :-

MINE OPERATING EXPENSES, 1903.

EXPENDITURE.	
Mining Account :-	
Mining.....	\$18,330 22
Excavation for Sluices.....	8,703 00
	<u>\$27,033 22</u>
Explosives :-	
Mining.....	\$7,418 15
Excavation for Sluices.....	7,120 00
	<u>\$14,538 15</u>
Sluice Maintenance and extension.....	9,449 80
Portable Hydraulic Plant Maintenance.....	37 33
South Fork Ditch Maintenance.....	2,870 28
Morehead Ditch Maintenance.....	2,815 84
Camp Maintenance.....	1,189 59
Mine and Camp Light Maintenance.....	398 46
Wagons and Harness Maintenance.....	144 07
Telephone Maintenance.....	77 57
Prospecting Account.....	729 22
Stationery and Printing.....	283 47
Postage and Telegraph.....	134 34
Incidental Expenses.....	11 40
Lands and Leases, (Lease Purchases, Rentals, etc.).....	5,267 30
License Account (Free Miner's Certificates).....	110 00
Fire Insurance.....	803 00
Travelling Expenses (Transportation of Miners, etc.).....	6,039 87
Mine Office Expenses.....	1,307 00
Bullion Expenses (Royalty, Insurance, Transportation, etc.).....	1,633 24
Management.....	5,228 18
Stable Expenses.....	628 85
Tools and Implements—Loss for Season.....	288 70
Horses Account " ".....	190 00
Quicksilver Account " ".....	242 69
Total Operating Expenses for season.....	<u>\$81,451 57</u>

RECEIPTS FOR SEASON 1903.

Gold Product for Season.....	\$44,943 70
Profit on Stores sold.....	2,123 19
Total Receipts for season.....	<u>\$47,066 89</u>

INVENTORY.

There is on hand at the Company's Stores and Mines, as per Inventory made August 5th, 1903 :-

Miscellaneous Provision Stores, Mining Supplies, Hydraulic Plant, etc.....	\$42,783 81
Explosives.....	20,764 59
Blacksmith Stores.....	1,724 63
Quicksilver.....	2,644 60
	<u>\$67,917 63</u>
Horses.....	\$ 1,192 00
Wagons, Sleighs and Harness.....	2,109 92
Saw Logs, Lumber, Flats, Fuel, Sluice Blocks, etc.....	7,943 74
Tools and Implements.....	15,557 40
	<u>26,803 06</u>
Total as per Inventories.....	<u>\$94,720 69</u>

WATER SUPPLY.

The quantity of water available for use during season of 1903 was 52,437 miner's inches less than the quantity of water used during season of 1902, 131,167 miner's inches less than the quantity of water used during season of 1901, and 333,795 miner's inches less than the quantity of water used during the season of 1900.

Precipitation for season 1902.....	23.40/100 inches
" " 1903.....	17.48/100 "
Less than precipitation for season 1902.....	5.92/100 "
Quantity of water available and used during season of 1902.....	179,520 miner's inches.
Quantity of water available and used during season of 1903.....	127,083 " "

The winter snowfall turned out again below the average for the district and fell 26.78% inches short of that reported for 1902. The spring and summer rains turned out also below the usual average and fell 1.18% inches short of the precipitation reported for season of 1902.

The snow went off during the months of April and May under the most unfavorable weather conditions, i. e., moderately warm days, cold nights accompanied with northerly winds and contributed but a small percentage of its water to the reservoir lakes. The unusual shortage in precipitation, together with the unfavorable weather conditions under which the snow went off, accounts for the shortage in the season's water supply.

SUMMARY OF MINING OPERATIONS FROM THE TIME OF COMPLETION OF WATER SUPPLY SYSTEM IN 1898.

YEAR.	Precipitation in inches.	Water used in Miner's inches.	Time Run	Cubic Yds. Gravel Washed.	Product.
1899	28-65/100	353,056	144 days, 8 hrs.	1,952,535	\$ 92,678 93
1900	30-67/100	460,878	171 " 13 "	1,843,938	350,085.77
1901	20-30/100	258,250	104 " 13 "	2,420,288	142,273 41
1902	23-40/100	179,520	65 " 15 "	690,442	61,395 19
1903	17-48/100	127,083	53 " 7 "	373,000	44,943 70

By reference to Report for 1899 it will be noted that the season's operations were confined, mainly, to cleaning out the deposit of boulders and debris left in bottom of old Chinese workings, and the low grade deposits of gravel and volcanic mud lying on the rims north and west of said old workings, which accounts for the light product, in proportion to the quantity of water used.

The precipitation for season 1900 was 30.67% inches, and made, with the 100,000 inches carried over from 1900, 480,878 miner's inches of water available for use, a quantity exceeding the estimated holding capacity of the reservoirs, aggregating 470,370 miner's inches, as shown by the following table that accompanied the Hydrographic Map prepared in 1897.

TABLE OF WATER SUPPLY.

LOCALITY	WATERSHEDS			DEPTH	RESERVOIRS			CONTENTS.	
	AREA		Sq. Ft.		TOP AREA		BOTTOM SQUARE FT.	Mil-lion Cu ft.	24 Hr Min. In.
	Sq. Ft. Mil-lion	Acres.			Acres.	Sq. Feet.			
Polley's Lake.....	337	7,736	12 09	8 ft.	40,660,000	933	35,400,000	304	140 741
Boojack Lake.....	174	3,995	6.24	6 ft.	27,500,000	631	26,500,000	162	75,000
Main Ditch below Hazeltime.....	352	8,081	12 63						
Main Ditch above Hazeltime.....	155	3,558	5.56	33 ft.	27,000,000	620	8,000,000	550	254,620
Dancing Bill.....	79	1,814	2.83						
Morehead Lake.....	460	10,560	16 50						
Little Lake above Morehead Ditch.....	99	2,273	3.55						
TOTALS.....	1,656	38,017	59.40			2,184		1,016	470,370
Little Lake below Morehead Ditch.....	95	2,150	3.41						

By reference to Annual Report for 1901, and Section No. 4 on the longitudinal section accompanying this report, it will be noted that the intrusion of an immense deposit of Slide Rock replaced a large area of high-grade gravel and reduced the average yield of the ground. This condition, together with the light precipitation and short water supply, accounts for the reduced product for that season.

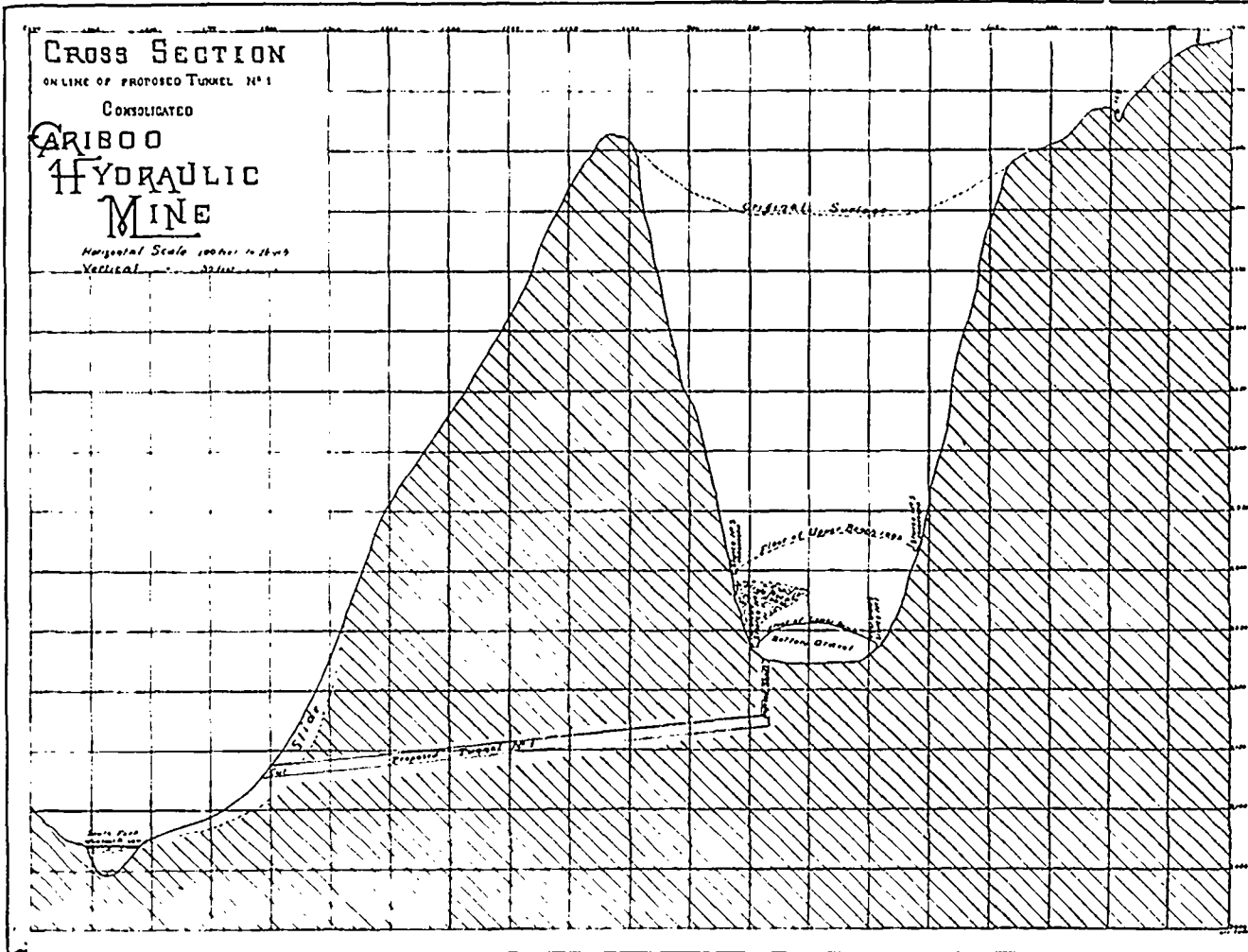
The short water supply and inclusion of large deposits of slide rock in the Lower Bench, accounts for the light product for the seasons of 1902 and 1903.

The tables indicate that the gold product is dependent, mainly, upon

copious precipitation and a water supply ample to operate the mine full time with at least 2,500 miner's inches of water during the open season, including a period of about six months, commencing on or before May 1st, and ending on or about November 1st

It is, therefore, evident that the precipitation must return to what it was prior to 1894, as reported by government agents and old settlers, varying each season, with few exceptions, from 30 to 40 inches annually, or the Company's catchment canals must be extended to control a much larger area of watershed, or to some stream affording an abundant and permanent flow of water throughout the open season. Surveys are now under way to

Sections 1a, 1 b, and portion of 1 c were worked out by the Chinese, who reported a gold recovery of \$900,000. The Cariboo Hydraulic Mining Companies worked out the remainder of Sections 1 a, 1 b, and 1 c, and recovered therefrom \$128,000. The Cariboo Hydraulic Mining Company worked Section No. 2 and recovered therefrom gold valued at \$400,000. The Consolidated Cariboo Hydraulic Mining Company worked Section No. 3 during season of 1900 and recovered therefrom \$350,085.77. Section No. 4 was worked out in 1901 and produced \$142,273.41. Sections No. 5 and 6 were worked out during season of 1902. Section No. 5 produced \$35,395.19, and Section No. 6 produced \$26,000.00, a total of \$61,395.19. Sections Nos. 7



determine the possibility and probable cost of extending the Company's system to a source that will insure an abundant and permanent water supply that will be ample to carry operations over seasons of light precipitation.

The heavy precipitation recorded for September ultimo, amounted to 6 $\frac{3}{8}$  inches, and caused the water in the storage reservoirs to rise as follows:—

Morehead Lake, rise 86 in., being now 13 in. lower than maximum height.
Polley's Lake, " 20 in., " 3 in. higher than for 1903.
Bootjack Lake, " 15 in., " 5 in. " " 1903.

With so large a quantity of water on hand in the storage reservoirs the outlook is certainly favorable for a good water supply for the ensuing season.

#### CONDITION OF THE MINE.

To better illustrate the subject, I have prepared, and append hereto, a longitudinal section on line of workings, and a cross section on line of proposed sluice tunnel site No. 2.

By reference to the longitudinal section you will note that all the ground in the Third Bench, including sections Nos 5 and 7, has been worked out up to the face of the Main Bank, leaving the shallow bench of ground between sluice No. 1 and bed-rock as Bench No. 4, extending from the point where sluice No. 1 goes above bed-rock at "A," about 1,110 feet to the face of the Main Bank.

and 8 were washed during season of 1903. Section No. 7 produced \$36,032.94, and Section No. 8 produced \$8,910.76; a total of \$44,943.70; making the total gold product for the 2,370 feet of channel worked, amount to \$2,026,698 07.

The bed-rock Cut "B," and Sluice Tunnel No. 1, at site No. 1, should have been completed during the season of 1900, so that all the ground included in Sections Nos. 4, 5, 6, 7 and 8 and the Fourth Bench, included in Section No. 6, could have been washed through sluice, cut and tunnel at reduced cost for mining and sluice maintenance, but the delay in the delivery of the power drill plant and electric appliances, until late in 1901, made it impossible to complete either cut or tunnel as expected.

The Sluice Tunnel must be driven, from either site No. 2 or site No. 3, during the season of 1904 to afford outlet to the dumps for the ground worked during season of 1905.

Since the Sluice Cut has been lowered and the branches of Sluice Section No 1 have been carried up to the Main Bank, and the working face includes a greater depth of high-grade gravel than has been exposed for washing since the opening of the property, the mine is in better condition for continuous and profitable operation than it was at the opening of the season of 1900, when \$200,000.00 was netted out of a product of \$350,085.77.

The outlook for the ensuing season's operations is, therefore, very favorable for a large output, at reduced cost, calculating, of course, on the precipitation being ample to afford a good season's water supply.

**Imports of Mining Machinery during 1903.**

The imports of free and dutiable mining and smelting machinery for the twelve months ending December 31st, 1903, are as follows:—

MONTHS	1903.			1902.		
	Free	Dutiable	Total	Free	Dutiable	Total
January.....	\$ 77,298	\$ 7,676	\$ 84,974	\$ 92,984	\$ 2,549	\$ 95,533
February.....	30,106	1,587	31,693	43,123	2,380	45,503
March.....	83,535	11,534	95,069	55,255	2,629	57,884
April.....	104,967	4,638	109,605	61,227	5,087	66,314
May.....	155,493	1,469	156,962	90,820	4,782	95,602
June.....	155,387	6,707	162,094	77,270	5,293	82,563
July.....	128,730	4,737	133,467	47,511	2,171	49,682
August.....	105,838	4,083	109,921	90,798	1,139	91,937
September.....	89,473	6,522	95,995	82,090	8,906	90,996
October.....	110,570	1,812	112,382	57,011	4,385	61,396
November.....	106,897	9,927	116,824	56,692	9,395	66,087
December.....	60,489	11,710	72,199	45,359	1,883	47,242
<b>Total.....</b>	<b>1,208,783</b>	<b>72,402</b>	<b>1,281,185</b>	<b>799,740</b>	<b>51,599</b>	<b>851,339</b>

The principal sources from which this machinery has been imported during 1903:—

MONTHS.	UNITED STATES		GREAT BRITAIN		Other Countries	Total
	Free	Dutiable	Free	Dutiable		
January .....	\$ 75,235	\$ 7,676	\$ 417	—	\$ 1,646	\$ 84,974
February .....	29,467	1,587	639	—	Nil	31,693
March.....	82,680	11,534	158	—	697	95,069
April.....	104,902	4,638	65	—	Nil	109,605
May.....	155,127	1,293	366	206	"	156,992
June.....	152,517	6,579	2,034	128	836	161,084
July.....	105,899	—	13,756	4,737	9,075	133,467
August.....	100,942	3,119	4,756	964	140	109,921
September.....	82,941	6,086	5,640	416	882	95,965
October.....	90,790	1,641	19,761	171	19	112,382
November.....	104,702	9,498	2,195	429	Nil	116,824
December.....	55,902	11,710	4,587	—	"	72,199
<b>Total.....</b>	<b>1,141,104</b>	<b>65,361</b>	<b>54,374</b>	<b>7,051</b>	<b>13,295</b>	<b>1,281,185</b>

Mr. Harry E. Macdonnell, general freight agent of the Kootenay lines for the C.P.R. made an important announcement recently which has been anxiously waited for by the mine owners of the Slocan for some time past. Mr. Macdonnell stated that the C.P.R. has decided to declare a rate of \$13 per ton on zinc ores and zinc concentrates from the Slocan district to Antwerp. This rate covers shipments in bulk, and this will obviate the necessity for sacking concentrates at the shipping points. The rate hitherto in effect was considerably higher and the reduction will allow some ores which could not hitherto be sent to be now shipped at a profit.

The largest mass of virgin copper ever discovered was found in the old Minnesota mine, in Michigan, in 1856. It weighed 525 tons and required twenty miners a year and a half, working with long-handled chisels, to cut the huge mass into chuks small enough to be hoisted.

**Imports of Wire Rope during 1903.**

The following table shows the imports of wire rope and cables for the year ending December 31st, 1903.

MONTH.	From Great Britain		From U. S.		Total.	
	Pounds.	Value	Pounds	Value	Pounds	Value
January.....	115,646	\$ 3,363	16,909	\$ 2,210	132,555	\$ 10,573
February.....	152,813	9,501	30,172	2,683	182,985	12,157
March.....	151,408	9,038	46,602	2,607	198,010	11,645
April.....	148,276	6,663	20,199	2,640	168,475	11,303
May.....	132,564	9,174	59,994	5,395	192,558	14,569
June.....	320,882	20,047	49,312	4,028	370,194	24,075
July.....	192,756	12,176	68,857	6,861	261,613	19,037
August.....	104,215	6,145	38,634	2,997	143,949	9,142
September.....	142,671	9,927	52,773	6,806	195,444	16,733
October.....	184,728	14,310	167,993	13,636	352,721	27,946
November.....	66,439	3,802	70,624	5,275	137,063	9,077
December.....	133,598	7,986	75,304	5,538	208,902	13,534
Imports from other countries					92,658	6,103
<b>Total.....</b>	<b>1,847,096</b>	<b>\$119,135</b>	<b>697,373</b>	<b>\$60,676</b>	<b>2,637,127</b>	<b>\$185,919</b>

**COMPANY NOTES.**

**The Tye Copper Co.**—The increasing output of the Tye mine has rendered it necessary for the Company to enlarge the tram-line. In order to do this operations were suspended for a short time during the present month. The work was completed by the 16th inst., and the company now expect to ship 200 tons per day from the mine to E. & N. Railway, thence to be carried to the company's smelter at Ladysmith. Work at the mine itself progresses steadily, with increasingly satisfactory results, the property looking better than ever as development proceeds. The company's smelter at Ladysmith is in very satisfactory shape, ore coming in regularly in large quantities. A contract has been made, we are informed, with Mr. Vaughn-Rhys, the present lessee of the Van Anda mine, to ship the output of that property to Ladysmith. The contract will run for two years, and calls for some 15,000 tons of ore per annum. During the month of November the smelter ran for 29 days. A total of 6,340 tons of ore was smelted, giving a return of \$65,735, after deduction of refining charges and amount paid for customs ores.

**The Yreka Mine.**—Among the satisfactory evidences of the progress the mining industry is making on the West Coast of Vancouver Island none is more gratifying than the announcement that the Yreka mine is again in a shipping condition. Operations at this property were seriously hindered during the past season by the scarcity of water. In addition to this, a large amount of work was necessary to place the mine in running order. This has now been accomplished to such an extent that shipping operations have been resumed, and a large additional force of men have been sent up to handle the increased output. At the commencement of the present month over five hundred tons of ore were on the dump ready for shipment. Mr. Nicholas Tregear, who has borne so conspicuous a part in the recent successful developments at the Lenora mine Mt. Sicker, went up to the Yreka in the latter part of November on behalf of his employers, the Northwestern Smelting and Refining Co., of Crofton, B.C., who are in control of the Yreka mine under a large contract, and who are making a great success on Quatsino Sound as they have done at Mt. Sicker. Mr. Tregear, on his return, expressed himself as extremely well satisfied with the work done and with the appearance and prospects of the property. The shipments now commenced will continue steadily for the future.

**The Blue Bird.**—This mine in the Slocan District, near Sandon, B.C. has just shipped a car and when the gasoline engine is ready for hoisting another car will be hoisted and steady shipments from that on will be in order. The property is looking very well and the grade of ore is rich. They have a nice sample of ore ready for shipment at the C. P. R. Depot to the St. Louis exhibition weighing 520 lbs. and assaying 150 ounces in silver and 60 per cent. lead.

**The Lucky Jim Group, Slocan District.**—Mr. Hughes has taken a bond on the Lucky Jim group at Bear lake and has started a small crew at work. This property has not been worked for a number of years. The last time it

was worked it was for its zinc by a Manches'er company. It is said to contain large bodies of zinc and is considered a very valuable mine for this alone. It also has some lead ore. It was one of the first shippers in the Slocan.

**The Sunset Mine, Slocan.**—The Sunset has started in to rawhide and there is already over 100 tons ready at the mine for shipment. They expect to ship about 500 tons this winter.

**Le Roi.**—Cable from the manager:—"Shipped from the mine to the Northport smelter during the past month 17 256 tons of ore, containing 5,428 oz. of gold, 6,665 oz. of silver, and 107,800 lb. of copper. Has resulted in an (estimated) loss of \$15,500, according to the usual calculations. Development work, 1,350 level.—In reference to my cable, dated the 17th, have commenced a stope 30 ft. by 20 ft., with ore in top, bottom and sides: the grade of the ore varies between \$10 and \$20—not possible to estimate closely, owing to presence of small dyke. Other work 1,350 level encouraging; although have not yet met masses of ore, I consider we have justified expenditure involved." (Office note.—The above includes not only the costs of mining, smelting and realisation of the smelter products, but also \$1.45 per ton of ore mined for depreciation and development. Mr. Parrish has already been requested in future cables to state separately the cost of development.)

Under date of January 12th, a Rossland despatch says:—"Manager Parrish has at last made an authoritative statement regarding the strike on the 1,350 foot level of the Le Roi. This is the first time that an authoritative statement regarding the strike has been made, after a studied silence of six months. Mr. Parrish declares that at a point 300 feet west of the main shaft and on the 1,350-foot level a crosscut has been run 100 feet along the course of the diamond drilling. Since encountering the ore body he has drifted fifty feet one way and thirty feet another, but as yet there is no sign of any end to the shoot. The ore is solid, and much samples run from \$12 to \$20 per ton. From time to time the assays run into big figures. This places the new discovery well within the limit of first-class ore that will yield handsome profits—greater, in fact, than is customary in any of the big properties. But this is not all. At a point a considerable distance further west and her crosscut on the same level has also encountered ore of similar grade to that found nearer the shaft. Mr. Parrish is not prepared just now to say whether this is a solid continuation of the first strike, but it may be, and the chances are that it is. If it is, then the biggest ore shoot ever discovered in the Rossland camp exists on the 1,350 foot level of the Le Roi. The new strike lies to the south side of the mine. The work on it at present consists of crosscutting and drifting. To better determine its extent a winze will be sunk and upraising will also be done. Attempts will also be made to prove the continuity of the ore body from the first to the second strike. Mr. Parrish was not prepared to say what he would do about proceeding with the work below the 1,350 foot level. He is concentrating his attention for the present upon the prospecting of the new find. Asked for an expression of opinion as to the merits of the strike, Mr. Parrish said that it might be the top of as big an ore shoot as was ever found in the mine. The showing so far was satisfactory. If it is as he hopes, Mr. Parrish declares that there are great days of prosperity for the Le Roi.

**The Canadian-American Coal and Coke Co.**—Over fifty men are again on the pay-roll of the Canadian-American Coal & Coke Co., of Frank, and Manager S. W. Gebro expects to be taking out and shipping coal in quantity within the next few days. The business men of Frank are feeling more than hopeful as an era of prosperity again appears to be opening for that place. Manager Gebro will have personal charge of the works and this in itself is sufficient to inspire confidence in all who know both that property and Mr. Gebro that the work will be carried through to success and the property again made a big producer.—*Blairmore Times.*

**The Arlington Mine.**—The expenses for the month of December, 1903, at the Arlington mine (Erie) amounted to \$4,146.2. Shipments were resumed commencing on December 19th, and 50 tons of ore shipped up to the 31st. The returns for these 50 tons will pay the month's expenses, but the payments were not received until January, so will appear in the statement for that month.

**Crow's Nest Pass Coal Co.**—Mr. T. R. Stockett has been appointed general manager of the Crow's Nest Pass Coal Co.'s mines for a period of three months, and Mr. G. G. S. Lindsey, K.C., the Toronto counsel for the company, has been appointed managing director while Mr. D. Davies has been confirmed in the position of comptroller.

**Payne Consolidated Mining Co.**—A despatch from Sandon, B.C., dated Jan. 19, says:—"Mr. Jones of the Lanyon Zinc works, Iola, Kansas, has bought the zinc from the Payne. He is reported to have bought 1000 tons. It has all to be shipped within the next thirty days. The price paid has not been divulged, but it is generally understood that he paid more for it than he was paying last year. Mr. Jones has also bought about 300 tons of zinc ore from Phil Hickey of the Ivanhoe, this is now being loaded.

## NEW COMPANIES.

### ONTARIO.

**The Corundum Refiners, Limited.**—Incorporated under the Statutes of Ontario, 27th November, 1903. Authorized capital, \$1,000,000, in 10,000 shares of one hundred dollars (\$100) each. Directors: J. N. Scatcherd, C. R. Huntley, J. A. Roberts, J. H. Tilden, J. C. Conway, H. H. Dewart, W. Vandusen, H. H. Coburn, W. B. Rankine, J. H. Jewell. Head office: Toronto, Ont. Formed to acquire the properties known as "The Corundum Refiners, Limited."

**The Northern Light Mining and Development Company, Limited.**—Incorporated under the Statutes of Ontario, 9th December, 1903. Authorized capital, \$1,000,000, in 1,000,000 shares of one dollar (\$1.00) each. Directors: J. Gonska, J. H. Hill, G. Collatz, W. Fawcett, N. Mueller, C. Larson, J. J. Durage. Head office: Port Arthur, Ont. Formed to acquire the properties known as "The Northern Light Mining and Development Company, Limited."

**Ontario Lead and Zinc Company, Limited.**—Incorporated under the Statutes of Ontario 16th December, 1903. Authorized capital, \$600,000, in 600,000 shares of one dollar (\$1.00) each. Directors: E. C. Kennedy, J. A. MacIntosh, A. R. Clute. Head office: Port Arthur, Ontario. Formed to acquire the properties known as the "Ontario Lead and Zinc Company, Limited."

**The Anglo-American Oil Company, Limited.**—Incorporated under the Statutes of Ontario, 18th December, 1903. Authorized capital, \$100,000, in 1,000 shares of one hundred dollars (\$100) each. Directors: W. McIntosh, J. A. McIntosh, S. A. Holbrook, Rose Lessler, D. S. Robb, J. C. Winters, J. M. Prophet. Head office: Chatham, Ont. Formed to acquire the properties known as "The Anglo-American Oil Company, Limited."

**Lindsay Portland Cement Company, Limited.**—Incorporated under the Statutes of Ontario, 18th December, 1903. Authorized capital, \$500,000, in 50,000 shares of (\$10) each. Directors: J. D. Flavell, T. Sadler, R. Sylvester, J. B. Knowlson, J. M. Squier, R. Kennedy, A. Ross, T. Stewart. Head office: Lindsay, Ont. Formed to acquire the properties known as the "Lindsay Portland Cement Company, Limited."

### BRITISH COLUMBIA

**The Bridge River and Lillooet Gold Milling Co., "Limited Liability"**—Re-incorporated and registered under the Statutes of British Columbia, 23rd December, 1903. Authorized capital, \$750,000 in 750,000 shares of one dollar (\$1) each. Formed to acquire the properties known as "The Bridge River and Lillooet Gold Mining Company, Limited."

**The Zala Consolidated, Limited, "Non-Personal Liability."**—Re-incorporated under the Statutes of British Columbia, 21st December, 1903. Authorized capital, \$600,000 in 1,200,000 shares of fifty (50) cents each. Formed to acquire the properties known as "The Zala Mines, Limited," "Non-Personal Liability."

**The Fraser River Coal Company, Limited, "Non-Personal Liability."**—Incorporated under the Statutes of British Columbia, 28th December, 1903. Authorized capital, \$10,000, in 100,000 shares of ten (10) cents each. Formed to acquire the properties known as "The Fraser River Coal Company, Limited," "Non-Personal Liability."

**Hardscrabble Hydraulic Gold Mines, Limited, "Non-Personal Liability."**—Incorporated under the Statutes of British Columbia, 28th December, 1903. Authorized capital, \$90,000 in 3,000,000 shares of three (3) cents each. Formed to acquire the properties known as the "Hardscrabble Hydraulic Gold Mines, Limited," "Non-Personal Liability."

**The Richmond Oil Company, Limited.**—Incorporated under the Statutes of British Columbia, 12th January, 1904. Authorized capital, \$12,000 in 1,200 shares of ten dollars (\$10) each. Formed to acquire the properties known as "The Richmond Oil Company, Limited."

**The International Gold Company.**—Registered under the Statutes of British Columbia, 12th January, 1904, as an Extra-Provincial Company. Authorized capital, \$15,000 in 1,500,000 shares of one (1) cent each. Head Office, City of Whatcom, State of Washington, U.S.A. Head Office in this Province, Vancouver, B.C., J. C. Martin, Vancouver, B.C., Attorney. Formed to acquire the properties known as "The International Gold Company."

## CONCENTRATES.

The following table gives in long tons, actual copper production of the various countries of the world, for the year 1902, with estimates of 1903 outputs. As the final figures will not be secured for six months in some cases, the table must be taken merely for what it purports, which is to be a reasonably close estimate of 1903 production, based upon the best data available at the close of 1903:

Country.	1903.	1902.
United States.....	318,861	303,446
Spain and Portugal.....	51,000	49,790
Mexico.....	48,000	35,785
Chile.....	30,000	28,130
Japan.....	31,000	29,775
Germany.....	22,000	21,605
Canada.....	22,500	17,485
Australasia.....	29,000	25,640
Peru.....	7,500	7,580
Russia.....	8,000	8,000
Cape Colony.....	4,500	4,450
Norway.....	5,000	4,565
Italy.....	3,500	3,370
Miscellaneous.....	8,500	7,895
Total.....	589,361	551,316

The Boundary B.C. ore shipments for the second week in the new year are almost exactly the same as for the first week, namely, a little over 16,000 tons. The several shipping mines sent out the following amounts to the different smelters:

Granby mines, to Granby.....	10,680
Mother Lode, to Greenwood.....	3,840
Emma, to Granby.....	750
Senator, to Granby.....	120
Oro Denoro, to Granby.....	570
Athelstan, to Granby and Greenwood.....	330

Total for the week..... 16,290

The total tonnage for the year to date is 32,560. This week the Granby smelter treated 12,441 tons of ore, making a total of 33,850 tons for the year.

The Slovan "Drill" reports the ore shipments from that district during the year 1903 to be 1,339 tons, as compared with 6,333 tons during the previous year. The decrease is due to the suspension of operations at the Arlington and the changed conditions at the Enterprise. In 1902 the former shipped 3,797 tons, and the latter 2,300, while for last year the figures were 40 and 915 tons respectively. The following is a list of the shipments for the past year:

Mine.	Tons.
Enterprise .....	915
Arlington .....	40
Ottawa .....	146
Black Prince .....	67
Bondholder .....	2
Dayton .....	12
Republic .....	70
Meteor .....	52
Hamilton .....	4
Westmont .....	2
Highland Light .....	2
Alberta .....	3
Cripple Stick .....	2
Nansen .....	2
Hampton .....	5
Sapphire .....	5
Kilo .....	10

The ore shipments from the Rossland district, B.C. for the week ending Jan. 16th, 1904, were: Le Roi 6,900, Centre Star 1,380, War Eagle 1,260, Eootenay 215, Jumbo 350, Le Roi No. 2, 600, Le Roi No. 2 (milled) 220, Spitzee 30. The week's total was 10,955 tons, and for the year to date, 22,098 tons.

The importation of Old Country French miners at Lille has proved anything but a success, as they have been a source of more trouble to the management than any other class of miners employed. This has always proved true of imported men, who unaccustomed to the customs of the country, foreign in speech and unused to the mining methods employed, soon become homesick and discontented.

Figures are given showing the production of coal in the five principal coal-producing nations in 1902, as compared with 1901, as follows.—United Kingdom, 227,095,000 tons, increase, 8,048,000 tons; United States, 268,638,000 tons, increase 6,814,000; Germany, 107,436,000 tons, decrease 1,103,000; France, 29,574,000 tons, decrease 2,060,000; Belgium, 22,769,000 tons, increase 556,000. The total known production of the world is stated to be about 700,000,000 tons.

The Rossland Miner's annual review of the year's operation in that camp states that the revision of tonnage figures gives an aggregate for the year of 377,134 tons, estimated to have a gross value of \$4,631,280. During the ten year's of the camp's history 1,687,768 tons of ore have been produced, having an estimated value of \$26,816,342. The camp has enjoyed a most prosperous year and notable strides have been accomplished in connection with the mining industry. The increase in tonnage is approximately 50,000 tons over last year. A notable feature was the inauguration of concentration and its successful application. The Le Roi two-plant is now treating at a profit ores carrying net values in excess of \$5.50, and the margin will be substantially lowered in the larger plants now in course of construction.



# Canadian Mining Institute

INCORPORATED BY ACT OF PARLIAMENT 1898

## AIMS AND OBJECTS.

(A) To promote the Arts and Sciences connected with the economical production of valuable minerals and metals, by means of meetings for the reading and discussion of technical papers, and the subsequent distribution of such information as may be gained through the medium of publications.

(B) The establishment of a central reference library and a headquarters for the purpose of this organisation.

(C) To take concerted action upon such matters as effect the mining and metallurgical industries of the Dominion of Canada.

(D) To encourage and promote these industries by all lawful and honourable means.

## MEMBERSHIP.

MEMBERS shall be persons engaged in the direction and operation of mines and metallurgical works mining engineers, geologists, metallurgists, or chemists, and such other persons as the Council may see fit to elect.

STUDENT MEMBERS shall include persons who are qualifying themselves for the profession of mining or metallurgical engineering, students in pure and applied science in any technical school in the Dominion, and such other persons, up to the age of 25 years, who shall be engaged as apprentices or assistants in mining, metallurgical or geological work, or who may desire to participate in the benefits of the meetings, library and publications of the Institute. Student Members shall be eligible for election as Members after the age of 25 years.

## SUBSCRIPTION.

Members yearly subscription.....	\$10 00
Student Members do .....	2 00

## PUBLICATIONS.

Vol. I, 1898, 66 pp., out of print.
Vol. II, 1899, 285 pp., bound red cloth.
Vol. III, 1900, 270 pp., " "
Vol. IV, 1901, 333 pp., " "
Vol. V, 1902, 700 pp., " "
Vol. VI, 1903, 600 pp., now in press.

Membership in the Canadian Mining Institute is open to everyone interested in promoting the profession and industry of mining without qualification or restrictions.

Forms of application for membership, and copies of the Journal of the Institute, etc., may be obtained upon application to

B. T. A. BELL, Secretary,  
Orme's Hall, Ottawa

## IN THE HIGH COURT OF JUSTICE.

MERCHANTS BANK OF CANADA vs. STEWART et al.

# JUDICIAL SALE

OF

## Canadian Anthracite Coal Company Stock

PURSUANT to a Judgment and Order for Sale of this Court, made in this action, tenders will be received by William Louis Scott, Esquire, Local Master of this Court at Ottawa, at his office in the Court House in the City of Ottawa up till 12 o'clock noon on WEDNESDAY the 16th day of MARCH next (1904) for 755 fully paid up shares of the par value of \$100.00 each in the Capital Stock of The Canadian Anthracite Coal Company, Limited, (a body corporate, incorporated by Letters Patent of the Dominion of Canada). The Company's mines are situated near Calgary in the North-west Territories of Canada.

Tenders may be made for the whole 755 shares or for any smaller number thereof.

Tenders must be sealed and addressed "W. L. Scott, Esq., Local Master, Court House, Ottawa, Canada," and marked "Merchants Bank vs. Stewart, Tender for shares", and each tender must be accompanied by a certified cheque payable to The Merchants Bank of Canada, for not less than ten per cent of the amount of such tender. Such cheque will be returned in the event of the tender not being accepted.

Upon the acceptance of any tender the balance of the purchase money shall be paid into Court to the credit of this action within thirty days thereafter and the purchaser shall thereupon be entitled to a transfer of the shares covered by his tender. In the event of the purchaser failing to pay the said balance of the purchase money the deposit of ten per cent above mentioned shall be forfeited and the shares may be re-sold and any deficiency thereon shall be made good by the defaulter.

The purchaser will prepare the transfer of shares at his own expense and will tender the same for execution and all expenses incidental to the investigation of title and the registration of the transfer shall be borne by the purchaser.

The highest or any tender will not necessarily be accepted.

Further particulars may be had from Messrs. Wyld & Osler, Messrs. Gemmill & May, Messrs. Lewis & Smellie, Messrs. Murphy & Fisher, Messrs. MacCracken, Henderson & McDougal, Messrs. Gorman & O'Connor, Messrs. Christie, Greene & Hill Messrs. Hogg & Magee, Messrs. Nellis, Monk & Matheson, Messrs. McLaurin & Millar, and Messrs. Gormully & Orde, Barristers, Ottawa; and Mr. Adam Johnston, Barrister, Morrisburg, Ont. Dated at Ottawa the 6th day of January, A. D. 1904.

(Sgd.) W. L. SCOTT,

Master at Ottawa.

Gormully & Orde,  
33 Sparks Street, Ottawa,  
Tenders' Solicitors.



The Mining School at Camborne, Cornwall, England, owns a mine known as the King England, which is under the management of the teaching staff. From 100 to 125 students get an opportunity to work underground two days in the week, the remainder of their time being occupied by studies at the school itself. It is claimed that this is the only mining school which owns and works a mine.

At the Bendigo mine, Australia, (the deepest gold mine in the world), the main shaft is down 3,900 feet. At the 3,856-foot level a cross-cut is being driven for one of the rich saddles in which high values have been found. In this the temperature of the rock has been found to be 108 degrees F. Three men are required to work a rock drill at this depth, and in order to keep them cool, the men at the face are sprayed with water.

**Public Companies Record in 1903.**

**LIQUIDATIONS AND RECONSTRUCTIONS.**

From the Somerset House returns of companies winding up, either voluntarily or by order of the Court, and reconstructions during last year, we find reference to the following Canadian and American undertakings:

**VOLUNTARY LIQUIDATION.**

- North-West Ontario Mining and Development Co.
- Vancouver Land and Securities Co.
- Clifton Tinto Copper Mines.
- Canadian and British Columbia Prospecting Syndicate.
- Doric Gold Mines.
- British Columbia Financial Trust and General Corporation.
- Anglo-Canadian Gold Estates.
- McDonald's Bonanza (Klondike).

- Utah Consolidated Gold Mines.
- Sultana Mine of Canada.
- Copper King.
- Clifton Consolidated Copper Mines of Arizona.
- British Mexican Syndicate.
- Klondike Development Co.
- British Canadian Timber and Manufacturing Co.
- Anglo-Alaskan Syndicate.
- Pacific North-West Mining Corporation.

**RECONSTRUCTION.**

- Rosslund Proprietary and Mining Co.
- Columbia Hydraulic Mining Co.
- Anglo-Wyoming Oilfields.
- Mikado Gold Mining Co.
- London and British Columbia Goldfields.
- Backman Mines.
- Diaz Mines.

**COMPULSORY LIQUIDATION.**

- Sapphire Corundum Co.
- Anglo-Canadian Produce Co.

**SALE OF VALUABLE MICA MINE IN CANADA**

PURSUANT to the Order of the High Court of Justice, for the winding up of the Wakefield Mica Company, there will be offered for sale by public auction at the Local Master's Office, in the Court House, in the City of Ottawa, in the Dominion of Canada, on the

**17th DAY OF MAY, 1904, at 2.30 P.M.**

1. All the mines, minerals and mining rights in and upon Lot No. 16 in the 2nd Range of the Township of Wakefield in the County of Wright in the Province of Quebec, containing 200 acres, with the buildings erected thereon for mining purposes.
2. Water power and mill privilege on Blackburn's Creek on said Lot, containing one acre in fee simple, with saw-mill thereon erected, and electric dynamo and other machinery therein, including auxiliary steam plant.
3. All wood and timber on Lot No. 16 B in the 3rd Range of said Township, with free right to cut and remove same up to the 29th day of October, 1916.
4. A large quantity of mining plant and machinery, consisting of electric pump, motors, belting, shafting, derricks, drills, blacksmith's tools, rope, piping, telephones, stoves, cutlery &c.

The property is situate about six miles from Wakefield Station on the O.N. & W.Ry., and about 20 miles from the City of Hull. A shaft has been sunk to a depth of 170 feet and a considerable amount of mica has been extracted therefrom. Specimens of the mica and a detailed inventory of the chattels, a report of an independent Mining Engineer, and other information may be obtained from the Liquidator.

The entire property will be sold in one block, subject to a reserved bid fixed by the Master.

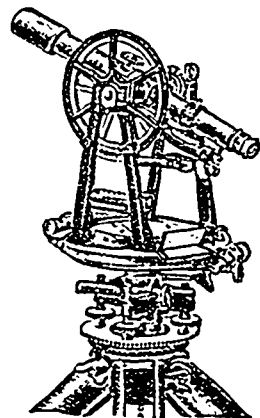
Ten per cent of the purchase money must be paid at the time of sale, and the balance within 30 days.

Dated the 21st day of January 1904.

ERNEST A. LARMONTH,  
*Liquidator,*

W. L. SCOTT,  
*Local Master at Ottawa.*

45 Elgin Street, Ottawa, Canada.



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**BOSTON, Mass.**

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TAPPETS, BOSSES, ROLL SHELL and CRUSHER PLATES.

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KENT AVENUE, KEAP AND HOOPER STREETS.



Canada Cam.

F. E. CANDA, President.

C. J. CANDA, Vice-President.

F. MORA CANDA, Secretary.

T. I. JONES, Treasurer.

# CROW'S NEST PASS COAL CO., Ltd.

**DIRECTORS:**

GEORGE A. COX, President.  
 ROBERT JAFFRAY, H. M. PELLATT, AND  
 G. G. S. LINDSEY, Vice-Presidents.  
 E. R. WOOD, Treasurer.  
 G. G. S. LINDSEY, Secretary.  
 THOS WALMSLEY, JAMES MASON, FREDERICK NICHOLS,  
 DAVID MORRICE, J. D. CHIPMAN, J. A. GEMMILL, WM. FERNIE,  
 AND C. C. DALTON.

**Head Offices—TORONTO, ONT.**

British Columbia Offices—Ferne, B.C.

## BITUMINOUS COALS AND COKE

Mines and Ovens at Coal Creek, Michel and Morrissey, B.C.  
 Present Capacity of Mines 1,000,000 tons of coal per annum.  
 Coke Ovens 350,000 tons per annum.

We would call attention to the superior quality of our Michel Blacksmith Coal, suitable for large forgings. Can be shipped at reasonable prices to all parts of British Columbia, the Northwest Territories and Manitoba.

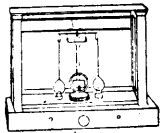
This Company also owns the Fernie and Morrissey Mines townships, which offer investments in town lots that cannot fail to prove productive.

Having a large amount of development under way, there is always work for coal miners at good wages, and it may be said that there are few places in the world where labor of all kinds can earn more net money under agreeable conditions.

**G. G. S. LINDSEY,**  
 Third Vice-President,  
 Toronto.

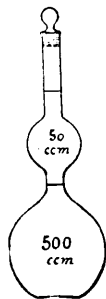
**THOS. R. STOCKETT, Jr.,**  
 General Superintendent,  
 Fernie, B.C.

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 Miners' Outfits Heavy Chemicals

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CHAS. L. WALTERS (12 years with Lyman Sons) Manager

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**The Cumberland Railway & Coal Company**

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Address: P. O. BOX 396.

# ANNUAL CONVENTION

OF

**Canadian Mining Engineers and  
 Mine Managers**

TO BE HELD UNDER THE AUSPICES OF

## THE CANADIAN MINING INSTITUTE

will be held in the King Edward Hotel,  
 City of Toronto, on

**WEDNESDAY, THURSDAY and FRIDAY,  
 2nd, 3rd and 4th MARCH, 1904.**

Special Excursion on 6th March to Niagara Falls, visiting Power  
 Plants and Electro-Metallurgical Works.

**SINGLE FARE TO ALL MINING MEN ON CANADIAN RAILWAYS.**

Among the contributors of papers are the following:—

Dr. Eugene Haanel, Dominion Superintendent of Mines; Prof.  
 Miller, Mr. James McEvoy, Mr. Eugene Coste, E.M., Mr. A. J.  
 Beaudette, Mr. J. N. S. Williams, Mr. C. A. Meisner, Mr. W. M.  
 Brewer, Dr. Ami, Mr. Wm. Thompson, Mr. F. T. Snyder, Mr. D. G.  
 Kerr, Mr. W. E. H. Carter, Mr. E. D. Ingall, Mr. L. J. Robe, Mr.  
 E. B. Kirby, Mr. F. Keffer, and others.

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EUGENE COSTE,  
 PRESIDENT.

B. T. A. BELL,  
 SECRETARY.

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**W. P. HINTON,**  
 Gen'l Passenger Agent.



# 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 \$10.00 per acre for soft coal, and \$20.00 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at such rate as may from time to time be specified by Order-in-Council 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 \$10.00 per annum for an individual, and from \$50.00 to \$100.00 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 of the line of the lode or vein.

The claim shall be recorded within fifteen 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 \$5.00.

At least \$100.00 must be expended on the claim each year or paid to the Mining Recorder in lieu thereof. When \$500.00 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 per acre.

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

The patent for a mining location shall provide for the payment of royalty on the sales not exceeding five per cent.

#### PLACER MINING, MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

Placer mining claims generally are 100 feet square; entry fee, \$5.00, 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 \$10.00 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 \$10,000.00.

#### 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 rivers 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, \$100.00 per mile for first year, and \$10.00 per mile for each subsequent year. Royalty ten per cent on the output in excess of \$15,000.00.

#### 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 obtained 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 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 \$15.00. Royalty at the rate of 2½ per cent. on the value of the gold shipped from the 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 \$2.00. 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 \$200.00, or in lieu of work payment may be made to the Mining Recorder each year for the first three years of \$200.00, and after that \$400.00 for each year.

A certificate that work has been done or fee paid 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*.

#### HYDRAULIC MINING, YUKON TERRITORY.

Locations suitable for hydraulic mining, having a frontage of from one to five miles, and a depth of one mile or more, may be leased for twenty years, provided the ground has been prospected by the applicant or his agent; is found to be unsuitable for placer mining; and does not include within its boundaries any mining claims already granted. A rental of \$150.00 for each mile of frontage, at the rate of 2½ per cent. on the value of the gold shipped from the Territory. Operations must be commenced within one year from the date of the lease, and not less than \$5,000.00 must be expended annually. The lease excludes all base metals, quartz, and coal, and provides for the withdrawal of unoperated land for agricultural or building purposes.

#### PETROLEUM.

All unappropriated Dominion Lands shall, after the first of July, 1901, be open to prospecting for petroleum. Should the prospector discover oil in paying quantities he may acquire 640 acres of available land, including and surrounding his discovery, at the rate of \$1.00 an acre, subject to royalty at such rate as may be specified by Order in Council.

**JAMES A. SMART,**

Deputy of the Minister of the Interior.

# 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 unsurveyed territory, \$5 for every 100 acres, and (2) in unsurveyed territory, \$5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

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

The fullest information will be cheerfully given on application to

THE MINISTER OF LANDS, MINES AND FISHERIES,  
PARLIAMENT BUILDINGS, QUEBEC, P. Q.

# Ontario's Mining Lands.

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

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

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

The output of iron, copper and nickel in 1900 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.



**PROVINCE OF NOVA SCOTIA.**  
**Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin**  
—AND—  
**PRECIOUS STONES.**

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

**GOLD AND SILVER.**

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

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

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

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

**MINES OTHER THAN GOLD AND SILVER.**

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

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

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

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

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

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

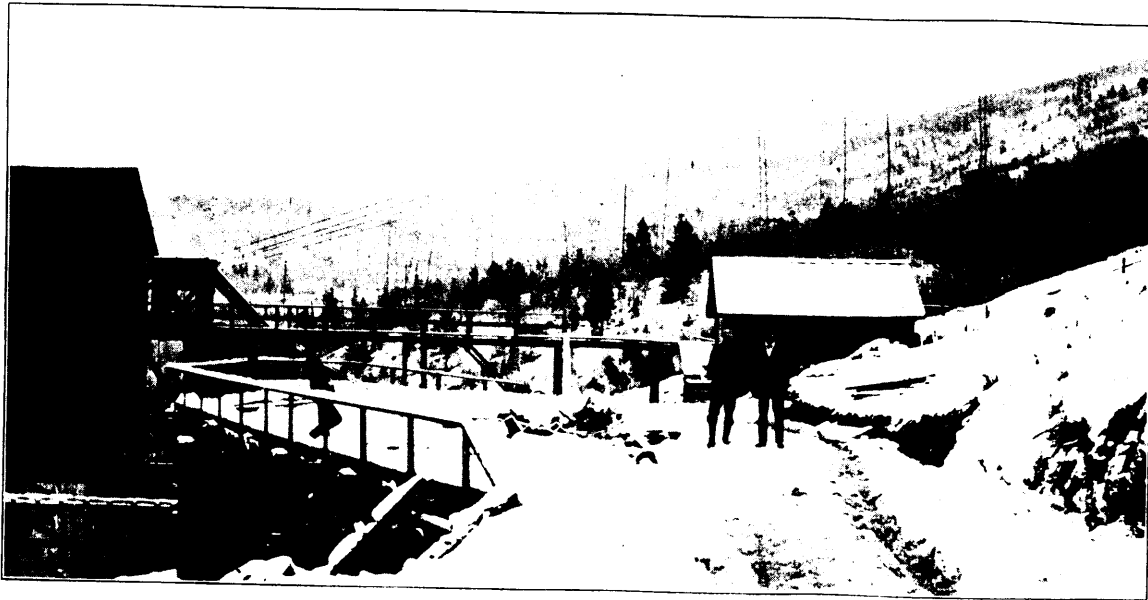
Copies of the Mining Law and any information can be had on application to

**THE HON. A. DRYSDALE,**

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.

# One Man <sup>Can handle</sup> 1200 TONS <sup>per day with a</sup> Riblet Patent Automatic Aerial Tramway



YOU CAN FIGURE  
THE COST PER TON

More Riblet Tramways are now being  
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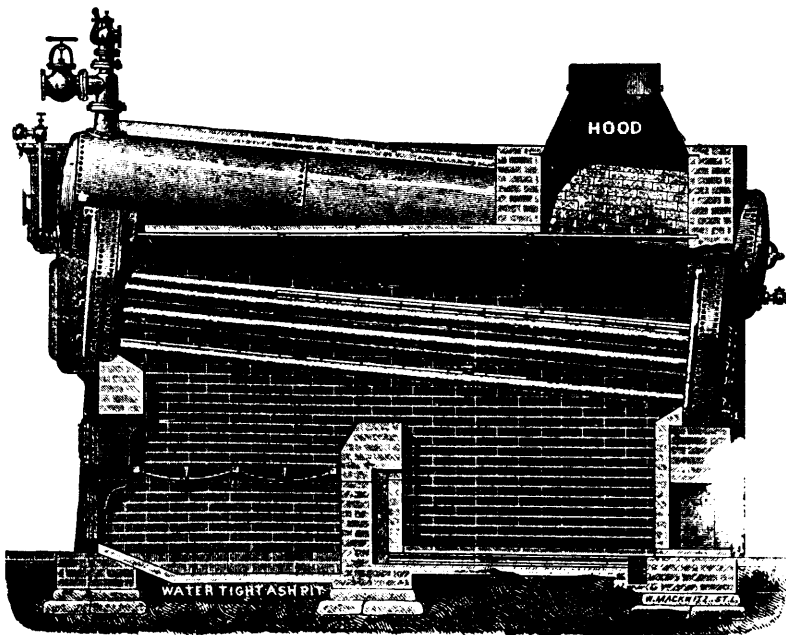
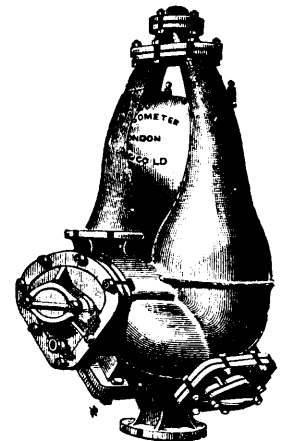
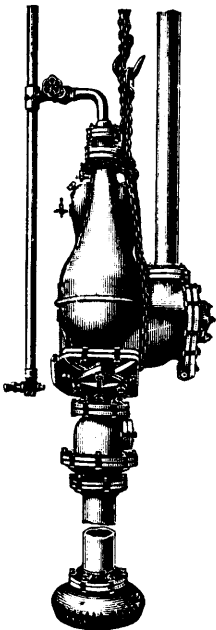
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NO SKILLED LABOR REQUIRED.  
MOST ECONOMICAL AND BEST MADE.  
NO EXHAUST STEAM. SIMPLE. DURABLE.

**PEACOCK BROTHERS** SOLE CANADIAN REPRESENTATIVES  
CANADA LIFE BLDG., 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.

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# Allan, Whyte & Co.

CLYDE PATENT WIRE ROPE WORKS

Rutherglen, Glasgow, Scotland

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## WIRE ROPES for Collieries, Mines, Aerial Tramways

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

Wire specially selected for own exclusive use.

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

Illustration of Winding Rope, 240 fms. long x 3½ circ. Galvanized Special Improved Patent Steel, Compound Make, supplied



to Kenneil Collieries, Bo'ness, Scot., which gave a record life of 6 years and 2 months. Shewing condition when taken off.

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

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John Burns, Vancouver, B. C.

# Drummond, McCall & Co.

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AND IMPORTERS OF

Beams, Channels, Angles and other Structural Material.

Steel Plates—Tank, Boiler and Firebox Quality.

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Mild Steel Bars—all diameters.

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Manufacturers of "LANG'S" PATENT WIRE ROPES



FOR COLLIERY AND GENERAL MINING PURPOSES.

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SOMETHING  
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SOMETHING  
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The Wearing Surface of Hemp.

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CATALOGUE ON APPLICATION.

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12 lbs., 18 lbs., 25 lbs., 30 lbs., per Yard  
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