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15th YEAR OF PUBLICATION.

THE CANADIAN MINING REVIEW

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

VOLUME XVI.

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INDEX—Continued.

SCHOOL OF MINING,

KINGSTON, ONTARIO.

The following Courses are Offered

1. *Three Years' Courses for a Diploma in*
   - (A) Mining Engineering.
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   - (C) Mineralogy and Geology (B. Sc.)
3. *Post-Graduate Courses for the Degree of*

   Doctor of Science (D. Sc.)
   For further information see the calendar of Queen's University for 1896-97, p. 128.
4. *Prospector's Course.*

   The School offers to Mine Foremen, Assayers, Prospectors and Mining Men generally, Special Courses of Instruction beginning January 6th, 1897, and continuing eight weeks.
5. *Extramural Classes for Prospectors and Mining Men.*

   Lecturers will be sent to Mining Centres to conduct Classes in Elementary Chemistry, Mineralogy and Geology as applied to the discovery and winning of valuable minerals.

The School is provided with well equipped Laboratories for the study of Chemical Analysis, Assaying Blowpiping, Mineralogy, Petrography and Drawing. In the Mining Laboratory recently built the operations of Crushing, Amalgamating, Concentrating, etc., can be studied on a large scale.

The BRUCE CARRUTHERS SCHOLARSHIP (value $200 per annum) will be awarded in May. Its object is to aid one who has had some experience in amalgamating, etc., in acquiring a good education in Mining Engineering. The conditions of the award will be made known on application to the Director or theBursar.

FOR CALENDAR OF THE SCHOOL AND FURTHER INFORMATION APPLY TO

WM. MASON, Bursar,

SCHOOL OF MINING, - KINGSTON, 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. C. E. CHURCH,

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.

MINING LAWS OF ONTARIO.

ANY person may explore Crown Lands for minerals. Mining lands may be taken up as surveyed loc a tions or staked claims.

Locations range from 40 to 320 acres.

Claims range from 10 to 20 acres on vein or lode.

Locations may be acquired in fee or under leasehold.

Price of locations north of French River, $2 to $3 per acre, and south of it, $2 to $1.50, according to distance from railway.

Rent of locations first year 60c. to $1 per acre, and subsequent years 15c. to 25c. per acre.

Rent of claims, $1 per acre each year.

Claims must be worked continuously.

Royalty on ores specified in the Act, 2 per cent. of value at pit's mouth less cost of labor and explosives.

Royalty not charged until seven years from date of patent or lease, nor (as provided in s. 4 (3) of the Mines' Act, 1892), until fifteen years in the case of an original discovery of ore or mineral.

Original discoverer of ore or mineral on claim entitled to stake out a second claim.

Crown Lands sold under provisions of mining laws in force prior to 4th May, 1891, exempt from royalty.

Copies of the Mines Act, 1892, Amendment Act, 1894, may be had on application to

ARCHIBALD BLUE,
Director Bureau of Mines

TORONTO, May 25th, 1894.

15th YEAR OF PUBLICATION.

The Canadian Mining Review

Established 1882

Official Organ of the Mining Society of Nova Scotia; The General Mining Association of the Province of Quebec; The Asbestos Club; and the Representative Exponent of the Mineral Industries of Canada.

B. T. A. BELL, Editor and Proprietor. Published Monthly. OFFICES: SLATER BUILDING, OTTAWA; METROPOLE BUILDING, HALIFAX; WINDSOR HOTEL, MONTREAL.

VOL. XVI., No. 1. JANUARY, 1897. VOL. XVI., No. 1.

Some Facts about Rossland.

It is not often that the REVIEW finds itself able to commend anything in the shape of a mining article in the Toronto daily press, but the contributions from its own reporter recently published in the *Evening Telegram* are so unusual in tone, and contain so much truth, that we must extend our congratulations to our contemporary; the pity is that they were not published earlier.

In its issue of December 11th the *Telegram* begins the series with the statement that one of its own reporters had been despatched to Rossland neither to write it up nor write it down, but "to find out the truth and tell it." Had this reporter had a previous training in mining his articles would have been still more praiseworthy, but they prove he has a clear head and a quick eye, and he has evidently been successful in sifting out the chaff from the seed and has gotten to the bottom of many of the schemes and practises of that notorious camp.

In his first article he enumerates eleven "doubts which occur to the ordinary Canadian when Rossland is mentioned" and attempts to shed light on these doubts; which are as follows:—

(1.) Whether there is gold in great quantity in Rossland?

(2.) Whether Rossland can be such a great camp when it can point to so few producing gold mines?

(3.) Whether there is any immediate prospect of improved and enlarged facilities for freighting and smelting Rossland ores?

(4.) Whether Rossland will ever become one of the great mining camps of the world?

(5.) Whether honest development work is being done in the Rossland properties which have been stocked?

(6.) Whether there are any honest men in Rossland?

(7.) Will the mines ever pay dividends, and if so, when and how much?

(8.) Whether there is much English capital now invested in Rossland?

(9.) Will English capital ever come into Rossland in large quantities?

(10.) Whether it is wise to buy stock in Rossland's so-called gold mines?

(11.) Whether the purchaser of shares in a Rossland mining company has any chance at all of getting returns on his money?

We must confess that after reading what the *Telegram* has to say under each heading we doubt whether the "ordinary Canadian" has *his* doubts removed.

If our contemporary will permit us to help him we beg to give our own answers to his doubts *seriatim*:

(1.) Yes, there is gold in Rossland, but not in such great quantities as has been represented. Up to date the vast majority of the ore bodies discovered are too low grade to permit of profitable treatment at present rates of freight and smelting charges, and when, if ever, the conditions are such that all mining, reduction and freight charges are reduced to $6.00 per ton, or less, then (2) Rossland will be a "great camp."

(3.) The Red Mountain railway is now an accomplished fact, and combined freight and smelting charges are lowered $2.00 per ton, we are told—say $9.00 (the Rossland *Miner*, of Dec. 21st., says $10.00 per ton to Tacoma), to which cost of mining, deadwork and general expenses must be added. How many mines have shipping ore that will realize a profit over such costs (about $15) the next six months will tell. Beyond desultory talk of phenomenal metallurgical processes there is no immediate prospect of improvement.

(4.) Is answered by (1) and (2).

(5.) We think a perusal of the letters of complaint published in the Rossland *Miner* will satisfy anybody that the shareholders in these companies complained of think that there have been irregularities in the "honest development work" of stocked Rossland companies. The libel suit of the War Eagle Companies against Mr. Charles T. Long may throw some light upon Rossland methods, and upon this doubt.

(6.) Because there are, perhaps, a greater number of fakirs living on their wits in Rossland than in any other town in Canada that is no reason to doubt the existence of very many first-class honest men in Rossland.

(7.) Those mines whose ore-bodies have not had "the pinch of gold" left out, and which are working a defined high-grade pay chute, certainly should pay dividends if properly managed, and should do so within six months The fact that only two mines in Rossland have paid dividends is deemed by many a significant reason for keeping away from the camp. That 10 per cent. of the companies now working in Rossland will ever pay a dividend we do not believe.

(8 and 9.) At the present time there is little or no English capital in Rossland; the City of Spokane, some interests held in the Centre Star, and a few minor sums invested, are all that are now represented. Nor will English capital come into Rossland, nor any other camp, so long as prices are four or five times in advance of values. English capital doesn't mind millions sterling so long as it gets "value received."

(10 and 11) are best answered by our Rossland correspondent in the December REVIEW, viz.: "The man who buys treasury stock to *develop* good ore is likely to come out better than the man who buys treasury stock to *look* for good ore." The vast majority of Rossland's companies have been formed to "*look*" for ore, very few have been formed to develop good ore already found—the latter class of prospects is usually snapped up by close corporations.

Mining in Ontario in 1896.

Mining in Ontario brings to the surface of the ground an unusually varied list of substances, including nearly if not quite all the more important metals, salt, petroleum, natural gas, graphite, mica, asbestos, gypsum and apatite. Actual production, however, is at present confined to a few minerals, the remainder awaiting higher prices, better means of transport, or the magic touch of enterprise and capital. The course of the mining industry during the past twelve months has not varied greatly from that of preceding years, except in one important department, that of gold mining. The developments which have taken place in this most popular of all branches of the industry, and which are briefly noted below, afford good ground for the belief that Ontario will shortly be entitled to rank among the gold-producing countries of the world. Other interesting incidents of the year were the discovery of corundum in Hastings county by Mr. Ferrier of the Geological Survey Department, though, owing to the early approach of winter, the extent of the deposit has not yet been determined, and the finding of a vein of so-called anthraxolite, or coaly material, near Chelmsford in the Sudbury district, which has given rise to much wild newspaper talk as to the existence of coal beds in that locality.

The metals being won are gold, copper, nickel and iron; while of the non-metallic minerals, petroleum, salt and natural gas form now, as they have formed for years, the bulk, both in quantity and value. Mica and gypsum are raised to some extent, and graphite has lately been added to the list.

It is matter for congratulation that iron mining has once more taken a place among the industries of the province. That both magnetite and hematite ores occur in abundance, the former especially, has long been known, but the absence of blast furnaces for many years prevented a domestic demand, and low prices and hostile tariffs have of late years forbade any considerable export trade. The establishment of a smelter at Hamilton by the Hamilton Blast Furnace Company, which was blown in during the closing days of 1895, has brought about the reopening of several mines in Hastings county, and the raising of about 5,000 tons of magnetite and 4,000 tons of hematite ore. In addition about 1,000 tons of bog ore has come from the counties of Norfolk and Kent. Some American ore is still used by the company to secure a proper mixture. The product of the company is foundry iron of a good grade, which has been well received by users throughout the country.

The copper-nickel deposits of the Sudbury district have been worked during 1896 on about the same scale as in former years, the three mines of the Canadian Copper Company being operated to their full extent. The Dominion Mineral Company and H. H. Vivian & Co. were idle throughout the year, but the Trill Nickel Mining and Mfg. Co. (formerly the Drury Nickel Co.) resumed operations last spring and partially supplied their place. The latter company has sold the entire output of the mine for some time ahead. The Sudbury mattes are now shipped exclusively to the United States to be refined, and the production of nickel in the latter country in 1896, wholly from Ontario ores and matte, is given at 3,697,039 lbs., as compared with 2,678,661 lbs. in 1895, an increase of 1,018,378 lbs. The demand for the year was light, but as there is no competition among producers prices remained nearly stationary, being at the close in the New York market 33 to 36 cents per lb. for ton lots, and 37 to 39 cents for smaller orders. The demand for this metal has not undergone the expansion which was at one time looked for, and it is probable this will only be realized by a considerable reduction in the price. The workings in the Copper Cliff are now the most extensive of any mine in Ontario, reaching down to the tenth level and a depth of 779 feet in the shaft. There are a number of promising properties in the nickel belt, and an increase in the requirements of the metal could be easily met from this, one of the two chief sources of the world's supply.

The salt wells of the counties bordering on lakes Huron and St. Clair have pumped up about the usual quantity of brine during the year. The immense extent of the salt beds of Ontario afford abundant material for a large industry, but present conditions do not appear favorable. There were about a dozen producing wells in the province in 1896.

The petroleum-producing area of Ontario is gradually widening, and during the past year experienced an addition of three or four square miles by the resumption of operations in the old Bothwell field. Production has been going on steadily in the Petrolia and Oil Springs districts, where there are now upwards of 10,000 wells yielding oil, the average over all being about one-third of a barrel per day. The low yield is offset by the continuous production of the wells, and the economy with which they can be worked The resuscitation of the Bothwell field, which was abandoned in 1866 on account of the fall in the price of oil and the flooding of wells by salt water, was the feature of the year. There appears to be an anticlinal in the Township of Zone which extends into the Township of Orford, and it is on this that the recent wells have been sunk, some of which have yielded at the start as much as 100 barrels per day. The anticlinal runs pretty nearly due east and west, and so far as delineated seems to be about five miles long by half a mile wide. Three separate horizons of oil-bearing rock are met with. The first is at the top of what is locally known as the great limestone, at a depth from the surface varying from 150 to 200 feet, according to the depth of the drift; but this source, though yielding a good deal of oil for a short time, is not a permanent one. The next is at a depth in the great limestone of from 50 to 100 feet, and this also occasionally yields largely for a short time. The permanent supply is found in a reddish sandstone underlying the limestone, at a depth of about 400 feet from the surface. Some of the wells yield 30 barrels per day, some 20, 15 or 10, but the majority average about 5 or 6. The first wells were put down by Alexander Elliott, of Bothwell, early in the year, and there are now a dozen or more companies or firms with drilling rigs at work, and about 40 producing wells have been obtained. Most of these, however, are not yet in actual operation, as the well-known system on which the Petrolia wells are operated, and which utilizes the power of a single steam engine to pump half a dozen or more wells, is being applied here also. About 15 new wells per month are going down. The reopening of the Bothwell field bids fair to add considerably to the yield of petroleum in this province. Oil was found in 1895 on Pelee island, and since then several wells have been sunk, in three or four of which oil has been struck, but the value of the field has not yet been proven. Prices were well maintained and steady during the year, the closing price of crude at Petrolia being $1.52 per barrel.

The natural gas areas of the province are situated in Welland and Essex counties. The latter has been extended eastward until it now occupies a length from east to west of about seven miles, or from a point about two miles north-east of Kingsville to a mile and a half south of Leamington. The greater part of the gas produced in the Essex field is delivered through thirty or more miles of pipe-line to Windsor, Walkerville, and Sandwich, Ont., and Detroit, Mich. Three or four villages and towns in the field itself utilize for domestic purposes this most economical of all fuels, and the Town of Leamington owns its own gas wells, the proceeds from which materially reduce the burden of taxation. In Welland county the Provincial Natural Gas and Fuel Company practically controls the field, and markets the whoel of its output in Buffalo, N. Y. This company was obliged several years ago to resort to the use of compressors in order to counteract the lessening rock-pressure at the wells, and the supply is no doubt undergoing gradual exhaustion. Several private wells in this field furnish gas for manufacturing purposes, burning lime, etc.

In the Township of Brougham, Renfrew county, a deposit of graphite discovered over a year ago has been exploited by the Ontario Graphite Company of Ottawa. The vein or mass of graphite is very large, probably ranking among the largest in the world. Samples of the mineral forwarded to European factories have been pronounced of the highest quality, and a mill has been erected at Ottawa to grind and treat the material.

Mica mining has not been carried on extensively during the year, though several deposits have been worked. Finds of the muscovite and phlogopite varieties are reported from Methuen township and from several points in the Parry Sound district, where it occurs in the Laurentian rocks.

The gypsum mines on the Grand river have been worked on the customary scale, about 3,000 tons of gypsum having been taken out. The product is converted into land plaster, alabastine, etc., in the mills at Paris and Caledonia.

The outlook of the gold mining industry in Ontario was never so promising as at the present moment. During 1896 more prospecting was done, more discoveries made, more development work undertaken, more machinery installed, and more actual gold produced than during any previous year. Gold mining in this province is rapidly taking on the aspect of a permanent business. The north-western part of Ontario has been the scene of much activity. The Lake of the Woods and Seine river regions, being the most accessible, have undergone a greater degree of development than any of the other districts, if indeed it is proper to regard as separate districts what further exploration may not improbably prove to be parts of one great gold area. On the Lake of the Woods two mines, the Sultana and the Regina, are now regularly at work producing bullion. The former mine, the pioneer of the district, situated on an island in Lake of the Woods, seven miles south-east of Rat Portage, is proving richer as it is being worked, and a weekly yield of $2,000 or $3,000 in bullion is easily maintained with a small force of miners. A ten-stamp mill is kept running day and night. The shaft is now down over 300 feet, and the workings are in a great body of rich quartz in places 40 feet wide. About 1,000 feet of drifting has been done, and the ore in sight is sufficient to keep a ten or twenty-stamp mill running for years. Sultana ore is 75 or 80 per cent. free milling, the concentrates being treated by a chlorination plant installed last summer. Mr. J. F. Caldwell is sole owner, and it is stated that a late offer has been made him of a million dollars for the property. The Regina mine is on Whitefish Bay and is under the management of General Wilkinson. The shaft is down about 175 feet, and drifting has been done on the main vein to the extent of over 500 feet. The vein is in protogine granite at the north and runs into a weathered diabase towards the south. A rich shoot of ore passes down through the granite into the diabase. The mill is of ten stamps.

On Shoal lake, west of Lake of the Woods, some veins have been struck of unusual value. One of these, the Mikado, was sold last summer to English capitalists represented by Colonel W. T. Engledue for $25,000, and mill runs made at the reduction works at Rat Portage gave an actual yield of about $70 per ton for upwards of 100 tons of ore. A few months' work has actually brought to the surface sufficient ore to pay for the mine. It is the intention to erect a mill next spring. Neighboring properties are the Cornucopia, Yum Yum, Nankipoo, etc., some of which have been shown by mill tests to be almost equally valuable, and if the ore holds out in quantity this corner of the field will be a very rich one.

The Gold Hill, Golden Gate, Treasure and Black Jack form a group of properties on the east side of Lake of the Woods, some of which have been more or less developed. There is a ten-stamp mill at the Gold Hill. The Triumph has recently been disposed of to an English syndicate formed by Col. Engledue.

East of Rat Portage and north of the C. P. R. are several promising locations, such as the Scramble, which is owned in Detroit, the Princess, and others.

In the Seine river region a number of locations are undergoing development. One of the chief is the Foley mine, situated on Shoal Lake (east), owned mainly by Americans, who have formed themselves into a company under Ontario laws, and who are proceeding with the work in a thoroughly business-like manner. There are many veins on the property. On one of the principal the company sunk several shafts, one to a depth of over 200 feet, another over 100 feet, and drove a number of levels, besides exploring several other veins by cross-cuts and test pits, before deciding on putting up a mill. The results obtained were so satisfactory that a twenty-stamp mill has been placed on the ground and will probably be producing bullion shortly after this is in print. The Foley mine is situated within an area of protogine or altered granite, six square miles in extent, lying between Shoal and Bad Vermillion lakes. Veins in this formation are looked on as likely to prove rich and persistent, and as many has been found this protogine area has nearly all been taken up by prospectors and speculators.

The Ferguson mine on A L 110, 111, and K 223, is also in the protogine. On one vein a shaft has been sunk 50 feet and on another 70 feet. The veins are not wide, but a good deal of rich ore has been uncovered. The Lucky Coon mine on 655 P is in this neighborhood. A shaft has been sunk 50 feet, at the bottom of which the vein is about eight feet wide in good quartz. There is a five-stamp mill on the property.

Further up the Seine river lies Lake Harold, a small sheet of water, on whose shores the Lake Harold Gold Mining Company have located several veins, not of great width, but of good quality. A five-stamp mill has turned out a number of gold bricks. Still farther up the river is Sawbill Lake, on which the well known mine of the same name is situated. The vein is remarkable, as occurring in biotite-granite gneiss, and is very strong, carrying a good deal of free gold along with considerable pyrites. It can be traced on the surface for more than a quarter of a mile. A shaft is now down about 150 feet and 125 feet of drifting has been done. A Fraser & Chalmers ten-stamp mill has been ordered by the Sawbill Gold Mining Company, the owners of the property, and will go up this winter. All accounts agree in stating that the promise of this property is unusually good. On the east side of this lake an extraordinary large body of ore in the form of a vein or dyke (or perhaps more correctly a fahlband) over two miles long, and in places 150 feet wide, has been discovered by James Hammond, of Fort William. Assays show varying contents of gold, but Mr. Hammond and those interested with him think they have the biggest thing yet found. To the east is Hawk bay, where there is said to be a well defined vein traceable on the surface for 5,000 feet. A shaft 50 feet deep has been put down, and the ore taken out at 30 feet showed no free gold, but gave an average value of $250 per ton.

On upper and lower Manitou lakes many locations have been taken up for gold, and fine specimens have been shown from them, but not much development has been done. Round Wabigoon lake, in Van Horne township, and other localities, the active prospecting which prevailed during last year has brought gold to light, but it remains for the future to demonstrate the value of the finds.

At Jack Fish bay, on the north shore of Lake Superior, the Empress mine occurs in Huronian schists. A ten-stamp mill has been put up and a quantity of gold recovered. In the vicinity of Schreiber station a number of properties have been located over a track 25 miles in length.

More or less prospecting has been done in the Lake Wahnapitae region, and some good finds are reported. No titles are being granted by the Government in this region for the reason that it is desired to

protect the pine timber from the fires which experience shows frequently accompany prospecting operations. This difficulty will probably be removed in a short time. The Crystal mine, a property of much promise, is to be equipped with a mill this winter.

The gold fields of Hastings county have seen a partial renewal of the activity that characterized them many years ago. The Deloro mine, near Marmora, upon which many thousands of dollars were expended on plant, and which was abandoned in 1885 as a costly failure because of the refractoriness of its mispickel ore, has once more been taken hold of, this time by the Canadian Gold Fields Company, an English concern. The company propose to treat the ore by the Sulman-Teed or bromo-cyanogen process, which has proven successful on similar ores elsewhere. A large plant is in process of erection. The other gold mines of Eastern Ontario have for the most part remained quiescent during the year, though prospecting has been actively carried on in Tudor and some other of the townships in Hastings county where free milling ores occur.

It is out of place to attempt a comparison between the gold fields of Ontario and those of any other province or country, but a few points in favor of Ontario, and more especially of the western parts of the district, may be stated. The ore is mainly free milling, and so can be treated at a minimum of expense; the regions are well timbered and well watered, chains of rivers and lakes everywhere inviting the prospector's canoe. The C. P. R. is not very distant from most of the mines, and steamers ply on navigable waters close to many others. Labor is cheap, and life and property secure. The fertile lands of the Rainy river valley can produce food enough to sustain a large mining population.

For the year ending 31st October, 1894, the gold output of the province was $32,776; for 1895 it was $50,281. For the period beginning 1st November, 1895, and ending 30th September, 1896, it reached $142,605, and for the calendar year, 1896, the product was probably not less than $175,000. In all likelihood 1897 will show a substantial gain.

In a time like the present, when the people are excited over the finding of gold and the working of gold mines in Ontario and British Columbia, it is inevitable that there should be much misdirected effort and wasted money. It is sound advice that those who cannot afford to lose their investments should leave mining ventures severely alone, and yet there is probably no business which yields larger returns when due care and business prudence direct the enterprise. There are always gullible people and sharps to gull them. In the present frame of the public mind fakes and wild-cats are not difficult to conceal behind the alluring front of a well-written prospectus. In British Columbia, and in Ontario, too, "all that glitters is not gold," and the public will probably learn by sad experience before the present boom is over that many of the short cuts to fortune presented so lavishly in the columns of the newspapers, both in reading matter and advertisements at the regular business rates, are likely to prove bonanzas only to the individuals promoting them. There is a danger lest the Ontario boom be overdone, and lest much money which might have borne fruit, had it been carefully invested, may turn out to be thrown away. Should this prove to be the case, capital which can now be had with little difficulty will take fright, and a reaction will set in which will depreciate valuable properties and discredit the whole business of mining. But such risks accompany mining excitement in all countries. That there is abundant material for legitimate enterprise in the Ontario gold fields has been clearly proven, and the prospects of establishing a profitable and permanent industry appear almost certain of being realized.

Gold Mining in Cariboo.

ARTICLE NO. 2.

I found so much to interest me around Horse Fly that I decided to spend further time in that neighborhood and give the district a thorough examination.

At the close of my last letter I mentioned having met Senator R. H. Campbell, the mining expert from California, and gave you the gist of a short interview regarding his recent locations on the continuation of the Horse Fly Hydraulic Mining Co.'s and the Harper channels. Desiring to know more of these rich and extensive deposits of auriferous gravels, I went with Mr. Campbell over the four miles of channel recently located by him for a San Francisco syndicate. The trend of the channel which he located is very plainly marked passing through the hay ranch owned by the Horse Fly Hydraulic Mining Co. and on down Beaver Lake Creek, where can be seen many pits sunk by Chinese miners and as many large piles of tailings, indicating that good pay gravel must have been found there. The Chinese had brought water to their claims through a small ditch of about 100 miner's inches capacity and about two miles long, around the side of the canyon to wash the gravel. This small quantity of water gave them little more than a sluice head, and was not sufficient to handle the large boulders and heavy wash gravel encountered as they neared bed rock. Even in their primitive way the Chinese took out considerable gold from their claims on Beaver Creek.

The gravel benches along Beaver Creek canyon, where exposed, show a heavy well washed deposit, and the great size of many of the boulders proves that the ancient river that once flowed through the depression was not a small one.

Senator Campbell says: "I believe that the waters of the Fraser, of the North Thompson and possibly the Columbia rivers, once flowed through this section, and that a system of ancient river channels exists in Cariboo, that when exploited will astonish the whole mining world, and will exceed in gold tenure and extent anything yet discovered or known to exist in California or any other mining country."

I have been in California and other mining countries, and from what I have thus far seen in Cariboo district, I can fully agree with Mr. Campbell as to the exceeding richness and great extent of the auriferous deposits of this, as yet, undeveloped country.

Mr. Campbell may be right also in his belief that the Fraser and North Thompson rivers once flowed through the Horse Fly and adjacent country. Further intelligent exploration will eventually prove the correctness or otherwise of his opinion, and will, I firmly believe, bring to light other ancient river deposits where the gravel will be found to be as rich as are either the Harper or Horse Fly Hydraulic Mining company's channels. It is reasonable to suppose, and morally certain, that all the gold was not concentrated within a mile or two of the above named channels, and almost as certain that as rich, possibly richer ground will be found on the extensions of these ancient river systems, as that which has already been uncovered. It has been found to be so in California wherever these ancient river deposits have been worked.

The deep channels under the Iowa Hill and Forest Hill Divides in Placer County, California, have been pierced by tunnels at different points for a distance of over twenty miles, and the character and richness of the deposits found to be very uniform. Of course there are places in these deposits where the gravel contains more gold than in others, according to the concentrating conditions of the current of the stream and its bends or curves, or as the smoothness or roughness of the bed-rock made bad or good riffles for catching and holding the gold that the flood of waters brought down from the higher levels.

The Horse Fly Gold company's ground, or the "Harper" claim, by which name it is better known, is one of the oldest locations on the

Horse Fly river, having been discovered in 1859 by James Moore (now employed at the Cariboo Hydraulic mine), Henry Ingram and four other prospectors who crossed the country from Hills Bar, near Yale, on the Fraser river in that year. This discovery was known as the Blue Lead and yielded rich results to its discoverers, who continued to work it until reports of richer diggings having been found on the Quesnelle river, caused Moore and his partners to abandon Horse Fly and go to the scene of the newer discoveries.

The claim was afterwards worked by a company of Chinese miners, who took out enough gold to satisfy their cupidity and start them all to their homes in the Flowery land, after disposing of the claim to Thaddeus Harper, who is said to have spent $50,000 in building wing dams, and in bringing an engine, boiler and heavy pumping machinery to the mine. At the Harper claim I saw one excavation about 40 or 50 feet in diameter, from which over $30,000 in gold was taken, and I was credibly informed that from other parts of the claim $10 to $30 per day had been washed out by rockers. Mr. Harper did not meet with the success that his energy and large expenditure of money deserved. A rapid rise in the river before his wing dams were completed carried away portions of the dam and flooded the workings. Mr. Harper lost his health, and the mine remained unworked for several years, until R. T. Ward of San Francisco got control of the property, and in 1895 organized the Horse Fly Gold Mining company. In 1896 this company decided to work their ground by Hydraulic elevator and constructed a ditch and pipe line to bring water from Mussel Creek to their elevator. Owing to some dispute with the Horse Fly Hydraulic Mining Co. as to the priority of claim to the waters of Mussel Creek, no mining has yet been done by the Horse Fly Gold Mining company. This company's ditch was constructed with too little slope to the banks, which have caved in many places ; much additional work will be necessary on this ditch and pipe line before sufficient water can be got through it to work the hydraulic elevator.

Dan McCallam, Leisk and Mr. Campbell of London have promising claims in this locality, which further well-directed work may develop into valuable mines.

On the upper deck of a cayuse I now start from Horse Fly to the Cariboo Hydraulic Mine, going over a good wide logging road, eight miles to the Horse Fly Hydraulic Mining Co.'s logging camp and thence over a good trail five miles long, to Polly's and Bootjack lakes. This road and trail were built by Manager Hobson for the accommodation of the two companies he represents, and saves him and his pack trains many miles of travel. The distances from Horse Fly to Quesnelle Forks by the above mentioned road and trail being now thirty miles, using the Cariboo Hydraulic Mining Co.'s ditch bank for eleven miles. This route can be shortened about five or six miles by cutting a trail direct from Polly's Lake to the Quesnelle Forks road, near the Cariboo Hydraulic Mine's camp.

The distance by road from Horse Fly to Quesnelle Forks via 150 Mile house is 108 miles ; and via trail to Beaver Lake and thence by road to Quesnelle Forks is 48 miles.

This great saving in distance should be a sufficient argument with the members of the Provincial Legislature to induce them to vote enough money to build a good wagon road from the Horse Fly Hydraulic Mining Co.'s log camp to a junction with the main road to Quesnelle Forks, at a point near the Hydraulic Mining Co.'s camp, and whence Major Dupont's wagon road to the dam at outlet of Quesnelle Lake starts. Such a road as here outlined would be a great convenience to the travelling public and save large sums of money in freight charges to all those living at Quesnelle Forks, and would also induce other mining companies to equip and operate their mining claims in that district.

Polly's Lake, a sheet of water about five miles long by one mile wide, and Bootjack Lake, of smaller dimensions, form the storage reservoirs for the Cariboo Hydraulic Mining Co. A cut of about one mile long into Polly's Lake taps it at 8 feet below its normal level and delivers water into the head of the main ditch at Six-Mile Creek. From this point a canal with a carrying capacity of about 3,000 miner's inches and 17 miles long, has been constructed, which delivers the water into the pooling reservoir about half a mile from the working pits. The dams, cut, ditch and flumes were constructed by L. F. Warner, Jr., under the direction of Manager J. B. Hobson, and show the same engineering skill as those constructed by him at the Horse Fly. Arriving at the mine I had the pleasure of meeting Manager Hobson,and under his guidance inspected the reservoir and distributing ditches, the immense hydraulic plant and the mine. About 2,500 inches of water was being forced through two giants with 9 inch outlets under a pressure of about 325 feet. The work was being done in two pits, Nos. 1 and 2. The banks of both pits being 300 or 350 feet high from the present working floor of the mine. On account of the height of the banks, the gravel was being washed in two benches, the lower or bedrock bench, upon which as yet no work has been done, I was informed by the manager was estimated to be from 80 to 120 feet from the present working floor of the mine to bedrock. Great difficulties were encountered in the opening of this mine, on account of the primitive methods of working adopted by the former Chinese owners,who worked the claim with a 6 inch pipe and blocked up the outlet in Dancing Bill Gulch with the boulders from their workings for a number of years. The removal of immense bedrock slides from both the north and west rims of the channel, and immense slides of top waste material consumed much time, labor and water in the early part of the season of 1896. The manager informed me that this mine was the most difficult one to open up he had encountered in all his experience. When I arrived at the mine they were working entirely in pit No. 1, close to the north rim. I was present during one clean-up, and must say that I never saw any hydraulic mining sluices look so rich as they did in this mine after about 15 days' run of 2,000 miner's inches per day of 24 hours. This clean-up amounted to over $37,000. Two other short runs were made before the frost shut off the water supply ; one of 25 hours of 2,000 miner's inches, producing over $5,500 and the other of 27 hours between $4,000 and $5,000. The frost coming so suddenly that only 7 or 8 boxes of one branch sluice could be cleaned up. Assistant Foreman George Coffey stated that if he could have had but 6 hours' more water to run down the cut at the head of the sluice he would have doubled that amount. All the obstacles that were met with in 1896 have now been overcome and the mine is in splendid shape for very profitable operation. A ditch two miles long from a drop in the old ditch was carried around to Dancing Bill Gulch and delivers the water into a new sand box 60 feet higher than the ditch used in the past season. It is intended to use the water from this upper ditch in the present workings on the upper bench, and to open the lower or bedrock bench of gravel with the water from the lower ditch, thus gaining more pressure and more effective streams to wash the gravel. I was informed by the manager that the gross output of this mine for 1896 was $127,000, at an expense for operation of about $85,000. These figures may be slightly changed after the season's accounts are fully made up, which had not been done when I was at the mine. I made a careful examination of the gravel in different parts of mine and was surprised at its richness, nearly every pan of gravel I saw washed going from 5 to 50 cents. The gravel directly in front of the branch sluice next the north rim was so rich, I estimated it would yield at least $5 to the cubic yard for that strata. Two prospect shafts have been sunk in the bottom bench in pit No. 2 about 25 feet deep, when they were obliged to stop on account of the water. The gravel taken from these shafts was washed in sluices and yielded, I was informed, 27½ cents per cubic yard for one, and the other over 50 cents per cubic yard. A prospect tunnel was then started in this lower bench

and continued until the weather compelled the cessation of operations for the season. I do not know whether the gravel from this tunnel was washed or not, but from what I saw during my examination of the mine I consider that any further prospect work was quite unnecessary and a useless expenditure of money. The extent of the deposits in these ancient river channels and its uniform richness in gold makes it in my mind the richest hydraulic mine in British Columbia or any other country.

The operation of the mine in 1897, if continued under as intelligent management as heretofore, will produce results that will astonish the shareholders and remove the last vestige of doubt as to the value of the investment.

I had the pleasure of meeting during my stay at the mine, Rev. Father J. A. Bedard, O. M. I. business manager of the St. Joseph's Industrial School at William's Lake, 150 Mile House. This gentleman graduated at the Ottawa University as a civil engineer, and after joining the religious order, of which he is now a member, spent ten years in Kootenay and other mining districts of the province,thereby gaining considerable experience in mining matters. The reverend father spent a week at the mine, and after seeing a clean-up and carefully inspecting the works and the property, stated that in his opinion this would be one of the best paying mines in Cariboo, if not in the whole of British Columbia. "I cannot err in this," he says, "for there are all the requisites to make this a decided success: 1st, good management; 2nd, sufficient volume and head of water; 3rd, a good dump; 4th, a very extensive deposit of gravel, which will last for many years; and 5th, the exceeding richness of the gravel, several stratum of which he was confident would yield from $1 to $15 per cubic yard." Speaking of Manager Hobson, Father Bedard, after watching with interest the whole process of washing the gold from the gravel, cleaning the amalgam from the sluices, retorting and melting the gold into the bar, said that "he is the right man in the right place, and that his careful management was the last thing needed, in addition to the natural advantages already possessed to place this property in the front rank of profitable mining propositions.

H. B.

The Meeting of the Lillooet, Fraser River and Cariboo Gold Fields Co., Ltd.

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The annual meeting of the Lillooet, Fraser River and Cariboo Gold Fields Co., Ltd., was held in London on the 19th Dec., 1896, and seems to have been most successful in lauding its own praises. In the speech of the Chairman, Mr. Horne-Payne, occurs a paragraph relative to concessions granted this company in its charter obtained from the British Columbia Government, by which power has been given them to group as many as eight claims together and consider them as one claim so far as improvements are concerned, the work prescribed by law being done on any one of them to eight times the extent required upon each if it were separate. This is a wise provision, and one to be imitated by any other large company operating many claims.

Of the 81 claims owned by this company it would appear from the report that only eight have reached a stage of development beyond prospecting, and that none are yet shipping ore. One-half of the capital of the company is understood to have been expended.

We note that Mr. Horne-Payne has very little to say of the "Apache" group, and we wonder if Mr. Jamieson would endorse his remarks as to that group still being a "good prospect"; and the "Aaron's Isle" group, in the same district, is also very tenderly handled. But Mr. Horne-Payne should be above using such a threadbare and untrue excuse as "value can only be expected with depth, as in the case of Rossland," and he also presumes upon the credulity of his audience when he tries to make the Le Roi vein turn nearly 1,500 feet north from its course to pass through the *City of Spokane* claim; The Le Roi and War Eagle veins have done duty for enough other claims within a two-mile radius of Rossland without Mr. Payne's attempting to stretch them up to pass through his company's claim.

We also note that the chairman did not communicate to the shareholders the very excellent advice he received from a resident of Nelson, viz.: "not to go shooting ducks with a brass band nor hunting claims with a palace car and a retinue of flunkies." which, if followed, might very materially reduce the expense account of the L. F. R. & C. Gold Mines Co., Ltd.

The Statement of the Gold Mining and Reduction Co.

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In another place we print the report of the Directors of the Dominion Gold Mining and Reduction Co. to its shareholders, with the balance sheet submitted. The account is worth a short analysis.

Of a total capital of £200,000, the vendors received £150,000 as fully-paid in return for properties, and in addition received £11,576 in *cash*, which undoubtedly came out of the £18,707 of shares subscribed. This left the company with the large share capital of £200,000 only £7,131 in cash to work with.

Under the economical and capable management of the illustrious Robert H. Ahn, who, as before said, has an intimate acquaintance with jewellery and trinkets rather than with mines and metallurgy, this sum was spent—as to £5,752 in machinery and plant, as to £1,853 in development, as to £1,064 in salaries, and as to £708 in preliminary expenses and furniture,—making a total of over £9,000, which necessitated *borrowing* £2,000, as appears in the statement.

To quote the report, "operations were suspended for want of working capital." This is not a usual want in British mining companies; the usual British shareholder is only too willing to put up money for development. Why was it that the thirty odd thousand pounds remaining of the capital stock was not offered on the market if the properties purchased had any value? Why was it the company had to let its properties lie idle and suspend all work from Jan. 1st, 1896, to Oct. 1st, 1896, for lack of working capital?

What do our constructing mill engineers think of the sum of over $27,000 being spent to remodel a ten-stamp mill? And what do our Rat Portage friends think of the equity of paying over $800,000 for the purchase of the reduction works and the few prospects that went with that sale?

We do not hesitate to say that to us this report seems very incomplete, and if we were a shareholder in that company we should demand an investigation into promoters' profits and the other chances for "rake-offs" which this statement suggests.

EN PASSANT.

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The Annual general Meeting of the members of the General Mining Association of the Province of Quebec will be held in the New Club Room, Windsor Hotel, Montreal, on Tuesday, 2nd February, commencing at 3 o'clock. The first session will be occupied by the transaction of business, election of officers, etc, and the evening meeting to papers reviewing the mineral industries during the year.

So far four entries have been received for the student's competition for the cash prizes offered by the Association. These papers will also be heard at this session.

His Excellency the Governor General has given his patronage to the Conferences of Mining Engineers to be held under the auspices of

the Canadian Mining Institute, opening on Wednesday, 3rd February, and has signified his intention of being present at some of the meetings. He will also be present at the banquet in the Windsor Hotel on Thursday evening, 4th February.

At the Inter-provincial Conference of Mining Engineers and Mine Owners, to be held under the auspices of the Federated Canadian Mining Institute, the morning session of Wednesday will be entirely devoted to the transaction of business. The reading and discussion of an excellent syllabus of papers will commence at the afternoon session of that date, the evening being principally occupied by a discussion on the subject of "Air Compressors," to be introduced by Mr. James F. Lewis, Chicago, Vice-President of the Canadian Rand Drill Co.

On Thursday evening a dinner on a scale in keeping with the character and importance of a federation of the mineral industries of the Dominian will be given in the Windsor, at which, as previously indicated, His Excellency the Governor General, Hon. Mr. Laurier, Hon. Mr. Fielding, and other Dominion and Federal Ministers will be present. Covers will be laid for 150; the chair to be taken at half-past seven o'clock.

The only official report of the proceedings of these meetings will, as heretofore, be published in these columns.

It is quite in line for the various brokers of Rossland stocks to turn upon the *Toronto Telegram's* reporter for saying "It seems to be admitted that there are no true fissure veins" in the Rossland camp. This gives us an opportunity to correct some misrepresentations in the public Press as to the opinion of some of the experts who have visited the camp. Those who have found it difficult or impossible to classify the ore bodies of Rossland as fissure veins are the two Janins, Covington Johnson, Clemes, McConnell of the Geological Survey, Susman and Hardman. And we make this statement on good authority.

The height of the audacity and impudence of the mining broker has been reached in the advertisement of the "Eastern Mining Syndicate" which is headed in prominent type with the legend "Mining Profits without Mining Risks." The prospectus has on its list of officers some fifteen or sixteen names of highly respected capable business men who well know, without being told, that there is no profit in any business without corresponding risks, yet who are indifferent enough (to use the mildest adjective) to allow their agent to attempt to mislead the public by such a headline as this.

It will be well for Canada and its reputation when a Dominion Act is passed making the Directors of a corporation, collectively and individually responsible for the statements contained in advertisements and prospectuses, and patterned after the British Act. We fancy there would be a decided shrinkage in the language used in such documents, and a more literal adhesion to truth. The pity of it in this case is that the company's officers are all good and representative men with a scheme af merit; why then the need of such ridiculous methods to promote its sucess?

We print in another portion of this issue a letter from the firm of Aemilius Jarvis & Co., Toronto, objecting to a paragraph in our December issue criticising the prospectus of the Lake Harold Gold Mines Co., Ltd. We cannot find anything unfair in our remarks, nor can we find in Messrs. Jarvis & Co's. letter any information or data to lead us to change that criticism. A property which has already a well equipped five stamp mill, which has 5 additional stamps purchased and ready to set up, which "has a full equipment of everything necessary to carry on operations" except one steam pump, which has milled 531 tons of quartz yielding $6935, which has $5850 "in sight" on which the profit as figured is $7.00 per ton net, which has over 400 ft. of shafts and levels, such a property, we repeat, has no need of $45,000 for the ostensible purpose of "development and machinery" when the company's own expert says "no further machinery is just now required." It should not take the tenth of $45,000 to open veins averaging from 18 inches to 33 inches in width so that not only a 5 but a 10 stamp mill could be kept humming. From the tabulated statement of expenditures furnished by Messrs. Jarvis & Co., we gather that the cost of the mill machinery in Chicago plus freight reached the extravagant sum of $9,391.23, and that supplies etc., plus additional freights made an additional sum of $10,219.63, so that this existing plant has cost the company nearly $20,000 ($19,610.86 exactly) *without reckoning the labor cost of erection and so forth*, which sum is a portion of the $8,145.68 which has been paid for "Wages of Workmen." In view of these figures, and the grand total of $32,000 already expended we think our caution to intending purchasers fully justified. We will go a step further and advise the officers of the company to keep their construction account separate from operating account so that shareholders may have an intelligible idea of how much of their money has gone into development and how much into plant and how much into "other purposes." It strikes us from the documents perused that economy has not been a feature of the past administration. Of the intrinsic value of the property we say nothing as we have no information beyond the prospectus reports.

"Can you read your title clear? Is every deed or other instrument in perfect form? Are all signatures and acknowledgements exactly what they should be? Has there been no deed or other necessary paper in the chain of title lost before it was recorded? Has there been no mortgage by, or judgment rendered against the prior owners of the land? Have all prior liens been carefully removed?" These are simply a few of the suggestions that it might be well for investors in Canadian mines to consider before making final payments.

As confirmatory evidence of figures that have recently been printed in the REVIEW concerning costs in the Rossland Camp we reprint the following exerpt from "*The Rosslander.*"

"The completion of the Red Mountain Railway will cause quite an addition to the shipping mines. Up to the present, freight and smelter charges, estimating the ore received at Northport, have been about $13 or $14 a ton. When roads are at their best, the charges for hauling ore from Red Mountain mines to Northport is $5 a ton, bringing the total charges up to $18 or $20, exclusive of the cost of mining. *It is therefore apparent that ore of less value than* $30 *per ton would not pay for shipping.* The schedule of freight rates for the new line has not yet been made public but it is estimated that about $14 will cover freight and smelter charges, or at least fully $5 a ton less than what the previous charges amounted to."

In view of the inflated values put upon the Le Roi, War Eagle and other properties in the Trail District the price obtained for the "Tom Boy" one of the chief mines of Colorado, which is reported sold to the Exploration Co, Ltd., of London, is of interest. This property is now stoping between the 250 and 300 ft. levels, and last year paid in dividends $450,000.00; it is opening the vein by a cross cut tunnel at 750 feet in depth yet the price obtained as reported is only $2,000,000. When a Rossland mine pays dividends for four or five years consecutively and at a rate of $450,000 a year it will be time enough to reckon its selling price in the millions.

The following from one of our subscribers in British Columbia may be of interest as indicating the views of men of affairs regarding the extravagant utterances of unscrupulous promoters in the present mining "excitement":—

"As a subscriber to, and a reader of the REVIEW for a number of years, permit me to offer you my humble tribute of praise for an admirably conducted journal, and in particular for the noble stand you have taken of late against the shoals and battalions of vagabonds who are doing their level best to ruin the mining industries throughout Canada in general, and, from my standpoint, in British Columbia in particular.

"Here at least, an infant industry (quartz mining) handicapped with, at the very best, a four months' winter, and geological disturbances that are at least different to those in other lands where this class of mining is followed, we must be saddled with a horde of gambling ruffians, the great bulk of whom should be swept into the penitentiary. I regret to say that they are in full force in this district now, consequent on the discovery during the past year of a quartz ledge fairly rich in gold, situated on Cayoosh creek, famous for the geological disturbances that exist everywhere in its neighborhood. Doubtless there are places on this creek that will pay well to work on the quarry or open face system, but I have my doubts if any of the ledges so far discovered will ever "live down" to any depth.

"I trust, sir, you will continue your good work of keeping a bright light on the mining gambler and his wild-cat offerings through the columns of the REVIEW."

The REVIEW is indebted to the Manitoba *Free Press* and the Victoria *Colonist* for editorials commenting favorably on our article "Truth vs. Exaggeration," but the *Colonist* is much mistaken in imputing to the REVIEW "prejudice against British Columbia," or "jealousy of its mineral resources." On the contrary our article expressly stated that we believe "British Columbia has an enormous wealth of mineral, both precious and base. . . . We are not bears, quite the contrary, we are bulls" on British Columbia. The *Free Press* has caught the inspiration of our article in its remark that "the danger is capital may misled into schemes the value of which is doubtful. It is in the interests alike of the mining districts and of the investors that exaggerated estimates be avoided."

Some interesting data of the cost of mining bituminous coal in the United States is given by Dr. Day, in the last volume of "The Mineral *Industries*" recently issued. He says:

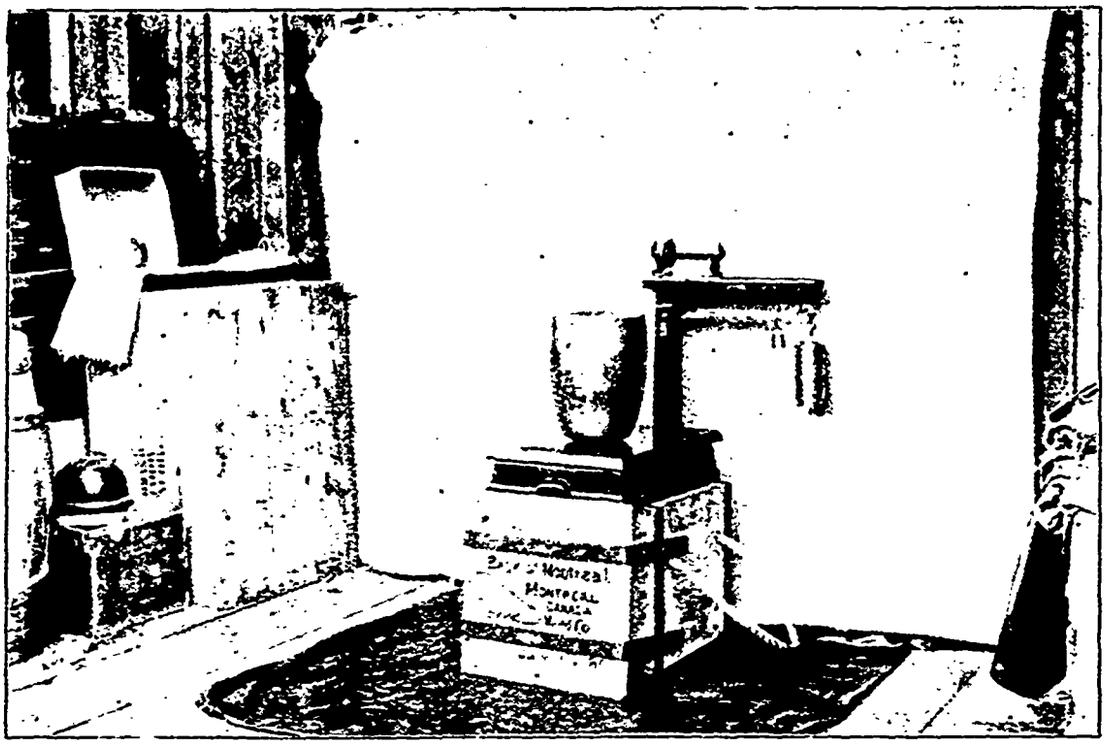
"The following table shows the results obtained from statements received from 425 mines producing over 10,000 tons each, and having a total output of 34,535,000 tons, or about 25 per cent of the entire bituminus coal product. The total selling value of the product shown in this table was $32,661,750, an average of 95 cents per ton, against an average price of 86 cents for the total bituminous coal product. The average wages received by the miners varied from 30 cents per ton in West Virginia to 78 cents in New Mexico, the general average being 48 cents, or practically exactly half of the selling price. The rate of wages paid the miners is shown to have represented 64 per cent of the total expense of mining the product and placing it on the cars for shipment. This makes the total expense average 75 cents per ton, not considering the interest on invested capital. The total expenses cumputed as above for the 425 mines amounted to $25,970,110. Taking the Mineral Industries volume of the Eleventh United States Census as a basis for an estimate, the capital invested in these mines was approximately $80,000,000 on which an interest charge of 6 per cent would be $4,800,000, making the total expenses chargeable against the tonnage $30,770,110, and the actual net profit to operators less than $2,000,000. If we apply the same averages to the total bituminous product of 1895, it will be seen that out of $115,779,771 received for coal there was paid out for mining coal $66,688,160, and the total expenses about $104,000,000. Interest charges, based on a capitalization of $320,000,000, would bring the total charges up to $123,200,000, more by $7,500,000 more than the amount received. Leaving out the item of interest charges, there remains, after paying the other expenses, a balance of $11,780,000 as the income of an invested capital of $320,000,000, a little more than 3½ per cent. It is not contended that these estimates are absolutely correct, but they are sufficiently approximate, as when taken in connection with the statistics of production and the review of the industrial conditions in the earlier pages of the report, show that the bituminous coal mining industry throughout the United States is not one of lucrative returns at the present time Over production and sharp rivalry among competing districts are the causes leading to the result."

Some figures of the production and consumption of mica in the United States will be of interest. From 1880 to 1885 the product of that country ranged in value from $127,825 in 1880, to $368,525 in 1894, the average the average exceeding $240,000 in the six years. The imports ranged in the same period from $5,175; in 1882 to $28,600 in 1885, averaging less than $15,000; while for the eleven years preceding 1880 the average annual imports were but little more than $3,000. From 1890 to 1895 the total importations show a total valuation of $970,552, an average for six years of $161,759, while the domestic product averaged only $78,691 a year, less than one-half the imports, whereas, ten years previous, the domestic product was sixteen times the imports.

The asbestos product of the United States in 1895 took a decided step forward. This was due to the increased production at the mines of the Sall Mountain Asbestos Co. at Santee, White Co., Pa. During 1894 these mines were developed and produced 250 tons of fibre. In 1895 the product was 700 short tons. In addition to this California contributed 90 tons and 5 tons were mined in South Dakota. The promises of good supplies of asbestos from Oregon and Washington were not realised.

As is well known Canadian Asbestos is of superior quality, strength, elasticity and fineness of fibre to any other known. The supply is unlimited and mining operations are carried on in Quebec on modern scientific principles, so that for many reasons the Dominion has almost entirely superseded the Italian in British, European and American markets. From 1879 to 1895 the production from the Quebec mines amounted to 72,921 tons, of a value of $5,284,516, and the principal operators have all earned handsome returns on their investment.

It would seem that we are still far from reaching anything like finality in our discoveries with regard to steel. If the announcement which Mr. Hiram S. Maxim has made in his communication to "Engineering" is well founded, then there is every probability that we shall soon be in possession of a steel which, for hardness, seems to rival the diamond. Mr. Maxim tells how his youngest brother, Samuel, experimenting in a small unpretentious way at his home in the State of Maine, has succeeded in producing some small quantities of steel of remarkable character. He has made drills that cut a clean hole through a hard file. Steel hardened so that it cuts glass has been drilled with the greatest ease. No one, so far, has been able to produce a piece of steel which he cannot drill.

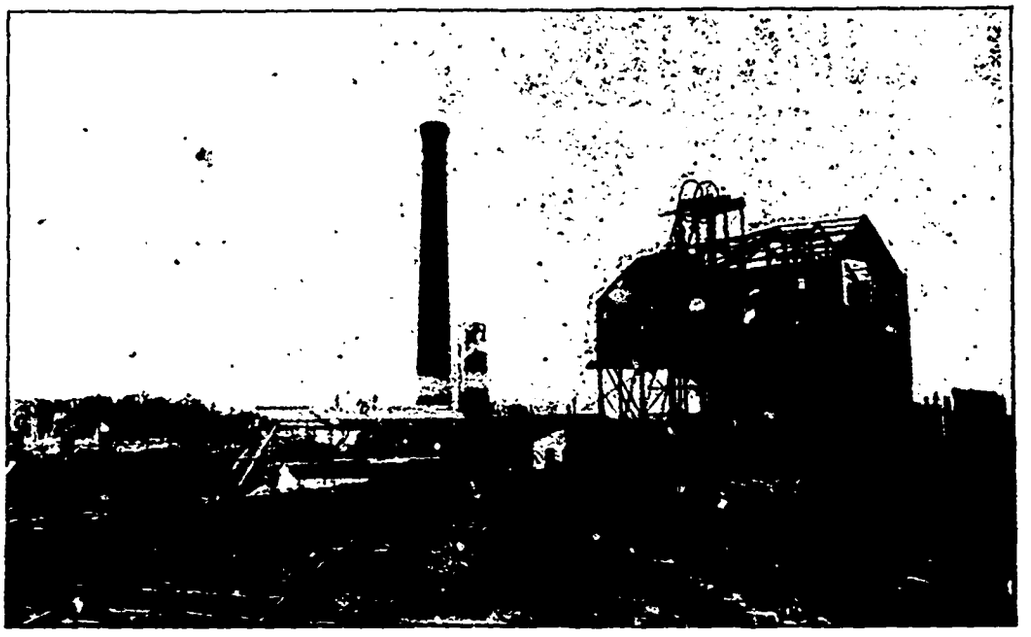


Cariboo Hydraulic Mine. Ingot of gold after melting.

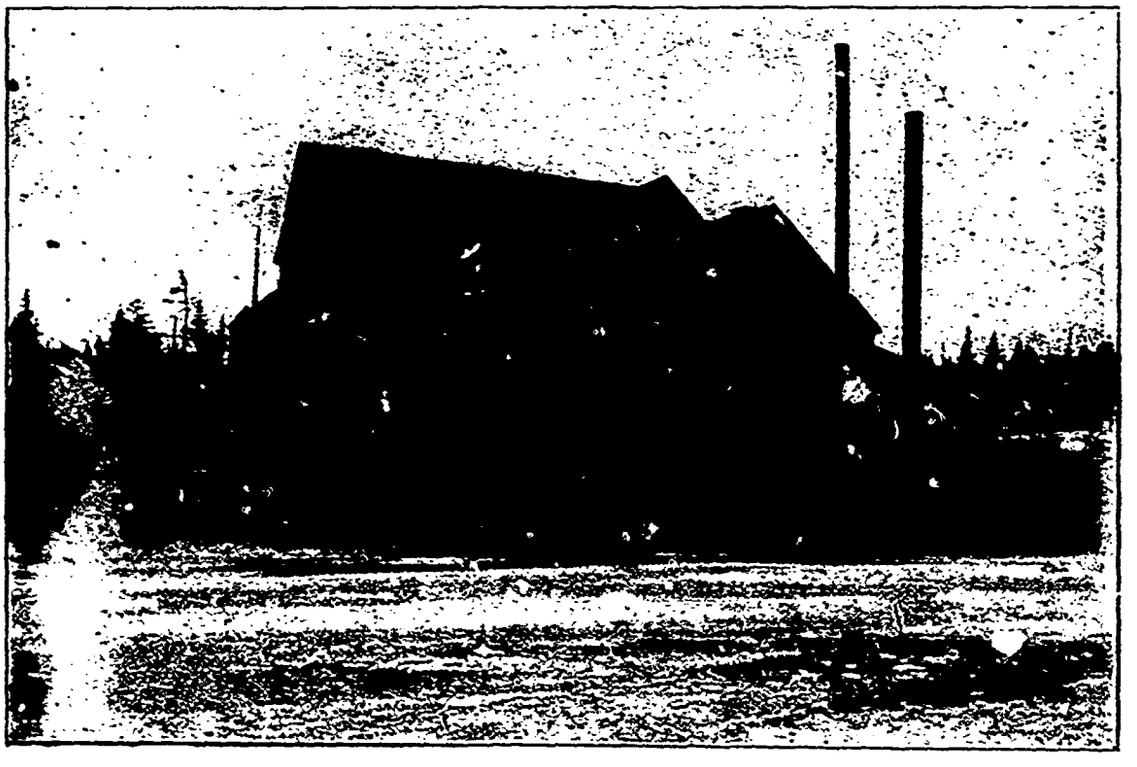
Cariboo Hydraulic Mine. Cakes of retorted gold before melting.

Canadian Copper Co.—Roasting Nickel Ore at Copper Cliff, Sudbury, Ont.

Canadian Copper Co.—Pile of Nickel Matte at Copper Cliff Mine, Sudbury, Ont.



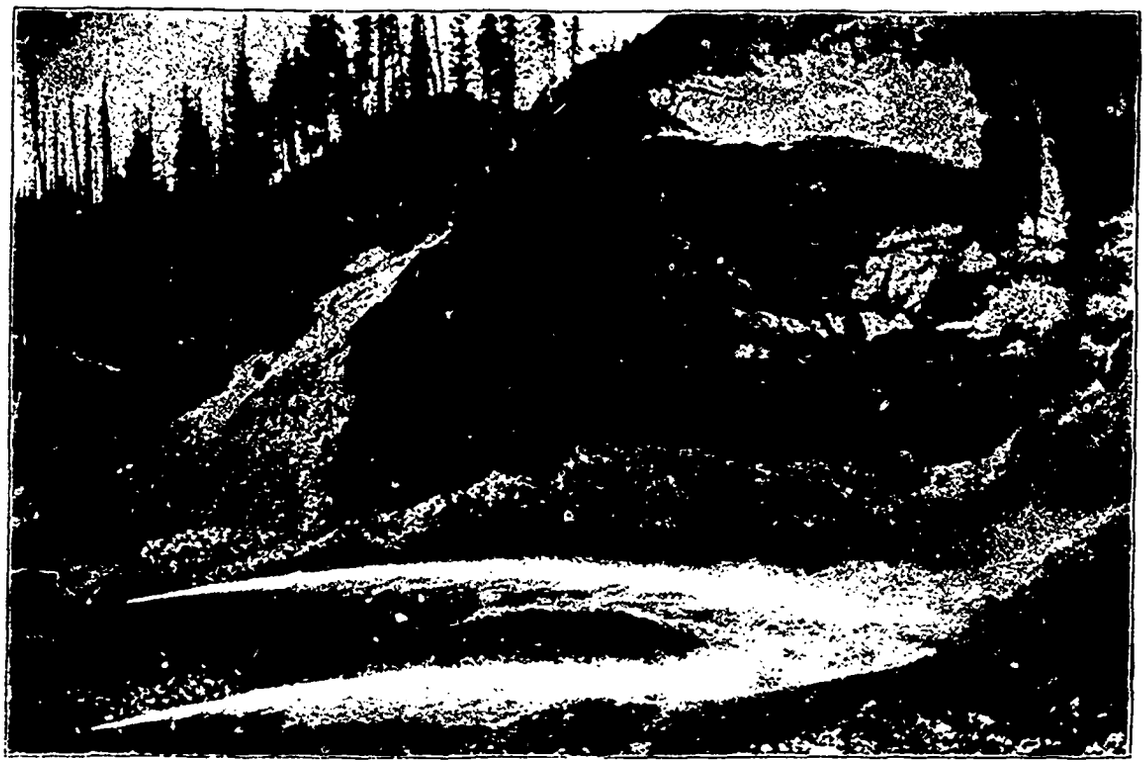
Dominion Coal Co. Ltd. Caledonia Colliery, Glace Bay, C. B.



Richardson Gold Mine. 40-stamp mill at Country Harbor, N. S.

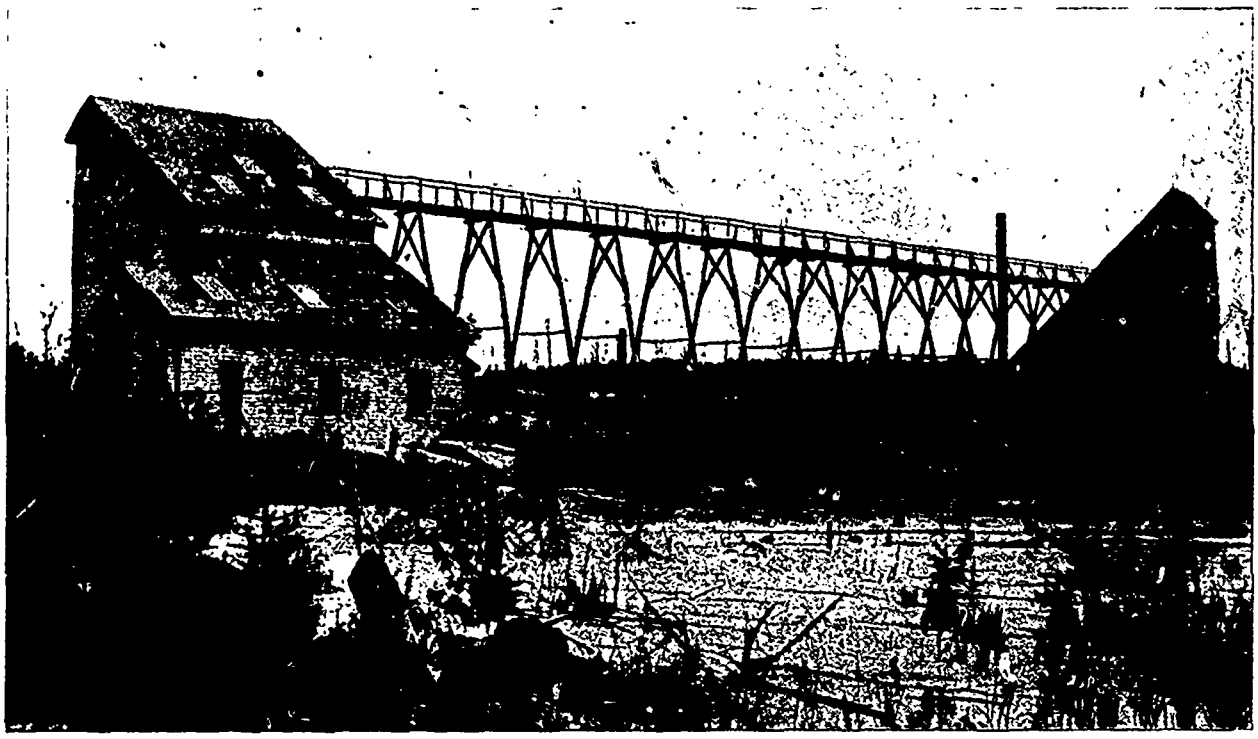
Cariboo Hydraulic Mine. Giants discharging 2000 miners inches of water in No. 1 Pit. August, 1896.

Quesnelle River, B. C., looking west from Quesnelle Falls Bridge.



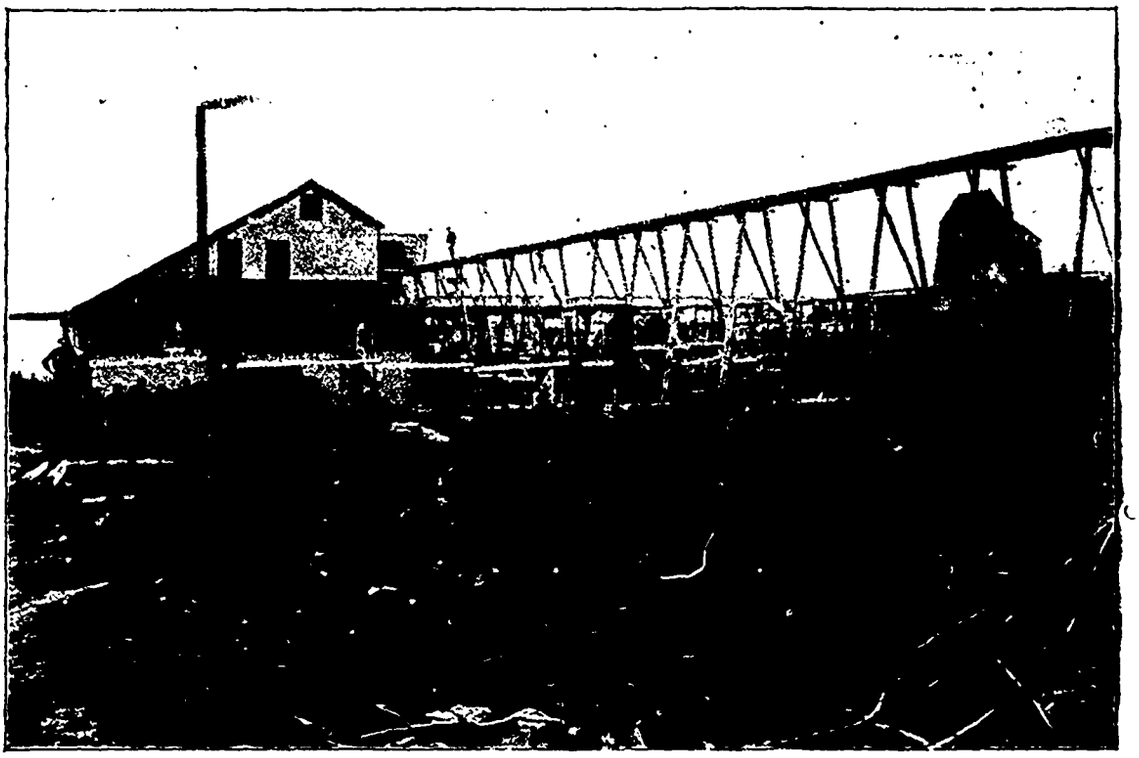
Cariboo Hydraulic Mine. Giants discharging 2,700 miners inches of water. Pit No. II. August, 1896.

Cariboo Hydraulic Mine. Monitors at work in No. I Pit.

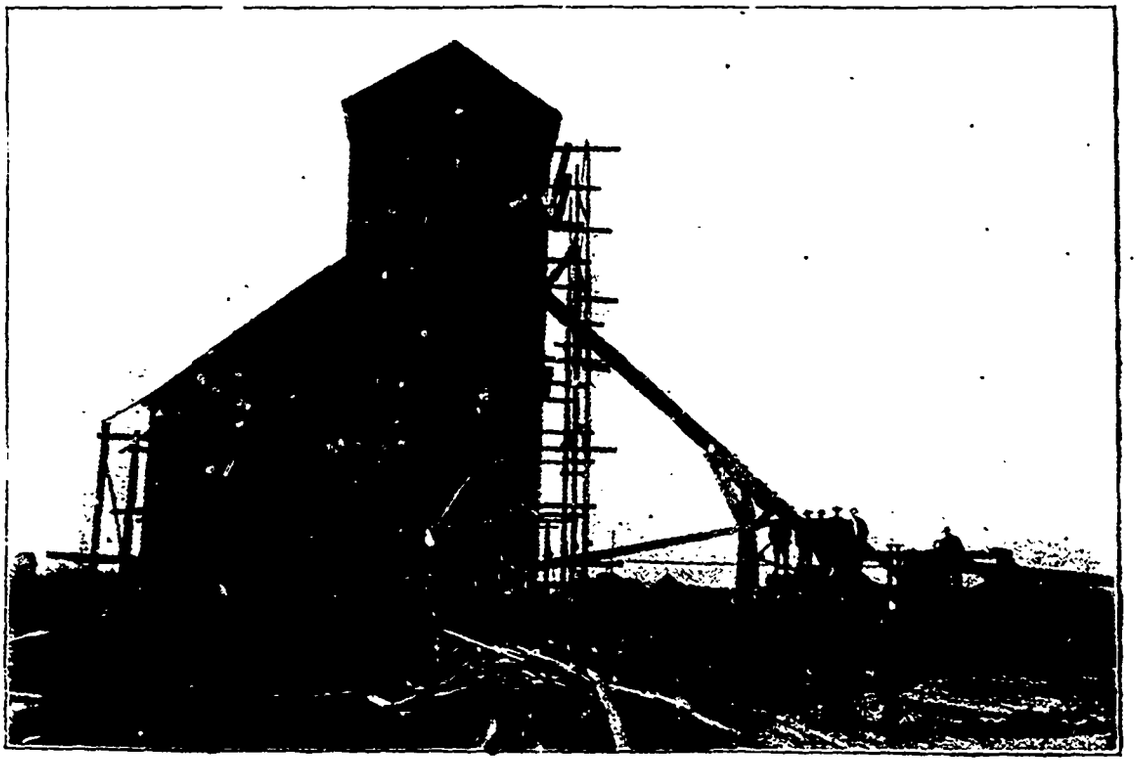


Lake Lo-le Gold Mine. Sander's New Mill and Shaft House.

Dominion Coal Co. Lt'd. Dominion No. 1 Colliery, Cape Breton.



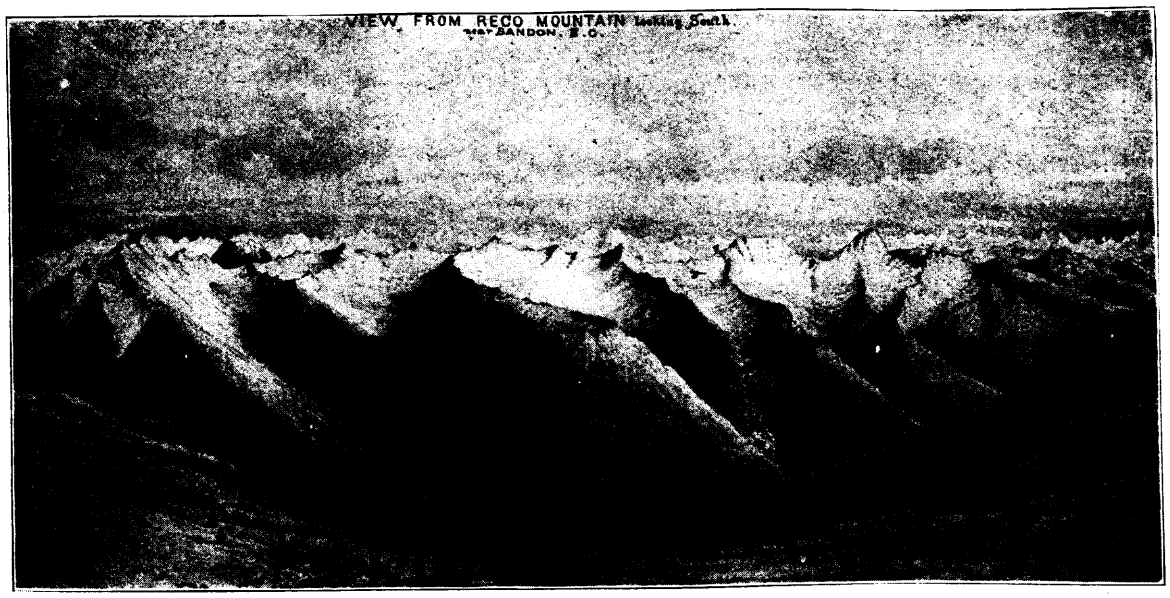
Bluenose Gold Mining Co. New 20 stamp mill, Goldenville, N. S.

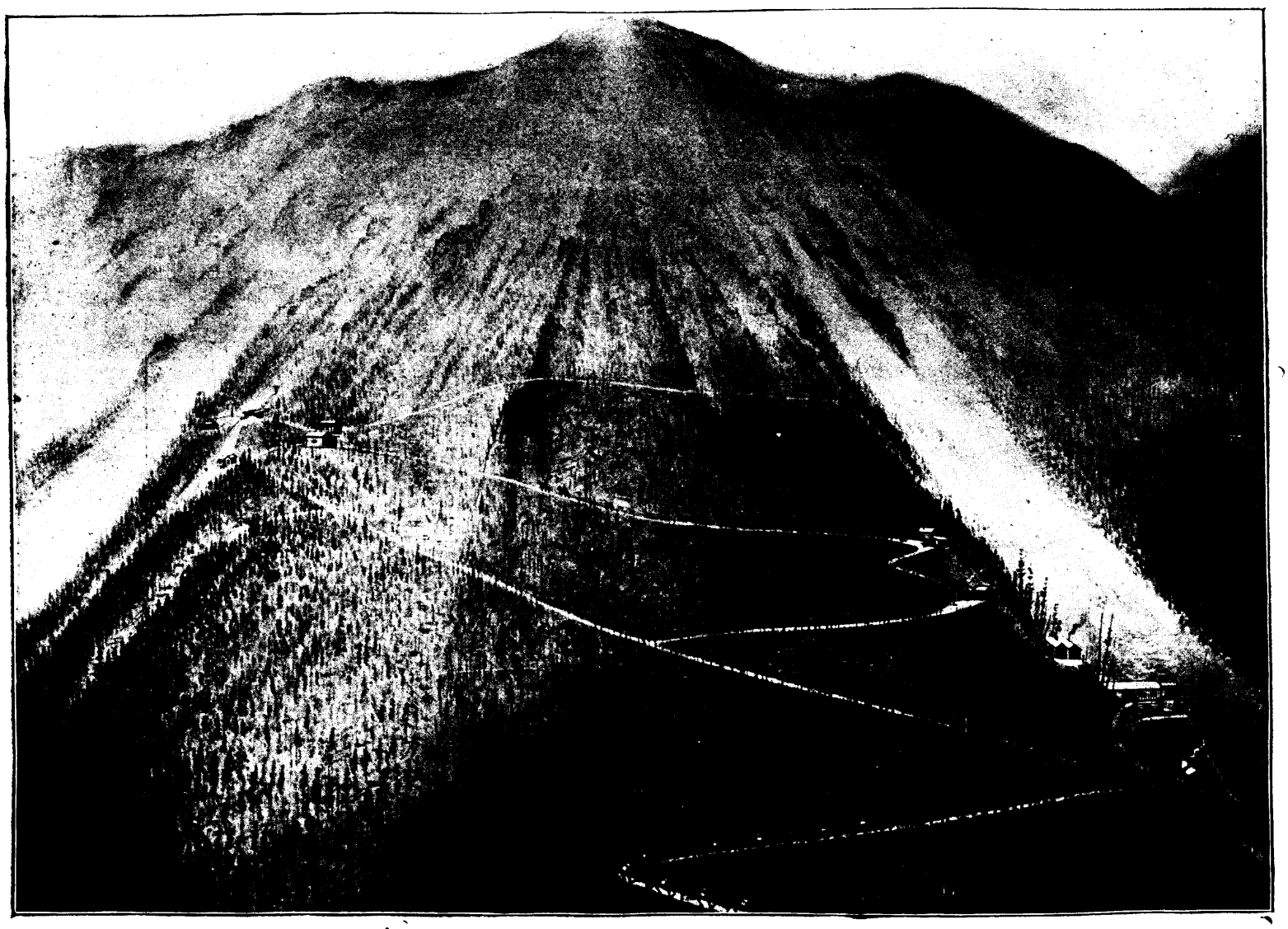


Bluenose Gold Mining Co. Shaft House, Goldenville, N. S.

SLOCAN SILVER MINES, B, C.

View from Reco Mountain looking south, near Sandon, B. C.





1. Noonday Group.
2. Freddie Lee.
3. Ivanhoe.
4. Canadian Group and Adams Group
5. Slocan Star.
6. Rabbit Paw.
7. Ruth.
8. Wonderful.
9. Carnation, Read and Tenderfoot.
12. Queen Bess.
13. Alamo and Idaho.
15. Town of Sandon.
16. Deadman.

16 x Noble Five.

17. American Boy.
18. Last Chance.
19. Cody.
20. Chamber's Group.

Coal Cutting by Machinery.

(Continued from December Number.)

By W. BLAKEMORE, Vice-President of the Mining Society of Nova Scotia.

INGERSOLL-SERGEANT MACHINE.

This machine is illustrated in perspective in Fig. 4 (Plate XIII.) and in detail in Figs. 5, 6, 7, 8, and 9 (Plate XIII.).* Another view (Fig. 10, Plate XIII.) shows the position of the machine when shearing, or cutting vertically. The Ingersoll-Sergeant machine weighs 750 pounds. The cylinders are 4 inches in diameter and 11 inches stroke, and with a pressure of 80 pounds per square inch, the normal speed is 200 strokes per minute. This machine comprises a reciprocating drilling-engine, mounted upon a pair of wheels to enable the cutting tool to operate in horizontal, vertical, and oblique planes for under-cutting and for cutting around parts of coal, to facilitate the transportation of the machine from point to point, and to enable the direction of the cutting to be determined by the operator to produce any desired results.

The wheels upon which the drilling-machine is mounted, together with their mountings, are so constructed that their axes may be shifted longitudinally along the machine in order to balance its weight, and thereby facilitate its manipulation by the operator, as for example when a shorter or longer tool or tool-holder is employed. It also comprises an extension tool-holder with means for attaching and adjusting the handles by which the machine is manipulated.

The improved mining machine also comprises a novel construction and arrangement of valves for controlling the ingress and egress of the steam, air, or other fluid by means whereof the piston is propelled. The valves are duplex, and operated to open and close the steam and exhaust-ports entirely independent of the motion of the piston, so that, even with the pick stuck in the coal, the valves would move and continue to open and close the ports of the engine, and a slight jar of the machine by the operator would free the pick and permit it at once to resume operations. An important advantage incident to the improved valve-motion is due to the fact that the travel of the valves is independent of the length of the stroke made by the piston. When the machine is moved up close to the work in commencing the cut, the stroke of the piston is very short, and the valves and piston may be caused to operate more rapidly and accomplish more strokes in a given time than would be the case if the valves and piston had to wait for the complete revolution or movement of some impelling mechanism.

The cylinder of the drilling machine is provided with the usual ports at the opposite ends of the cylinder, and also with an exhaust-passage. To the outer end of the main cylinder is attached a supporting or guide sleeve (front-head), provided with cuts at its outer extremity, and with clamping bolts (front-head bushing-bolts) passing transversely through the divided portion for the purpose of contracting them and securing a bushing (front head bushing). The piston rod works through suitable packing in the forward-end of the cylinder, and is made long enough to project beyond the end of the sleeve (front-head) when fully retracted. At the forward-end of the cylinder is placed a buffer of leather of such construction as to form an air-cushion for the piston. The projected extremity of the piston-rod is tapered, so as to fit into a corresponding taper in an extension which is held in place by means of a wedge (extension-key); the outer extremity of the extension is adapted to receive the shank of the pick, which is secured in position by a wedge (pick-key). The extension may be made tubular for lightness and portability, and may be made in various lengths to adapt itself to any desired work or position. By reason of its extremely simple adjustment it can be readily attached or detached.

*The following references describe Figs. 5, 6, 7, 8, and 9:—1. Cylinder. 2. Piston (long). 3. Piston (short). 4. Extension. 5. Extension key. 6. Pick. 7. Pick key. 8. Front head (long). 9. Front head bushing (long). 10. Front head (short). 11. Front head bushing (short). 12. Front head bushing bolts. 13. Cup leather. 14. Cup leather washer. 15. Side rods and nuts. 16. Back head. 17. Back head buffer. 18. Back head buffer plate. 19. Front head washer. 20. Front head filler. 21. Cup leather washer screw. 22. Wheel. 23. Wheel trunnion. 24. Wheel trunnion bolt. 25. Wheel trunnion washer. 26. Wheel trunnion washer stud and nut. 27. Valve. 28. Valve chest. 29. Valve chest bolt. 30. Valve chest head. 31. Valve chest head bolt. 32. Valve plunger. 33. Valve seat. 34. Regulating screw. 35. Regulating screw gland. 36. Piston ring. 37. piston ring spring. 38. Handle. 39. Handle bolt. 40. Socket wrench. 41. Throttle valve. 42. Front head cushion.

The piston-rod is provided with eight straight grooves engaging in similar projections in the end bushing for the purpose of preventing any undesired movement of the piston and pick. The improved pick is in the form of a tapering chisel, the end of which is provided with a V-shaped notch, having a sharp edge, and cutting points. This form is very easily sharpened and would remain sharp and do more work than the thin sharp edge frequently used.

The carrying-wheels (wheels) on which the machine is supported have adjustable trunnions (wheel-trunnions) upon which the wheels are mounted. The increased size of the axes of the carrying-wheels is intended to develop friction between the wheels and their axles, and thereby add stability to the machine when in operation—that is, the recoil of the machine at each blow is opposed to the friction between the wheels and their axles, in addition to the inertia due to the weight of the machine, thereby diminishing the recoil and increasing the effective force of each blow.

On each side of the central portion of the cylinder an extension is formed, provided with a transverse slot or recess, leaving a narrower exterior opening, shoulders being formed by the front inner walls of the slot. The slot has a downwardly extending opening through which is inserted a short-headed bolt, the head of the bolt being retained in the slot by the shoulders, and the bolt is capable of longitudinal movement. The inner end of the trunnion fits against the projection on the cylinder against which it is firmly held by the bolt which passes through it, and it is provided with a locking-nut at its outer extremity, which bears against and holds the trunnion firmly in position. The trunnion is further provided with smaller projections, which extend to the outer portion of the slot on each side of the bolt to prevent the bolt from dropping through the downward opening while being adjusted. To adjust the wheel with respect to the weight of the machine the nut is loosened, and the bolt can be moved longitudinally in the slot, carrying with it the wheel and trunnion, which latter is firmly locked in the desired position by tightening the nut.

The steam-chest is formed with a lateral extension forming longitudinal apertures to receive the shanks of the handle. The openings in the projections are formed by cores when the steam-chest is cast, and are sufficiently large to receive the shanks of the handles. The handles are secured in position by the toe-bolts (handle-bolts) which are inserted from below into the apertures for the handles and project upwards through the extensions, where they are fitted with screw-threaded nuts. The attachment of the handles is extremely simple, it being only necessary to loosen the bolts, then adjust the handles, after which a few turns of the nut will draw up the toe-bolts (handle-bolts) and firmly lock the handles in position.

The valve (Figs. 11, 12, and 13, Plate XIII.) comprises two air-driven piston-valves *l*, *m* (valve-plunger), whose end-portions work in single-acting cylinders *N O*, *N' O'*, formed in the ends of the steam-chest *J*. The central portions of the pistons *L*, *M* are considerably reduced in size in order to allow of the free passage of steam or air around and between them to the main auxiliary set of ports 1, 2 located side by side transversely to the central portion of the steam-chest, and both are of the same external dimensions so as to render the valves interchangeable if desired. For convenience in construction, the steam-chest consists of two parts: the valve-chest which contains the pistons *L*, *M* (valve-plungers), and the valve-seat in which the ports are formed. The pistons *L*, *M* are each provided with a slide-valve moving upon and controlling the two seats of the ports 1, 2.

One series of the ports comprises inlet-port *P*, exhaust-port *Q*, and inlet-port *R*. The port *P* communicates by passage *P'* with inlet-port *p*, located on the opposite side of the steam-chest, and extending into the cylinder *O*. The port *R* also passes across the steam-chest by passage R', issuing at the outlet *r* into the cylinder *O'*. The exhaust-port *Q* extends laterally to the exterior, and adjustable throttling-valves, regulating-screws *q'*, *q''* are provided for increasing and diminishing the area of the exhaust-passages, and of the ports *P*, *R*, thereby controlling the speed of movement of the valve actuating-pistons (valve-plungers).

The second series of ports comprises *a*, *a'* leading to the respective ends of the main cylinder, and the exhaust-port *B*, leading to the exterior of the machine. From the port *a* extends an auxiliary passage 3, which crosses the steam-chest and issues at the opening 4 into the cylin-

der *N'*. From the port *a'* extends a similar passage 5, which likewise crosses the steam-chest, and issues at the opening 6 into the cylinder *N*. The valve-actuated passages just described are smaller than the main ports, being about one-third of their area.

When the valves are in position, the compressed air in the chest will find passage alternately through the ports and passages shown, which will cause them to move alternately and independently of the movement of the main piston, so long as air is supplied and the exhaust-port *B* is open. The passages cross each other without communicating, as shown in Fig. 11, each piston being alternately the valve of the opposite one, and their speed can be regulated by throttling the ports *P*, *R*, to a greater or less extent.

The specific operation of the valves in the position shown in Fig. 12 is as follows:—Piston *M* being in its forward position, the piston *L* will exhaust through the passage 5 and receive air at its opposite end through the passage 3. Simultaneously the piston *M* will receive steam through the passage *P*, and exhaust through the passage *R*, and so on as long as steam or air is supplied.

The Ingersoll-Sergeant machine has been used with highly satisfactory results in the different mines, first, for driving headings at the Dominion No. 1 mine in the north deeps, whilst the Stanley header was working on the south side, and although, of course, the rate of progress in the initial stages was much slower, it was found as a matter of fact that the deeps were completed for a given distance just as quickly as on the south side, and at less cost. The reasons are obvious: the percussion-machine, not being confined in any rigid position, could be humored to suit the varying conditions of work, and so handled as to avoid difficulties that hampered both the Stanley header and the longwall machines; *e. g.*, the water could be avoided by cutting a little higher up the face of the coal, and leaving a shallow bench to be afterwards wedged up; an irregularity or roll in the pavement could be negotiated in a similar manner; a stone or layer of pyrites could be cut around and dislodged; and then the greatest advantage of all—the road could be driven the full size from the commencement, and completed day by day.

The deeps were driven 12 feet wide and 7 feet high. The maximum rate of progress was 90 feet a week in each road, working three 8 hours' shifts; the average rate being about 80 feet. This speed would have been exceeded, but the wide heading in so thick a seam yielded a large tonnage, say 10 tons to the yard, and it was not possible to remove this quantity as rapidly as it could be cut and blasted. As fast as the deeps were driven down, rooms were broken off, and, by the time they had reached the present limit of 2,000 feet, working-places were ready from the top of the deep to the bottom. The same process was repeated on the south levels, affording at the end of one year from the commencement of driving to the deep of the shaft, 3,500 lineal feet of workings, 75 rooms, and an output of 1,000 tons per day; the whole being opened out and mined by the machinery which has already been described.

Mode of Operation.—The writer will now give an account of the method of handling and working percussion-machines, and the same description applies equally to the three varieties mentioned.

The machine, if the pavement be hard, can be dragged from room to room on its own wheels by means of a rope, and, if the grade does not exceed 1 to 12, two men can compass this. If, however, great expedition is required, or if there be a sufficient number of machines working in any one section, it is more economical to have them hauled round on a low truck by a pony; one pony and a boy will attend to twelve or fifteen machines. The machine, board, hose, and fittings can easily be packed together, on one small truck.

Under-cutting.—Each machine works on a flat board, 6 feet long by 3 feet wide, which should be substantially made of pine or other hard wood, 2 inches thick. This board is set endways to the face and the back-end is raised, so as to give the board a pitch towards the face of, say, 3 inches in the yard. The machine is then dragged on the board and a length of pliable hose connected from the nearest stationary air-pipe. The operator sits on the board at the rear of the machine, with one hand on each handle. He also, as a rule, wears an iron shoe over his left foot and places that behind the left wheel, leaving the right leg across the board. The air is then turned on, and the piston makes a stroke on the face of the coal, which causes the latter partially to give way and the machine partially to recoil, but its own weight and the sloping grade of the board carry it to the front again, and so the process goes on—the machine doing all the cutting, the man simply steering it. When the under-cutting is finished, the same machine can be used, if desired, for shearing; all that is necessary is to take off the ordinary wheels and put on a larger pair, proportioned to the height of the seam. In the 8 feet seam, it was found by using wheels 32 inches in diameter and a rather longer pick, that a clean shear could be made to the top.

Drilling.—Following this, the Jeffrey borer comes along in charge of two workmen, who with one drill do the boring for twenty rooms, that is, two holes in each room, each 5 feet deep. The actual time for boring each hole with one change of drill is two minutes; the rest of the time is consumed in moving the drill from room to room, and in setting up the machine.

Blasting.—The coal being undercut from rib to rib, and sheared in the centre, the two boreholes are put in as near the ribs as possible, and blasting follows. Often the coal comes down practically in two large blocks, with very little small, and then the work of cleavage is heavy, the rooms being from 20 to 22 feet wide. The coal is now ready for loading, and the writer need not follow the process further. There are, however, three important points on which he knows reliable information will be valuable to the members.

(1) *Proportion of Slack.*—An important question arises as to the proportion of slack made by the machines as compared with hand-labor. To illustrate this matter, the writer appends a sketch (Fig. 14, Plate XIII.) which shows in section the space cut away by each method in the same seam. This drawing is made from actual measurements and represents in each case a fair average result. It will be seen that there is a saving of coal in favor of the machine of about 40 per cent., *i. e.*, the machine makes 40 per cent. less slack than hand-labor, and the reason is obvious: the workman requires more room underneath after the first cut to swing his arms and pick, than the machine to drive its cutter.

(2) *Quality of Coal.*—The machine has no effect on the quality of the coal produced, if ordinary intelligence and skill be used in directing it, and especially in taking the cut clean up to the rib, and making it a little deeper there than elsewhere, so that when the shot is fired, it will fall readily.

(3) *Amount of Work.*—In making an estimate of the amount of work performed as compared with that done by hand-labor, it is necessary to remember that the general arrangements are totally different for the two systems. In the case of the machine, the operator does nothing else but attend to his machine, and he has a helper to rake away his cuttings, and help him generally. This keeps the machine profitably employed all the time, In the case of hand pick-work, the workman performs all the processes of cutting, shearing, blasting, loading, and timbering. Confining the estimate, however, exclusively to the under-cutting, the writer finds that an average day's work for a hand pick-man is about 50 square feet, and for a percussion-machine about 200 square feet; although a good workman can under-cut 300 square feet, and in the special test referred to, the three runners averaged more than 500. These figures show the actual capacity of the machine, but in average working it is safe to assume that when once the workmen have become accustomed to the use of the machine, they can comfortably manage from 200 to 300 square feet.

The writer appends a statement showing the details of the result of the special test, which excited great interest, and established a record for this class of work.

TABLE I.—SHOWING THE AREAS OF COAL UNDER-CUT AT THE DOMINION NO. 1 MINE, DURING THE SPECIAL TEST IN AUGUST, 1895.

Name of Machine.	Under-cut.	Full Days.	Cut. Per Day.	Hours Worked.	Cut. Per Hour.
	Sq. Feet.		Sq. Feet.		Sq. Feet.
Ingersoll-Sergeant	6,038	11	549	97	62·24
Yoch	5,929	11	539	99	59·88
Harrison	4,940	11	440	99	49·89
Totals	16,907	33	1,528	295	172·01
Average	5,635	11	509	98	57·30

(4) *Physical Effects.*—The question has often been asked, as to whether working with the machine is harder for the workman, and as a rule it has been presupposed that the reply would be in the affirmative. The writer has, however, no hesitation in stating that after the first month the work

is decidedly easier, being less exacting than hand pick-work, and as a matter of fact when workmen have once learned how to manage the machine they will not give them up on any account. When they were first introduced in Cape Breton, every one was opposed to them—not a workman would look at them. Experts had to be imported to start them,and instruct the workmen. That was two years ago; to-day there is not one expert left. There are now workmen who can cut more coal than the experts did when here. There are more applicants than machines, and last year the machines under-cut 226,000 tons. This statement marks considerable progress for so short a time, and speaks well for the popularity and efficiency of the machines.

YOCH MACHINE.

The writer has dealt at considerable length upon the construction, capacity, and method of working of the Ingersoll-Sergeant machine, because, as previously stated, it is fairly representative of the three machines of this type under consideration. There are, however, several special features about the Yoch machine (Fig. 15, Plate XIII.) which will repay attention, and which the writer would now like to point out. He may preface a detailed description of its construction by saying that the principal features are additional weight, larger cylinders, and the important factor that it cushions upon air instead of upon a leather buffer, as in the case of the other machines. This cushioning is effected by means of an escapement-valve, which allows a small quantity of the compressed air to reach the front of the cylinder in time to receive the piston. The advantages are considerable, as the air is elastic, and there is consequently less jar and vibration on the machine, to the advantage of the latter as well as of the workmen.

One of the first objections always raised to the Yoch machine is its additional weight, a matter of some 400 pounds greater than the Ingersoll-Sergeant or Harrison machine. This necessitates a horse for moving it round from room to room; but there are compensations: (*a*) although heavier it is just as easy to steer; (*b*) having larger cylinders, and being somewhat more compact, and altogether stronger in construction, it strikes a heavier blow; (*c*) it is, the writer is disposed to think, less liable to get out of order, and (*d*) there is less vibration.

When first introduced the workmen were opposed to it, and all were in favor of the smaller machines; but it is a singular fact that, during the last season, after trying one or two of the Yoch machines, they became very popular, and in a little while the whole of them were asked for and placed in the hands of workmen who had previously been working the other machines. This favorable opinion bears out a remark which the writer made above, to the effect that although the Yoch machine looks heavy, and suggests at first sight a necessity for a burly, strong workman to handle and move it, as a matter of fact it is not so in practice. The machine and not the man does the work, and any ordinary miner can handle one. It is, of course, as true in connection with coal-cutting as with anything else, other things being equal, that a big man is stronger than a little one; but speaking generally it is not true that a little man stands at any greater disadvantage in working a coal-cutting machine than in using a pick. In confirmation of this opinion, the writer may state that although the Harrison machine came out at the bottom of the list in the special test referred to, this position was due entirely to a defect in the machine which was not discovered before the test began, but it has since been remedied. This machine was worked by a man who weighed less than 150 pounds, but who was able to cut an average of 440 square feet per day; and two workmen, who only learned to operate the machine in 1894, are the best cutters in the Dominion mines, and neither of them weighs over 160 pounds.

The Yoch mining machine is of heavy solid construction, the main cylinders being 24 inches long by 6 inches in diameter. The piston-head is made of grey cast-iron, four packing-rings are sprung on, closely fitting to the walls of the grooves cut in the head to receive them. The rings are cut, so as to allow them to expand outwardly and make air-tight joints between the bore of the cylinder and the periphery of the packing-rings; thereby preventing any leakage of air from one end of the cylinder to the other, and securing the full power of the air-pressure upon the area of the cylinder-bore. The piston-rod is 3¼ inches in diameter on the rounded portion, and 2½ inches square on the guiding or square portion. It is fitted with an ordinary stuffing or packing-box and gland to ensure absolute prevention of leakage, and is easy of access for the insertion of packing. The rod has a range of stroke from zero to 16 inches, and can be instantaneously adjusted by means of the regulator to any length of stroke desired, within those limits, and that without changing the position of the throttle-valve.

The guiding-sleeve, or front-head of the cylinder, is 32 inches long, and is constructed in one piece, securely connected with the cylinder. This sleeve is cut longitudinally on opposite sides of the front-end to receive cast-steel gibs, used for the purpose of holding the piston-rod in its true position in the centre of the bore of the cylinder, and the inside surface of the gibs coming in contact with the piston-rod is planed so as to act as a safe and reliable guide for the rod during its active operation, and to prevent any twisting tendency resulting from glancing blows on the surface or face of coal, which invariably occur. The sleeve, being slotted to receive the gibs, is bored out on the inside, and the outsides of the gibs are turned true, so as to fit the bore of sleeve, which is then held and clamped securely by means of four turned bolts.

This guiding gibs-system embracing the piston-rod for a length of 12 inches longitudinally, having a square bearing-surface to prevent too frequent wear which is noticeable on other piston-rods, with only 3 to 4 inches in length of bearing on the gibs, is clearly noticeable, and this long bearing with variable stroke of piston is appreciated as a repair-saving quality.

The machine under discussion is also equipped with self-acting automatic air-cushions to prevent the piston-head from striking the ends of the cylinder. Two check-valves, placed in both ends of the cylinder,imprison the air in the cylinder so as to make a soft springy cushion. They require no attention in repairs, unless, perhaps, a small piece of coal or pyrites becomes lodged between the check-valve and its seat, thereby preventing the proper action of the valve. This defect is self-apparent, as the next blow will strike the cylinder-head, and warn the operator of the trouble. The saving in repairs caused by this feature in a machine of this kind makes it stand a step far in advance of its competitors.

The writer will now examine the valve motion of the machine, and trace the action of air after passing from the air-receiver to the valve, and thence to the piston of the main cylinder. The main valve is driven by a separate single-acting reciprocating-engine, and is of the class known as side-valves. On the back wing of this valve there is a hub, 1¼ inches high by 1½ inches in diameter. On this hub is fitted a wing-valve,which works on the side of the air-chest, and acts as a cut-off valve between the air-receiver and the air or valve-chest. This cut-off valve is operated by a direct connection to the piston-rod of the small reciprocating-engine, and is connected by a pitman-rod which drives the main crank; this crank has an eccentric key to it, and this operates the small-engine valve, thereby keeping up a continuous motion. The forward stroke of the small engine-piston propels the cut-off valve; this in its connection carries along the slide-valve, and when the slide-valve is opening the cut-off takes place. It will be observed that the air-chest is charged with the full air-pressure, and then cut off. The main valve then opens, and has got a sufficient supply of air to complete the stroke by expansion. This method of using the air is similar to that of measuring out each particle necessary to execute the labor required, and at the end of each completed stroke the terrible recoil which other machines of this class possess, is greatly reduced. It enables the operator to use more power (assisted by the weight of the machine, 1,200 pounds), and at the start of the blow, utilizing the sudden speed attained by the piston, assisted also by the imprisoned air in the main cylinder, cushions, and is then cut off after having advanced seven-twelfths of stroke; the balance of work being performed by expansion.

It has been found expedient to use the full power of the machine in mining, and in order to be able to handle the same, without the recoil jarring the operator so severely as to call forth protest, and eventually condemn the tool, the inventor saw plainly that, instead of decreasing the power of the machine, it was necessary, by auxiliary mechanism, to control and use the full power, and overcome the inconvenience which recoil and jar would cause to the operator. Hence, he introduced a novel and useful feature: an air-brake which operates automatically upon the right-hand wheel of the machine. This brake applies itself to the wheel only on the outward movement of the piston, and is so accurately adjusted that it times itself to each blow of the pick upon the surface or work operated on.

To be continued.

Meeting of the Mining Society of Nova Scotia.

OFFICIAL REPORT OF THE PROCEEDINGS AND THE PAPERS CONTRIBUTED.

A meeting of the members of the Mining Society of Nova Scotia of Nova Scotia was held in the Halifax Hotel, Halifax, on Wednesday, 16th ulto. Major R. G. Leckie, M. E., president, in the chair. The proceedings opened at 10:30 a. m., when there were present among others :

R. H. Brown, General Mining Association, Sydney Mines, C. B. ; Charles Fergie, M. E., Intercolonial Coal Co., Westville, N. S.; B. C. Wilson, Acadia Powder Co., Waverley, N. S.; Hiram Donkin, C. E , Dominion Coal Co., Glace Bay ; H. S. Poole, M.A.A. R. S. M., Acadia Coal Co., Westville ; C. H. Dimock, Wentworth Gypsum Co., Windsor, N. S.; D. W. Robb, Robb Engineering Co., Amherst, N. S.; C. A. Meissner, Londonderry Iron Co., Londonderry, N.S. ; Dr. F.L. Slocum, People's Light and Heat Co., Halifax ; A. A. Hayward, Golden Lode Mining Co., Halifax ; Captain Macduff, Waverley ; T. R. Gue, Acadia Powder C., Halifax ; C. E. Willis, Halifax Chrome Co., Halifax ; F. H. Mason, F. C. S., Halifax ; Hon. David McKeen, Dominion Coal Co., Halifax ; Charles Archibald, M.E., Baltimore Coal & Ry. Co.,Halifax; C. C. Starr, Halifax; G. E. Franklyn, Cunard & Co., Halifax ; Hon. J. W. Longley, Attorney General, Halifax ; M. R. Morrow, Dominion Coal Co., Halifax ; H. M. Wylde, secretary.

NEW MEMBERS.

The following gentlemen were duly elected members :

Geo. S. McAvity (McAvity & Sons), St. John, N. B. ; H. A. Drury (Imperial Oil Co.), St. John, N. B. ; John C. Oland, Halifax ; George W. C. Oland, Halifax ; Dr. F. L. Slocum, Halifax.

INTER-PROVINCIAL CONFERENCE OF MINING ENGINEERS.

A letter from Mr. B. T. A. Bell, secretary of the Federated Canadian Mining Institute, was read regarding the forthcoming Inter-Provincial Conference of Mining Engineers and mining men to be held in Montreal during the first week in February, 1897, and submitting a programme of business and papers for the occasion.

ADDRESS BY THE PRESIDENT.

Major Leckie : This being strictly a business meeting, I have not prepared an elaborate address. Seeing that the Legislature is going to meet before our annual meeting, I think it is very important that our Committee on Amendments to Mining Legislation should be preparing for the session.

Although our attendance is not very large we can congratulate ourselves on the quality. It is an inconvenient time of the year for those living outside the city.

At the present time mining is creating more interest over the world than any other industry. Nova Scotia is the only province in this Dominion which is taking no action in a public way. The Government and press seem apathetic. We ought to do something now to call attention to the resources of the province and more especially to the gold industry. The coal and iron industries are well represented here today, but I am sorry to see so few of our gold men. That is at present an exceedingly important industry. The governments of Ontario and British Columbia have engaged special experts to examine every new discovery and report. Our government has really done nothing in the way of examination of our mining districts since probably Doctor Hyne's report. The mining department is really the most important one in the government. It is the great source of revenue. Formerly the government published in the annual report a statement on the income and expenditure, but now the difference between income and expenditure is so great that the statement is omitted. The revenue is $265,000 or $270,000, and the government does little or nothing for the encouragement of the industry. Their only aim seems to be to extort from the hard working miner all they can possibly get from him. Legislation within the last few years has had a tendency more to influence the votes of a certain class than towards the development of the general mining industries of the province. It now, behooves the committee to meet in time, discuss these things thoroughly, and take a most active part in agitating for reform in the mining legislation. Our laws are the most illiberal in the Dominion. Many objectionable features exist in them through want of knowledge, though perhaps I should not say so. The department of mines requires at its head a man of the greatest intelligence and technical knowledge, and we should have the most active and energetic man that can be found.

NOTES ON SOME COMPARISONS BETWEEN SOUTHERN AND NOVA SCOTIA IRON METHODS.

MR. C. A. MEISSNER.—In presenting this paper before you to-day it is necessary that I should preface it with an apology, in so far as it hardly appears to me as finished and complete as such a paper should be when read before a society composed of the best industrial minds of the Maritime Provinces. My excuse must be lack of time, as the departure of our managing director for Europe has thrown a large amount of additional work upon me. I trust therefore you will overlook any shortcomings in this sketch of comparisons between Southern and Nova Scotia iron methods.

The subject is perhaps one of peculiar interest, in so far as there are many conditions in the iron industry of these two sections of this continent that are strikingly similar in many of their prominent features, and yet for the present, at least, present very dissimilar results in many instances ; some of these are of a nature that can and ultimately will be obviated or changed, while others are permanent and inherent to race and natural characteristics of the two sections, and I feel our endeavor should be to gradually change our conditions to such a degree so as to more closely meet the extremely low priced southern irons with their peculiar natural advantages. This should not only refer as to prices but also as to quality, and I will discuss these two points.

The subject is, I think, of interest to nearly all our Maritime Province industries in so far as we are largely producers of raw material, while on the other hand our finished industries are steadily forging ahead and demand for their fullest development that we should present the raw materials to them at the cheapest possible price and of the best possible quality. It is perhaps needless to state that the producers and consumers of raw materials in any section of country are bound to each other by strong commercial ties, and are one a protection to the other, for the moment you remove or cripple one, the other is forced to seek for its market or its supplies outside of its natural invironments, and the result is that either is sure to be taken advantage of in such case by such outside sources of market or supply ; that is simply a natural characteristic of "human natur," as your inimitable Sam Slick puts it, and hence must be taken into consideration whether in individual or national matters of business or trade ; the nearer therefore that the raw material manufacturers can come to the more favorable conditions of any extraneous trade sections, the more willing will they find the consumers to support them, the greater facilities do they offer to their section for the expansion of such finished manufactures, and the more prosperous does the section become, for I might state that I have always been a firm believer in the principle of patronizing home industries wherever you may be, on anything like equal conditions and deprecate the feeling expressed in the old proverb that "A prophet is not without honor except in his own country," and I might venture to

say that there is perhaps still quite a strong feeling in the Maritime Provinces to look outside for their requirements rather than in their own midst, thus adding to the difficulties of their manufacturers. This is perhaps natural in one way as the manufacturing industries are comparatively young, and the whole tendency of former generations has been to go outside for all such supplies, but certainly manufacturers in the Maritime Provinces are now well able to meet almost any reasonable requirements, and it would facilitate their efforts towards the material progress of the provinces if their citizens could shake off that feeling of dependence on outside sources, wherever the home manufacturers are prepared to supply them. I do not think that they as yet give full credit or fully realize the importance to them of the great Industrial system of which you here are the representatives, and for which you are putting forth your utmost endeavors. There is, however, I think, a gratifying progress and change of feeling being noticable on this matter in the last few years, which will ultimately lead to a full realization by a large majority of the fact which is all important in this effort to improve the material progress of the provinces, that of every dollar spent at home a large portion is bound to come back directly or indirectly, while every dollar spent abroad is an absolute drain on the country ! While this may be disputed by some, yet I think I can safely say that to any student of national economy this is an absolute fact.

As against all this it may be urged that Canadian manufacturers were not able to furnish either raw material or finished product as cheaply or as well as other sections can; as before said, this may have been true formerly, but certainly has not been true of later years, and in manufacturing industries, when once the impetus has been given, their forward progress increases relatively very much more rapidly after they have once obtained a foothold, and it is only ignorance of industrial conditions that would permit of taking the stand that because any new industry has languished for a number of years it is bound to be unsuccessful, or that conditions are naturally against it; take your industry here and compare it with the Southern, and look back to the number of years that the Southern Iron Industry languished, was pronounced a failure, was practically abandoned except by a few persistent far-sighted men, who, realizing the truth of above statements, clung to it and finally brought it out to its present large dimensions and its enormous advantages to its own section of country, and I do not hesitate to say that some of your industries in special lines are now far ahead of some of theirs. You have here the same experience to go through, and from what I have seen and studied of the progress of the last few years, it appears to me that the industries here are decidedly on the upward trend and have obtained that foothold from which,if not checked, their forward progress is likely to be as rapid, with the advantages of greater diversification than the Southern industrial system.

You will pardon this digression, yet it was made in view of the enormous strides made by the Southern industries, especially raw material, which have not only built up industrially a large portion of the United States but have also furnished to the general consumers of the country an article, that through its low cost and good quality has been a most potent factor in stimulating its iron industries.

Roughly speaking the average cost of Southern iron is about $4 to $5 cheaper than Nova Scotia iron, of which probably $3 or more is due to the peculiar labor and commissary conditions, caused by the preponderance of ignorant negro labor, neither of which I am sure you would ever want introduced here, even for the sake of this $2 or $3 lower cost, and of which I shall try to speak later; they have a large distance to go before they reach their markets, but so do we here; the geographical conditions of Canada being exceptionally unfortunate in this respect.

The main reasons for this difference in cost lie first in the natural and labor advantages they possess over us, which are difficult to remedy; and second, in conditions of plant and improved appliances which we have not yet had time to either introduce or get the full benefit of, but which are bound to be remedied by us if we receive as they do the proper national encouragement, and I repeat again that it is only in the last four or five years that they have been able to adopt that perfection of plant and manufacture which they lacked for fifteen or eighteen years previous owing to conditions before mentioned.

To begin with their natural advantages, the ores take first place. They have practically two classes of ore, the Red Hematites, soft and hard, and the Limonites or Brown ores. They have some deposits of Black Band and Magnetic ore, but neither are of commercial importance; the Red Hematite belongs to the Clinton formation of the Silurian and runs from Middle Alabama through the States up to Maine, and curiously enough even through Nova Scotia, as I had a sample from Cape Breton which in appearance was distinctly the Red Clinton ore of Alabama; though I do not yet know its extent. This Alabama Red ore lies in a regular vein formation, traced for miles and in some cases within a mile of the furnaces; it varies in thickness from three to thirty feet and outcrops on the hilltops; it is cut by many gorges, making it easy of access at a number of places; the ore is divided into soft and hard, the latter appearing in the vein after the soft has been worked down some two or three hundred feet; in fact the hard red ore is the original formation, containing the lime, while the soft ore has had the lime leached out of it by action of water and air. This soft red ore will run all the way from 35 to 50 per cent. metallic iron, and from 2-10 to 6-10 of Phosphorus; Silica running from 13 per cent. to 18 per cent. The hard red contains from 12 to 17 per cent. of lime,35 to 40 per cent. iron, and 11 to 15 per cent. Silica, and is therefore often more than self fluxing; the brown ores are usually limonites and lie in pockets of greater or less extent, and very uncertain character. They occur as lump or gravel and seldom is any soft paint ore found with them. They can hence be washed to good advantage, and extensive washing plants are found at all the larger mines; they usually lie in a stiff clay, seldom in rock; analysis runs from 45 to 52 per cent. of iron, and varies considerable in phosphorus according to location, running from less than 1-10 per cent. to over 1 per cent.; Silica is from 8 per cent. to 15 per cent. One peculiarity is that they never contain lime to amount to anything, in which respect they differ radically from the Lake Superior brown ores and also from those of this, our province, they seem largely to have been formed from pyritiferous formations, while our brown ores here are formed like the red ores from lime, iron and magnesiam carbonates, by the action of air and water; the red ores lie close to the Furnace in most cases and are touched on all important points by the branches of the many railroads making them readily accessible at very low freight rates. The red ores are mined at a cost of from 38 to 50 cents per long ton, freight rates run from 10 to 25 cents a ton, and as they are handled in large 20 to 30 ton self dumping hopper cars, the cost of unloading is very slight; this therefore puts them into the stockhouse at not exceeding 75 cents a ton, and in many cases at 60 or 65 cents per ton. The brown ores cost about 65 to 80 cents per ton to mine, wash and put on cars and 25 to 45 cents freight, making cost from $1 to $1.15 delivered varying with location and distances; in considering these abnormally low costs you must remember that cost of mining is almost exclusively labor, and that this low cost is largely due to the peculiar labor and commissary conditions existing, and that the average mining community being 9-10 ignorant negro labor is not such as you would want in any of your countries, even for the sake of the cheap mining.

When I compare a mining community in Alabama with those here I cannot possibly conceive the feeling that would prompt the statements so often made that manufacturers should be able to make their products as cheaply as these southern industries do, or not become a burden to the people by demanding to be protected against these industries, when it is not the protection against their materials that is

desired so much as the proctection against that class of labor, which produces those materials. I do not want to talk politics but that is my idea of protection. It is the labor that needs the protection and not alone the manufacturer. Comparing these figures with our local ores we find in the first place we have no such regular vein formation as is found in the Alabama Red ores: we have several grades of Red Hematites some in the Annapolis Valley, which seem to have a fine, well developed vein formation, and some in Newfoundland showing a closely developed vein formation of large extent. The Nova Scotia Red Hematites are rather limited in extent, though richer in iron than the average Alabama Red ore, as they will average 50 to 52 per cent. iron with 10 per cent. to 14 per cent. silica: they are however very much higher in phosphorus running from 1.00 to 1.50 per cent. thus giving a pig iron containing up to 3 per cent. phos. if used alone making an ideal basic pig but too high for general foundry or mill purposes. This is not the case with Alabama ores and hence is one point in their favor. The Newfoundland Red Hamatite is also hard, showing about the same percentage of metallic iron with but ½ per cent. of phosphorus and hence is richer than the Alabama ores, though entirely dis similar in physical structure and formation. They are however, very much more distant from the furnaces and more costly to mine, so at best these ores can only be put into the furnaces at from $1.85 to $2.00 per ton actual cost; freights running from $1.10 to $1.50 per ton; to these figures must be added profits, as the interests are not all united, as is the case almost entirely in Alabama, making the cost of Red Hematite at furnace $2.00 to $2.60 as against 75 cents in the Alabama ores. Of course the higher iron percentage overcomes some of this but there is still a large margin against the Nova Scotia furnaces, and I can repeat that this margin is largely due to the difference in the labor as before described. The Brown Hematite and Limonites of Nova Scotia are largely pockety, though following general leads of ore-carrying strata, and present certainly a very mixed and curious conglomeration of brown ore formation. The base is apparently ankerite and white ore, a carbonate of iron, lime and magnesia, which pervaded the whole formation. From this by action of water and air the other grades of ore have been formed and it appears that the extreme irregularities are caused by the fact that the walls of these deposits are rock, and hence have not permitted the drying out and draining, but on the contrary have caused the more porous masses of ore to act as the channels for all precipitations of moisture. The result is one of peculiar natural disadvantage as compared to the Alabama Brown ores. There they have a hard, lumpy gravelly ore which can be washed perfectly clean, without loss of ore, is physically dry, though chemically containing from 6 to 8 per cent. of moisture, while we have to deal with an ore running from a soft muddy paint with 30 to 35 per cent. of moisture, to a soft brown, soft red, hard brown and black limonite, and some rich specular ore. All these ores are constantly cut and mixed with the hard ankerite and white oie, though in some sections barite and concretionary manganese deposits are found which demand constant care to separate from the regular ore in order to insure any reasonable regularity. Under these conditions it is but natural that the cost is higher, the analysis more variable and the difficulties of manufacturing are greater than is the case with Alabama ores, and that we must develop every other resource and use all possible practicable interests and influences to enable us to overcome such natural difficulties, for it must not be forgotten that these raw material producing plants and departments form a very heavy factor in the labour giving elements of our industrial systems, more so relatively than the finished products, and further that they employ a class of labour which is not as yet able to either make a living elsewhere, or to change its abode, as the higher priced mechanical and skilled labour employed on finished products, where a good man can almost always save enough to move to other districts if his own are closed down and and also to find work more readily elsewhere, and is it not our labor here as yet largely composed of this class, simply because it has not as yet had the opportunity to so develop its capabilities, owing to the comparative newness of our industrial system, and will not therefore any failure to meet such more advantageously placed competition through lack of natural resources, lack of encouragement, and other causes, throw out of work a very large proportion of this labor with all its attendant miseries?

I think this covers the ore question as to its natural conditions. The limestone or flux is so similar in character and of minor importance that I will pass it with but brief remarks. The Southern limestone is partly calcite, partly dolomite, and from three to 20 miles distant from the furnace. The limestone here is from 15 to 20 miles distant, I believe in some cases nearer, and cost of quarrying should not show much difference, nor is its quality materially different from Southern stone. What difference there is of cost in favor of Southern stone is due to the labor conditions.

The fuel comes next, and as it represents one of the most important factors in the economy as well as the quality of the iron manufacturer, it is well to study it carefully, though I must do so very briefly.

The coals of Alabama, as a rule, are good coking coals, though rather high in ash in many cases. Five years ago they were coked unwashed, and ash in coking ran from 14 to 18 per cent. When the question of washing was broached it was claimed that owing to the slight difference in specific gravity of coal and slate, especially bone coal, it was not practicable, and coal miners rather opposed the erection of washing plants. Now the greater portion of coke used in furnaces is from washed material, except a few favored seams. The present type of coal washing plant most successfully used down there seems to be the Ramsey-Robinson Washing plant, which is used by the large companies. The result of washing there has been so apparent in the improvement of the coke, the furnace results and the quality of the iron, that I am satisfied the same conditions will ultimately prevail here. Most of our coals give an excellent coke, though most of them are rather high in ash, and hence our unwashed coke is too high in ash to compete anyway in favorable with the washed Southern coke. Already considerable effort has been made with very fair success to overcome this difficulty, although we have not yet come down to a steady 10 per cent. ash coke. All experiments made in this direction have shown a marked diminution of ash, and I have no doubt that with proper appliances and study we can yet get the desired 10 per cent. ash coke. This would be one of the greatest factors towards the lowering of our costs and enabling us to compete successfully with the Southern irons but as is natural, with improvements of that kind, it takes time to fully develop and perfect them, and it must not be forgotten tnat that portion of the iron industry dealing with patent coke ovens and washing plants is comparatively so new that it would be unreasonable to expect its full development in any short period of time. The cost of Nova Scotia coke is rather higher than in Alabama, owing to the proximity of the mines there in most cases to the coking plants and furnaces, which not only reduces freight charges, but saves freighting the ash and the volatile matter, for which as yet we must pay full freight, and when you calculate that the loss in coking is 40 to 42 per cent. and the loss of ash in washing is 8 to 10 per cent. of the coal, you will see that here is a very heavy factor of cost which could only be overcome by washing and coking coal at the mines. Another natural condition which nobody can remedy and which is against you here is the difference in climate, in so far as it would be impossible to wash coal in winter at the mine and ship it to the furnace owing to its freezing to a solid mass. There are therefore but two solutions to this problem, first wash and coke the coal at the mines and save freight on ash and volatile matter; second wash and coke at the furnaces and pay all extra freight. If the iron and coal interests were connected, the former way would at once be

adopted, as it is the latter, the more costly plan, is the more feasible and is already in operation at one plant. It hardly seems to me though that we should abandon our iron plants simply because we cannot make coke as cheaply as they can elsewhere.

The next point is the labour question, which is a serious factor in favour of the southern furnaces, and yet of such a nature that I am certain that no Canadian would be willing to see it inaugurated in his own country. I have lived and worked five years with the southern colored labor and while it was a very satisfactory labor in one way, in another it holds the country down to a very much lower grade of civilization and progress as a whole than any similar amount of white labor. The negro does not strike, he works hard when properly pressed, he is good natured and willing as a rule, and can stand climatic conditions but he is naturally ignorant and lazy: he will only work when watched closely and can seldom be relied upon to do any work without slighting it. He lacks all feeling of responsibility, of morality, means well, but like a child cannot see the difference between right and wrong as we view it. He is usually shiftless, seldom saves his money, yet when closely watched and in localties where there is not much other employment to be obtained by him he will work steadily and quite faithfully: he gets about the same wages as the white laborer in the north, and if this were all there would not be a marked difference in his labour as a cost factor against the average white laborer, but it is through his ignorance and indifference that he becomes a cheaper laborer, because through him the Company Store System flourishes, as it is absolutely impossible to flourish with any white labor. The negro in most cases is paid through the Company's store. Some few will have a large portion of their pay coming to them at the end of the month, especially in town districts, but in more remote districts there is no question but that any considerable amount of cash on pay day is a rarity. Owing to his ignorance the temptation arises to charge him heavy prices, and the result is that while our iron costs are more than those of the Southern iron, yet this is largely due to this peculiar labor condition, as you can readily see when you consider that the mining of coal, ore and limestone is almost entirely labor, and that it is just in these processes largely carried on in more remote places, that the conditions above mentioned of inordinate store profits cause the extreme cheapness with which those articles from which iron is made, can be produced. Canadian labor is so vastly the gainer by more of these conditions existing among it, that it cannot afford to lose sight of them for a moment in any discussion of our industrial systems.

The worst feature of the Southern labor conditions, however, is the contract prison labor, which is a virtual system of legalized slavery. All State prisoners are auctioned off to the highest bidder, usually a mining company, and then penned up in a camp near the mines and made to work, the company feeding and housing them, besides paying the stipulated price to the State per man. This system naturally allows of very cheap mining, for, while the men are usually treated quite fairly, yet, every effort is made to get the most work out of them for the least expenditure.

In regard to railroad facilities and distances from market, both sections are at a disadvantage as compared with the Northern and Central iron plants, but taking this long distance into consideration, the differences are not great, though Alabama has the advantage of 7 or 8 trunk systems, while you practically have but two. This not only gives occasionally more competition, but also a wider scope of market. This, however, is so purely a geographical condition of Canada, and was so well known at the time of Confederation, that neither we here nor our customers west should ever complain of this. If Canadians are to act as a body, these geographical conditions are simply inevitable, and must be dealt with, and no amount of grumbling will ever change them. They should be accepted, and no one section can afford to throw over any other section on that account without disorganizing or disrupting the whole country. There are always certain phases of national entity, and this strikes me as one of them, which cannot well be thrown aside from commercial reasons, without threatening this national entity by disintegration. There is one point, however, where the railroads here are very much behind those of the South, that is in car equipments. Coal, ore and limestone in Alabama is principally hauled in large hopper cars, holding 15 tons and running up to 30 tons capacity, self dumping, so that one or two men at any plant can dump the entire stock received at the furnace daily. This is a very strong point in their favor and the lack of this equipment a serious tax on Nova Scotia industries. The lack of this class of cars causes a detention and delay, especially in winter, forces the railroads to put a much larger equipment into the service, and adds to the cost of the work, to them as well as to the furnaces. This is one of the points that can be remedied, and I have no doubt that the time is not far off when it will be.

As to plant, the Southern furnaces, as a rule, are very much better equipped than those here, though it is only in the last few years that this material improvement of plant has taken place, and the progress made since then has been very marked. The same is beginning to apply to the Nova Scotia industries, though the extremely hard times for the last few years have held them back to some extent, still improved coal washing plants, mining appliances and other appurtenances to plant have been and are being introduced everywhere, and I look for the next few years to show a very marked activity in this respect, as we will all realize the importance and absolute necessity of such improvements to enable us to properly meet our competitors. Naturally tariff legislation will play a large part in this activity. It must never be forgotten that improvements of this nature for the production of raw materials, whether coal, ore or iron, are almost invariably of a very costly nature: they take time, care and study, for failure means the sinking of a large amount of capital, which then can seldom be realized again or converted to other uses, and capitalists will therefore be very slow in undertaking such matters unless assured that they will work properly and economically, and also, that trade conditions will be of such a nature as to warrant such expenditure and assure a reasonable return for it. If we have the iron industry here on such a footing as is the case in the South, except the labor conditions, we could more readily overcome the disadvantages of long distance from markets, and could in fact create a home market which would be bonnd to be of the greatest material advantage to the Maritime Provinces.

Before closing I want to call your attention to a most excellent pamphlet on the subject of Southern Iron Manufactories, by Dr. W. B. Phillips, chemist of the Tennessee Coal, Iron and Railway company, and one of the best authorities on Southern scientific and industrial matters.

I think I have now taxed your patience to its utmost extent, and will therefore close with an expression of sincere thanks for your courteous attention, and hope that the paper here presented, in spite of its shortcomings, may have been of interest in some few points to all of you.

Discussion.

Mr. R. H. Brown.—I have taken a great deal of interest in the paper of Mr. Meissner. He dwelt on the subject of protection in connection with labor. I don't see how it could be applied to Nova Scotia in that respect because there is no attempt to bring in Southern labor.

Major Leckie.—This labor is turned into material.

Mr. R. H. Brown.—It will always have to take the shape of material. I don't see any help for it. Cheap labor is on the increase there.

Mr. Meissner.—My reference applies solely to the material composed of this cheap labor. That is why I made the remark that our

labor should be protected against the product of that cheap labor. The fact of the existence of those conditions would make it necessary to adopt some protection against the class of material made from that class of labor.

MR. FERGIE.—The paper was very interesting. I hope Mr. Meissner succeeds in getting ten per cent. of ash from his coke, but I doubt it. I agree with him that the very best place to put his furnace would be near a coal mine. I guarantee that we will give him a free site, free taxes, water, etc., etc.

MR. POOLE.—I am sure the hesitation on the part of most members to comment on the paper has not been at all from want of appreciation, but the reverse. They feel that it is beyond the experience of most of us. We feel that we should want to study it before speaking of it in the manner we would wish to.

IS THERE AN ECONOMIC LIMIT TO THE OUTPUT OF A COAL MINE?

MR. WM. BLAKEMORE.—Among the many features which are presented in a review of coal mining to-day and twenty-five years ago,none is more marked than the contrast between the average output of the two periods, unless indeed, we pursue the subject further and note the wide range between the maximum and minimum output.

In 1870, before the great boom in the coal trade of the world (but especially Great Britain) took place, there were many mines in England and Scotland working upon the same lines which they had followed with slight variations for at least one-half a century, and it seems difficult in 1896 to believe that at so comparatively recent a date appliances so ancient, and workings so limited as then prevailed, could have produced a satisfactory result to the colliery proprietor.

Take one instance. In the town of Willenhall, in the Black Country, was a property of some fifty acres containing about twelve workable seams of coal and iron stone; within a depth of 300 feet from the surface, upon this property there were no less than sixteen pit shafts, at all of which coal was raised; there were five hoisting engines as well as three pumping engines. The average output per day from each shaft was about forty tons.

Within a mile of this property was another area of sixty acres, belonging to the same firm. Upon this, were thirty shafts with an average output of twenty tons each per day. And still another smaller property of some fifteen acres with six shafts, averaging thirty-five tons each per day. The whole of this coal was hauled in small cars by horses a distance of nearly two miles, then transferred to canal boats, towed again by horses three miles, to the iron works, where it was consumed; yet, by this slow, antiquated and apparently costly process these three properties were worked successfully for more than thirty years, yielding a large profit to the fortunate owner and contributing no inconsiderable proportion of the $15,000,000 fortune which he left at his death.

I am tempted in this connection to mention another striking illustration of small output and slow work which is a fair example of what prevailed in the adjoining district of Shropshire, where the Duke of Sutherland holds large estates. Within the period mentioned, I have known mines worked on the "charter" or "butty" system, where the hoisting was done by means of an old vertical engine with reversing gear operated by foot, and travelling so slowly that the old man operating it, after starting the load from the pit bottom would saunter down the steps to the engine house, clean his fire, shovel on the slack, light his pipe, stroll back again, sit down on the stool, and still be waiting for the bell to ring which would indicate the approach of the load to bank, and that in a shaft any more than two hundred feet deep. The output in this case would be about ten tons per day, and scores of such pits were working on this estate up to fifteen years ago.

Now contrast this state of things with mines to be found in every district in England to-day, yielding from 1,000 to 1,500 tons, and a few in Lancashire and South Wales reaching 2,000 tons a day, to say nothing of many in Ohio and Pennsylvania and Wyoming exceeding 3,000 tons.

The era of 1,000 ton mines may be said to have dawned with the boom above referred to in 1870, and in England at any rate, the result is largely due to the enormous influx of capital under the "Joint Stock Company's Act," but in this as in everything else, the economy of Nature played a very important part, for it must not be forgotten that in 1870 a Royal Commission had been appointed to investigate the unexhausted supplies of coal in Great Britain, and that while the report of this Commission removed all doubt as to the adequacy of coal supply for at least 100 years to come, it also pointed to the necessity for delving deeper in order to unearth the rich stores of natural fuel still to be recovered.

With this heavy capitalization of coal mines, it was imperative that if shareholders were to receive even a moderate interest upon their outlay, larger outputs must become the order of the day, and as most of the coal seams developed by these new enterprises lay at a greater depth than the older workings, the incidence of more costly appliances, as well as deep sinkings and wider areas of working, accentuated this same necessity, in other words the large output was a perfectly natural and legitimate evolution of mining science, and our subject is not in any sense an attack on the principle involved, but to ascertain whether it has been developed to an undue extent.

It must be conceded that when a mine has been properly laid out, that is, upon the principles of recognised and well-established mining practice, the most economic result is to be attained by putting out the maximum output consistent with the safe, systematic and efficient working of the mine, but to this output there is a limit imposed not only by physical conditions, but oftentimes at a much earlier stage by what we prefer to call economic conditions.

Manifestly it is impossible in this, as in many other things,to erect a standard which shall be applicable to all mines, or even to mines in general, the many conditions prevailing below ground, with all of which the practical manager is conversant, contributing their quota to a full consideration of the subject. But there are certain suggestions which seem to have a bearing upon the decision of this matter in respect to every mine, and which may here be briefly indicated.

The first, and most important of these is the thickness of the seam, because however perfect and up-to-date the mechanical appliances in use, it is impossible to raise as much coal in a given time from a three-foot seam as from a six or nine foot, at least if such a thing could be done at all it would only be for a comparatively short period and at an enormous outlay which would not ultimately be profitable. So far as I know, there is not a colliery raising as much as 2,000 tons a day up a single shaft from a thinner seam than five feet. The thick seam renders a large output not only desirable, but necessary, if a maximum is to be attained and while it is possible by special layout and haulage system, and by constructing cages to carry as many as six or even twelve tubs of coal to reach a high figure from a considerable depth, this is done at a great disadvantage compared with the raising of the same output from a thicker seam by the aid of a larger tub. Wherever an attempt is made to reach the very large outputs which now seem to be the aim of mining men, there is a tendency constantly to increase the size of the tub, and at the Nottingham Colliery, in the State of Wyoming, where the average output is slightly over 3,000 tons per day, a three ton tub is used. That is, however, a very thick seam, and the conditions of haulage differ but slightly from haulage on the surface railroads.

The second essential condition of a very large output, and one scarcely less important than the first named, is a good roof and floor; however thick the seam, unless it is thick enough to admit of a coal roof being left up, it is impossible to recover coal daily from a large and rapidly increasing area of working, unless both roof and floor be strong, as the least weakness in this respect can only be overcome at a

very great expense, and I have no hesitation in saying that it is much more economic with unfavorable conditions of roof and floor to limit the area of workings, maintaining a moderate output, and duplicate the mine.

But, if we have the favorable conditions of coal and roof,and there are no other special difficulties of water or "faults" to contend with, there are still other considerations which must assign a limit to the output. The first, is the difficulty of handling and despatchlng more than a given number of tubs per day up a single shaft, and the second is the time limit for hoisting. Thanks to the splendid machinery which is now available for the latter purpose, speed can almost annihilate distance, and there are well equipped coal mines where the load is raised 200 feet in forty seconds, but even in shallower mines where the actual time of hoisting from a depth of 200 feet does not exceed 10 seconds, if to this we add the unavoidable loss of time in caging and dumping, I believe it will be found a fairly correct estimate allowing for accidents and hindrances which occur more or less daily, that 1,000 single hoists in a shaft, is the maximum that can be safely reckoned upon, although under the most favorable conditions, it is possible to reach 1,200. If the coal be hoisted in a single tub, as is so in the case of dumping cages, and as seems to be the best practice wherever the seam is thick enough to admit of it, this would give us a basis of calculation, and would show that in the case of a very thick seam (admitting a large car which holds three tons, like that in use at the Nottingham Colliery) 3,000 tons would be the maximum output consistent with other conditions claimed, and from this figure we must graduate downwards according as the conditions vary.

Coming to a thinner seam of coal altogether, such as is worked in the Rhondda Valley, South Wales, we find the Ocean Colliery, which is one of the best equipped in that district, yielding 2,000 tons per day from a five foot seam, here, the tubs are much smaller, only holding about a ton, the mine is admirably laid out and under the management of one of the most experienced mining engineers in South Wales, and the output attained may be fairly accepted as the highest consistent with good management and profitable working. From the foregoing it may be deduced that physical conditions must limit the output from a single mine, up a single shaft which is reached in the case of a thick seam, that is, a seam from 8 feet and upwards at about 3,000 tons per shift, and in a seam below five feet at about 2,000 tons; and that any attempt to force a mine beyond some such working as this, while it may be possible to yield a few more tons, is likely to add to the difficulty and expense to an extent which would far outweigh any advantage derived.

That the minimum limit is determined by natural conditions which have been described and which cannot be overcome except at a loss, and that this limit is also fixed at a much earlier stage than that determined by merely physical conditions such as the necessity for maintaining the safety of the mine in the interests of the workmen by limiting the area ventilated, timbered and otherwise kept safe, it being much easier to do this in a mine of moderate than of excessive output. I know that this statement will be met with the objection that to insure safety it is only necessary to increase your inspecting staff as you enlarge the area of working; this is true to a certain extent, but not absolutely, there are certain officials who must supervise the whole of the mine if its efficiency and safety is to be maintained, and who say that the enormous extent of workings in recent years prevents this being properly attended to. It is hardly necessary to insist upon this law, which is with every rightminded colliery proprietor the chief consideration to point out that however perfect the system of a mine, the larger the output, the greater loss and inconvenience arising whenever one of the many hindrances to which mining operations are always subject, occurs; and the last consideration that there are few mining engineers of experience who would not prefer if they had their choice, to raise 10,000 tons per day from six mines than from three.

In conclusion, I wish to emphasize what I have already stated, that there are conditions which render it imperative to secure a larger output if financial success is to be attained and of this we have an excellent illustration in the case of the Dover sinkings just commencing in the County of Kent, England, where a seam of coal 4 feet 6 inches has recently been pierced at a depth of nearly 3,000 feet, here the conditions appear to be favorable for a maximum output, and the depth is so great that a small output would never pay, but I would point out that the proprietors are starting with a full knowledge of the conditions to be met, and are adapting their appliances from the commencement to do what is required.

DISCUSSION.

MR. CHAS. FERGIE.—I would suggest that papers be discussed at the meeting following the one at which they are read. You cannot get at the merits of a paper read to-day, but if you had an opportunity of reading it at your leisure you could be prepared to discuss it.

MR. H. S. POOLE.—A foot note should be attached to the papers to the effect that they would be open for discussion at the following meeting, and that the secretary would receive comments on them in writing.

It being one o'clock, the meeting adjourned.

VISIT TO THE WORKS OF THE PEOPLE'S LIGHT & HEAT CO.

In the afternoon the members assembled at the Halifax Hotel at 3 o'clock, and from there were driven to the People's Heat & Light Co. Works at the North West Arm. Mr. B. F. Pearson, the secretary, and Mr. Young, the manager of the company, courteously welcomed the party and showed them over the works, from thence the members were driven to the works of the Halifax Electric Tramway Co., where an interesting hour was spent in inspecting their plant, under the guidance of their genial superintendant, Mr. R. C. Brown.

The members re-assembled at eight o'clock.

THE SHAW GAS TESTER.

MR. CHAS. FERGIE.—The instrument is the invention of Mr. Thomas Shaw, M. E., of Philadelphia.

It is the most delicate instrument for accurately testing and determining low percentages of gases in the air of a mine yet brought before the mining world, and is accurate to the one thousandth part.

There should be no misapprehension as to the use to which this instrument is intended to be put. It is not intended to take the place of the safety lamp for examining the working faces of a mine. Its purpose is for detecting small percentages of gas in the return airways, and such per centages as the safety lamp is not capable of showing.

The ordinary safety lamp will not detect gas unless the proportion of gas present in the air is from 2 to 4 per cent. The Shaw machine will detect the presence of one-tenth of one per cent.

Some may argue that it is not necessary for a mine manager to ascertain such minute proportions of gas, and such as the ordinary safety lamp is incapable of doing. It is, however, now an acknowledged fact that coal dust plays a very important part in mine explosions, and it has been proved that under certain conditions one per cent. of fire damp in a dusty atmosphere becomes explosive. It should also be remembered that mixtures of air and small percentages of fire damp—considered quite safe under normal conditions—of the mine become highly dangerous in the event of an explosion being propogated. It is therefore obvious that some fire damp detector is necessary other than the safety lamp to show the true condition of the air of a mine as regards the percentage of gas it is carrying.

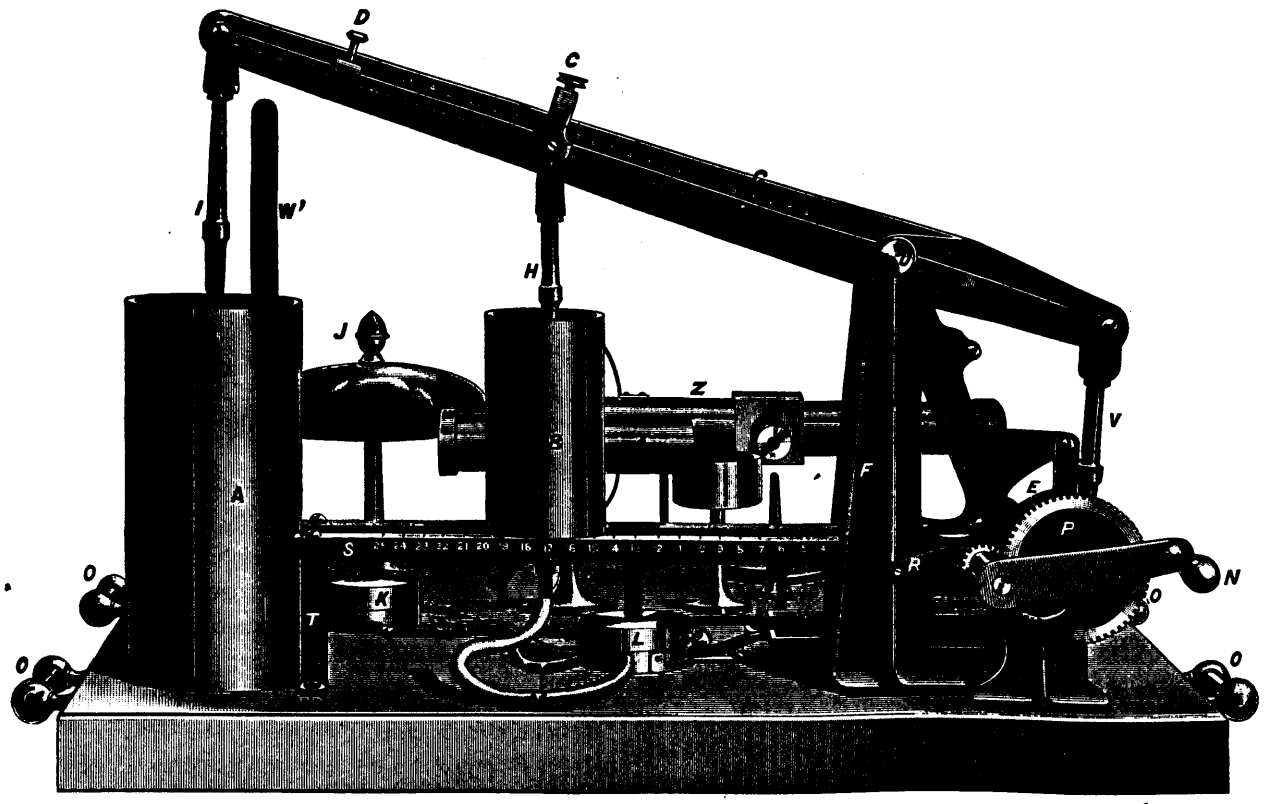
Periodical tests should be made of the air of the main returns and the exact percentage of fire damp present ascertained, and any increase due to atmospheric depression, reduced volume of air current or an outburst of gas is detected at once, and steps can immediately be taken to remedy and counteract the same.

The writer has had the Shaw machine in use at the Drummond Colliery for the past three years and has found it to be everything that the inventor claims for it. There is great satisfaction in being able to tell exactly just what per centage of fire damp is being carried in the air currents of the return airways.

The machine is better explained by referring to the cut, and the following description of it is taken from the *Colliery Engineer*, Scranton, of April, 1893:

It will be seen that F represents two standards supported on an ordinary metal bed-plate, and G represents a beam lever mounted on bearings at the top of the standards; the short end of the lever is connected by the connecting rod V with the crank disc E; the long end of the lever is connected by the rod I with the plunger-head of the pump cylinder A, and the intermediate section of the long end of the lever is connected in an adjustable manner with the plunger in pump cylinder B, through the connecting rod H. The lever is vibrated in a vertical direction, a pre-determined distance, by the crank disc E, actuated, through gearing P, by the hand crank N. The full stroke of the cylinder A equals 800 cubical centimetres, and that of cylinder B equals 266⅔ cubical centimetres.

The plunger of cylinder A is given a full stroke at each revolution of the crank disc E, whilst the position of cylinder B is made adjustable upon the supporting bars S, and secured in any position by an ordinary screw nut beneath the bars S. The cross head of the connecting rod H is arranged to slide upon the two projecting ribs of the vibrating beams G, and is secured in place by the clamping screw C; the beam and bars are marked with figures showing the exact percentage of the relation of the two cylinders to each other in cubical contents. The pumping cylinders are free from all ordinary check valves; the valve duties for both cylinders are performed by one single disc valve L. This valve consists of two discs with ground faces, the upper disc vibrating upon the face of the lower one, through an accurately determined distance. This valve is operated automatically by the connecting rod W. At the upstroke of the pumps two ports in this valve are open and an equal amount of air and gas would be forced through, if the arrangement of the cylinders was such as to take equal amounts. But as the cylinder B is smaller than cylinder A, and the stroke of the plunger connected with rod H is shorter than that of the plunger in cylinder A, only a certain proportion in volume of each is conducted into the cylinders. It is well to state here that the gas or mixture to be tested is conveyed by a rubber tube to one of the ports of the disc valve L. On the up stroke of the pumps cylinder A is filled with air, and cylinder B with the gas or mixture to be tested. On the down stroke the ports in disc valve L that were open on the up stroke are closed, and opposite ports are opened. Through these the air and gas, or mixture, is forced to a mixer, where they are thoroughly mixed with each other. The resulting product of mixed gases are led by a tube to a central port in the hand valve K, from which it is conveyed to tester Z. This is the case in testing ignitible gases. This tester is of the highest importance, as it is the instrument that solves the problem of giving quick and positive tests of all percentages of ignitible gases in the air, and for determining values of pure and mixed ignitible gases to the smallest desirable fraction. For testing choke damp the hand valve K is set so that a different port is opened, and the mixture instead of being conveyed to the tester Z is conducted to the tester X.



Standard Test for Ignitable Gases. Shaw's System.

If the handle of the hand valve is turned so that the arrow points to F D the mixture will be conveyed to the fire damp tester Z, and if turned so that it points to C D the mixture is conveyed to choke damp tester X.

Tester Z consists of a square metal valve box supported upon metal pillars. This box is provided with screw threads for the reception of brass cylinders. The cylinder to the right of the square box is provided with a perforated cap end, while the one to the left is provided with a piston valve held under slight compression by bow springs and wire thread with an adjustable lever and weight to regulate the tension.

The mixed ignitible gases for test are led into the tester under slight pressure, and blown against the piston valve from which point they flow backward, expelling any previous air or gas out of the aperture in the perforated cylinder head, and out an igniting nozzle against the flames of a small lamp. The mixed gases blowing through the flames are caused to unite at the lowest ignitible point, and about four per cent. below the explosive line, at which point there is sufficient expansive effect of the combined gases in the test cylinder to propel the

piston valve against the gong J, causing an audible and unmistakable sound, which occurs always at a certain definite fraction of the percentage of the gas tested, and which point is made a standard for comparison for all other percentages of the same gas.

If it is desired to test the gas taken from a mine for fire damp, a supply of the mixture existing in the mine is secured by pumping it into a rubber bag by means of an ordinary small diaphragm pump and brass tube fitting the mouth of the bag. As soon as the bag is filled it is corked and taken to the testing machine on the surface, and a cork with a tube and ordinary stop cock replaces the first cork. This is then connected by rubber tube to the disc valve L. The gas cylinder B is set at the point marked 6 per cent. on the beams for the first test of gas of unknown quality. The crank handle N is operated by hand, giving two or three strokes of the pumping cylinders, the combined action of which forces 6 cubic inches of gas from the rubber bag with 94 cub. in. of atmospheric air through the mixer, to the tester. If the lowest point of ignition is sufficient to cause the gong to ring, by the expulsion of the piston valve, it would determine the presence of pure light carbureted hydrogen gas of rich quality. When tests of air containing low percentages of fire damp are required, any ignitible gas is first taken in a rubber bag, and its lowest point of ignition, when mixed with air is determined. The clamp D on the beam G is moved to the point at which the small cylinder B was located when the lowest point of ignition was determined, or 6 per cent. and clamped. The cylinder B is then shifted to a point marked one per cent. less than the point marked by the clamp or 5 per cent. At this point the instrument can be operated without any possible sound from the gong, because the quantity of gas is decreased. If, when the air from the mine is forced through the machine and mixed with the standard gas taken, the gong rings, it is known that there is more than one per cent. of explosive gas in the mine air, so a smaller proportion of the standard gas must be taken, by moving the cylinder B back to 4½ per cent. and again operating it. If the gong rings from a faint blow of the piston valve, it is known that the test is nearly completed, and the line of demarkation nearly reached. If by moving the small cylinder one-tenth of one per cent. nearer the fulcrum, or to 4·4 per cent., it is found that the gong does not ring, when the machine is operated, it is evident that the air from the mine contains the difference between 6 per cent. and 4·4 per cent. or 1·6 per cent. of pure light carbureted hydrogen. The tests for fire damp are all simple, and depend entirely on the mixing of air to rich samples until the lowest point of ignition is found, and then adding to this the percentage of air used. This will give the percentage of pure gas in the mixture. If the sample is weak in gas, a standard gas whose point of ignition has been previously determined must be mixed with the sample tested, and the proportion of this standard gas taken must be subtracted from the previously determined point of ignition. The remainder will accurately show the percentage of gas in the sample tested.

To test safety lamps, it is only necessary to remove the cap from the choke damp tester X, and attach to it a glass bell jar, with a rubber tube. Under this bell jar place the lighted safety lamp and pump on it any percentage of illuminating or other ignitable gas (an explosive mixture from the mines is best), and watch the effect. For best results safety lamps should be tested in absolute darkness.

In testing for choke damp, a standard glass tube containing lime water representing the turbidity caused by one-half of the large cylinder full of air containing one per cent. of carbonic acid gas (which is furnished with the machine) is used. Now, if in another tube of lime water 20-100 of a cylinder of the air tested caused the same turbidity, it is evident that the sample tested contained 2·5 per cent. of carbonic acid gas, because $50 \div 20 = 2{\cdot}5$. The graduated scale W¹ is used to measure the proportion of the stroke at which such turbidity was attained, or in other words it measures the quantity of the sample pumped into the cylinder A.

The test for White Damp or Carbonic Oxide is more complicated than the tests for fire-damp or choke damp, but can readily be learned by a man of average intelligence. Our space is too limited to describe it here, so we will merely state that it is very similar to the test for choke damp. The principal differences being in the chemicals used for the fluid in the standard and test tubes.

The test for sulphureted hydrogen is, like that for white damp, slightly more complicated than the other tests, but it is not a difficult one to understand.

DISCUSSION.

MR. FERGIE.—In three mines in the United States they have this machine connected with the mine itself. If there is more than a normal amount of gas the bell rings in the office. Our safety lamp will detect from two to four per cent. of gas, while this instrument will detect one tenth of one per cent. From two to five per cent. of gas may be perfectly safe in a mine under ordinary conditions. In the event, however, of an explosion in another part of the mine, the first mentioned gas will become explosive on account of the compression of air. As a matter of practice, we test our airways once a week, and if we see that the per centage of gas in the returns is greater than usual we ascertain the reason why. We find that gas will explode when mixed with air at certain proportions. The gas I have here will explode at 10 8-10, the gas we have in the mine will explode at 7 per cent. What you have to determine is where the ringing line is. If it is at the point where you have a proportion of ten per cent. of gas it will not ring in that proportiont. The test for carbonic acid gas is different. In that case you force the gas through lime water in a test tube, and this tube is compared with tubes having a precipitate formed by a known amount of carbonic acid gas.

Place a lamp under a glass bell and fill the bell with gas, and you will see what is known as the blue cap. This experiment will also shew that when the light is put out by the presence of too much gas, the explosion takes place within the lamp itself. A back draft or suction always occurs just before an explosion.

MR. F. H. MASON suggested that the suction is caused by the two atoms of hydrogen and the one atom of oxygen going to form the one molecule of steam which immediately condenses to water.

MR. POOLE.—I will illustrate the principle of the Davy lamp. The gauze obstructs the heat to such an extent that the flame will not pass through. As I burn the gas inside of the gauze tube you will notice that the flame does not pass through. If the gauze, however, were to become red hot the flame wonld burn on the top side. I will now show you the reverse. The flame you will notice is on the top side above the gauze and the heat does not pass down, therefore there is no flame within the gauze tube. There is perfect safety so long as the flame is on one side of the gauze.

MR. FERGIE.—We have three hundred lamps in our mine. They are brought out at the expiration of each day's work, thoroughly cleaned, and tested before being given out again, and before passing into the working places of the mine they have to pass through the hands of two examiners, first at the surface just before entering the mine, afterwards at the bottom of the slope or before going into the workings. The lamp used is the "Marsaut," with double gauzes. The gauzes are protected by a bonnet of sheet iron; at some mines three gauzes are used, but the light is not so good as when only using two. Asbestos rings are used for the glass to bed on. The old "Davy" was not considered safe when exposed in an explosive current of 6 to 8 feet per second, and if the gauze became red hot in an explosive atmosphere it was possible for the flame to pass and ignite the gas outside if the person carrying the lamp subjected it to a jerk or violent motion. The

modern and most improved lamps are considered safe in an explosive atmosphere, and moving with a velocity of 3,000 feet per minute.

NEWFOUNDLAND GOLD DEPOSITS.

Mr. J. J. Oxley, the original discoverer and owner of the gold properties of Cape Broyle, Newfoundland, gave an outline of his discovery there, the opposition he met with, and the nature of the rocks in the vicinity of the find. The most important discovery was that the bed or country rock was diorite similar to that at Trail Creek, B. C., which is now being mined so extensively. There are now over seventy claims recorded in the immediate vicinity of his find, but there has not been much development, owing to lack of capital. The following were the results of assay, from an eight foot hole made by Johnson, Matthey & Co. of London in August last :

No. 1, marked 1 case, 9 dwt. 12 gr. Silver, 3 oz. 9 dwt. 0 gr.

1 box, 2 oz. 19 dwt. 12 gr. to 2,240 lbs. Silver, 1 oz. 11 dwt. 0 gr.

3 grey mineral, 8 dwr. 12 gr. Silver 4 dwt. 0 gr.

Assays by other firms ran from 6½ to 19 dwt. for silver. The rocks also contain copper and iron pyrites. Mr. Oxley is very sanguine and predicted a great future for Newfoundland gold deposits.

MINE DRAINAGE.

By Hans C. Behr, Mechanical Engineer.*

Where a pipe is longer than the height vertically pumped, as in inclines, or where the pipe is partly horizontal in its course, the velocity of flow should be less than for an entirely vertical pipe,and the diameter therefore greater for the same capacity, because in that case the energy of the greater moving mass has less proportional retarding force due to gravity, and shocks are more liable to occur. Velocities over 5 ft. per second should not be allowed in discharge pipes, unless a number of pumps are arranged to come to the end of their respective strokes in rotation, so that the water in the pipe will be continuously advanced. In the Cornish system the diameter of the column-pipe is frequently the same or nearly the same as that of the plungers, and, for a double line of pumps, a separate column is used for each plunger, except where the pumps act alternately on independent rods, in which case only one column need be used.

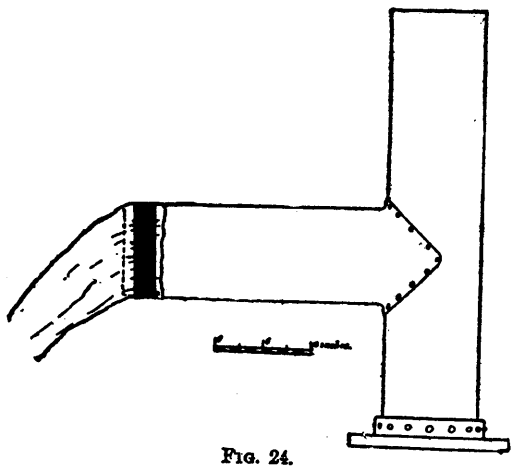


Fig. 24.

Discharges and Inlets of Water-Pipes. With Cornish pumps, particularly, the discharge from vertical or column-pipes into the station-tanks should not be by means of ordinary elbows or short bends, because the intermittent flow of the water will cause a jar by striking against the side of the elbow. It is best to carry the pipe up vertically for a few feet above the outlet-pipe, because then the water can rise freely without shock, and flow gradually from the outlet. Fig. 24 shows the usual discharge-top for column-pipes of Cornish pumps. It is generally made of galvanized iron, for the sake of lightness in handling, and has a short piece of canvas hose attached to the outlet to prevent splashing.

In order to reduce losses due to resistance, inlets to pipes should be flaring (or bell-mouthed), if the velocity be great. It is also economy to gradually enlarge the outlet, and submerge the end in the discharge-reservoir, in case of high velocity, because thereby the energy of motion is changed into pressure or lift, and, in case of pumping, less of the pump work is lost. These remarks apply particularly to low lifts and considerable velocities, and where the additional lift gained is an object, on account of its considerable proportion of total lift.

Thickness of Water-Pipes. Pipes subject to uniform, constant water-pressure can be made much lighter than those subject to water-hammer, and to varying pressures due to starting and arresting the column of water, as in the discharge-pipe of a single reciprocating pump. Again, pipes which lie on the ground, and which are not liable to be disturbed, can be made lighter than those which, like the column-pipes in vertical shafts, are subject to strains from being forced out of line by moving ground. Corrosive action of the mine-water may also require extra thickness. All strains and destructive influences must be taken into consideration, in designing a line of pipe, especially in mines where delays are nearly always expensive. The column-pipes for underground pumps are therefore usually made several times the strength that would be required for a pipe-line operating under constant pressure. What applies to strains in discharge-pipes of pumps, applies, however, with greater force to such power-pipes as are used for operating reiprocating hydraulic engines, because here the shocks are liable to be even more severe than in the case of pumps. The discharge-pipes of centrifugal pumps are not so liable to water-hammer, and can therefore be considered in the same category as pipes subject to uniform pressure.

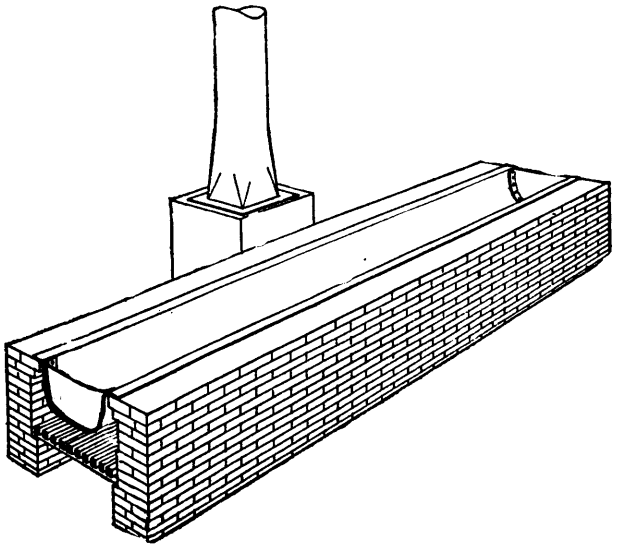
Air-Chambers on Water-Pipes. Air-chambers are frequently used along a line of pipe and at sharp bends to reduce shocks, such as occur when valves are suddenly closed or when the flow in pipes supplying water to power-wheels is suddenly arrested by obstructions finding their way into and closing the nozzle.

Air-chambers under pressure usually require some charging device, as the air is absorbed by the water. This device may be a small air-compressor operated by hand at long intervals, or whenever a trying-cock or gauge-glass on the air-chamber shows that the air-space has become too small. Air-chambers should be so tight that no air can escape. It is well to coat them inside with paint or asphalt, for heavy pressures, as the air is liable to leak through the pores of the metal.

Air-chambers on pumps perform the functions of equalizing the flow in the discharge, or in the suction-pipe, and of reducing shocks on the valves. They will be considered more in detail in connection with direct-driven pumps. Spring-loaded pistons or plungers are sometimes used in place of air-chambers of small capacity.

Relief-Valves. Spring-loaded or weighted relief-valves or pistons are also used on pipes liable to sudden stoppage of the water column, so as to afford an escape for the water under excessive pressure. Weighted valves are not so good as those loaded by springs, because they are slower to act, on account of the greater mass to be moved.

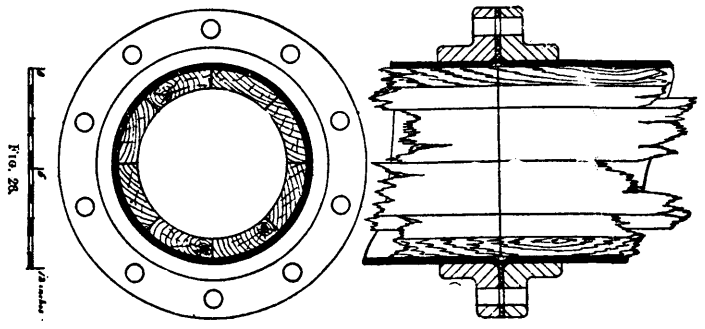
Protection of Water-Pipes against Corrosion. Pipes conveying water, and particularly those used in mines where the water is acid, are either made of material to resist corrosion, or, if the corrosion be slow, as is usual, of greater thickness, so that they will stand a reasonable time with such protection as is afforded by a coating applied to their surface. The use of copper pipes in exceptional cases has been previously men-



tioned. They are rarely used, on account of their cost. Coatings of asphaltum, or paints prepared from the resinous part of oils, constitute the usual method of protection. The asphaltum coatings are applied by dipping the pipes into a melted bath of it. The pipes should be thoroughly heated to the temperature of the bath, and the latter must be maintained at uniform temperature. Where pipes have to be transported great distances over rough roads, the asphalt coatings are liable to be injured, and it is therefore sometimes better, if the appliances be available, to dip the pipes at the mine. Fig. 25 is a form of asphalt bath for dipping pipes. The illustration shows the apparatus arranged with a double-end fireplace under the pan. By this construction, with the chimney at the middle, more uniform heating is secured. In out-of-the-way places a pan is generally made from a spare length of pipe by cutting it open lengthwise and riveting pieces to the ends.

It requires some experience and attention to maintain a uniform temperature throughout the bath with this arrangement. Where steam is available the bath can be heated very uniformly by placing steam-pipes in the bottom, in which case a wooden trough will answer as a make-shift.

To avoid the difficulties attending the hot coating of pipes in out-of-the-way places, the pipes are often painted or dipped cold with some of the so-called paraffine paints. The dipping should in this case be done vertically, the coating fluid being contained in a vertical pipe sunk into the ground, and only slightly larger than the pipe to be dipped, so that a minimum of surface is exposed to the atmosphere and for evaporation of the very volatile solvent. In applying any coating to pipes they must first be thoroughly cleaned, and every particle of rust scraped off, as otherwise the coating will not adhere well at such places. The asphalt coating costs generally about half a cent per foot per inch diameter of pipe, so that a 3 in. pipe would cost 1½ cents per foot to dip.



Where the water in the mine has a high temperature, as in the Comstock mines, coatings of the kind described are of no value in protecting the pipe. Galvanizing the pipes will protect against some waters. Some pipe manufacturers use an alloy consisting of lead, tin, and nickel, lead being the chief constituent. This is a better coating than the zinc of the galvanized pipes, and also has the advantage that the pipes can be bent cold without cracking the coating. To bend galvanized pipes and not injure the coatings, they should first be carefully heated to a moderate temperature.

Iron pipes have also been protected inside by wooden linings. At the New Guston Mine, Montrose, Colorado, the lining shown in Fig. 26 was used. The pipe in this case should be asphalted or painted with a protective coating before introducing the lining. Redwood is the best material for the latter. The staves should be cut off slightly longer than the lengths of the pipe, so as to secure contact of the ends of the staves and also allow for the packing between the flanges. The pipes are necessarily larger for wooden linings, and this is perhaps the main objection to their more common use. A thin coating of cement has in some cases been a good protection.

In the greatest number of cases the best plan will be to use heavier pipe and protect it as well as possible by coatings.

Air in Water-Pipes. Frequently pumps take in a small amount of air on the suction-stroke, either by leakage or intentionally, in order to keep the air-chambers filled; and this air will accumulate not only in air-chambers, but also, when these are filled, at any high places along the discharge-pipe. Besides contracting the free passage of the water, such air is liable to be carried along in a body when the over-pressure necessary to force the water through the contracted space has become sufficiently great, and then to cause water-hammer by rising back through

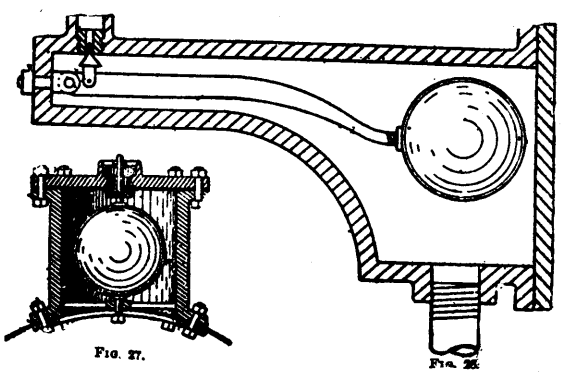


FIG. 27.

the descending pipe; or, if carried far enough, by entering the next rising part of the pipe, where it is in a position still more dangerous to the pipe. Therefore, wherever possible, discharge-pipes of pumps should rise all the way toward the discharge end, so that the air may be continuously expelled. Where this is not possible, it is necessary to use either some form of automatic air-valve, or a vertical pipe connected to the high part of the pipe-line (the vertical pipe rising to an elevation equal to the pressure-head at that point). A small adjustable opening or a cock, placed at the highest point to permit the air to escape with a small waste of water, would in some cases serve the same purpose. For all air-escapes it is necessary to have a pocket or chamber at the highest part of the pipe-line, to permit the air to accumulate, as it would, for the greater part, run past any small opening without being diverted into it. Automatic air-valves for letting accumulated air out of pipes must have sufficient weight in air to open the valve against the overpressure in the pipe. They must also be so constructed that they will close by the combined effect of buoyancy and the pressure due to the rush of water. Figs. 27 and 28 show air-valves of this type.

On many light pipe-lines, the main office of air-valves is to admit air to the pipe and prevent its collapse from atmospheric pressure when the pipe becomes emptied of water, and also to let out the air when the pipe is first filled with water. It is evident that such air-valves must be much larger than those previously described.

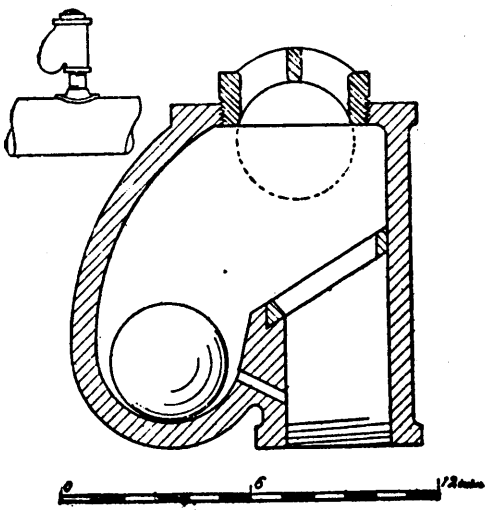


FIG. 29.

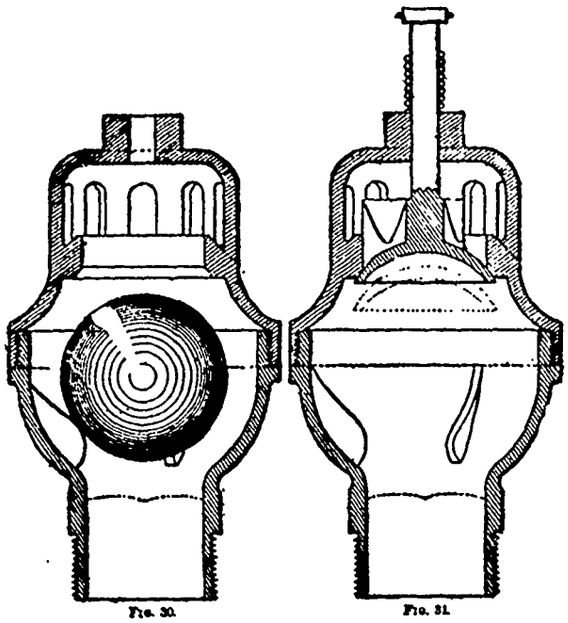


Fig. 30. Fig. 31.

Fig. 29 shows a hollow ball air-valve suitable for light pressures. The air-valve in Fig. 30 has a wooden ball covered with rubber, and is, therefore, more rigid and not liable to be pressed out of shape and remain stuck in its seat. For high pressures, the same make of valve is constructed with a bell-shaped metal valve, as in Fig. 31. The bell-shaped valve (Fig. 31) is closed by the rush of escaping water. In all the forms of ball valves, the ball is the valve and float in one. They do not operate to let air out of the pipe, unless the pressure falls very low, as in case of a break in the pipe or its emptying.

Besides the air taken in by pumps, there is always air contained in the water. It is not generally possible to predict under what pressure such air will be liberated from the water. It is, however, almost certain to be liberated if the pressure falls below that at which it has entered from the outside, where it was under atmospheric pressure.

Air is generally absorbed under pressure in an air-chamber, and such air will be released when the water which contains it reaches a high point at a lower pressure. Air will also be more readily released when the temperature increases, so that air may be looked for in the elevated parts of long pipe-lines which are exposed to the heat of the sun.

Notes on Steam and Air-Pipes. In this class of pipes the first care next to safety and preventing leaks should be to keep as much of the heat in the steam or air as possible. It is advantageous, therefore, to locate such pipes in upcast shaft compartments. In the case of steam and reheated-air-pipes further protection against radiation must be afforded by non-conducting coverings. The latter should in turn be protected from moisture in order to be efficient. This can often be done by wrapping the non-conducting material with tarred canvas. The pipe connections should not be covered, as leakage from them might enter the non-conductor, and they should also be accessible for repacking. It is a good plan to provide small conical rings at intervals, to act as "umbrellas" for shedding off the drip. These are best placed just below pipe connections, so as to carry off any leakage drip and prevent its soaking into the non-conductor.

Steam-pipes, and generally air-pipes, should be provided with traps at low points, for the purpose of draining off the condensed or entrained water, which must be prevented from getting into the motor cylinder of the pump engine, and which, besides contracting the passage at points where it accumulates, and thereby causing resistance to flow, is also liable to produce water-hammer and endanger the pipe. For this reason, as soon as a steam-pipe is shut off for a time, the drains should be opened to let out all the condensed water.

A break in a large steam-pipe underground is a serious matter. Where such an accident is liable to occur, as in some shafts in moving ground, provision should be made either to have the increased rush of steam automatically operate a self-closing device, or to connect a throttle at the surface, or valves at intervals, with a handrope passing down the shaft or other parts of the works containing the pipe.

Where steam or air is conducted a long distance to drive a reciprocating pumping-engine underground, it is best to connect the pipe to a receiver from which the engine takes its air or steam. The receiver, from which the engine draws intermittently, acts as an equalizer of pressure and flow in the pipe, so that a somewhat smaller pipe can be used with the receiver than without it, because the flow in the pipe is practically uniform.

It is better to use first-class gate-valves on steam and air-pipes as they cause less obstruction to the flow than globe valves, which, if used, should be so placed that water cannot accumulate in the globe. Tightness against leakage is important in steam and air-pipes, for economical reasons. In long pipes the loss from leakage is often enormous. These should, therefore, be carefully designed and erected.

Steam and air-pipes should have stop-valves, not only at the pump engine, but also at the boiler or air-receiver, so that the pipe can be repaired without shutting down the boiler or exhausting the receiver. Before connecting steam or air-pipes to the engines to be operated through them, they should be thoroughly blown out to remove any loose scale or dirt which might afterwards get into the engine.

The heat generated by steam-pipes has a tendency to cause vapor to form, which rots the timbering of the mine.

General Remarks. All pipes (water, steam, or air) should be larger when their length is great, to compensate for the additional resistance to flow.

Elbows and bends for the same reason should be formed to a large radius, where economy is desired and where space permits.

All shut-off valves and gates on water-pipes should be so arranged that they can only be closed slowly; then the water flowing in the pipe will be brought to rest gradually and without shock. The longer the pipe and the swifter the flow the more slowly should the gate or valve be closed.

Joints in pipes should be accessible. In underground workings they should stand some crowding out of line without leaking, and should remain in good condition for a long time.

It is of the greatest advantage to have as much as possible of the supporting arrangement for pipes, pumps, and rods in a shaft designed to be made of wrought-iron and timber, and the iron work of simple form, so that breaks can be quickly repaired by the mine blacksmith and carpenter. For large pumping-plants, a small machine shop is almost a necessity. Extra flanges for pipes, elbows, and other parts should be kept on hand.

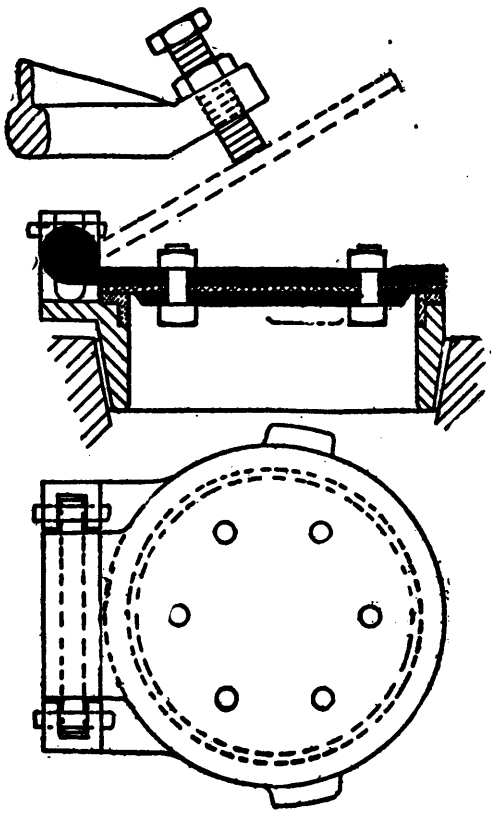
If a line of pipe be properly designed and carefully put up at the start, much annoyance, repair work, and stoppage of machinery will be avoided, and the expenses of these in a year's run will almost more than equal the increased first cost.

PUMP-VALVES.

General Types. Valves for pumps used in mines are of various types, their design and construction depending upon the conditions under which they are intended to operate. They may be divided roughly into hinged valves, commonly called clacks, which open by swinging about an axis parallel to the face of their seat; straight-lift valves, which rise evenly, and generally vertically, off their seats; and flexible valves, which alter their form on opening.

The pumps of the so-called Cornish system have usually hinged or clack-valves, although single and double-seated straight-lift valves are also often used, particularly in Europe.

In direct-driven pumps, straight-lift valves are almost entirely used. These are usually simple, often practically rigid, rubber disks, the seat being in the form of a grating. Flexible valves of rubber or leather are suitable only for very low lifts.



Requirements. The points to be aimed at in the design and co n struction of a pump-valve are :

First—It should close tightly against its seat, which latter is usually made so that it can be readily removed for the purpose of truing up and repairing. Tightness of valves and plungers or buckets is particularly required in a pump which has to raise water partly by suction, and where reduced inflow of water necessitates slow running of the pumps.

Second—It should open easily, and remain open with a minimum of overpressure on its lower side.

Third—It should, when open, present very little resistance to the flow, and divert the current as little as possible from a straight course.

Fourth—It should close as promptly as possible, immediately on the completion of the stroke, or when the forward motion of the water ceases, because, if the valve is still open during the commencement of the return-stroke, the water flows back and acquires a velocity which is suddenly checked with a blow by the closing of the valve. The blow is the more severe the more tardy the valve is in starting to close and the longer the column of water above it.

Fifth—It should be simple in construction and not liable to get out of order easily.

Sixth—It should be readily accessible for purposes of repair and interchange.

Valves and Valve-Seats. In mining pumps, which have nearly always to deal with water carrying sand in suspension, the tight closing of the valve is, by this cause, often prevented. The valve-faces, or the whole valve, are usually made of some elastic material, so that any particles lodging on the seat will be pressed into the valve-face and not prevent its coming in contact with the metal seat, as would be the case if the valve-face were also of metal. When the water permits it, leather is much used for facing the valves. Where the water is very acid, rubber must be used. Hot water requires rubber-composition. This material has long been used for the disk-valves of direct-acting steam-pipes. It is said to have been first used for the faces of clack valves of Cornish pumps by Mr. Deidesheimer when superintendent of the Hale and Norcross Mine, in Virginia City, Nevada. The composition disks are usually $\frac{1}{8}$ in. thick for clack valves. Fig. 32 shows a hinged clack of common form, with composition-rubber facing. When the valves are large and the water very hot, it is better to bore out the central portion of the disk in order to reduce liability of cracking from unequal expansion. Hinged valves are more liable to leak than straight-lift valves, as they generally wear unequally by striking first either at the edge nearest to or at the farthest from the hinge. When the hinges are made of metal the pins should be very loose, so that they will not become clogged and by their friction retard the valve. The leather faces of clack valves are often extended to serve as hinges for the valves, as in Fig. 33, which shows a double valve of this kind.

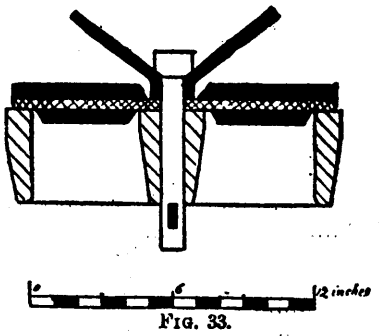


FIG. 33.

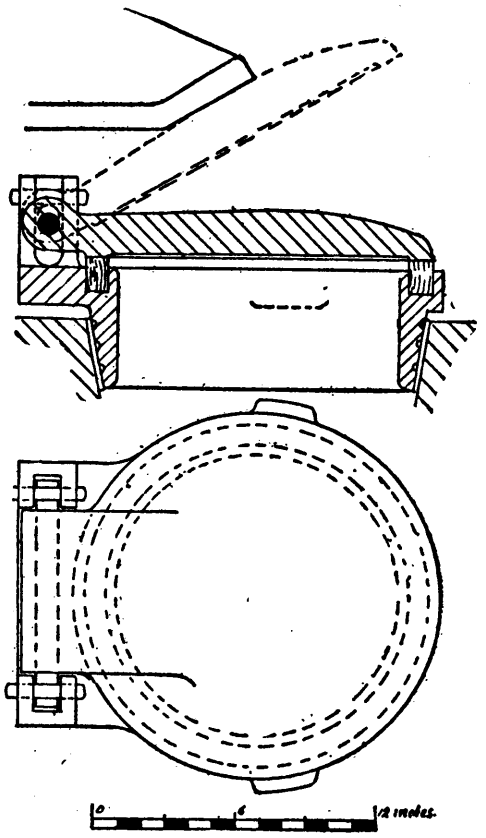


FIG. 34

For low heads and small pumps, such as are operated by men or animals, simple leather flaps, reinforced by a couple of washers held together by a bolt, are often used. Sometimes they are nailed to one side of a bored wooden block, which serves as a seat.

Boxwood, maple, beech, and even pine, have been used for valve-seats of metal-faced valves, and they are very durable, but always leak, as the grit in the water cuts out the soft part between the fibers of the wood, and this also retains particles of sand, which cut out the valve-face. The small blocks of wood are pressed into a groove in the valve-seat, the end of the grain being presented to the valve-face. Fig. 34 shows a hinged valve with its seat constructed in this manner.

For valves with elastic faces, brass seats, or seats faced with brass, are advisable with acid water. The last Cornish pumps operated on the Comstock had brass-faced valve-seats, constructed as shown in Fig. 32.

To be continued.

COMPANY NOTES.

Dominion Gold Mining and Reduction Co.—The following is the report to the shareholders at the meeting of the company held last month:—

"The Company was incorporated in August, 1895, and active operations were conducted up to the end of that year in the equipment of the Reduction Works at Rat Portage and the Gold Hill Mill, as well as in the development of a number of the properties owned by the company.

During the rest of the period under review operations were suspended for want of working capital, but in October last work was again started up at the Gold Hill and Black Jack mines, from which satisfactory results are expected to be reached during next year.

During the year now closing there has been great activity in the Rainy River and Lake of the Woods districts, and a number of mining properties have been purchased both by English and Americans. The Directors anticipate that during the coming year they will be in a position to realize handsome returns from the sale of one or more of the properties now being developed." The accounts are:

DR.

	£	s.	d.	£	s.	d.
To authorized capital	200,000	0	0			
Capital issued:—						
To vendors as fully-paid	150,000	0	0			
" subscribed	18,707	0	0			
				168,707	0	0
" loan				2,500	0	0
" sundry creditors				565	17	1
" bullion received from mines				233	19	6
" to transfer fees, &c.					16	0
				171,507	12	7

CR.

	£	s.	d.	£	s.	d.
By purchase of mines				161,576	0	8
" office furniture, at cost				80	0	0
" machinery and plant, at cost				5,260	17	5
" stores on hand				276	4	0
" exploring and development account				1,852	17	0
" preliminary expenses account				428	3	11
" sundry debtors				230	1	0
" cash at bankers	£79	19	11			
" " in hand	3	19	11			
" " at mine	144	10	6			
" bullion at mine estimated	92	11	10			
				321	2	2
" insurance account				127	10	3
" interest account				75	6	6
" Reduction Works' account				120	4	2
" Gold Hill Mill account				95	8	3
" salaries, taxes and management expenses at mines				599	5	3
" salaries, rent, stationery, cablegrams and sundries, London office				464	12	0
				171,507	12	7

Lillooet, Fraser River and Cariboo Gold Fields, Ld.—The annual meeting of this company was held in London on the 19th of December. Mr. R. M. Horne-Payne, Chairman, in course of his speech said:—In reviewing the present year, one of the matters of first importance that has occurred in our history has been the granting of our charter by the Legislature of British Columbia—a charter which confers upon us important privileges, and enables us to take full advantage of the natural resources of the country, such as land, timber, mill sites and water power, and especially facilitates the economical working of our enterprise. The power given us to group several adjacent claims, and to work them as one property, is particulary useful, inasmuch as the ordinary Mining Act of the country requires a certain amount of actual development to be done upon each claim before a Crown grant can be obtained. This would be a great handicap to a company developing its properties on a large scale, because it is more often expedient and economical to develope several mining claims by one shaft in one of them, with tunnels and winzes projecting into the others, underground or otherwise, than it would be to dig a series of small shafts from the surface of each claim. We are allowed to group eight claims together, and do the work of the eight on any one of them, and therefore we are enabled to do eight times the amount of prospecting and development work, in proving a vein or ore-shoot, for the same money that we should have to expend in driving a separate small shaft in each claim. Very early it became apparent that 1896 was going to be an era-marking year in the history of British Columbian mining enterprise. A very great change had occurred since 1892 and 1893. What was then a virgin country, almost untrodden by the foot of white man, save in a few beaten tracks, is now a country freely besprinkled with mining encampments and villages, roads, and even railways. Rossland itself claims to have 10,000 white inhabitants, and I think it is pretty generally admitted that its population is about 7,000. Trail, probably, has from 1,000 to 1,500. Both are now flourishing towns, with well-built streets, hotels, shops of all descriptions, and saloons galore, and are conspicuous amongst all the mining camps of the Pacific coast for one thing of which every Englishman feels proud—the remarkable law and order and safety to human life and property which prevails in them, and the splendid and fearless way in which the law is enforced. These improvements and developments have been mainly the result of the greatly improved facilities for travelling. There is now a very fine line of steamboats on the Arrow Lakes and Columbia river, and on the Kootenay lakes and Kootenay river, and such lines of railway as the Nakusp and Slocan, Kaslo and Slocan, and the Columbia and Kootenay, only a few miles in length each, suffice to unite these great waterways and practically throw open every facility to mining enterprise in the West Kootenay district, of which you have a map in your reports. Your operations, as you know, are controlled by the board, and I think I may truly say that no company in London has a board that has more constantly and determinedly attended to its interests and devoted more to them than ours has. In British Columbia we have at present a head office at Vancouver, where most of our accounts are kept, and where the details of the company's business are under the supervision of our managing director, with the advice of our local directors. Last, but not least, we have Mr. Jamison, aided by a staff of three or four competent junior engineers and assayers, who makes regular rounds and inspect all the property, directs all mining enterprise proper, and takes entire control of the acquisition of options and the development of our mines, and an assistant manager or inspector who also makes regular rounds and takes charge of all matters other than mining, and especially of mining supplies and the commissariat. And now as to your property. You are told in your report that you have 81 claims, and that among them you have two groups forming well-developed mines, one good mine composed of only one claim, and three groups which are rapidly coming well to the front. The Lanark Group is situated at the little town of Laurie, on the main line of the Canadian Pacific Railway, where the railway company recently built us a very nice station. The mine is situated about a mile from the railway station, and straight up about 3,000 feet above it. The group consists of some six claims, and nearly all the development work at present is on the Lanark claim proper, although, as our chief engineer tells you, a good body of ore is visible above the Lanark on the Maple Leaf, which he is very shortly going to commence to develop, and in the interior of the mountain on the lower level a good portion of the ore is in the Red Fox. The ore is a solid, heavy, sparkling galena, formed in large cubes, containing a very large percentage of mineral; much of it is so malleable that you can easily take shavings off it with an ordinary pocket-knife. As you are aware, we had already acquired our interest in the Lanark property before our last meeting. As it became more and more developed and proved it became apparent that the ore body spread into the neighboring claims of the Maple Leaf and the Oak Leaf, and our chief engineer advised us to buy these claims if possible, and to consolidate all the interests on the vein. This we successfully accomplished. The next thing to do was to make arrangements for realising our ore. Mr. Jamieson advised us to erect an aerial tramway from the mine to the railway, and a concentrator to separate the galena proper from the surrounding rock and gangue, without which it is impossible to get it down. After carefully examining the various classes of tramway, we decided that Messrs. Fraser & Chalmers' "Otto" tramway would be the most suitable for our purpose, and a contract was therefore let to them on August 27 for its erection. A very careful test was also made to ascertain exactly what was the best machinery to be used in the concentrator, and this was also ordered. A small saw-mill with which to cut our own timber, of which we have a very large supply of excellent quality on the property, to be used both for mining purposes and to construct our buildings with, was erected. A bridge across the Illecillewaet River, which intervenes between the mine and the railways, was built; and, according to our last report, our concentrator building, office building, store, store rooms, stables, accommodation for our men and manager, and blacksmith and carpenter shops, etc. were all practically completed. We are now anxiously awaiting the completion of the machinery and tramway, and we hope that within the next thirty days we shall hear that everything is in working order. Your chief engineer estimates that the amount of gangue which must unavoidably come down with the galena will not exceed 3 to 1, and therefore we anticipate getting 50 tons of concentrates regularly per day, year in and year out. Next on the list we have the City of Spokane Mine, referred to in the map as Trail Mine No. 1. The property is practically a full-sized mineral claim, and is situated right in the centre of the main or north mineral belt of the celebrated Rossland district. We have four clear, well-defined veins running throughout our property almost parallel, which can now practically be traced straight from Le Roi and War Eagle, through the Centre Star and the Iron Mask, both proved mines, into our own, and out of our own again beyond us. We next have the Alpha group on the list, and this, though one of our most recent acquisitions, gives promise of being our Bonanza. Since bonding we have ourselves further staked out three full-sized claims and three small fractions. The vein rises through a mountain from a point where it was first located on the Broad View Claim through its entire length and through the length of the neighboring Old Sonoma Claim well into the Phillipsburg—a distance, all told, of some 4,000 feet, and, owing to the rugged character of the mountain and the absence of vegetation, the outcropping is continuously traceable throughout the whole distance. It has been opened in three places by three shafts, which demonstrate its continuity throughout, in character as well as in size. An open cut and shaft having been made in the side of the mountain on the extreme end of the Broad View on the one side, and a shaft having been sunk at the opposite extreme end of the Old Sonoma on the other, by which the trend of the vein and its character were disclosed to our chief engineer, he decided to concentrate his work on a new opening

which he made about half-way between the two, and just at the juncture of the Broad View and the old Sonoma Claim. He tells you, in his report, that the vein is from 45 feet to 50 feet wide, and that 20 feet or 25 feet of this is rich in grey copper and galena; and he adds that he is sinking a shaft to be 100 feet in depth, with all possible speed, and that at that depth he proposed to crosscut parallel in the ore body to its extremity, or far as should be practicable. I am glad to tell you that we have received a cable from him, informing us that the shaft has reached a depth of 100 feet from the bottom of the open cut, or 105 feet from the surface outcropping; that is in ore all the way, and that he has done 326 feet of crosscutting still in ore, which gives us at least 5,000 tons immediately available, with an average value of $60 per ton. Considering the short time we have been at work on this property, I think that this affords us a subject for very great congratulation. We now pass on to our second category of properties—those on which a good deal of development work has been done, and which show excellent prospects, but which we cannot yet place in the category of practically proven mines. First we get the Sunshine group, also in the Lardeau district, and about seven miles away from the Alpha, on the opposite side of the Lardeau Valley. The vein here has been proved to be well in place, though of a comparatively smaller size. There is in all about 9 feet of ore, which gives results rather higher than those of the Alpha, and leads Mr. Jamieson to say that we may anticipate a net profit of between $60 and $80 per ton. In all respects the composition of the vein is very similar to that of the Alpha, and whilst there is not sufficient development work done to justify us in claiming any great proved value to the mine, there is ample to give us every reason to hope for big results. These remarks alike apply very largely to the Isabella and the Aaron groups. Of the Apache group we can only say that there are good prospects. As to the Aaron's Isle, the shaft is down some 50 feet, but as value can, as in the case of Rossland, only be expected with depth, it will be some three or four months before we can speak with any positiveness as to its real worth. There is one other claim to mention specifically, namely, the North Star, at Rossland. On this we have done up to the present no work at all; we bought it exceedingly cheap, and have been offered, and have declined to consider, over three times as much as we paid for it. It lies between two properties, the Georgia and the Columbian-Kootenay, on both of which large bodies of valuable ore have been proved. These properties have been selected from amongst a great number. The majority of them, almost without exception, are gold-bearing properties, as we think, of promise. The exceptions are a group of cinnabar or quicksilver properties, which were located for us by one of our own prospectors. In conclusion, it may interest you if I give you my views, for what they may be worth, as to the prospect of immediate development of the province in which we are interested. I believe that British Columbia in the next twelve months is going to claim by right that which it has long claimed by reputation—a place in the list of the richest gold-producing countries of the world. I also believe that during the next twelve months British Columbia will give a very large yield of precious metals, which will enrich those of us who have taken an interest in the development of her resources. There are two other matters of general importance which it is pleasing to note in passing, and they are the liberal considerations which are given by the Imperial Government both to the Pacific cable and to the fast Atlantic steamship line to Canada, and it is satisfactory to know that the pioneer direct line of steamships between Australia and British Columbia have recently found it necessary to add a third and larger vessel to their regular sailings. I should like to conclude my remarks to-day, as I think the chairman of almost all companies would, by asking you to vote yourselves a substantial dividend; but I regret that it is impossible, and I think you will realise that a big mine cannot be developed in one year. Our mines have been well developed, and show every possible prospect of success, and I trust and believe that when next we have the pleasure of meeting you it will be to ask you to vote yourselves a substantial dividend, even if we have not in the meantime been able to give you an interim taste of the good things that are to come. I beg to move that the report and accounts now in your hands be approved and adopted. M. Henri Rosenheim said, as a French director, he had very great pleasure in seconding the resolution. The motion was then unanimously carried, and the proceedings terminated with the usual compliment to the chair.

Cariboo Mining, Milling and Smelting Co.—The following is the financial statement submitted to the shareholders under date of 1st ultimo:—

Capital stock		$800,000 00
Water rights and mines	$800,000 00	
Dividends unpaid		30 00
Dividend account	108,964 76	
Expense " (general)	11,516 74	
Mill account	17,352 62	
Labor "	73,198 24	
Mine and Mill supply account	20,164 17	
Personal property	354 51	
Rent account		2,119 04
Mineral tax	259 86	
Bullion account		243,115 95
Building "	425 73	
Amelia mining claim		26,230 20
Profit and loss	8,700 00	
Treasurer's account	30,558 56	
	$1,071,495 19	$1,071,495 19

Dividend of $1,600 paid December 7th, 1896.

Hall Mines, Ltd.—The following is the report of the Directors submitted at the annual meeting of shareholders on 17th ultimo:—

"The directors now beg to submit to the shareholders the statement of account and balance sheet for the year ending 30th September, 1896, duly certified by the auditor, being the third balance sheet issued since the formation of the company.

"The balance sheet shows a gross profit of income over expenditure of £28,067 6s. 5d., from which it is proposed to write off the sum of £3,807 19s. 9d., for depreciation on buildings, plant, machinery, etc., for the past year, during which the smelting furnace was only 185 days in blast. This profit balance would have enabled the directors to have recommended the declaration of a dividend upon both preference and ordinary shares, but for the debit balance brought forward from the 30th September, 1895, which has first to be met. The balance remaining however, will suffice to pay the dividend due upon the preference stock, £3,662 8s. 2d., and carry forward a balance of £1,930 6s. 4d. to the credit of the current year, which disposition of this balance the directors accordingly recommend.

"The wire tramway was originally constructed to work in one section, but this having been found to cause too great strain upon the rope, the tramway has been divided into two sections, at the cost of the contractors, and has since worked satisfactorily. The ropeway and standards have all been thoroughly overhauled and put in efficient order, so that it is now confidently relied upon that this means of conveyance will suffice to bring down continuously the present output of say 120 tons a day from the mine to the smelter.

"The work at the mine has proceeded with vigour during the past year, and we refer the shareholders to the report of the mine superintendent appended hereto for particulars of the work done.

"No further work has been done on the gold lead on the Daylight claim, the directors having thought it advisable to suspend further operations thereon until the result is known of the prospecting work now being carried on by another company on the same lead on the neighbouring Starlight claim.

"The smelting works were completed and the furnace blown in during January, and with some stoppages the furnace continued in blast until the beginning of September, when it was found necessary to shut it down and make substantial alterations and repairs. These alterations and repairs have now been completed and the furnace is now again in full blast. A new blast furnace has been ordered and is under construction; and refining works, consisting of reverberatory furnace and roasting oven, are now approaching completion.

"The Auditors' report is herewith annexed.

"There are three vacancies on the baard to be filled by election, Mr. D. H. Gibb, Mr. Walter Neilson and Mr. Ramsay (the latter of whom has occupied a seat on the board, temporarily, since July) having resigned. The two former gentlemen do not offer themselves for election.

REPORT OF THE MINE

"The mine superintendent, in his report, gives the summary of tonnage shipped from the mine to the ore bins, from September 30, 1885, to September 30, 1896, as 23,600 tons.

"The company's mines are shown to be as follows: Silver King, Kootenay, Bonanza, American Flag, Koh-i-noor, Lakeside, Daylight, Britannia, J. M. B., Bid, Grand Jessie, Eureka, Rose, Thistle, Shamrock, National Emblem, Horseshoe and the Iron hand for iron flux.

"He shows that during the past year the mine development has been confined to the Silver King, as follows: drifting, 505 feet; sinking, 139 feet 6 inches. The ore in stock in the mine bins on September 30, 1896, was estimated at 1,910 tons. All pumps, hoists, drills, etc., with present air supply are able to be in operation when required, which greatly facilitates carrying on the working of the mine and increases progress of development work. The superintendent estimates the probable amount of ore in sight on 30th September at 159,600 tons. The estimated daily output from the date of the report is given as follows: from September 30 to January 1, 125 tons; from January 1 to March 1, 125 tons; from March 1 to May 1, 130 tons; from May 1 to September 1, 150 tons. The aerial tramway has been in operation during the past year and has taken 22,100 tons away from the ore bins; 12,691 by contractors prior to June 1, and 9,839 tons by the company from June 1 to September 30. In conclusion the superintendent says: 'I may say that with present appliances the mine is now fully equipped, both with machinery and labour in all its branches, and I hope now to be able to push along the work in a workmanlike and satisfactory manner. I have received great help in carrying out the work during the past year from the staff of the mine, and have, I consider, men thoroughly efficient in all the several branches.'"

INCOME AND EXPENDITURE.

Income and expenditure account for the year ending 30th September, 1896:—

DR.

	£	s.	d.
To Ore in stock 30th September, 1896	7,345	16	0
Ore purchases	1,979	15	6
Expenditure in British Columbia—			
Mining—wages, salaries, stores and general expenses	24,305	0	9
Taxes on ore and cordwood	259	4	7
Smelting—wages, salaries, coke, fluxes, stores and general expenses	23,471	13	11
Offices and general expenses, salaries, law charges, insurance and miscellaneous expenses	1,557	18	3
Interest	609	6	1

Expenditure in London—	£	s	d
General expenses, including salaries, law charges, travelling expenses, auditors' fees and office expenses	1,564	19	6
Directors' fees	812	10	0
Interest	75	10	2
Depreciation—buildings, plant and machinery, tramway, smelter and office furniture	3,807	19	9
Balance, being surplus income over expenditure for the year carried to balance sheet	24,259	6	8
	£90,049	1	2

CR.

By Ore sales	68	9	6
Matte sales	78,933	16	10
Ore and matte in stock at September 30, 1896	10,850	11	9
Rent received	1	0	6
Assay charges	21	7	11
Transfer fees	173	8	0
Difference in exchange		13	0
	£90,049	1	2

BALANCE SHEET.

September 30, 1896. To share capital, 50,000 cumulative preference shares at £1 each	50,000	0	0
To 250,000 ordinary shares of £1 each	250,000	0	0
	£300,000	0	0
Issued—25,000 cumulative preference shares of £1 called up	25,000	0	9
175,000 ordinary shares issued as fully paid up	175,000	0	0
75,000 ordinary shares of £1 each called up	75,000	0	0
Loan account	13,888	17	8
Sundry creditors	2,135	5	5
Income and expenditure account—Surplus income over expenditure for the year ending 30th September, 1896, per account	24,259	6	8
	£315,283	9	9
Deduct—Calls in arrears	350	10	0
" Balance at 30th September, 1895	18,666	12	2
Total liabilities	£296,266	7	7
Contingent liabilities, dividend at 7 per cent. per annum on amounts paid up on 25,000 cumulative preference shares	3,662	8	2
Directors' fees	779	5	0
	£4,441	13	2

PROPERTY AND ASSETS.

By Mines cost account as at 30th September, 1895	201,931	10	4
Add further expenditure during the year ending 30th September, 1896. By new claims taken up	556	1	5
Prospecting	1.152	14	9
Water rights and development	494	17	5
Buildings, plant and machinery, as at 30th September, 1895	5,203	3	8
Additions during year ending 30th September, 1896	4,323	17	2
Tramway from mine, as at 30th September, 1895	10,843	12	9
Expenditure during year ending 30th September, 1896.	4,892	9	8
Smelter account. as at 30th September, 1895	2,636	4	6
Expenditure during year ending 30th September, 1896.	17,928	17	9
Land purchased, as at 30th September, 1895	411	10	5
By addition during year ending 30th September, 1896	226	6	8
Office furniture in London, as at 30th September, 1895.	82	7	3
Additions during year ending 30th September, 1896	49	7	9
Stores and tools on hand, B. C.	12,493	13	7
Ore and matte in stock, B. C.	10,850	5	5
Open shipments of matte	13,323	9	11
Sundry debtors	229	8	4
Cash at bankers and on hand	3,444	8	7
	£300,074	7	4
Deduct depreciation written off	3,807	19	9
	£296,266	7	7

Le Roi Mining and Smelting Co.—We are officially advised of the output from this company's mine at Rossland as follows:—

1894— 6,000 tons of a value of	$250,000
1895—11,000 " "	450,000
1896—20,000 " "	800,000

The dividends paid during the years 1895 and 1896 amounted to $250,000.

CORRESPONDENCE.

The Largest Nugget Found in Australia.

SIR,—Referring to page 255 of your December issue, I note that you have been put right with regard to the colony in Australia, where the "Welcome" nugget was found, but you are still very much in error, as to the weight. As one who has had the "Welcome" in my arms permit me to say that it was found by a party of 24, at Bakery Hill, Ballarat, in the colony of Victoria, 15th June, 1858, was sold by the discoverers in Ballarat for £10,500, and after being exhibited for a time in Melbourne was again disposed of for £9,325.

It then weighed 2,159 ounces, so that the price obtained was £4 4s. 11d. per ounce. This nugget was found at a depth of 180 feet. It was apparently water worn, contained about 10 pounds of quartz, clay and oxide of iron, and measured 20 inches in length, 12 inches in breadth, and 7 inches in depth. The "Welcome" was melted in London in November, 1859, and contained 99·20 per cent. of pure gold.

A still larger mass of gold than the above was discovered on 5th February, 1869, at a spot about a mile west of the village of Moliagul, in the neighborhood of Dunolly, also in the colony of Victoria, and was named the "Welcome Stranger," and is the largest nugget ever found in Australia, or perhaps anywhere else. Similarity of names often leads it to be mistaken for the first named. It was found by two miners, on the extreme edge of a patch of aurifirous alluvium, within two feet of the bed rock (sand-stone), in a loose gravelly loam, resting on a stiff red clay, the nugget being barely covered with earth, in fact it was in the rut made by a cart wheel that the treasure was first noticed. The melted gold weighed 2,268 ounces, 10 dwt. 14 grs, and contained only 1-75 of alloy, compose chiefly of silver and iron. Including the pieces given away to their friends by the finders, the nugget yielded 2,280 ounces, equivalent to 2,248 ounces of pure gold, its value at the Bank of England being £9,534.

Trusting that Canada will, in the near future, unearth something to beat the two "Welcomes."

Yours, etc.,

Clinton, B. C., 6th January, 1897. F. SOUES.

Lake Harold Gold Mines Prospectus.

SIR,—On perusing the December copy of your journal, recently sent us by you, we are surprised to find a very unfair criticism upon the prospectus issued from our office inviting subscriptions for 300,000 shares of stock of the Lake Harold Gold Mines Company, Ltd.

It appears to us that for a journal, occupying the high position your's does in the mining world, and to which many look for guidance, that before writing on any enterprise, full enquiries should be made upon the points doubtful to your mind, as you must be fully aware of the powerful agency for good or evil, wielded through your medium.

On a careful perusal of the prospectus, which we are sending by concurrent post, no such meaning or inference, given by you, can be attached to its wording.

As guardians of the public, we think it would have been advisable had you requested us for more information before criticising a property in which the public have already invested, as in our prospectus we volunteer to supply any information required, and to exhibit a copy of the agreement made with the recent owners of the property and a copy of the report made for us by an expert of our own choice.

Further, we might say that this company has a property with an area of between 200 and 300 acres, with many veins and a large ore body and that in place of a 10 stamp mill being sufficient, it is not at all unlikely that in the near future it will require 20 to 30 stamps.

The directors are well known men, who are responsible and fully aware of the responsibilities of offices, and are not by any means guinea pig directors, and a well filled treasury is not likely to go amiss in their hands.

In order that you may be fully informed upon the subject, we enclose in the prospectus above mentioned, a copy of a statement made under

oath of the monies already expended upon the mine, together with the report made by Mr. Peter McKellar for us, before we took up the transaction.

We feel sure that it is only necessary for us to give you this information and to draw your attention to the injustice done, to have you correct the wrong impression conveyed in the remarks of your December issue.

Yours &c,

(Signed) AEMILIUS JARVIS & Co.

We refer editorially to this letter.—Ed.

Amendments to Ontario Mining Act.

SIR,—As the provincial legislature is about to convene in the near future, I have taken the liberty of calling your attention to a deficieny in our present Mining Act. There is nothing in it which makes provision for the working of mineral properties when the minority prospector or other inter interest will not be party to or accept any reasonable proposition for the sale or working of such minority interest. A number of properties up here are lying idle for this reason. It would be to the benefit of the country if a clause were inserted in the Act making it compulsory for the minority interest to accept the same pro rata terms should the majority dispose of their holdings. Or in the event of the majority interest working the property that the minority be compelled to contribute their share for the expense of opening up, proving and equipping of the property, if results warranted it. Some of our prospectors and others holding very small interest in properties have been able by their extravagant demands to keep properties tied up and undeveloped which would otherwise have been opened up and tested. The end in view is simply that such provision be made as will prevent this and at the same time protect the minority interest. It would seem as though this could be accomplished if the government would appoint one or more umpires to rule on such matters whose decision would be final and prompt. In such cases at present there is no way of settling such matters unless the courts are resorted to. This is expensive and much valuable time is lost before a final ruling is given.

In view of this can we ask you to bring this to the attention of the Canadian Mining Institute that the matter may be forcibly presented to the legislature at its coming session and oblige.

Yours &c,

R. W. DE MOREST.

Sudbury, 13th Jan., 1897.

The Bertrand-Thiel Process.

SIR,—I am sorry to find that my paper on the above has not been as clearly expressed as it ought to have been.

The yield which will ultimately be attained is possibly indicated by the fact that in the four charges, 84,456, 84,463, 84,488, 84,499, the steel obtained was practically the same, although the amount of scrap used was variable.

Thus in charge 84,456, 57½ p. c. of scrap was used and the loss was 8·29 p. c.
" 84,463, 57½ " " " 7·28 "
" 84,488, 20·47 " " " 8·4 "
" 84,499, 10 " " " 7·83 "

That is to say where least scrap was used there almost the smallest loss was obtained. In other words where the least iron (in the form of pig and scrap) was put into the furnace (as scrap contains more iron than pig iron) there almost the smallest loss was obtained.

Further, in charge 85,241 (this result was only received by me on the 14th inst.) the total metal charged equalled 20·06 tons and the yield of steel was 20·13 tons. In this case 30 per cent, of scrap was used.

It is utterly impossible to melt 30 per cent. of scrap without largely oxidising some of it (if the scrap be melted in the ordinary manner), but this oxide formed from the scrap is partially or entirely reduced again by the metalloids in the charge and thus the loss so occasioned is hidden.

When no scrap is used then more oxide (ore) will be charged and the yield will more nearly approach that indicated by theory; then 100 of pig must produce more, much more, than 100 of steel. If so this process will almost certainly produce steel more cheaply than steel is being produced to-day by any process whatever, not even excepting the Basic-Bessemer.

It is possible that the following statement embraces the theory or theories which will enable the above results to be obtained:

1. The intense heat employed permits a certain chemical re-action to take place with much more ease and rapidity than formerly.

2. The transfer from one furnace to another gets rid of the voluminous slag and enables the steel to be got ready for casting.

The "certain chemical re-action" above referred to is:

(*a*) The Silicon
(*b*) The Phosphorus
(*c*) The Carbon
(*d*) The Manganese
} in pig iron each combined with oxygen.

The above oxygene may come from the air, in that case, 100 parts of pig iron must make less than 100 parts of steel, because there is both the loss due to the elimination of so much Si. P. C. and Mn., and the loss due to silicon and phosphorus becoming acids, viz: Silica and phosphoric acid. These acids being greedy for bases combined with lime and some oxide of iron (derived from the pig under treatment).

If, however, the oxygen comes from oxide of iron a very different state of affairs results (*provided there be heat enough* at the disposal of the operator) to liquefy the iron reduced from the iron then each atom of silicon, phosphorus, carbon and manganese (in seizing on oxygen from oxide of iron) liberates some metallic iron from the oxide, this liberated iron passes into the steel.

It follows from the above that the more silicon, phosphorus and carbon that there is in the pig the greater will be the weight of the steel obtained.

What the limit of the metalloids in the pig will be theory cannot say, practice must determine this.

In conclusion I would remind your reader that Part 1 contains my views on the subject and that perhaps the most important page is 21. Parts 2, 3 and 4 contain the data upon which Part 1 is based, as it is always desirable that my statements should never be taken without giving opportunity for an examination of the facts upon which such statements are based.

Yours etc.,

PERCY GILCHRIST.

London, Eng., 31st Dec., 1896.

Stuart's Statement Confirmed.

SIR,—I have read the correspondence in your last issue from Mr. John W. Thickens, prospector, and Mr. George W. Stuart, mining engineer. I was at Fort Frances when the party mentioned left there on steamer "Lloyd." R. H. Wiegand, not Wiggin, is a brother of Thomas Wiegand, the discoverer of the Foley Mine. Preston gave me an introduction to Stuart. The "Maple Leaf" is the steamer which makes triweekly trips from Fort Frances to Mine Centre for the Combine Lumber Co., and had just arrived at Fort Francis from Rat Portage with supplies for the company's winter camps in the Manitou district. The captain of the "Maple Leaf" had been persuaded to miss one trip to Mine Centre in order to take two barges of supplies up the Manitou Lake. The "Lloyd" was going part of the way to Mine Centre, but not having Canadian Register, Mr. Stuart's party arranged to go on the "Lloyd" to the International Boundary and take canoes the rest of the way. I got one of these for Wiegand, who was going prospecting for me on a two weeks' trip after arriving at Mine Centre. I quote the following from Wiegand's letter: "I did not find anything on the trip, as we had a snowstorm after starting. I was out six days."

Yours etc.,

JOHN GREEN.

Toronto, 15th Jan., 1897.

MINING NOTES.

British Columbia.

From our own correspondents.

Rossland District.

It is reported on excellent authority that the War Eagle has been sold; that is, an offer to buy has been made and accepted and the deal has been closed except for the actual handing over of the purchase price, which is said to be $850,000, though, of course, the figure agreed on cannot yet be stated positively. The purchasers are Messrs. Gooderham and Blackstock, of Toronto, who bought the Crown Point last summer. So much has been said within the last six months about the sale of the War Eagle to an English syndicate, and so much comment made because the mine was not bought, that the public is now slow to believe that a deal has been made. The publicity given to these uneventful sales and the anxiety shown by the owners to sell their property have tended to put the mine in a bad light, and being one of the finest pieces of ground in Trail Creek this sentiment was of course hurtful to the camp. Too many people have the idea that when the owners of a mine want to sell their property it is because they believe it not worth mining, not taking into consideration that when a man has already made a goodly profit on his investment he is often willing to sell out for cash and let somone else carry the burden of care and trouble attendant upon any large enterprise. In fact there are many men who follow mining in a perfectly cold-blooded manner, developing their property extensively enough to demonstrate some of its value and show its possibilities then selling out, allowing the investor to furnish the large amount of money necessary to open up a big mine with the responsibility that goes with it. As a matter of fact the War Eagle has a very enviable record, and can be nothing but a credit to the camp. The mine was bonded to the present owners for the sum of $17,500. A tunnel was started and run some distance before striking an ore body, and development showed it to be a remarkable one. This chute was stoped out to the surface, and the several thousand tons shipped averaged $47.80, which is certainly very fine ore. This chute paid for the mine, paid for a compressor plant and paid something like $125,000 in dividends, and is now being mined in the lower tunnels; all of which is an eloquent commentatory on the value of the property.

It is also reported that a meeting of the shareholders in the Deer Park has been called to consider an offer of $500,000 for the mine by an English syndicate. This seems to be a very large figure for a property which has not yet shipped a pound of ore and which has but little development work done. However, there is nothing definite about it beyond that some sort of a deal is being agitated. The Deer Park people deserve success after working in the face of the obstacles they have overcome. The ground was known to contain a large deposit of sulphides, but they were valueless, and it was not till after sinking a hundred feet through this large body of barren sulphides that pay ore was found. A cross-cut was then run to the hanging wall, and the vein appeared to be very wide at this point.

The Red Mountain R. R. was finished about three weeks ago, and has been carrying passengers and freight regularly since its completion. The good effects of this road are being already felt, increasing as it does the transportation facilities and making the camp more easily accessible. One may now travel directly by rail from Rossland to Spokane, and this through traffic allows a much more expeditious handling of freight than was possible before. This also offers another outlet for ore, and the ensuing year will probably show greatly increased activity in the shipping.

The Red Mountain mine has installed a seven-drill Rand compressor, and is pushing ahead with its cross-cut tunnel, making about five feet a day. The face of the tunnel shows ore, and is somewhere in the neighborhood of a hundred feet from the vein it is intended to tap. There is a shaft on this vein seventy-five feet deep, with a short drift to the west from the bottom. An upraise is being made from this drift, and so far has blocked out some very fine copper ore. The Red Mountain made the first ore shipment over the new railroad, sending one carload on January 1st to the Tacoma smelter as a trial shipment.

The O. K. mill has been closed down for some time owing to an accident to the engine. The mill has been running very irregularly since its construction, and some time ago the connecting rod on the engine broke, ripping up the cylinder and blowing out the head. A new engine had to be ordered as the old one was wrecked beyond repair. The new engine of 80 h.p. is now in place, and connections being made the mill is expected to start up in a few days.

A reception was given to Hon. Mr. Blair, Minister of Railways and Canals, and Col. Domville on their visit to Rossland, followed by a banquet later in the evening, during which many speeches were made and congratulations exchanged; but the subject of greatest interest and the pivot, so to speak, on which the evening turned was the building of the Crow's Nest Pass R. R. The Hon. Mr. Blair expressed great surprise and gratification at the development and activity of Kootenai, and was strongly in favor of the building of the road, which was exactly the sentiment desired. It seems now that the road will be surely built, and it most certainly will be a great benefit to the country and a great developer of the country. It will open up the little known riches of the Kootenai, to say nothing of West Kootenai. It will probably be some time yet before the road is in running order—possibly some three years; but, by that time, if present indications count, it will act not so much as a pioneer as it will like an artery of industry.

Railroad building seems to be quite an epidemic now in this region. Mr. F. Aug. Heinze, who built the smelter at Trail and the narrow gauge road between Trail and Rossland, has now let out a contract for a road to Robson. The contract calls for the finishing of the road by May 1st, '97. Camps along the line are now being made, and grading will be commenced in a few days. The road will be run up the right bank of the Columbia and will cross at Robson either by bridge or ferry. This will connect with the road from Robson to Nelson, which is in connection with the Slocan, and will facilitate the traffic with Trail, eliminating the uncertain factor of the river, whose low water makes heavy freighting difficult.

The management of the Trail smelter has decided to do its own refining, and has ordered the necessary plant. Whether it is intended to turn out high grade bullion or an actual separation of the three metals, gold, silver and copper, is not known, but the refining will be done by a process of Mr. Bellinger's, the superintendent in charge of both the Butte and Trail works. The works are now shipping very high grade matte, thus reducing freight expenses to a minimum; but the installation of a refinery will still further reduce this expense.

For the past two years, off and on, the project of building a smelter either here at Rossland or at Northport has been talked of and dropped and talked of again, while in the meantime Mr. Heinze goes quietly into Trail, builds his own works and treats ore. Lately the subject has been revived with renewed vigor, and a company has been incorporated to build works at Northport for matting this ore. One of the promoters of this company is Mr. Wedekind, late superintendent of the Trail smelter, and it is proposed to give a freight and treatment charge from Rossland of seven dollars a ton. This being the case, it will allow the profitable mining of low grade ore that the present charges of eleven dollars a ton will not permit, and, consequently, the camp will make much larger shipments. This smelter, or matting works, at Northport would have great advantages over the one at Trail. While Mr. Bellinger is an exceptionally competent metallurgist, and one who has the science of the economic smelting of auriferous sulphide ores down to a fine point, still the location of the works at Trail puts the owners more or less at the mercy of the outside transportation lines for their supplies, etc., while the works at Northport working, as is proposed, in conjunction with the Spokane Northern R. R. and the Red Mountain R. R. would not be hampered in this way.

It is said by some of the mine owners interested in this project that the construction of the plant will be begun in a month's time. It is to be hoped that no cut-throat rivalry will drive either company from the field, for the more the merrier, and the better for Trail Creek; but when the Crow's Nest Pass road is built, opening communication with the great coal fields on the C. P. R. and the potential mineral wealth of East Kootenai, then we may look for a fair field and no favor.

The Jumbo is looking well, and an ore chute has been built from the tunnel down the mountain side communicating with newly constructed bins. From the bins the ore will be hauled by wagon to the Red Mountain R. R., a distance of about a mile and a half. As soon as scales have been built the Jumbo will make a shipment. It is not expected that the shipments will be large, as the mine has but little ore blocked out as yet. A drift is now being run on a large ore body. A rather interesting strike was made on this property a short time ago by the discovery of some sylvanite, and associated with this was free gold. The ore was very silicerous, unlike the massive iron sulphides found in other parts of the mine. This ore of course gave very high assay returns, and this occurrence of a small amount of high grade ore, while the bulk is low grade, is the habit of the region. It is a low grade camp, and as such commands attention, for the large bodies of low grade ore have always been the most remunerative; but those who expect large quantities of high grade rock from Trail Creek are doomed to disappointment.

Early in December a syndicate headed by D. M. Linnard acquired by purchase four well known claims in the South Belt, all supposed to be on the same ledge. These claims are the Homestake, Gopher, Maid of Erin and Robert E. Lee. Of these claims the Homestake had considerable work done on it showing up more or less ore. Three shafts, a tunnel and open cuts demonstrated the continuity of the vein. The Lee had a small hoist and had been working a steam drill. The Maid of Erin and Gopher had comparatively little work done. The Homestake was bought by Mr. Linnard and a compressor put on the ground before the consolidation of the four claims. A compressor was then bought for the Lee, the machinery for which has just arrived and will probably be in working order very shortly. The work of mining the four claims has been put into the hands of Mr. Haskins as superintendent. A tunnel has been started on the Gopher and is now in about ten feet. This tunnel is to be one of the longest in camp, and will be run into the Homestake under the main shaft which will be sunk to meet it. The Lee is a shaft proposition and will be developed by sinking and drifting.

G. O.

Rossland, 15th Jan., 1897.

Slocan District.

The Nelson *Tribune* of January 2nd, 1897, places the total value of mineral exports from West Kootenay during 1896 at $3,500,000 or slightly over this amount. This estimate is compiled from the weekly reports of shipments furnished to that paper by customs returns at the Port of Nelson, and by the secretary of the Columbia and Kootenay Steam Navigation Company, which ships westwards by the Port of New Westminster. Sanguine estimates of a $10,000,000 export of mineral were made a year ago for 1896, but these were not fulfilled owing to a variety of causes, chief of which was the great amount of development work done on new properties whilst those properties which were already shipping were working under the disadvantages of high transportation rates and small capital. The output for 1895 was somewhat over $2,000,000. The increase for 1896 was $1,500,000. What the output of 1897 will be has not yet been estimated. If the same expansion of preliminary development is carried on into new districts, as in the past year, the mineral output will suffer to some extent in those camps already opened up.

Sandon, the shipping metropolis of the Slocan, is probably ahead of Rossland in the amount of business carried on and payments made. This town does practically all the business for the mines up the South Fork of Carpenter Creek, and it has also the advantage of competitive railroads. This point ships the ore of the Slocan Star, Ruth, Wonderful, Payne, Reco, and several other less well known mines, all working with stronger forces this year and paying good wages and fair dividends.

A mile up the creek from Sandon, is Cody, which is the natural shipping point of some of the best mines. Such as the "Reco" and Noble Five, together with a considerable number of small shippers of high grade ore. Two stores, warehouses, several hotels and a saw mill are operating at this point. Also the large group of mines known as the Noble Five Consolidated Mining and Milling Co., will very soon have their aerial Tramway and Concentrator at work.

This concentrator at Cody is almost entirely a duplicate of the one built for the Slocan Star Mine, and if it runs as satisfactorily as the latter, the Noble Five will be a large shipper of concentrates during 1897. The Tramway is a modification of the Bleichart system, the upper fixed cable is 1¼ inches, and the lower ⅞ inches. The towers or bents are placed at irregular intervals, several hundred feet apart in most cases, and there is one very long span across the "Noble Five" slide. Everything will be done to make the system as automatic as possible, and the total length in one section is about a mile, having its upper station just below the 8th level, from which will come all the ore stoped out of the upper workings, and be received into a large ore bin which will feed the buckets. A large amount of concentrating ore has been already exposed, and connections between the levels are being run so that there should be no hindrance to the steady output after the tramway is once started up, as it is expected to be in a week or two. No shipments are at present being made, the ore being stored. The water supply is taken from Cody Creek, about 400 feet above the point at which the Slocan Star flume draws its supply, and it is intended to use this head for driving the 32 inch Pelton wheel, and to supply the jigs with water.

The Reco Mining Company are pushing along development work on their property, and continue to ship considerable rich ore. There are six tunnels or levels on this property. Three of which are being worked on the rich vein, for which the Reco is well known; and three on another vein of concentrating ore. It is probable that a mill will be put up at or near Cody to treat this ore before very long. A very commodious house for the men's quarters is being built, and there appears to be a desire to give the miners decent lodging at this mine.

Up to the present time very little attention has been paid to housing the men comfortably at most of the Slocan mines. A score or two of men were obliged to sleep in dim log shacks which had a double tier of bunks all round the walls, with hardly a breathing space in the centre. The result of this is a good deal of sickness, at least more than is necessary amongst the miners. The Slocan is a gloomy enough country in winter without shutting men into dark, damp, and crowded shacks after working in wet drifts all day.

A comfortable and large boarding house is nearly completed for the Slocan Star Mine. Over a hundred men are working here now, and all the ore goes through the concentrator at present. The concentrator being run partly by steam and partly by the Pelton wheel at this low stage of water in the creeks. The jigs are supplied by a flume from Cody Creek. The engineering of which flume was done by R. Green, a McGill mining engineer. This flume is almost entirely run on a ground or rich bottom, thus avoiding the danger of frost and breakages fouud in using trestle work in the Slocan climate.

The Payne Mine, in which A. W. McCune is largely interested, is putting out more ore than at any former time. Two and three car loads are shipped per day lately, and a strong force of teams are kept busy bringing the ore down the new waggon road to the ore house just above Sandon, on the K. & S. Ry. This mine is under the management of Geo. Hughes, one of the earliest silver mine operators in this district, and this mine is the first find of the pioneer prospector, Eli Carpenter, who sold it for $2,000 to S. S. Bailey.

It was reported last month that the Alamo concentrator (Slocan Milling Co.) had shut down their mill for the winter. It is not so. They probably intended to do so but the very mild season has caused the flume to be no trouble, and the light fall of snow makes it easy to run the gravity tramway.

The Mountain Chief is a shipper this winter again, also the Moniter, and there is some revival of interest along the North Fork of Carpenter Creek, chiefly upon the Roulette, Phœnix and London properties. A good deal of dry ore is found up this branch of Carpenter, but the place has not been popular so far, although having a good deal of facility for development, owing to its nearness to the C. P. R. at Three Forks.

Along the Bear Lake and Kaslo Creek country there is more interest than usual. A store and hotel have been built at McGuigan Siding for the accommodation of the mines in the Washington, Surprise and Best claim swhich ship at this point. No concentrates are being sent down from the Washington during this season of winter and short water supply.

Further east, towards Bear Lake, it is reported the Lucky Jim is shut down for the present. This mine is the only one at present using a compressing plant in the Slocan. Though the Slocan Star is now installing a 50 H. P. plant in their old bunk house.

East of Bear Lake, about a mile on the K. & S. Ry., is the Wellington siding and ore house of this mine and of the Eldon Golden & Silver Mining Co., which is working this winter, and is situated a little above the Wellington.

At White Water, or the old 17 Mile House, on the Kaslo road, a little town has sprung up, owing to the proximity of several promising properties. Chief of which are the White Water on the north side, and the Northern Bell on the south; besides these, several others are working in a small way on ore bodies which are somewhat richer than the usual galenas. These ores are chiefly a dark dense galena, zinc blende and grey copper, the zinc blende and grey copper carrying high values. In this they resemble the Enterprise Mine on 10 Mile Creek, Southern Slocan.

The White Water has six drift levels along the vein, in five of which there is a showing of ore. In places there are large bodies of this ore, and the showing which this mine made during December of 15 car lots shipped, recommends its productiveness, and also a dividend of $26,000 was divided amongst the owners on January 1st. The mine is but a short distance up White Water Creek from the K. & S. Ry. and is well placed for timber and development work.

The Sunset, a claim east of the Wellington, is being worked by a few men, who are sinking a shaft on the outcrop, and there is a general interest and amount of development going on which shows great confidence in the Wellington White Water camp.

Coming to the Slocan Lake district work is being done on a cross cut to tap the Fisher Maiden on the Wakefield Group, Thompson Group, and others. These all doing development work and only making trial shipments. South of these, on Eight Mile Creek, work is still being done on the Silver Nugget and the Silver Band. Supplies have been taken up to keep them going until spring.

On the Galena Farm a good deal of work is being done. The payments due under the option given last summer fell due during this month, and the original operators have turned over the group to a London company capitalized at $2,500,000 in £1 shares. It will be interesting to see how silver mines in the Slocan sell in the London market.

On Ten Mile Creek the Enterprise has changed hands. It was bonded to J. A. Finch, a little over a year ago. The bond was taken up after a good deal of development, and now the mine has been sold for somewhere in the vicinitv of $300,000, part payment down. The ore in this mine is singularly well collected along the walls of a narrow vein, and there is great regularity in the ore body.

Other prospects under development on this creek are the Neepawa, Iron Horse, West Mount and Oregon City close round. Aylwins, New Townsite and further down the creek, on the Springer Creek side, are the Bondholder and Dalhousie.

Springer Creek continues to produce ore from The Two Friends, a rich galena mine eight miles up. Occasional shipments from the Howard Fraction of dry ore, and a trial shipment from the Chapleau, which carried $72 in gold, the highest gold value yet shipped out of the Slocan, also carrying 92 ozs. in silver. There are Lemon Creek ores, which carry nearly equal values in silver and gold and are characteristic of this section, being argentite pyrites and gold in a coarsely crystallized quartz gangue.

Work is still being carried on at the Republic, Slocan, Bob, Morning Star, Two Friends, Howard Fraction, Katie, Tail Holt, Lilly B, North Exchange and Old Glory. With the exception of the Two Friends, these are all dry ores of silver and gold. On the Exchange Group work has been abandoned temporarily pending a possible transfer.

Upon the Skylark and Ranger work is to be begun very soon, under the option of the Hall Exploration company, to whom this property has been lately transferred.

Notwithstanding the excessive cost of opening up prospects at this season, preliminary development seems active and the usual season of dullness in such matters promises to be a short one in this particular section about Slocan Lake. No doubt being due mainly to the construction of C. P. R. steamer and transfer barges for the lake, and the almost certain building of the branch road down the Slocan river valley from the lake to the Columbia & Kootenay railroad.

J. C. G.

Slocan City, B. C., 15th Jan., '97.

From our Sandon correspondent.

Since the first of the year the town has been rather quiet, owing in a great measure to the mines engaging so many extra men, but is now stirring up owing to the influx of people who are looking around for investments and also to settle here. We do not, nor ever have boomed this town or district, as the people here firmly believe that so many dividend paying mines in this vicinity is the best and most lasting advertisement, and we strongly deprecate the methods and ways that have been adopted by others.

The Cameronian Gold and Silver Mining Co. Ltd. ,have completed the organization of the company, and the stock is $1,000,000 at $1 per share, fully paid and non-assessable under B. C. laws. The officers of the company are: President, J. R. Cameron; vice-president, Angus Cameron; secretary-treasurer, M. L. Gimmett. The head office is in Sandon. The property consists of the Cameronian and Radnorian claims on Lemon Creek. Development work is being vigorously prosecuted during this winter, and as one result so far, a fine body of ore of three feet has been opened. They have about 30 tons of ore ready for shipment. and samples of same have been assayed, showing up very well and very pleasing to the directorate, one assaying $122 in gold and 21 ounces in silver, and a second one $65 in gold and 87 ounces in silver. It is the intention of the directors to put in a plant next summer to reduce the ore to greater advantage and more profit than by shipping out.

The Phœnix has struck a chute of high grade ore which runs from seven to fifteen inches and gives promise of still increasing, and average assays give returns of 200 ounces silver and 40 per cent. lead to the ton. Besides the Phœnix, there are the Cordelia and Roulette Groups in the North Fork of Carpenter Creek, which are creating interest in that part for which we are pleased, owing to the fact that returns from assays and shipments made show that although the quantity is not very large at present the quality runs very high and a greater part of it being concentrating ore.

The Payne Mine company have erected a large warehouse and office by their new siding on the Kaslo & Slocan railway, so as to give them greater facilities for shipping. They are sending out at the rate of fifty tons of ore a day. of high grade, which is bringing the owners in a very handsome dividend. This is a private corporation and is one of the many mines around here which is working away quietly but which has assisted in establishing a good name for this district.

It is remarkable how obtuse and shortsighted the policy of the present Provincial Government is in spite of so many warnings given them. Here in this town we supply the treasury of the government with recording fees, licenses, trade taxes, etc., etc., to the tune of about $5,000 and we get in return a paltry $30 towards a police constable, the balance of whose salary is made up by the citizens. But the citizens have been long suffering enough, so in public meeting assembled, respectfully demanded the following: 1. The appointment of a Stipendiary Magistrate and the holding of a Small Debts Court. 2. A regular sittings of the County Court here, and a Registrar. 3. The establishment of a Record Office here. 4. The establishment of a Jail here, the Constable's salary to be wholly paid by the Government. We consider number 3 as a very important matter for this district, as we have at present to send to New Denver, which causes considerable delay, but trust our representations through the proper channels will have due effect on the government. The wagon road between Three Forks and New Denver, which would greatly assist us as well as the two towns, is also neglected by the government so that there is a large bill against them on the day of reckoning.

The Reco Mine is shipping out a carload daily, and with the increased staff which, in the course of a few days, will be increased to 75 men, the output will be very largely increased. The president, Mr. Harris, who is superintending the mines for the next few weeks, has erected a splendid bunkhouse for his men, he being a believer in the axiom: feed and house your men well and you can then demand good work. . The company, as already announced in your paper, was stocked for $1,000,000 last November at $1 par value per share and placed on the market at that price, are now selling them at $1.25, with an upward tendency which is caused in a great measure by the directors guaranteeing a dividend of $100,000 by March 1st, thus making it a safe and sound investment. In the summer they will erect a tramway and concentrator to work the large quantity of concentrating ore.

The Star Mining and Milling Co., Limited, of this town, advertised for bids on their Rabbit Paw claim, and let the contract for the second 100 feet of tunnelling. This claim is next to the Slocan Star, and from the present appearances, the hanging wall having been struck, the lead which has made the Slocan Star famous, will be struck probably before the second hundred feet has been driven. The directors are not pushing the sale of stock, as they believe they have a good thing, and are waiting until they see how this new contract will turn out.

The Reed and Tenderfoot Group, which was taken over by C. W. Callahan, representing a London syndicate, is showing remarkably well. The lead is distinctly traceable through all the claims. The Reed claim is where most of the work has been done, and it is the intention of the company to drive a tunnel clear through the mountain for over 1,000 feet so as to enable them to bring their concentrating ore to the mill which they intend erecting on Tributary Creek, at Sandon, where they have selected five acres. There is practically an unlimited quantity of ore which compares very favorably with other shipping mines, but its great source of wealth will be when the immense body of concentrating ore keeping worked. A carload shipped the other day netted a profit of $85 a ton. We are very much interested in the progress of this group, inasmuch as when the tunnel is driven through, and the concentrator at work, it will be an increase in our prosperity, as it will be directly tributary to us.

McVay Bros. have sold their one third interest in the Ruth Mines to Geo. Alexander of Nelson. These are the mines in which W. Forster, M. P. of England. bought, some little time ago, a two thirds' interest for $166,000. It is one of our large shippers.

The Slocan Star is keeping up its shipments of two carloads a day and has been making improvements both in the mine and erecting an air compressor plant. It has also erected a fine new bunkhouse.

The Noble Five Concentrator will be started in a few days which will be a matter for congratulation, as it adds greater premanency to the town and district, and we shall be glad to see many more of such running here.

The new year has been ushered in with many expressions of future prosperity, and in looking back over the past year, Sandonites are proud of the fact that without any "booming" or "wildcatting," by persistent and strict attention to business, they are now occupying one of the foremost places among great producing mine centres and almost solely by the inherent wealth of their silver mines, and we are ever ready to give all legitimate investors all the information possible regarding good and sound investments.

W. W. F.

Sandon, Jan. 15th, 1897.

(From our New Denver correspondent.)

At the commencement of another year, we in this section of the country, have much to congratulate ourselves upon and much that would warrant us in forming bright hopes for the future. It is undoubtedly true that many, we might almost truthfully say the majority, are over expectant; but the fact remains that the most painstaking and conservative authorities predict brilliant developments in the Slocan during 1897. This ridiculously over-sanguine spirit was exemplified conspicuously at the beginning of last year, when absurd estimates were fearlessly advanced in many quarters, regarding the amount which the mineral production would reach for 1896. From the latest returns it appears that $3,500,000 represents approximately the value of the entire output for West Kootenay, which it is unnecessary to remark, is considerably below even the most moderate estimate of last year. That this will be largely increased during 1897 goes without saying, although by just how much, it is impossible to predict at present with any degree of accuracy, because it depends very largely on the improvements effected in the way of transportation, and the facilities afforded for cheaper ore treatment. Despite the large amount of capital now being expended in the Rossland district, it is probable that the exceedingly rich silver mines of the Slocan will be more than able to hold their own.

An opinion prevails that gold is almost unknown here, and conspicious rather by its absence than its presence. Although probably 99 per cent. of the value of the present production is derived from silver and lead mining, it is not by any means safe to assert that this will always be the case, because there are several promising localities where gold is very much in evidence; and similar indications in other parts of the country which I could name, would be liable to create somewhat of a boom there. On Eight Mile, a Creek entering Slocan Lake, a little below Silverton, a distinct gold belt is met with, and smelter returns from a small shipment in that neighborhood showed a value of $125 to the ton principally free gold. Again, the ore from the lower end of the lake which contains the silver mainly in the form of Argentite, frequently exhibits a gold value which in the Rossland camp would be considered phenomenal. A recent shipment from a claim situated on Dayton Creek gave returns of 94 ozs. silver and $72 in gold. Either of these alone would constitute a very desirable ore, and suffice to pay all working expenses, but together they form an exceptionally valuable combination.

The rumor regarding the sale of the Enterprise seems to have some foundation in fact. It is reported on excellent authority that the group comprising two full claims and a fraction has been bonded for $300,000 to a private firm represented by D. M. Hyman of Denver, Col.; $50,000 has already changed hands on the deal, and the remainder in two payments of $100,000, and $150,000 will become due on May 1st and July 1st respectively. The sale of this mine is interesting commercially, as showing the amount of money that can be made out of legitimate mining operations in a short time under favorable conditions. The claims were located in 1894, and bonded to Mr. Finch and his associates in Oc-

tober, 1895, for $25,000. Such a marvellously quick return on the outlay is unprecedented here. The ore is peculiar in character and almost unique in the Slocan, containing some 25 to 40 per cent. zinc, 15 to 30 per cent. lead, and averaging about 200 ozs. in silver, the larger proportion of which is found associated with the blende. Four carloads a week are now being shipped regularly from the property, and this notwithstanding the vein is only from 8 to 10 inches in width.

On the Arlington, which it will be remembered was also at one time under bond toMr. Finch, who expended some $10,000 on its development, frthuer exploitation is disclosing valuable bodies of ore, and there is talk forming of a company and placing the stock upon the market. This now appears to be the last resource of claim-owners where other legitimate means have failed, and although it is no doubt efficacious in many instances, it must be admitted that they appear just at present to be rather the exception than the rule, and discrimination is very necessary in the interests of investors. While, of course, the fact of the bond having been relinquished would be no inducement to outsiders to take shares, it is only fair to add that there is infinitely more reason in asking the public to support this undertaking, than a large number of other schemes which appear elegantly attired in recommendations from all sorts of interested parties. This mine is renounced for the magnificient specimens of native silver which it produces, and although a large number of the Thunder Bay companies formed for working this particular variety of ore, came to unfortunate ends, this need not deter others from attempting exploration here, providing they take reasonable precautions and not work blindly as is often done in this class of mining, luck being considered the most potent factor.

A company has been formed in London known as the "Galena Mines Ltd." with a capital of over $2,500,0 0 to work what are described in the prospectus as six valuable silver lead mining claims, situated two miles below Silverton on Slocan Lake. We can of course have no objections to others holding whatever opinion they like as to the value or otherwise of these claims, certainly the engineers employed should know their business in the matter, but from personal examination I should hardly be inclined to risk my reputation by calling more than one of them a valuable property, namely the Currie, on which almost all the development work has so far been done, and which was obtained on a bond for $20,000. It is quite possible that they may all eventally turn out to be worth large sums of money, it certainly never has been proven to the contrary, but so may a great many others of the same nature which could now be obtained for a mere song. Positive evidence alone is permissible in floating mining ventures, and it is admitted that with respect to five of the claims referred to, this has not as yet been obtained. The lead on the Currie which is very large, has up to the present been proven only to a depth of a hundred feet, and the ore is lower grade than that generally met with in the Slocan, yet the engineers employed, by some process of calculation known only to themselves have estimated the daily output at about 35 tons of clean ore and 135 tons concentrating ore, and the annual profit at $1,250,000. While there is no reason for doubting that a valuable property only awaits development, it seems to me that the estimates are to say the least, a little premature, and savour somewhat of the idea of counting the chickens before they are hatched. As judged by this standard, the Slocan Star with its modest $250,000 a year profit will fade into utter insignificance. Although we cannot possibly see how it is to be accomplished, we sincerely hope for the reputation of the country that these predictions will be amply fulfilled, because we cannot afford at the start to get in the bad graces of influential English capitalists, to whom a few millions spent in development is a mere bagatelle; this being the first occasion when a Slocan property has been floated successfully in London. Such a vast capitalization seems hardly warranted in view of all the circumstances, and it is clearly a case where those concerned have been enabled to get the inside track on the London market, as it is stated that many times the amount of money required could have been readily obtained. The management are doing all in their power to make a great mine of it, development is proceeding actively and on very liberal lines, a waggon road has been built to the lake, hoisting and pumping machinery is being installed, and a concentrator is contemplated at an early date.

All the mines on which sufficient development work has been done become heavy shippers about this period of the year, but the feature of the month in this direction has been the wonderful and persistent exodus of ore from the Payne; for some time upwards of three carloads a day left the mine for the smelter, and close on to 300 tons were shipped during last week. This is largely in consequence of the property having been placed under new management. and a fresh policy of development inaugurated. The intention of the U. S. government to erect sampling works at Northport and Bonner's Ferry has been abandoned, fortunately for the Slocan. In the event of the work having been carried out as originally projected, the only outlets for Slocan ores would have been practically controlled by the K. and S. road. The C. P. R. would have been unable to assist in transportation except as far as Nakusp, and consequently there would be danger of competition in freight rates ceasing until such time as the ore could be treated at home. Mine owners are of opinion that they are quite high enough as it is, and any movement which would enable one company to obtain a monopoly of the traffic is to be deprecated. Besides, in the end, it could only lead to confusion, and the expense of twice sampling the same ore. Where a discrepancy in results was apparent, the smelter people would be unwilling to pay on returns as obtained by the government works, but as obtained at their own; while on the other hand, mine owners would naturally resent paying duty unless the results corresponded. The advantages of continuing to pay direct on the smelter returns as at present, are too obvious to require explanation.

The Whitewater closed the year in good style by declaring a dividend of $24,000, which added to one of $12,000 earlier in the year made a grand total during 1896 of $36,000. In the case of a mine which is looked upon as being only in the incipient stage of development as yet, this must be considered a very happy omen and augur well for the future of the company.

So much is being said about railroad building in every conceivable direction and locality, and so little done, that it is reassuring to hear that the construction of the road which is necessary to connect Slocan City with Nelson is to be commenced immediately. That this is not merely a flying rumour is evinced by the fact that men have already been put to work clearing the right of way. The C. P. R. will also begin at once on the construction of a first class boat to ply between Slocan City and Rosebery, making connection with their two systems of road. The increase to be noticed in all kinds of traffic, is extremely gratifying to those having the welfare of the country at heart; Two trains a day are now running without interruption on the Nakusp and Slocan firanch, one of which is devoted entirely to freight; while additions to the rolling stock of the Kaslo road are also found necessary to handle the growing ore shipments satisfactorily.

It is good news to hear that the C. P. R. has obtained control of the fine fleet of steamers on the Columbia river belonging originally to the C. and K. S. N. Co., the amount involved being in the neighborhood of $200,000. The system has been totally inadequate to the strain put upon it since the Trail Creek excitement of two years ago, but will now no doubt receive the attention that the requirements of the district demand. New and if possible even better equipped boats will be added to the fleet, and we may soon expect to see the inauguration of a daily service which is very necessary, if only for the purpose of providing better mail facilities than we enjoy at present. The fact that such an influential and powerful corporation as the Canadian Pacific Railroad Co. sees the immense benefits to be derived from extending their system, and so being able to control the traffic in these regions, speaks volumes for the richness of the country.

The question of Chinese labor has been brought prominently before the people of the Slocan, and much agitated of late. Hitherto popular feeling has been strong enough to contend successfully against their employment in any capacity whatever, the general opinion being that if they are once introduced, it will not be long before they are found performing every kind of work now accomplished by the use of white labor, including their employment in the mines. Experience with them in this capacity in the coal mines on Vancouver Island, has induced all in the Kootenay to fight vigorously against their adoption here as far as practicable. Although they are abundant at Revelstoke, Kaslo and other places, they have not as yet been allowed to gain a footing in the Slocan proper. Those having the temerity to settle here from time to time, have been universally boycotted until they found it impossible to gain a livelihood, and were consequently compelled to go elsewhere. A private mess club in New Denver recently imported one from Kaslo to attend to their culinary department, but as they met with opposition from every quarter, and indignation meetings of the citizens were called denouncing their action, they were overwhelmed by the torce of public sentiment, and in the end found it expedient to send him back again.

The validity of the title of the present claimants to the Sandon townsite is being widely questioned, and a case is now before the High Court of B. C., on the decision of which will depend largely its future growth and prosperity. It appears that the sole claim to the ground is based on the location of a mineral claim, which included the area now occupied by the town of Sandon. According to the present law the owner of a mineral claim is merely entitled to as much of the surface rights as he requires for the efficient carrying on of mining operations connected with the working of his claim, and it is difficult to see how under these circumstances, the present owners are entitled to the entire surface rights, notwithstanding the fact that they have obtained a crown grant. This does not by any means amount to the same thing as a pre-emption in the eyes of the government, although it is frequently interpreted in that way, and it is quite possible that the ground may revert again to the Crown. It is understood too, that the K. and S. railway are also laying claim to the land in dispute, alleging that it forms part of their subsidy obtained from the government as an inducement to build the road.

The visit of the Hon. A. G. Blair to this section of the country is fraught with immense possibilities in the way of development. The people of Sandon realizing the significance attached to this demonstration of attention on the part of the Dominion government, received him with open arms and did all in their power to convince him of the importance of the Slocan as a field for mining operations. In the address which was presented to him by the citizens, it was stated that there were now over forty shipping mines in their immediate vicinity, and in addition to urging the early construction of the Crows Nest Pass road, as vital to the interests of the whole country, and more particularly the Slocan, they made a welcome plea for the admission of mining machinery of every description free of duty, and emphasized the importance of local smelters in fostering the mining industry.

There is quite an agitation here on the part of British subjects with regard to the expediency of excluding aliens from participating in the

benefits to be derived from the opening up of our mineral wealth, more especially American citizens who are now permitted to stake claims at random. I suppose fully half the claims are either owned or located in the first place by denizons of Uncle Sam's dominions, and the recent hostility on the part of the U. S. government towards Canadians has stirred up considerable feeling on the subject. While, no doubt, the country owes a deep debt of gratitude to them for the able manner in which they have led the way in the exploitation of B.C.,and the Kootenay in particular, it must not be overlooked that they came here primarily for their own benefit, and not with the laudable intention of assisting us, or helping to develop our country. They are, nevertheless, very desirable citizens in a mining community, and although a great deal of unnecessary hardness has been caused lately between the kindred nations, it would be poor policy on the part of our government to cut off its nose to avenge its face, so to speak, by driving good miners away from the country ; because there is ample room in British Columbia for fully ten times the present population. Besides it would be creating an ugly precedent, in a line of action which it has not been considered necessary so far to adopt in any part of the British Empire. It is indisputably true notwithstanding, that by paying $5 a year an American becomes possessed of all the rights of a British subject here, with the sole exception of the franchise, whereas the treatment which Canadians receive in the States is too well known to require comment.

HOWARD WEST.

New Denver, B. C., 15th Jan., 1897.

BOUNDARY CREEK.

Leslie Hill arrived in camp a few days ago and already has six miners working. The bonds on the Jewel and Denero Grande which he took in the fall have been assumed by the British Columbia Prospecting Syndicate. Prior to his arrival cabins had been put up on the claims and a sleigh road built in, as it will be necessary to put in a pump on the Denero Grande before doing much further work. The remaining eighth in the Jewel was bonded last month for $6,000. The bonds on the two claims aggregate $58,500, and as a heavy payment is due on them in March, it is expected that Mr. Hill will "get in and drill" forthwith.

The Ethiopia supposed to be on the Jewel lead was sold to the British Canadian Gold Fields Co. for $3.000 cash. The claim has 14 inches of clean mineral averaging about $40 in gold and silver.

The holders of the Sunset bond were expected in some time since to commence work ; they will probably be in this month.

The Great Hopes Deadwood Camp,one of the old locations in camp, was sold in December for $12,000 cash to Spokane and Montana parties, it is understood. This is a very large deposit of Iron Pyrites averaging across its extent $10 to $15 in gold. In the early days of the camp the original owner used an arrastra with more or less success on the foot or more of iron oxides covering the unaltered ore.

At 70 ft. on the Old Ironsides shaft the contractors found that owing to the toughness of the rock and excess of water, they would be unable to make wages. The contract accordingly was thrown up and it is probable that matters will remain thus until spring.

On the Boundary Creek M. & M. Co.'s properties a shaft is now down on the G. A. R. 30 feet, and the vein averages well in gold and silver; an adit has been driven in on the Big Lodge vein, and the D. A. shaft is being continued in ore of shipping value.

The litigation over the Jack of Spades lease between the owners and the French company, leasing has been amicably settled. M. Gire, the company's engineer, will install an electric plant for carrying on mining operations as soon as Spring opens. A plant for the electric treatment of ores, which he claims is successfully operating in France, is also to be put in.

Work is proceeding regularly on the Skylark, R. Bell, No. 9 and No. 7.

It is rumored that a deal is being made on the Golden Crown Wellington Camp, but nothing authentic is at present at hand.

H. S.

Greenwood, B. C., 15th Jan. 14, '97.

Nova Scotia.

The meeting of the Mining society, which took place on December 16, although poor in point of numbers, was one of the most pleasant that has been held for some time. Among the guests were the Attorney-General, Dr. McKay (the superintendent of Education) and Mr. Oxley of St. John's, Newfoundland. In the morning a deputation of the Mining Society, the Institute of Science and the Arts Society waited on the government with a view to recommending the erection of a suitable building for a museum and library. Premier Murray informed the deputation that the government had already appropriated the sum of $50,000 for that purpose, but the difficulty they had encountered was to find a suitable site. At this point the Attorney-General asked the deputation for suggestions, and about an hour and a half was taken up in discussing the pros and cons of erecting a building in the Provincial Building Square. Several members of the deputation objected to a building being put on this site from a sentimental point of view. Personally, we are inclined to side with Mr. Gue, who said that the building was an absolute necessity, and if the government could only be induced to put it up he thought no stumbling block should be thrown in their way. But what to our mind was undoubtedly the best suggestion of all was that of Professor McGregor of Dalhousie. His suggestion was that the government should appropriate Government House for a museum and library, with the ultimate end in view of establishing a technical school there and that they should build a new and smaller house for the lieutenant-governor. At the present time Government House is much too big for the purpose for which it is used and a large portion of it is kept shut up, with the amount of money the government has appropriated, a good house could be built in its place and the present one fitted up for museum and library purposes. That a museum would be of very great value in bringing the mineral resources of this province to the notice of visitors there can be no possible doubt, and it would also, we are inclined to think, assist in bringing capital for their development. For variety of minerals, Nova Scotia will take a great deal of beating and there is little doubt that many of them which at the present time are lying idle in the ground are of considerable economic value. The afternoon was taken up by going over the People's Light & Heat Company's Works which are rapidly nearing completion, and which have already been described in this paper. When the works are completed we intend giving a full account of them. The new Electric Light and Power Works were also visited. The evening was devoted to papers which appear elsewhere, Mr.Fergie's demonstrations of the Shaw gas tester being particularly interesting.

At North Brookfield, the roasting furnace has already been started, and before this paper reaches our readers the Chlorination Plant and New Stamp mill will be in full swing.

Mr. F. H. Mason of Halifax has gone to the Lake of the Woods district in the interest of English capitalists.

We regret to have to announce the death of Mr. Dean Turnbull,which took place in his home in Vermont. Mr. Turnbull was well known in Nova Scotia as a practical gold miner, having operated in various parts of the province.

Mr. Pellew Harvey has paid a visit to some of the Nova Scotia mines with a view to introducing the cyanide process. We have very grave doubts as to the success of the process in this province. Parcels of ore and tailings which have been sent to the companies' experimental works at Glasgow, the company refused to report upon. Comment is needless.

Gold miners generally will regret to hear that Mr. George Stuart has been confined to his house through illness for over a month.

The two principal mines at Goldenville produced over 350 oz. of gold last month. Mr. James A. Fraser's mine leading with 202 oz. from 360 tons of ore, while the Bluenose Co. produced 150 oz. from 600 tons of ore.

The new company opening up Beaver Dam mine have been exceedingly unfortunate in the way of accidents, both the pumping gear and mill having caused trouble.

The Modstock mine yielded 169 oz. of gold from 272 tons of ore during November.

The coming year promises to be a very active one in the matter of gold mining. Several private gentlemen as well as an influential company, who in the past have directed their interests in other industrial channels in the province, have been brought to see the value of our gold mines and are now directing their energies in that direction. The general idea of these people is to consolidate a number of areas and put in big stamping capacity. The large low grade belts are the ones which are receiving attention, and we have little doubt as to the ultimate success of these enterprises.

Our new premier, the Hon. G. H. Murray, has expressed his anxiety to several of our prominent mining men to do everything in his power for the benefit of the mining industry, and a few suggestions have been made to us by prominent mining men which we think are certainly worth consideration. One of these is the appointment of a provincial assayer,the object of the appointment being that that official shall receive a salary from the government which will enable him to reduce the price of assays to about one half what they are at present in this province, thus in reality the government will pay half of every assay made. This, it is thought, will considerably help prospectors and thus open up our great mineral resources, and it will further get mill owners generally to keep a check on their tailings, and will be the means of getting concentrators put in in many mines where they would undoubtedly yield handsome returns. Another very worthy suggestion is the removal of royalty from all gold recovered by chlorination and metallurgical methods other than stamping and amalgamation. Yet another suggestion is the erection of a sampling and testing works preferably at Dartmouth (a place easily accessable by railroad and water), where trial lots of ore could be tested by milling.

Mr, Murgatroid has sold the new find he made at 15 Mile Stream to Mr. J. D. McGregor of New Glasgow for $12,000.

New finds are reported from Mount Uniacke and Isaacs Harbour.

Mr. C. F. Andrews and others have bonded their property at Caribou to Mr. Wright.

The woods are just now full of mining journalists, and the Halifax dailies have recently contained many columns of wonderful mining information! Sometimes cracking up some district which no one has ever heard of before; at another time running down scientific managers and pointing out that the royal road to mine management is to be gained by an apprenticeship in a lumber yard or grocery store. We should be the last in the world to discourage the local papers giving legitimate mining information. Goodness knows, these papers are dull enough with their columns devoted to the School of Cookery, the W. C. T. U., Conventions etc., etc., but honestly, we cannot see that any useful end is to be gained by publishing a lot of rot in the form of anonymous letters about mining by some gentleman who has a few areas for sale or who wants to crack up some unknown man as a manager to get him a job.

During the past year some forty persons were employed by the Pictou Charcoal Iron Company at their mines at Bridgeville. The output amounted to 10,784 tons, and was mainly consumed at Ferrona.

From returns furnished by the Dominion Coal Co. we find that the production of their various collieries was: Gowrie, 50,166 tons; Reserve, 269,802; Old Bridgeport, 140,539; Victoria, 62,810; Caledonia, 231,515; International, 98,721; Dominion, No. 1, 161,528; Hub, 137,721; or a total output of 1,152,802 as compared with 874,431 tons in 1895 and 988,170 tons in 1894. Recapitulating the business of the company during the calendar year, we find: Coal shipped, 1,057,595 tons; land sales, 1,160 tons; collieries and railways, 56,339; employees, 18,239; or a total of 1,133,331 as compared with 855,152 tons in 1895.

The output of the Acadia colliery was 199,303 tons as against 202,971 tons in 1895. The production of coke reached 3,773 tons. 795 persons were employed.

The Cape Breton colliery at New Campbellton had an output of 17,577 tons. The Messrs. Burchell also supplied the Nova Scotia Steel Co. at Ferrona with a very superior quality of dolomite. The analyses of this mineral shows magnesium carbonate 44·39 per cent., with only slight traces of siliceous matter. There is a prospect of the company finding a good market for this limestone in the United States. During the year the railway was extended three-quarters of a mile beyond the colliery.

The shipments from Springhill reached 355,887 tons, as against 384,971 tons in 1895.

The Canada Coals and Railway Co., at Joggins, disposed of 51,026 tons, as against 101,686 tons in 1895.

The General Mining Association, the oldest colliery proprietors on the continent, shipped 226,465 tons, of which 219,979 tons were round coal and 6,486 tons slack. The shipments in 1895 were 203,039 tons round and 6,856 tons slack.

The output of the Torbrook iron mines in 1896 amounted to 8,797 tons.

The Londonderry Iron Co's. furnace production in 1896 was:—

Pig iron made	10,497 tons	of a value of		$136,197
Ore charged	27,053	"	"	54,110
Flux "	8,882	"	"	8,654
Raw coal "	1,256	"	"	2,288
Coke "	18,290	"	"	48,935

The ore mined to 31st December amounted to 29,327 tons; limestone 9,062 tons.

What is known as the Elk mine at Caribou, Halifax Co. N. S., was recently sold by Mr. C. F. Andrews *et al* to some Truro capitalists. Some twenty years ago it is estimated that $70,000 in gold was taken from this property in sinking a single shaft to the depth of 90 feet. Since then the property has been worked at odd times with indifferent success. The present company started work in the early part of January, and in the first fortnight struck what appears to be the old pay chute. Two small barrels of gold brought to the surface are estimated to contain nearly $3,000 worth of gold, some of the pieces containing 50 per cent. of the precious metal.

The yield from the Richardson gold mine, Country Harbor, for the calendar year reached 2,550 ounces.

Ontario.

The Crystal Gold Mining Company at Lake Wahnapitae have contracted with the Jenckes Machine Company for the construction of a five-stamp mill. The mill is to be built on the specifications of Mr. John Hardman, the well-known Montreal mining engineer.

The main shaft of Saw Bill Lake mine, in the Manitou district, is now down about 150 feet, and driving second levels north and south has been commenced. The first level has been driven about 100 feet in the same direction. The ore won is reported to be rich.

The shaft at the Hawk Bay is down 50 feet, and workings to date look well.

At the Hammond-Folger gold property the working force has been increased, and a compressor plant is now on its way to the mine from Kingston.

The Hamilton Blast Furnace Co. produced 25,270 tons of pig iron in 1896, consuming 43,900 tons of ore; 11,876 tons of ore were purchased in Canada and 32,024 in the United States; 30,217 tons of coke were also brought in from the United States.

Quebec.

The shipments of asbestos from the Towhship of Low, Ottawa County, during the past year, amounted to 172 tons.

About four tons of mica were shipped from Gracefield, a new mine opened in the fall of the year by a Toronto company.

The Nichols Chemical Co., operating the Albert pyrites mines and the Chemical and Fertilizer works at Capelton, is being reorganized, a charter under Dominion Statutes being applied for. The new company will be known as "The Nichols Chemical Co. of Canada," and the authorized capital is $25,000. The directors of the reorganized company are: W. H. Nichols, W. H. Nichols, jr., and J. H. Bagg, New York, S. L. Spafford, Capelton, A. W. Elkins, Capelton, S. L. Clough and W. B. Pritchard of the Township of Ascot, Que.

Full returns of the mineral industries of the province will be presented, as usual, at the meeting of the General Mining Association of Quebec on Tuesday, 2nd prox. The subjects are allocated as follows: "Asbestos," by Mr. John J. Penhale; "Gold Mining," by Mr. John E. Hardman, S. B. M. E.; "Copper and Pyrites," by Mr. John Blue, C. & M. E.; "Chromic Iron," by Mr. J. Obalski, Inspector of Mines; "Graphite," by Mr. H. P. H. Brummell; "Mica and Other Minerals," Mr. B. T. A. Bell; "Phosphate," by Mr. J. S. Higginson.

The following returns have been kindly furnished by the accountant of the Quebec Central Railway of the mineral shipments over this line during the calendar year:—

From	Lime.	Brick.	Flagstone.	Asbestos.	Chrome Ore.	Total Tons.
Sherbrooke	57					57
Ascot		6,128				6,128
Dudswell J'tn	4,744					4,744
Dudswell			1,057			1,057
D'Israeli					58	58
Black Lake				996	2,224	3,220
Thetford Mines				4,640		4,640
Broughton				63	80	146
	4,804	6,128	1,057	5,699	2,362	20,050

Notes on the Hall Mines, B. C., Smelter.

From our own correspondents.

It was about the Spring of the year 1895, that the determination of the directors of the Hall Mines Co., Lt., was made to erect and run a smelter of their own for the purpose (at first) of handling their own ore from the Silver King Mine. This ore had been for some time previously carefully sorted at the mine, and only the best or shipping ore was sent away to other smelters, thus causing the accumulation of thousands of tons of good ore which however was hardly good enough to stand freight and smelting charges. The question naturally arose as to what could be done with this inferior ore, and more than one well known firm of smelters were conferred with on the subject. All who had smelted the

ore were highly pleased with it on account of its being so easily treated, but no satisfactory terms could be arranged with these outside firms, hence the Hall Mines Co. were almost compelled to build an experimental furnace at least and see how the average output of the mine would "pan out" in practice. The writer of these notes was honored by the confidence of the directors, who submitted to him, for careful analysis, with a view to smelting, a great variety of samples taken from the very best to the very worst rock produced from the mine. With the exception of course of great variation in the silver and copper contents, all the rock was found to be nearly self fluxing. Some of it quite so, and it is a matter, perhaps, of pardonable pride, that as a fact nothing but a little limestone has been found necessary as a flux during the time the furnace has been running, now twelve months. Other materials are always on hand, of course, in case of emergency, such as iron oxide and some waste concentrates rich in sulphur, but in practice limestone has been sufficient.

Having then decided that their ore could be smelted, the next question arose as to the cost of the process and fixing on a site for the works. The first item, cost, was rather a difficult subject to tackle, and one hardly in the domain of chemistry; yet even that seemed to offer a very considerable excess of income over outlay, so the site was the next item to settle. Fortunately a most excellent site close to the town was available; having a large area and a natural though gradual fall which is of immense importance in arranging the machinery and buildings in connection with a smelting works.

The erection and general design of the entire plant was entrusted to Paul Johnson, Esq., a gentleman who has made a record for himself in various works in the States, and it must be admitted that he has acquitted himself admirably, especially when the difficulties of building in the fall and winter of B. C. are taken into consideration. The works were finally sufficiently completed to start the furnace on January 14, 1896, on which date the first copper works ever erected in B. C. commenced operations, with, sad to say, no more ceremony than is shewn in dumping a slag pot! With occasional brief interruptions, owing to necessity for repairs, etc., the furnace has run continuously and successfully ever since, and it is very gratifying to see by the last balance sheet that the directors were able to declare a dividend on some of the shares.

A description more in detail of what the Hall Mines Co. now have, and of what they intend to have, may not be without interest to mining engineers and metallurgists, for whose benefit these notes are intended.

The ore then is delivered from the mine 4½ miles away and ⅞ of a mile higher up by a Hallidie ropeway, which, though troublesome at first, owing to the unusual distance and grade, is now working smoothly and well. The buckets on this ropeway are dumped (not automatically) into a large wedge-shaped iron wagon, which runs on rails over the tops of the ore bins, thus enabling a better mixture of the ore to be made than the buckets alone could do, as they can of course discharge only along the line of the rope. These ore bins are six in number, each nominally capable of holding 1,000 tons, though less is found more convenient in practice. Here the larger lumps are broken by hand, and the very worst, practically barren rock, are rejected. From these bins the ore is sent down to the furnace on a gravity tramway about 100 yards long, the full tubs, as usual, pulling the empty ones back to the top. All ore and all fluxes and fuel are weighed before being shovelled into the furnace, and a very large platform scales is placed conveniently for that purpose. This large scale has eight beams, all of which can be independently set and locked up so that the charge-wheeler doesn't know how much he is putting in, that matter being settled by the superintendent and foreman. The limestone and coke are on the same level as the feeding floor; the coke being sheltered from the weather by an iron roof.

Before following the ore further, we will look into the sampling works close by, where all products going out, or customs ores coming in, are sampled. The shed is about 70 feet by 50 feet, and contains two large jaw crushers and two sets of Cornish rolls—in addition to these there is a small steamdriven sample crusher and the usual bucking plates, as well as a large steamheated oven to dry all samples that need it. This sampling shed, together with all the rest of the works and offices, is lighted by electricity, derived at present from the Nelson Electric Light Co., though fn the near future no doubt the company will operate their own plant.

The present Blast furnace or Waterjacket is about 84 x 42 inches inside at the tuyeres, of which there are six on each side. The wind is supplied by a No. 6 Root Blower (about 220 revolutions per minute), which is itself driven by a 75 H. P. (nominal) horizontal engine, and the average pressure of blast is about 20 inches of water. The furnace was intended to smelt about 100 tons of ore per day, besides the usual fluxes and fuel, but she (why is a Blast furnace usually called *she*?) has frequently run through 130 and even over 150 tons on special occasions—the average being probably 125 tons. As above mentioned, limestone of a very excellent quality from the Hall Mines Co.'s own quarry is the only flux used except on very rare occasions.

The entire melted contents of the furnace flow into the usual square settler where the matte by reason of its greater specific gravity, settles to the bottom, while the slag is continuously discharged from a spout at the top and is received into another settling pot of the usual conical shape, so that any shots of matte accidently escaping from the settler will be caught in this second pot. The slag finally flows from a spout in the upper part of this pot, and falls in a red-hot stream into a trough below the level of the furnace floor, where it instantly meets a powerful and voluminous stream of water, which not only granulates the slag, but flushes it away to the dumping ground. Of course, an ample water supply is needed for this operation and it is obtained from a large creek close by the works.

The matte is tapped at intervals from the settler at a point near the bottom and is received into cast iron moulds of a rectangular shape. When cool the masses are removed to the sampling shed, crushed, sampled, sacked, and sent to a refinery in the States.

Average composition of the matte, 50 per cent. copper and 250 oz. silver. Average slag, silica 40, lime 12, iron oxide 12, manganese oxide 10; it is remarkably free from both silver and copper.

One peculiarity of the furnace should be noted—it has no crucible in the ordinary acceptation of the term, but a square iron tray filled with fire bricks carefully laid together, is raised by jacks till the bottom edge of the jackets are in contact with the top edge of the tray or box, any joints being made good as usual with fire clay. The bottom of this tray or box is kept cool by a series of pipes with cold water circulating through them. It will be very evident that with this arrangement no great quantity of metal can be locked up in the crucible, or even penetrate into the solid ground below it, as has been the case under the old system.

In the (about) 270 days this furnace has been running about 30,000 tons of ore have been smelted and about 2,000 tons of matte produced, but the new furnace now in course of construction will far exceed that work. This new furnace will be 144 by 44 inches at the tuyeres, and is intended to smelt 200 tons daily; but if she does as well in proportion as the old one, 250 tons should easily be put through. In addition to this new Blast furnace the Hall Mines Co. have built a large 3-hearth calcining furnace about 40 feet long by 20 wide to treat such custom ores as may require roasting, or, of course, their own matte should they decide to convert it to a higher grade. Close to the calciner, a new Reverberatory furnace has been built, hearth inside about 17 feet by 13, this will be probably used for making blister copper or even a still richer product. This last furnace has its own stack, all the others are connected through spacious dust flues with a very handsome new stack some 180 feet high from the foundation that was built last fall, which is probably the highest and finest chimney in Canada, as it certainly is in B. C. The Laboratory and Assay Office are worthy of a passing notice, as the rooms are spacious, lofty and well lighted—a condition of things that does not always prevail. This department is under the charge of Mr. A.H. Holdich, who endeavors to keep all apparatus well up to the mark and to turn out reliable analyses. Some not unimportant alterations have just been made which will nearly double the assay producing value of the Office; a step rendered necessary in view of the large increase of work likely to come in this year. In conclusion, the Hall Mines Co., Lt., are much to be congratulated on their valuable property, both in the mine itself and also at the smelter, and as the pioneer Copper Smelters of B. C., they deserve every encouragement and all good wishes for a prosperous New Year.

The Tariff Commission.

NOVA SCOTIA GOLD MINERS OBJECT TO THE DUTY ON EXPLOSIVES.

At a meeting of the Tariff Commission at Halifax, Mr. J. D. McGREGOR, of New Glasgow, said that gold mining was carried on in Nova Scotia under great difficulty, and the work was very hazardous, and therefore difficulties should not be put in the way. Dynamite is an article largely used in this industry, but the I. C. R. will not carry it. In some places it has to be trucked over 30 miles of rough road. We have just as much respect for life and limb in Nova Scotia as they have in Ontario and Quebec, and yet the C. P. R. and Grand Trunk carry it. The I. C. R. should do the same. This confines us to one market.

Sir RICHARD CARTWRIGHT reminded Mr. McGregor that this was a matter for the Minister of Railways, and he would bring it to the notice of Mr Blair.

Mr. MCGREGOR advocated a reduction in the duty on candles. They cost 10¾ cents per lb., and the duty is 5 p. c., or over 50 p. c. Oil cannot be used in the mines, as it interferes with amalgamation.

Mr. J. D. COPELAND, Antigonish, wanted an inspection of dynamite. Miners buy a box marked 50 p. c., but do not know what percentage of nitro-glycerine it contains.

Sir RICHARD CARTWRIGHT questioned Mr. Copeland at length on gold mining in Nova Scotia, and expressed surprise that low grade ores could be mined with profit.

Mr. JEFFREY MCCALL, of New Glasgow, said that he, being interested in gold mining, was not asking for reduction of duties. If they are required for purpose of government, he did not object, but if they are levied for the benefit of certain privileged individuals, he most emphatically objected. To-day there are at least 4,000 men directly engaged in this industry in Nova Scotia, and they are as much entitled to recognition as the iron miners and workers.

Sir RICHARD CARTWRIGHT—Do you want a bounty?

Mr. MCCOLL—Yes; but only a small one; merely enough to show that we are recognized.

Sir RICHARD CARTWRIGHT—Is this an infant industry?

Mr. MCCOLL—Yes; but it has died and came to life several times. The iron miners get a bounty of $2 per ton on every ton of iron they produce. We want that on every ton of gold.

Sir RICHARD CARTWRIGHT—Will you be content with the same, $2 on every ton of gold? If so, you are easily satisfied.

Mr. MCCOLL—Yes; we only ask for recognition. If the bounty is right in one case it is right in the other. If the iron bounties were used for the purpose of insuring the lives of employees or paying sick rates we would not object. But they are used for the purpose of putting money in the pockets of capitalists who have enough already. The iron industry is making more paupers than any other industry in the country. The I. C. R. should carry dynamite on the same terms as the G. T. R. and C. P. R. If the iron industry is entitled to a bounty, the gold mining industry is entitled to one also. He had spoken to several farmers asking them to be present, and also put in a claim for a bounty. They are as much entitled to a bounty of 20 p. c. on every load of hay or bushel of potatoes

they produce. While you pamper one class at the expense of another you can never make the people prosperous and happy.

Mr. McGregor submitted the following letter, which was to have been read by Mr. Geo. W. Grant, who was unavoidably prevented from attending:—

"In compliance with the request of many of the mining men of the province, and my own desire as well, I beg to express my views on the question of tariff reform.

At once let me say that if this province desires to increase and retain her population she must do so by encouraging her mining industries by at least removing the present existing barriers. Under the present existing state of affairs, perhaps a few questions asked will not be considered impertinent.

First. Why should one mining industry receive large bounties on their product and other mining industries in the same province, of much greater importance, receive none?

Second. Wherein is the consistency of giving a bounty on the product of a mine and at the same time placing a prohibitory duty on the articles used in the prosecution of the work in the same mine, causing them to cost from 35 to 75 p. c. more than they would were they on the free list?

Third. Why should the largest and most important industry of a country be handicapped by prohibitory duties on the articles used in the prosecution of such industry, where such prohibitory duties benefit only smaller industries, representing less than one per cent. of either the labor or capital represented by the industry handicapped?

The above questions are pertinent to the position of the leading industry of this country to-day.

I beg to represent more particularly the gold mining industry of the province and I do not hesitate to say to you that the future success of Nova Scotia largely depends upon the development of her gold mines. We have immense deposits of low grade ore that can only be worked profitably under the most favorable circumstances. These deposits are now lying idle and will remain so until we can obtain our supplies at the lowest possible prices. Permit me to tell you, as a practical mine owner, that it is not the wage bill that usually closes a low grade mine. It is the supply bill, such articles as explosives, steel, candles, picks, hammers, shovels, mercury, oil, etc., etc. Usually the cost of explosives, dynamite, exceeds the cost of all other supplies. If you consult your blue books you will find while we have had to pay excessive prices for these articles, particularly the latter, the revenue has not been increased thereby, as the duties are practically prohibitory.

As I have said, the mining industry is the most important of any in this province. If you want to encourage it and make the province equal in prosperity to any of the other provinces in the Dominion, you cannot be too sweeping in the abolition of duties on all articles used in its prosecution.

In justice, however, to the manufacturers of heavy machinery, such as boilers, engines and stamp mills, I am bound to say there seems to be a sufficiently healthy competition; that such articles have been supplied us at rates probably as low as they could be imported were they on the free list.

Regarding the cost of dynamite, none of the other provinces have suffered as we have in Nova Scotia, as we have been deprived even of the benefit of Canadian competition, owing to the restriction on the carriage of this article by the Government over the I. C. R. rails. This restriction is said to be on account of the danger in transportation. Both the C. P. R. and G. T. roads carry dynamite; so also do all American roads, so far as we have been able to learn by enquiry. This extraordinary precautionary measure, ostensi[illegible] the care of public life and property, that other great transportation roads do not recognize, has resulted in many of the smaller consumers of dynamite to clandestinely carry this article in their valises in passenger cars.

I may say to you that all the above representations have been made from time to time to the late government. They were waited upon by committees and memorialized by societies and communities, and the most earnest private appeals were made to them on the subject, yet all to no purpose.

In conclusion, let me say that in expressing myself as above I am expressing the sentiments and desires of nearly the entire population of this province, representing both capital and labor. Grant us these, our most reasonable and consistent requests, and soon, very soon, the cheer of prosperity in the province will cause its bone and sinew to laugh at our neighbor's alien labor law."

We, the undersigned mine owners, concur with the principle of the foregoing letter, and commend it to the consideration of your Commission: New Egerton Gold Mining Co., by James D. McGregor; Modstock Mining Co., Ltd., by J. D. Copeland, Pres.; Beaver Dam Mining Co., by J. H. Austen; Golden Group Mining Co., Ltd., by A. M. Jack, Sec.-Treas.; Golden Lode Mining Co., Ltd., by A. M. Jack, Sec.-Treas.; North Brookfield Mining Co., Ltd., and Tangier Mining Co., Ltd., by Miner T. Foster; Richardson Gold Mining Co., by Geo. A. Pyke, Pres.; Mooseland Gold Mining Co., by John Peters; Griffin Gold Mining Co., by Henry C. Bauld; Oldham Gold Co., Uniacke Co., and Harrigan Cove Co., by G. L. Flawn.

Another Large Canadian Compressor.

As an illustration of the fact that mining machinery of the latest and most economical types can be obtained in our own country, may be held up the large Le Roi compressor, which has this summer been built in the shops of The Canadian Rand Drill Co. in Sherbrooke, and which has recently been shipped. This compressor is the largest which has ever been manufactured in Canada, and on both steam and air ends possesses the most economical features.

On the steam end the engine is of the Corliss type, made in the form of a cross compound condensing machine. The high pressure cylinder is 22 inches in diameter by 48 inches stroke, packing steam through a pipe 6 inches in diameter. The low pressure on the opposite side of the machine is 40 inches in diameter by 48 inches stroke. As we said above, both cylinders are fitted with the Corliss liberating type valve with vacuum dash pot and with a sensitive governor operating on the releasing gear of the steam valves, controlled by the air pressure, enabling the compressor to be operated automatically from six to eight revolutions to the maximum number of revolutions per minute.

The main shaft is 14 inches in diameter by 13 feet long, weighing about 5,500 lbs. The shaft is fitted with cranks pressed on under immense pressure. The connecting rod forgings and piston rod forgings are carefully finished, and without flaw.

The air end of the machine is fitted tandem with the steam cylinders, and is also compounded, the high pressure air cylinder being 22 inches in diameter by 48 inch stroke, the low pressure cylinder being 31 inches in diameter by 48 inch stroke. The valve motion supplying these cylinders is Rand's most economical type, being in the form of mechanical valves. By this means the cylinder is ensured being filled with air at atmospheric pressure, which fact largely effects the efficiency of the machine, for were the cylinder either not completely filled, or were the air hot and expanded, in just such a ratio would the efficiency be decreased.

Between the high and low pressure cylinders is an intercooler of the latest type. Through this intercooler the air passes over a system of water circulating pipes, and is cooled in the process. This intercooler is a very elaborate affair, being about 20 inches in diameter and weighing about 8,000 lbs.

On the main shaft is fitted a fly wheel 16 feet in diameter, 40 inches face, weighing about 28,000 lbs., which insures the steady running of the machine. The machine is fitted with a very complete set of patent oilers for all bearings, and taken as a whole, is a piece of work which would do credit to any shop in any country.

The machine weighs about 240,000 lbs., and was shipped in six full carloads to the Le Roi Mining Co. at Rossland, going forward over the Northern Pacific road in one solid train. This is the second compressor of this type which The Canadian Rand Drill Co. have turned out of their Sherbrooke shops, the other one they installed at the War Eagle Mine last year, and since installation it has been working to the utmost satisfaction. The object of entering into such a full description of this machine is to try and put such facts before the Canadian Mine manager as will convince him that he can produce up to date machines in Canada and of Canadian manufacture.

BOUNDARY CREEK MINING AND MILLING COMPANY.

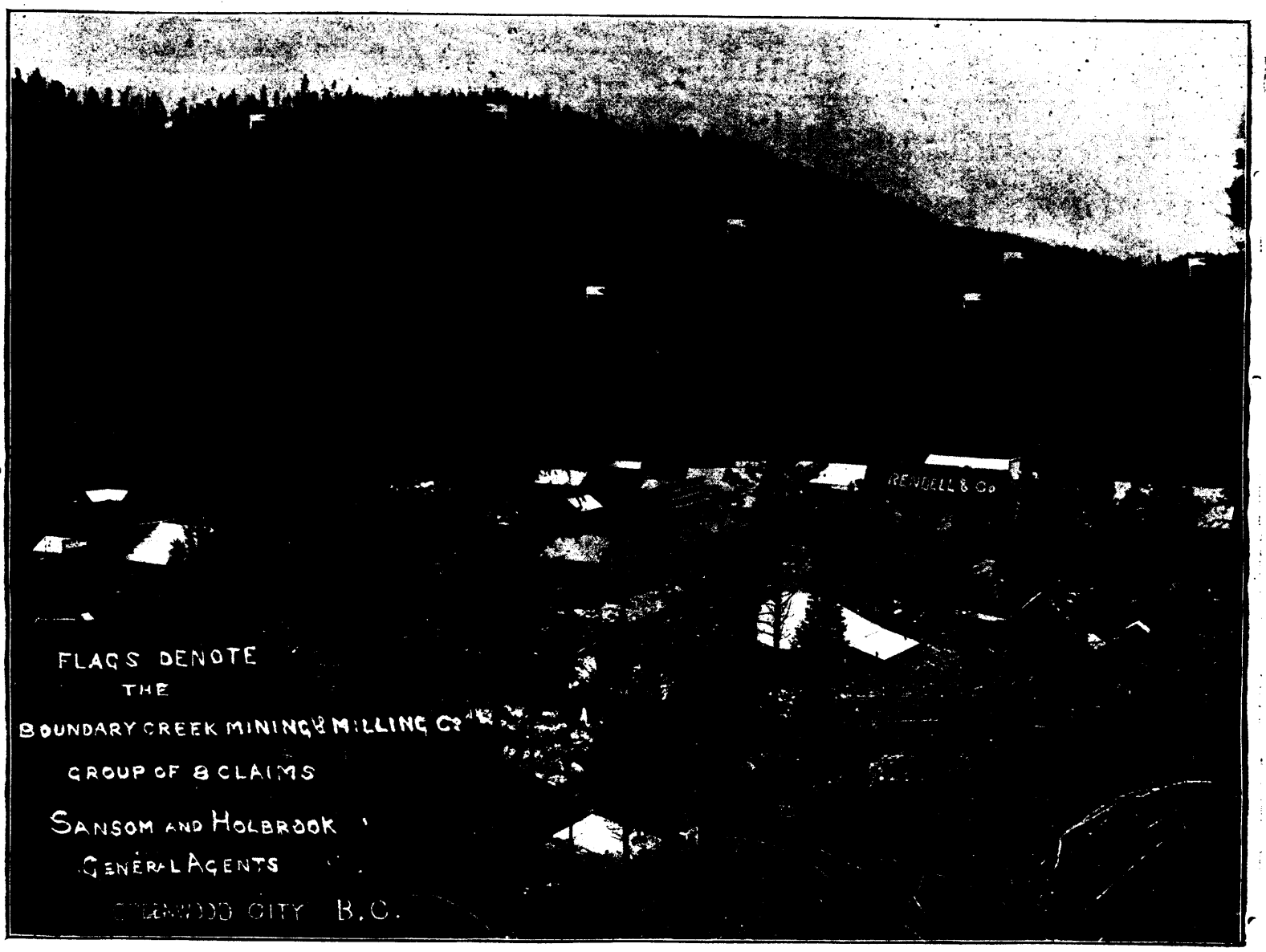
INCORPORATED OCTOBER 21st, 1896.

CAPITAL, $1,500,000. - - - - 1,500,000 Shares at $1.00 Per Share.

. . 700,000 Shares in the Treasury for Development. . .

THIS Company owns and operates a group of the highest grade in Gold, Silver and Copper properties in Boundary Creek.

EIGHT CLAIMS—The G.A.R., D.A., O.B., S.H.B., J.A.C., FRED D., S.F., and BIG LEDGE, constitute the group which is the most compact and advantageously situated of any under one ownership in Boundary Creek. The proposed Columbia and Western R.R., being surveyed to pass right through Greenwood City and along the base of the hill.



From the above photograph it will be readily seen that, lying as they do on a steep sloping hill the properties offer unusually good facilities for drainage and rapid and economical development, by main working tunnels driven in from the base of the hill.

The veins lie in the Granite Area—which occupies the upper part of Boundary Creek basin—along the line of contact with the more basic eruptures, and are among the oldest locations in the camp.

A small shipment of 8,653 lbs. was made to the Everett Smelter in 1894, yielding per ton, gold $103.15; Silver 74-7-10 ozs.; Lead 2 per. cent. and a considerable amount of shipping ore is at present on the dumps of the different claims.

Careful investigation is earnestly invited by the Company as their properties are being developed with a view to making mines and not to booming stock.

Shares in this Company can be confidently recommended in all respects as a strictly first-class investment.

150,000 shares have been put on the market at 10 cents, and most of the stock so far sold has been taken up locally. A large proportion of the miners now working are also taking stock in payment. For further particulars address,

BOUNDARY CREEK MINING AND MILLING COMPANY,

SANSOM & HOLBROOK, - - - - Greenwood City, B.C.