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Established 1882

Vol. XVII.—No. 9.

MONTREAL—OTTAWA—HALIFAX.

SEPTEMBER, 1898.

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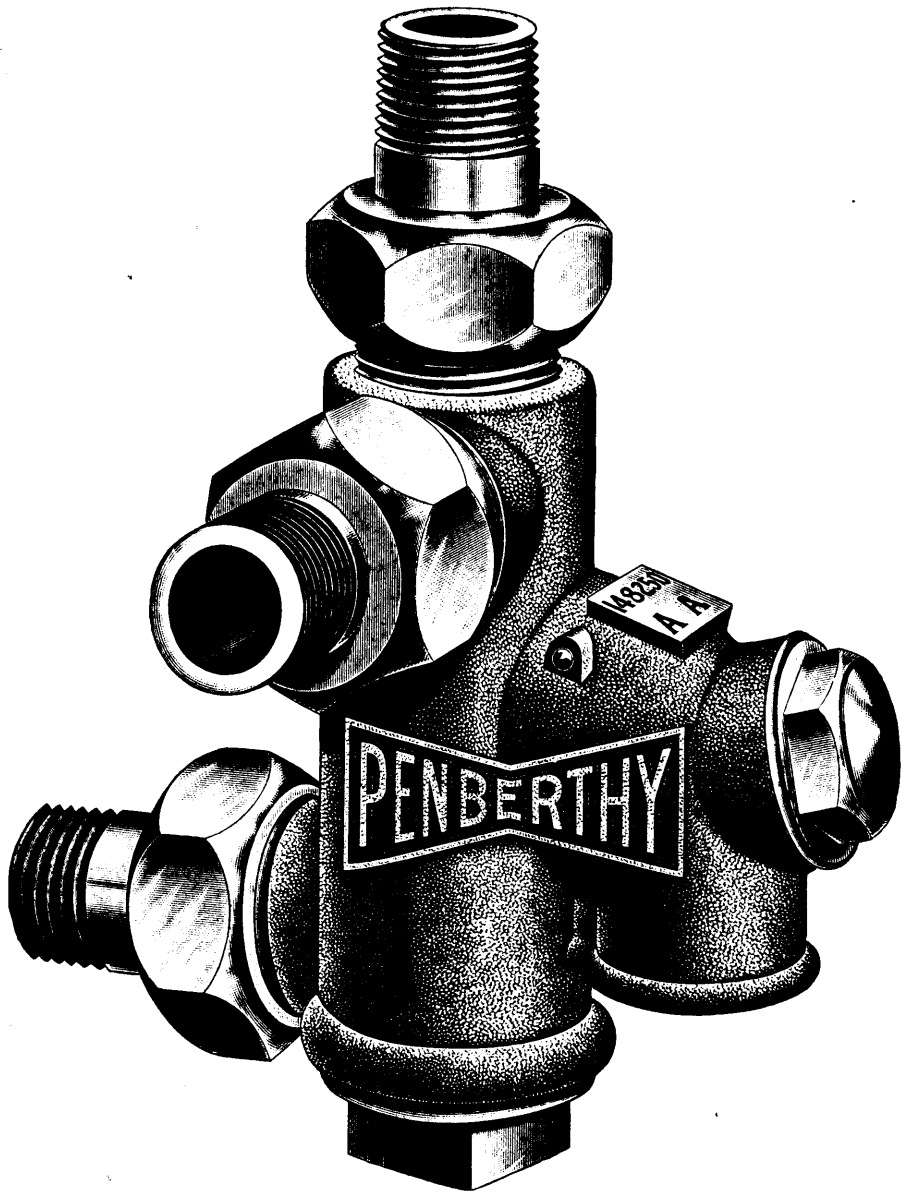
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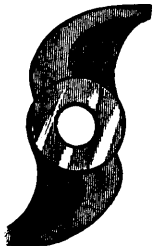
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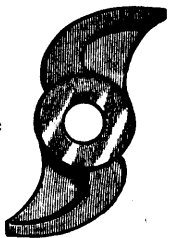
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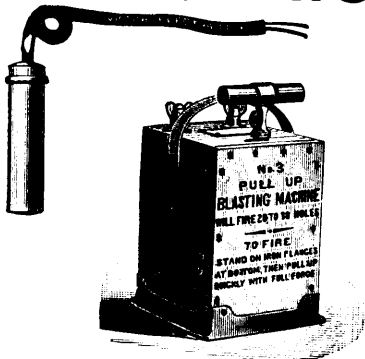
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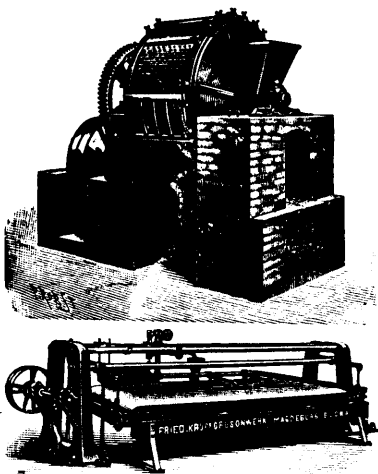


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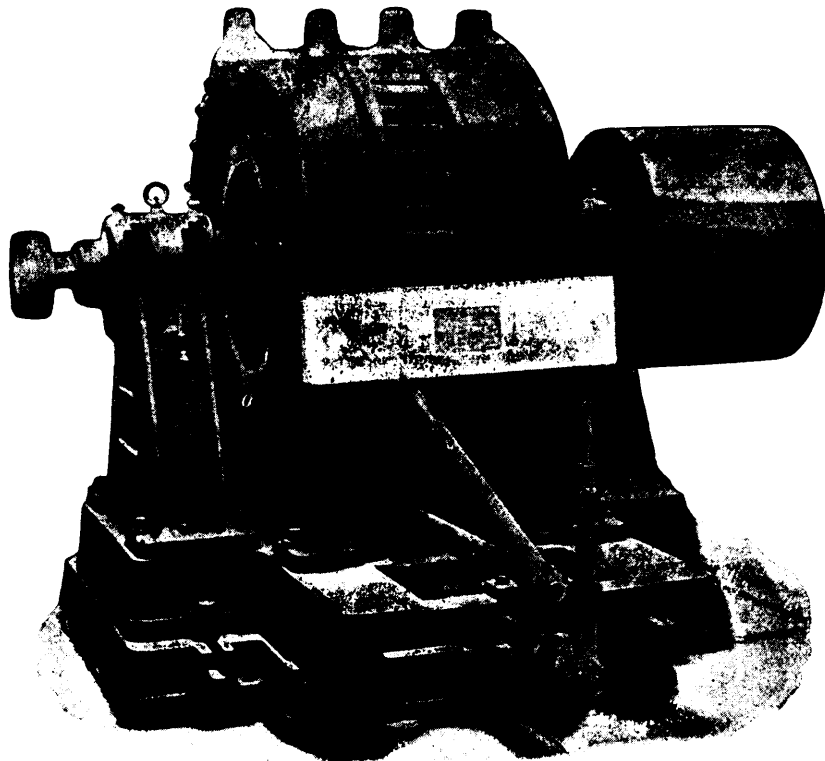
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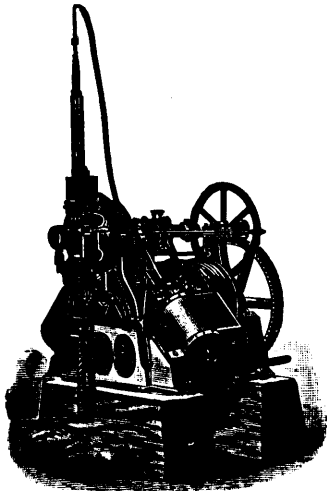
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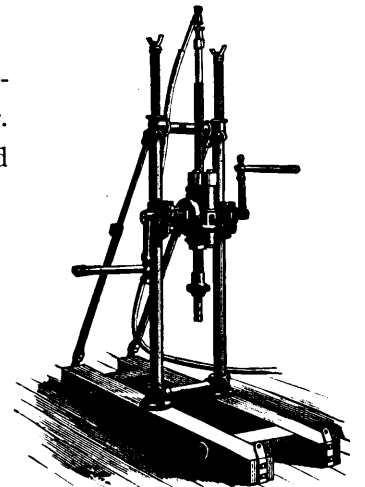
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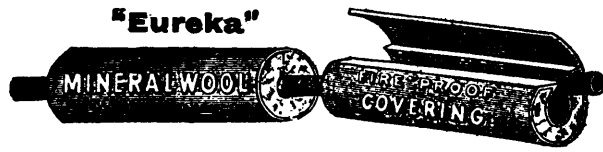
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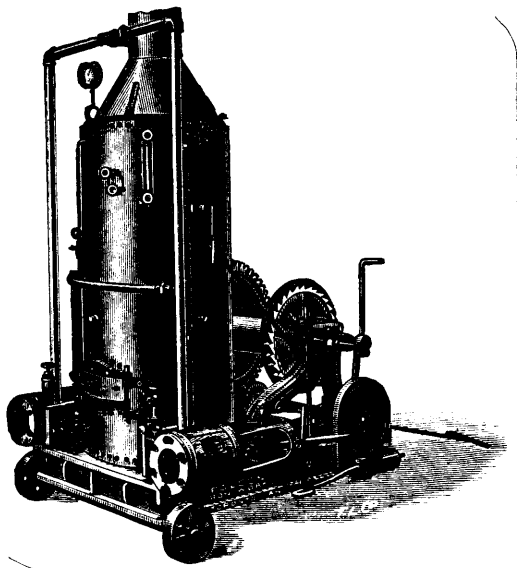
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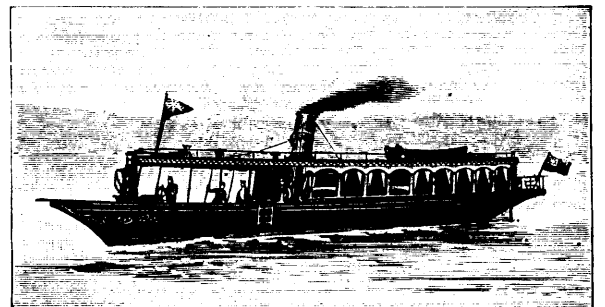
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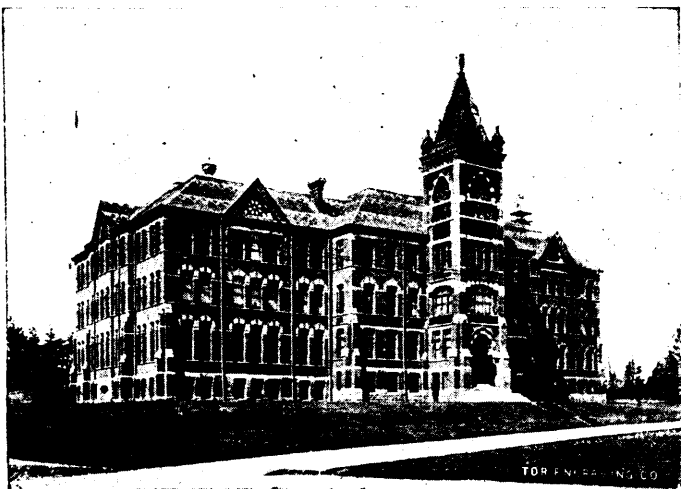
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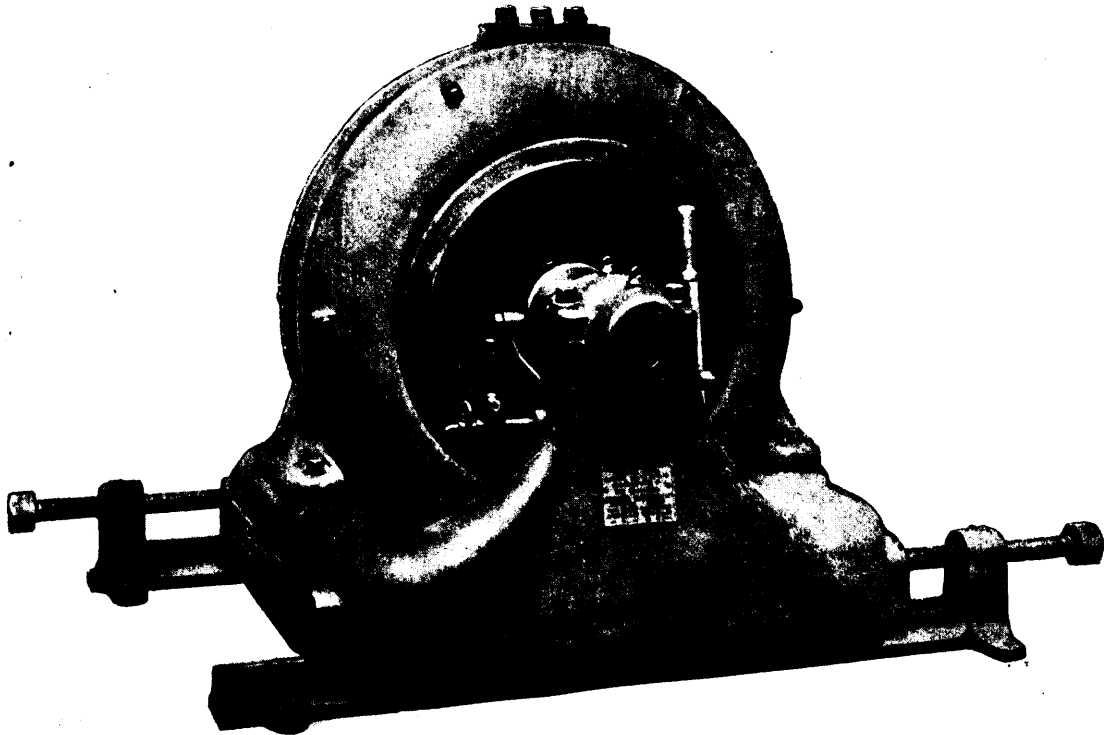
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		Quantity.	Value.	Quantity.	Value.
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“ Quartz .....	Oz. ....	62,259	1,244,180	106,141	2,122,820
Silver .....	Oz. ....	3,135,343	2,100,689	5,472,971	3,272,836
Copper .....	Lbs. ....	3,818,556	190,926	5,325,180	266,258
Lead .....	Lbs. ....	24,199,977	721,384	38,841,135	1,390,517
Coal .....	Tons ....	894,882	2,688,666	882,854	2,648,562
Coke .....	Tons ....	615	3,075	17,832	89,155
Other materials .....			15,000		151,600
			\$7,507,946		\$10,455,268

Production for 1890, \$2,608,608; for 1896, \$7,146,425; for 1897, \$10,452,268.

## GOLD.

Gold-bearing lodes are now being prospected in many parts of the province, and at Rossland magnificent ore-chutes of very profitable gold-copper ore are being mined and smelted, the Le Roi having paid to date, \$725,000 in dividends, with a large and increasing amount of ore in sight as the workings attain greater depth, while systematic development on other properties is meeting with excellent results, mining having just fairly begun in this camp. Little doubt can now be entertained that Rossland will become a heavy producer of gold, and that excellent properties now only await sufficient and abundant capital to become paying mines, to further aid in which the facilities for cheaper transportation and smelting are being now supplied. At NELSON and at FAIRVIEW, CAMP MCKINLEY, GREENWOOD, CENTRAL and other camps in the southern part of Yale, important work is being done on the quartz ledges there, several new mills being under erection.

Exploratory work is also in progress in EAST KOOTENAY and in LILLOOET, ALBERNI, and on the Gulf islands and along the coast line of the mainland, as well as in other parts of the province.

In CARIBOO, several large undertakings, involving a large amount of capital, are at work exploring both modern and ancient river channels, the Cariboo Hydraulic Mining Co., on the Quesnelle river, proving, on development, to have in a channel of the latter kind, a great gravel deposit of exceptional richness, while other parts of this district now offer every inducement to capital.

Into CASSIAR, OMENICA, and the great area to the north, as well as Cariboo, there now promises to be a great exodus of explorers, incited by rich diggings now being mined in the YUKON, as on the KLONDYKE, to the north, and river and creeks long reported to be gold-bearing will now be made accessible, and well tested.

## SILVER-LEAD.

Despite the drop in the price of silver, the SLOCAN mines are being much more extensively worked, while the shipments of high grade ore are constantly increasing, the higher price of lead more than compensating for the lower silver values. The production for 1897 has much exceeded that of 1896, as such mines as the "Payne," "Ruth," "Whitewater" and other mines increased their output.

At NELSON, the "Silver King" or Hall mines is shipping constantly a large amount of silver-copper ore, and the LARDEAU, TROUT TAKE, LILLOOET districts, on further exploration, promise to become rich districts. In EAST KOOTENAY large bodies of silver-lead ore will be mined on completion of the railroads now under construction.

## COPPER.

Copper is being produced to a limited extent at ROSSLAND and NELSON, but the large deposits of at present low-grade ore in the BOUNDARY CREEK district will be fully tested when the railroad, now almost assured, is constructed. Prospecting is being done at KAMLOOPS, along the west coast of

the mainland and of Vancouver island, as well as at many other points, and TEXADA is producing high grade bornite ore.

## COAL AND COKE.

The large collieries on VANCOUVER ISLAND are producing about a million tons of coal annually, and at COMOX an excellent coke is now being produced, much of which is shipped to the inland smelters. The great deposits of coking coal in East Kootenay, at the CROW'S NEST PASS, are now being opened, as the C.P.R. is now being built to the Columbia river to supply the great mining regions with cheap coal and coke.

## SMELTERS AND RAILROADS.

The smelting industry is now beginning to assume large proportions, as preparations are being made to treat the ores of this province within her own borders, a most important factor in the increasing prosperity of this country, entailing as it does, and will, the employment of much capital and many men. The extension of the railroad systems to different parts is now in progress, and the next few years will see many parts in which the prospects for good mining are excellent, made easy of access, while ores can be shipped with facility to the smelting centres, where the assembling of the various interfluxing ores will make possible the treatment of all British Columbia ores at home.

## CAPITAL.

Capital can now find here excellent and many opportunities for investment, if proper business care and the experience of qualified men are utilized, as the values placed on mines and undeveloped properties have reached a reasonable basis.

## MINERAL LANDS.

Mineral lands are open to location to any person over eighteen years of age, who has obtained a free miner's certificate, and perfect titles to lode claims can be easily secured after \$500 worth of work has been done per claim. A great extent of territory has yet to be prospected.

## YUKON GOLD FIELDS.

As the KLONDYKE and other gold fields in the Yukon in British territory is reached mostly via British Columbia, all SUPPLIES and OUTFITS obtained at VICTORIA, VANCOUVER, ASHCROFT, KAMLOOPS, etc., can be taken in FREE OF DUTY, which otherwise WILL HAVE TO BE PAID if not purchased in CANADA.

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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.

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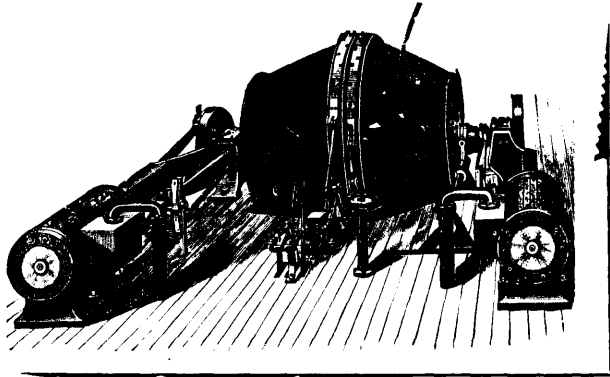
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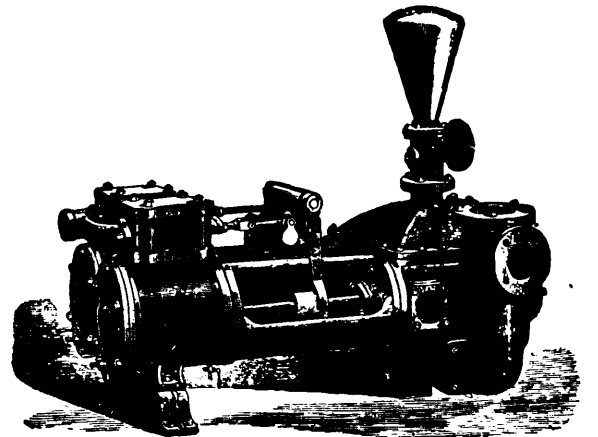
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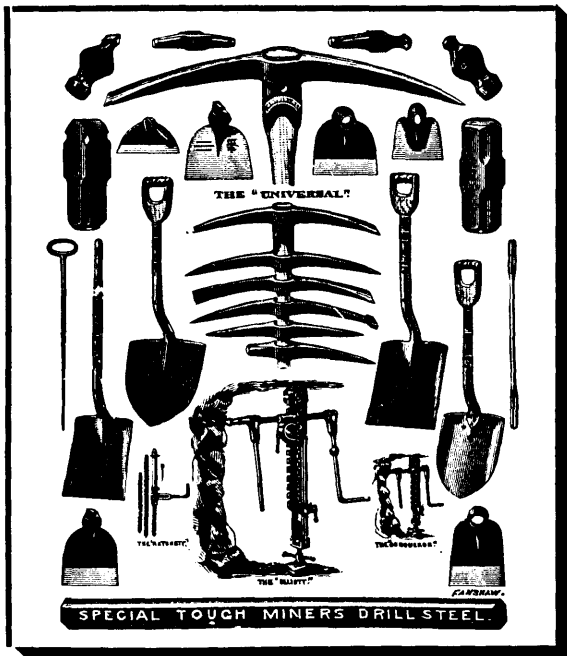
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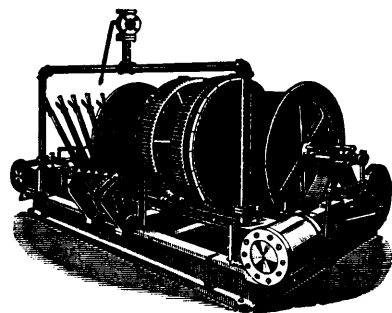
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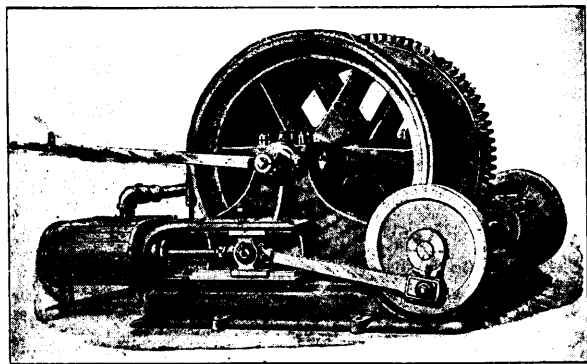
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Published Monthly.

OFFICES { Slater Building, Ottawa;  
Metropole Building, Halifax;  
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VOL. XVII., No. 9.

SEPTEMBER, 1898.

VOL. XVII., No. 9.

## The Yukon Royalty.

Everybody at Dawson and in the Dawson district is using evil language of the royalty which we are assured by Major Walsh the mine owners love to pay. Let us consider whether they ought to grumble. And first as to royalties in general, there seems no reason why the miner should not pay some proportion of his earnings from ground provided for him by the State. Other occupations are taxed, let the miner be taxed too; and there is no reason why the miner should not be taxed on the gross output of his mine; we do not necessarily let off other producers because they may have been working at a loss, and the miner too may be called upon by the State to pay a share of his gross output. This is sound principle for the politician in need of money doubtless; but when we come to apply it in this particular amount (10 per cent.) in this particular country, the Yukon, and at this particular time, after a winter of great hardship for pioneer miners who need all possible encouragement, then we find our argument runs less smoothly and it is difficult to defend a royalty of this amount. The miner in any case pays for his license, pays for every claim he records, pays for every year of renewal of a recorded claim. On two suppositions, both demonstrably foolish, (1) that a new country must be made self-supporting at once; (2) that the Klondyke is so enormously rich as to be able to pay any royalty imposed, the miner has been saddled with a new tax which he cannot in a large number of cases bear. The miner is the producer of the Klondyke, and he alone is thus specially taxed there; the money traders who live upon the fruit of his labors get off free while he is heavily taxed. Again, there is in this royalty much of that retrospective nature which is always hated. Purchases of mines did not include it, contracts with laymen did not take it into account, being made long before it was enacted in many cases. Even where it was known before the winter's work was arranged, men inside did not believe it, did not think it would be enforced. Then too it was decreed by Major Walsh that mine owners should pay all the royalty and laymen none, that is to say, Major Walsh split every dump in half and said "this half belongs to the laymen and pays no royalty, this to the mine owner and pays all." Thus the owner paid 10 per cent. on the whole with his half share or 20 per cent. on the amount he received! Work this out and the owners pay one ounce in every five to Government. It is not surprising that many had to be exempted while others borrowed money with which to pay royalty—there are in fact, naturally, many claims which cannot stand such a tax. If one seeks to understand its imposition, one must suppose it to have been due to the quaint representations of the prophets of the Klondyke who talked wildly of the

fabulous wealth of the country, and doubtless those who imposed it meant to give the Klondyke many blessings with it, especially a railway and improved trails; but, while the royalty was rushed on, the railway was rushed off, and as the executive at Dawson failed to attend to the trails, the miners found themselves saddled with a new huge burden and no corresponding improvements at a time when everything was at its dearest, *e. g.* lumber \$400 a thousand at many of the mines, nails \$5 per lb., freightage and provisions fabulously dear. He might then well complain and may still, for he remains without help from Government where Government can best help him, *viz.*, in improved facilities for cheap transportation to the Yukon and in the Yukon. Private enterprise in road making has not been wanting, but has not been backed up by Government support—the contrast between the neat sidewalks of Dawson growing more numerous every day, and the horrible Bonanza and Quigley trails is painful and suggests that the authorities are not great travellers. It would seem that this excessive royalty should have been kept back until it could have been presented with some counterbalancing gains to the miner whom it loads heavily at the time when he is struggling with very imperfect methods to develop a hard country of his own discovery. There has been given him as yet by Government little save law and order secured by a civil administration. But he will tell you that he throve well and that law and order were splendid under Inspector Constantine and his few "boys," and he will complain that too dear a price can be paid for a more complex executive, and his words have weight for he is so law-abiding and orderly in the Klondyke. Some results of the present royalty may be mentioned; it encourages dishonesty of course; false returns must necessarily be made in many cases. It renders a large number of the middling and poorer claims unable to be worked at a profit and therefore unable to be sold. It must not be supposed that it depreciates values of property only 10 per cent.; it does that only to the best class of properties; a large number of the poorer sort of mines, which just paid without it, under it become valueless until at least such time as methods of mining and general conditions of production shall have greatly improved in the Klondyke. Consequently much is heard about closing of mines by rich owners and poor alike, and many mines which would have been opened up for summer working have been kept back; hence labour is not wanted in the mines in anything like the amount which the gold in the creeks would warrant; this presses hard and will press on new arrivals, for whom there ought to be plenty of work especially during next winter; but men who can afford to wait mean to wait for better conditions, and labour is not in very great demand. Capital from the outside too will wait for more favourable conditions. It is no argument for this royalty that it is

easily collected. If it is true, which any man will doubt, that is only a sign of the capable management of Inspectors Macgregor and Norwood, not a proof of the reasonableness of the royalty. As a matter of fact, the best informed officials have all been dead against it. One argument for the royalty I would not notice, were it not so commonly advanced by men in high positions who seek to gain a name for economy and patriotism by it. "The men who dig out gold in the Yukon," they tell us, "are largely aliens and do Canada no good with the gold they take out; therefore, we will take it from them in part." This argument would require Canadians to be exempted from the tax!! In fact, there are, of course, plenty of Canadians among the diggers of the Yukon, and all who dig there benefit Canada directly or indirectly. In conclusion it will be instructive to see what the prospector has before him in Canada. After paying for his license he is allowed to stake a claim of 250 feet in length, on a creek of which one half is reserved for the Crown. Of this very short claim one-tenth is the Crown's as royalty, and the miner pays the recording fee and renewal fee. He may stake a bench claim too and a quartz claim, but on the creeks he is undoubtedly not generously treated. The Crown keeps back too much especially in a far remote land like the Yukon, where men need much encouragement to stand the hard life of the prospector. The conditions of mining in the Yukon want knowing—they are not yet known—and improvements should be made in them before a royalty of so much as 10 per cent. is imposed. When the conditions are known, a moderate royalty will be imposed on an improved and willing camp.

A. N. C. TREADGOLD.

## CORRESPONDENCE.

### Notes from the Klondyke.

To picture the area known as "the Klondyke," start from Dawson as the northwest corner of a rough square each of whose sides shall be about 30 miles long. The western side is the Yukon, flowing almost due south. The south side is formed by Indian River, flowing due east; and its main tributary, Dominion Creek, gives us half of the eastern side. The northern boundary is the Klondyke River, with its main branch, Flat Creek; All Gold Creek, a tributary of Flat Creek, helps Dominion Creek to form the eastern boundary of the area under notice. This area is still very imperfectly prospected and outside it on every hand lies country of which very little is yet known. Some part of that little I hope to give in a later paper.

The Klondyke is an alpine area with a temperate summer lasting from May to August and an Arctic winter lasting from November to March. Its hills are rounded, rising to upwards of 4,000 feet by easy gradations, clothed with stunted spruce, birch, poplar and scrub and densely covered with moss of many hues. Rock exposures are rare and climbing is easy enough, for a mountainous country, up the gentle slopes. The scrub is seldom thick enough to impede the traveller, though the moss makes walking harder. The valleys are fairly wide and the streams have a fair flow of water with a grade of not often more than 30 feet per mile; thus the valleys are flat, and moss and wet from muskeg in them, which makes travelling bad in summer. Even on the side hills the surface black muck tends to become clayey often, and, retaining wet, makes the trails bad. The moss is about a foot thick and (1) keeps out the sun from the soil beneath, (2) covers up the surface from the eye of the prospector. When timber and moss are cleared off from hill or valley, Klondyke soil soon thaws to a fair depth and grass quickly grows. The soil is black and thin on the hill-sides, but in the valleys is found as much as 4 feet thick in places.

The fertile soil and summer sun tend to force vegetation; peas, radishes, onions, lettuces, come on with astonishing speed. I have seen few parts of the district where feed was not to be had for horses and cattle. It is a land of flowers and butterflies with still a fair amount of big game, moose, bear, caribou. Birds, too, are there in plenty, thrushes, finches, siskins, redpoles, swallows, martins and many more, but not many birds of prey; I have seen only the hooded falcon and the bald eagle. The raven is common. Most people are too busy with the physical difficulties of the trail to observe and enjoy natural history objects, but they are there for such as love them. I shall have more to say about them later. Timber (spruce) grows in fair quantity and good quality up the Klondyke valley for at least 25 miles up Hunker and Gold Bottom Creeks and a little way up Bonanza Creek. Birch of very fair size grows in the Klondyke valley and on the hills, especially from 1,000 feet upwards, above Eldorado Creek. I have plenty of sections of spruce 28 inches through and birch 7 inches through. It is fair to say that all the creeks have a great supply of cordwood up their own hills, but of course the miners have to go further up as work advances on the creeks. From one creek to another over the divide is always a considerable walk, but it is worth taking, because one sees the country better. A good way to see the Klondyke is to walk about 30 miles from Dawson, south-east, to the Dome, the highest hill of the district. From it one sees the lie of all the creeks which have produced gold. They all head from near it. A stay in the Klondyke soon shows why it has been so grossly misrepresented; the difficulties of the trails prevents all but the most active and eager from observing the facts around them. Most men sent to write about the country find one tramp up one creek more than enough, and finish their stay and their gleaning of facts in Dawson itself. Thus it happens that there has been so little original observation of the district; most of our accounts have come from men who, owing to press of labor or lack of education, were not qualified to inspire journalists' accounts of the Klondyke. Nowhere have I found greater ignorance, combined with greater willingness to misinform. "There be liars, d—d liars, and Yukoners," is an adage well worth carrying in one's head up here. The Yukoner of this adage never says he does not know, but invents a fact in order to give a civil answer. He would think himself unkind not to inform a questioner; this is a charitable view of his case; for indeed the civility and general kindness in this far-off land are remarkable and quite infectious. A "tough" and a churl coming in here soon becomes civil and hospitable by contact with so much good, manly, kindly nature all round him. It is only consideration of this kind, combined with a due regard for the firm, absolute rule of the Mounted Police that explain the phenomenal quiet and orderliness of Dawson. In Dawson a man can follow his trade in absolute security; crime is almost unknown. There have been three robberies of dust in 1898 in a camp of 20,000 people. Saloons abound, but they are orderly, and to see them close at 12 on Saturday night for a whole Sunday's rest is a sight to make a man think. Drunkards of course there are, but as soon as one of them makes much noise he is locked up and duly fined next morning. What is the health of Dawson like? Good, except for dysentery, to which men seem very liable in all this north country in summer. Deaths from any cause are very rare in Dawson, but numbers of men are much weakened by dysentery, which, if not soon cured, tends to become chronic in the lower bowels. There has been very little typhoid up to now (Aug 5). It must not be imagined from this fact that the hospital is empty and doctors are lean. Dawson is a big mining camp and of course there is some sickness, but it is not noticeable; there is no epidemic; and men run to a doctor very quickly and pay their ounce needlessly in many cases. The doctors tell me that it is the worry and bustle of the life up here

which makes dysentery hard to stop. Some of the sickness in Dawson is the work of last winter not yet cured.

Dawson itself lies in part on a damp black soil flat, some 200 acres big, washed on the west by the Yukon, on the south by the clear green Klondyke River, closed on the other two sides by a high hill which rises from the flat abruptly on the Klondyke River and sweeps round to the north-west corner of the flat in a fine semi-circle, offering along most of its course gentle slopes on which the other part of Dawson is being built. The town does its business on the flat, especially the main street is along the Yukon front; its cabins it builds on the slopes of the grand two-peaked hill which screens it from the cold north and east. Dawson drinks spring water from this hill or Klondyke water from the river. Town lots are already very valuable, and though there are no real titles to land yet obtainable, lots on Front street have sold for \$40,000. Squatters' rights to a lot of land and wood are to be had on one part of the big hill reserved expressly for squatters. The main street is nearly always crowded with men trying to find one another, for that is the way to find a man who has no office, and most, of course, have only tents as yet. It is a hard matter to find a man in Dawson, and much time is wasted thereby. When you find your man, the two of you sit down on the edge of the sidewalk (raised a foot above the road for cleanliness) and talk. This is a picturesque sight, to see men of all nations in all kinds of quaint garments, standing or sitting at business in this main street. The keen trader may be seen with every conceivable article for sale, from a whip-saw to a tin of Dr. Tibble's Vi-Cocoa. There are fresh Yukon salmon, huge fish, at 20 cents a pound, bread at four 1 pound loaves for a dollar, fresh moose at 40 cents, beef and mutton at 75 cents to \$1.25 per pound, all kinds of fresh fruits, for Dawson's demand is just beginning to be met; she has proved that she has in her gravels plenty of gold with which to pay for all her wants. Any number of restaurants offer a good meal for \$1.50; saloons give any drink for 50 cents and none for less. On the river front loafers wait for the boats that are so slow in coming up from St. Michael's this year and so delightfully quick in running down from Bennett Lake. Those men in long line over yonder, quite 40 yards long, are waiting hours to get into the post office to get mail, which is worse distributed in Dawson than in any important town on earth. It is a hard task, to be sure, for the officials, but it could be better done than it is. Many a miner has lost a whole day or more getting his mail. As we fare down the main street we come to the mining auction, where a never excited crowd bids chilly for claims generally worthless. The true miner hates the auction, because it sells worthless claims for little or nothing and makes all mining property seem worthless, so he says, and he tried to get the auction suppressed; but the about town man, the loafer, rather likes the wild excitement of the auction, and claims still sell there on creeks and gulches never otherwise heard of. Soon we pass a log building on our left where the English Church holds service twice every Sunday. Six churches have applied for sites in Dawson and will get them when the titles come. On Sundays in Dawson there is quiet, there is very little business done, and the old familiar strains of ancient hymns steal through the clear northern air and one fancies himself not so very far away after all. Of course the Salvation Army is here with its street services; and other churches are represented too. When we come to the several blocks of Government buildings we find another long queue at the Gold Commissioner's office; there, too, there is more business to do than the staff can at all cope with. Many a miner has had to wait for hours with the thermometer many degrees below zero. It takes hours to get a license or title to a claim, and men pay a dollar per hour to a man to stand in line for them. All these Government offices are hopelessly undermanned and, I fear, underpaid, with resulting

dangers to business. I think, too, that the Gold Commissioner has had far too many things thrust upon him. At one time he was managing timber claims and gold claims, and that without any proper office stationery. Dawson has had to emerge through very rough times, but she is emerging; the marvel is that things work at all, and they would not have but for the very orderly character of the Klondyke mine owners and miners. I have never seen such patience, such willingness to help the authorities as up here. In the same building with the recording the hearing of disputes about claims is done. These have become much more frequent with the great increase of men in the country and many very crooked cases of staking have to be recorded. I have copies of stake notices from Dominion Creek, five in number, all put up on the same claim, on the same day, but all have different dates and all but one, the genuine one, are antedated. Five men when locating Dominion Creek staked out enough claims for about thirty men, and helped to get the creek into a tangle from which it has hardly yet been extricated. One of the men who followed these five did not suspect what was happening until the numbers began to grow badly mixed, owing to the rascally five forgetting how many claims they had staked. Formerly the Gold Commissioner had all these cases to settle; now he gets some help, but the recording office is still far from satisfactory, so slow. The Government buildings are very pretty one-storey log buildings, about five in number, and they adjoin the police barracks, a series of log cabins built on the sides of a square which is used for drill practice. Here is the court house, where Judge Maguire has a not very busy time with the few men who, in a land of grand natural honesty, are foolish enough to be dishonest. There come two of the poor wretches, see! attended by a guard with loaded rifle; one of them stole \$8,000 worth of dust on the trail, the other robbed the pocket of a waymate; both will be taught honesty by long hewing of wood and drawing of water for the police. A still sadder case we have had lately tried in Dawson. Last April two miners, out prospecting near Lake Marsh, were fired upon by some Indians; one was killed, the other was wounded but got away. Robbery was the motive. The Indians sank the dead body in the water, hanging a pick-axe to it. They have been caught, identified by the survivor, confessed, when the body was found, and duly condemned to death, after fair trial.

I must not omit the banks. As yet housed in back streets, they are still very important centres. The Bank of Commerce has handled \$3,000,000 worth of dust and the Bank of British North America \$2,000,000 since June 1. Then there are the stores of the Alaska Commercial and North America Trading and Transportation Companies, the biggest buildings on all Front street—not very good names in Dawson since last winter when they held up food, though miners badly wanted it, for higher prices. On all sides Dawson is growing and lumber is in good demand.

Wooden buildings of two and even three storeys are rising on every favorable site, the marshy flat being avoided by common consent save along the river front, where it is dry enough. Prices are still rather high for most things, but are coming down and will drop still further. Lumber is \$170 per 1,000 feet, flour \$7 per 50 lb. sack, and everything a man can want is to be had for money. Dust is decidedly plentiful and prices keep up longer than was expected; in fact it is still fair to say that the only cheap thing in Dawson is gold dust, which commands only \$16 per oz. at most, though its assay value is usually well above that and on Hunker runs to nearly \$18 per oz. The banks are doing a fabulous trade.

To visit the creeks a man walks about two miles up the Klondyke River by a good trail over Dawson hill, then across the Klondyke by a marvel of rough bridge building and by ferry boat (half a dollar).



Another half mile or less across the Klondyke valley brings him to Bonanza Creek which runs due south-east for about 20 miles. At its mouth the creek is a good-sized stream, perhaps 30 to 40 feet wide; its water is, of course, yellow with dirt from the gold washing. We have to pass through many claims before on 85 we at last find some work done. The valley is very wide, perhaps 500 yards in places, at its lower end, and the gold is scattered and will have to be worked on a large scale before it can pay. The stranger will probably find Bonanza much prettier than he expected—there are many pretty spots—but the trail is so bad that a man's eyes must watch it rather than the scenery. There is not much work done till we get to the Fifties, and then for about ten miles most of the claims have been worked up to about 45 above Discovery. But we must stop at 5 above Discovery for there the famous Eldorado comes in. This creek runs nearly due south and shows an almost continuous good pay-streak for  $4\frac{1}{2}$  miles up to about 45. Eldorado is not a typical Klondyke creek, for the reason that it contains so few blanks. Klondyke pay is spotty, as gold always is; it differs from alluvial gold elsewhere only in that its spots tend to be so much richer. Lower Bonanza is very spotty and shows many disappointing claims; Upper Bonanza shows a few disappointments. The good pay dirt in these two creeks is most interesting to follow. In Eldorado it has been proved at one point to a width of 100 feet, while on an equally good claim lower down it will contract in places to a few inches, in other places widen out to a few feet. Then again two streaks will exist often of different kinds and amounts of gold, on opposite sides of the creek. Sometimes it will be 300 feet wide, all the gold being fine and scattered throughout; then again it will suddenly contract into rich pockets of coarse gold. I know several claims in which there is one wide streak of coarse gold, perhaps of 30 feet or more, and then away from it a wider streak of fine gold. Facts like these will show how easily a man may mislead himself and others by computing on a basis of uniformity a deposit of gold which could not in the nature of things be uniform. The Klondyke deposits upset the thoughts of many men by their exceeding richness, and even when one has spent weeks of careful study on them, there is much to puzzle even a practical geologist. The unpractical dreamer early in the history of the new field inferred that because, say, claim 1 on a Klondyke creek showed 200 feet of pay and claim 20 showed 250 feet of pay, therefore, all the intermediate claims were equally good. In the same way a picked pan of gravel was shown to yield a large amount of gold and the dreamer's calculations were at once based on this fancy pan. The pan as a means of measuring gold-production from gravels should be discarded in serious mining; it misleads; the cubic yard is better; the section across a cut is better still. Meanwhile we are not too late for the washing of the winter's dump on many claims in both Eldorado and Bonanza and the owners seldom object to our examining whatever we wish. The general result is success on Eldorado and Upper Bonanza, disappointment on Lower Bonanza. Expenses proved too heavy often for Lower Bonanza. Thus on one excellent claim whose pay is wide and good, \$100,000 did not pay the owner anything for taking them out, while, to show how things can differ which ought to be the same, a little lower down the creek also on a good claim \$57,000 extracted paid the owners 35 per cent. Again from both these creeks comes a wonderful show of fine nuggets, headed by one from 36 Eldorado of just under \$400 (about 24 oz.), with plenty more from 36, 31, 22, 21, 13, 6, 5, 4, 3. Big Skookum 1 and Bonanza 2 above and especially fraction A adjoining this latter claim show a quite astonishing proportion of fine nuggets, very frequently with quartz still adhering. There is a curious want of uniformity in this matter. Some claims show little or no quartz in their nuggets; thus 19 Eldorado shows smooth ones free from quartz.

The striking feature of Klondyke nuggets still, however, remains the prevalence of quartz in them. Fine streaks of coarse gold were struck in Upper Bonanza by drifting under the side hill in 3 consecutive claims, and there too the nuggets were free from quartz mostly—these claims had previously yielded well in fine gold in the creek and between the two streaks (fine gold in creek and coarse gold under side-hill) lies a space of at least 300 feet which a man might imagine to be all auriferous and it has so proved in some claims, but they are exceptional. It remains true that 70-90 feet is a big pay streak even in the Klondyke. Nearly all the gold so far mined in all the creeks has been mined in winter by the burning and drifting method so often described, but there is growing up now the true method of mining in the Klondyke in which summer is used, and the top muck and waste gravel stripped off early expose the frozen gravel to the sun which thaws it at a fairly quick rate. This method is the Siberian one and will soon be largely used in the Klondyke; already at least 14 claims are working in summer by this method of open cuts, and the summer season is much longer than is commonly supposed; it extends from early in May to the middle of September. Fourteen claims may sound very few, but men do not realize how few claims are at work in the Klondyke to produce this output of 1898, so difficult to estimate, but sure to reach ten million dollars by September. I calculate that not more than 160 creek claims, and 40 bench and hill claims, have produced it. There are about 11,000 claims recorded in the district, at least 10,000 of these must be quite unprospected. About 40 claims were worked on Lower Bonanza and about 40 on Eldorado, and if we turn back from Eldorado and tramp up Upper Bonanza by the worst trail possible, we shall find about 40 worked there; but we will get a good meal at the hotel at the Forks, the junction of Eldorado with Bonanza first, then on up higher Bonanza, another almost continuous rich section of the Klondyke. At about 61 above we find the creek forks; above the forks no work has been done and we take the divide up from the forks and follow it up up up for about 9 miles, till at last we reach the Dome by a beautiful dry hard trail. From the Dome the view is unimpeded, and the whole gold bearing area lies open before us; Bonanza and Eldorado head from its western slopes, Quartz and Sulphur from its southern, Dominion from its eastern, Gold Bottom, which is the main branch of Hunker, from its northern. Away to the north the so called Rocky Mountains show their jagged teeth in long, distinct lines marked off from the rounded Klondyke hills. Dominion Creek need not keep us long for all its more than 300 claims and promising prospects; for only about four of these have been worked; in the same way Sulphur has not proved itself as yet, though much boomed inside the Klondyke. Quartz too can show but little promise as yet, so we leave them all quickly and mount the Dome again and descend its northern slopes into Gold Bottom, which has produced some gold already, but has been very little worked; it will bring us out into Hunker at about 40 below then we can turn to the right up to Discovery, and have a chat with Mr. Hunker who will tell us how he staked Discovery in September, 1895, after finding gold on the rim at a point below his present claim. Then he will show us coarse gold in great lumps from one side of his claim and fine gold from the other. Here too we shall see good summer mining on a cheaper basis. Mr. Hunker is an old British Columbian miner and will have plenty to tell about famous old McCulloch Creek down at Big Bend. Much too about the discovery of Bonanza by George Cormack, we shall learn and how Eldorado was staked by the novices, Eldorado "good only for Swedes and moose." Then we can tramp down Hunker past a few well worked claims, but mostly unworked ones for 12 miles, the last three being Mr. Anderson's hydraulic concession, wondering all the while how \$1,000,000 have been produced from such slight

scratchings of the creek surface. But we must remember that good pay has been found at intervals all the way from the fifties below to the thirties above. The lower part of the creek is very wide, indeed fully 600 yards often, and will only pay for hydraulic on a large scale as is the case with Lower Bonanza and the Klondyke valley too. From the mouth of Hunker we turn west and tramp down the Klondyke valley past Bear Creek and Quingley Creek, past Bonanza mouth to Dawson home again. We have been the round of the creeks already proved to be gold bearing. The gulches of these creeks have not been prospected as yet, but are all staked and waiting for a cheaper form of prospecting than that of sinking a shaft by burning. And what have we noticed chiefly on our round? (1) The br<sup>3</sup> trails which could be made good by an effective administration with ease; private enterprise has done a little; Government has spent a little on the three miles nearest to Dawson, but has no road policy. Why not make claim-owners build a part of the road through their claim instead of doing the foolish representation work which they now too often do in summer, building cabins which are not wanted and sinking holes which they never mean to push down to bedrock? (2) The flatness of the creeks and and slight fall of the streams making long flumes necessary to get fall enough for their sluice-boxes—these flumes are very impressive to the eye in the creeks but they cost a great deal. (3) Absence of wood on the hillsides; it has been cut but there is plenty up higher on all the creeks; you must climb to find it. (4) The sunny look of the creeks: when the timber and moss are cleared off the sun gets in and has great thawing power (5) The wonderful thawing power of the water: when they wish to strip a cut for summer mining, they turn the stream upon it and the stream soon cuts through and carries away the black muck and lays bare the gravel. (6) The absence of machinery; a waterwheel pump is the only machine used, except one home made derrick for hoisting boulders on Skookum, and one little steam engine on 6 Eldorado for hoisting gravel. (7) The great depth to which the gold penetrates the bedrock; in places as much as four feet of bedrock are taken out and washed. (8) The great beauty of the tailings heaps, the quartz and schist pebbles and fragments show very bright and much the same in character on all the creeks. (9) Flatness is not necessary to make a claim good; Eldorado is narrow and confined in the thirties; yet they are among the best as a whole; Hunker is steep and narrow in the thirties above; yet there are good claims there. (10) The telephone lines make one feel nearer to friends, and make the telegraph line from Skagway seem more certain to be built. (11) The cattle grazing on the Klondyke flats and a cow on 7 below on Bonanza mark great advances in the Klondyke. (12) The new discovered bench and hill-claims which, especially the latter, have begun to be important factors in the gold production of the Klondyke. In them nearly all the washing is done by the primitive rocker, a clumsy toilsome and wasteful machine, part of the crude methods of the "heroic age" of mining. The bench claims are found in no great numbers, chiefly on points projecting into the creeks and at a height of 10 to 20 feet above the present creek level. The hill claims are found much higher up and have been proved to be often very rich, especially (above 19 Eldorado and above 3 Eldorado and on Skookum) on French Hill. There is still another kind of claim called "bench" claim, and on a level with the bench claims, but really not deserving that or any name. It is just hill side bedrock whose crannies have had gold silted into them with a very little grit and mountain wreckage and are overgrown with moss. There are very few of those claims known; in them a surprised miner has discovered gold, once in large quantities, immediately on removing the moss in order to prospect. But I shall have much more to say on the various kinds of claims when I come to write on the geology of the district, so far I have tried to give only a general impression of the country. Special papers on various subjects are to follow.

DAWSON, 5th August, 1898.

A. N. C. TREADGOLD.

### Between the Mine and the Smelter.\*

By ALBERT R. LEDOUX, A.M., M.S., PH.D.

GENTLEMEN: It is probable that the majority of you upon graduation will seek positions either at the mines or metallurgical works of our Great West or British Columbia, and the course you have taken at Columbia University has amply prepared you to apply practically in the field the instruction here provided. But there are in all professions practical points which can be learned from no book, which are not taught in college lectures, and I have been requested to speak to you this morning as a practical man who has had some twenty years' experience since leaving the School of Mines, in lines of work connected with, or rather *connecting*, mining and metallurgy. I have chosen for my subject: "Between the Mine and the Smelter," and shall discuss it under two heads, the first being general and commercial, and the second specific and technical.

#### I.

Mr. Walter B. Devereux, one of the most successful of metallurgists graduated from the old School of Mines, has in his lectures supplemented from his large experience what your permanent instructors have told you of conditions necessary to be carefully considered before deciding whether your smelter or mill shall be erected at the mine or at some distant point—questions of fuel, water supply, hauling, etc.

Let us suppose that, as in nine cases out of ten is the fact, you have decided to locate a smelter at a point where fluxes and fuel are more available than at the mine, or to ship your ore to some custom works, at a point so distant in either event that it necessitates railway transportation. The first problem which will usually concern you will be that of freight contracts. There are some railroads, like the Great Northern, for instance, that were built through an almost uninhabited country with the express purpose of building up that country and reaping profits in future, and such roads make very liberal rates to miners and smelters along their lines, as well as to other settlers. But there are other roads primarily built perhaps to secure land grants, or, which run from one populous district to another, almost regardless of grades, and, to some extent, of distance; the longer the distance the more land to be obtained from the government. The policy governing such roads has, generally speaking, been unfavorable to industrial development, unless indeed at points where some of the gentlemen interested in the railroad were interested in the local development.

When my firm began receiving shipments from Montana, in 1880, the freight rates were from \$40 to \$60 a ton. They probably do not exceed \$18 at this time. One of the most conspicuous instances of the separation for economic reasons of works and mines is that of the Boston-Montana Company, in the State of Montana. Their mines are at Butte, and their works at Great Falls, a distance of 175 miles apart, with one of the main ranges of the Rocky Mountains between. At Great Falls was unlimited water power and cheap fuel; at Butte was not enough water for concentration, and expensive fuel. Before the works at Great Falls were started a freight contract was entered into, the rates of which are popularly supposed to be not much over \$1.00 per ton of ore for this 175 miles of haul over an elevation of 6,000 feet. But way of contrast, I examined a mine in Nevada, only 100 miles from fuel and water by rail, but \$3.50 per ton was the lowest freight named for a seven per cent. copper ore.

Recently competition between railroads and falling prices for metals have introduced into the question of transportation a new factor, that of the application to ores of the "milling in transit" applied to wheat. You know that a railroad will take a contract to carry wheat from Dakota to New York at a certain price, consenting that the wheat

\*A lecture delivered before the graduating class of the School of Mines, Columbia University.



shall be stopped at Minneapolis, turned into flour, packed in barrels, and the flour go forward under the original contract. There are likewise shipments of ores in which the freight contract is based upon the number of pounds of copper and lead which they contain, as determined by assay, the contract covering the transportation of the ore from the mine to the smelter in the Middle West and the bullion from the smelter to the Eastern market; all considered under one contract, not completed until the bullion is delivered. You can readily see the necessity for carefully considering the question of transportation before deciding where to locate works, from this brief outline.

There is still another question of transportation which has been often overlooked by producers of precious metals by smelting, whose product is in the form of rich lead or copper bullion; and when I have suggested that it was worthy of consideration I have been met sometimes with incredulity until the interested parties began to figure. That is the difference between freight and express rates on precious metals from the Rocky Mountains to, say, New York.

Take for illustration the Anaconda Copper Mining Company. The freight on its product in the form of converter bars or anodes probably does not exceed \$15.00 per ton to the Atlantic seaboard, and, of course, the gold and silver contained in the copper pay the same freight by the ton. During the fiscal year ending June 30, 1896, the Anaconda Company shipped about 108,000,000 pounds of copper, containing about 6,000,000 ounces of silver and 16,000 ounces of gold. The freight on these 206 tons of gold and silver, at, say \$15.00 a ton, amounted to not much over \$3,000.00; but had this material been refined entirely in the West, and the fine gold and silver all been sent forward by express, the expressage and insurance at 2 cents per ounce would have amounted to \$120,000.00, difference enough to erect an electrolytic refinery in the East from the saving of two years. In the East, labor is cheaper, sulphuric acid cheap, and there is a market for the incidental sulphate of copper produced. Then again, the distance from market of the finished product has great influence with the location of works, especially for ultimate refining, as freights are higher as a rule on finished products.

As a result of these conditions, slowly realized, sentiment at present is strongly in favor of the erection of copper refining works on the Atlantic coast, or at least in the East, and it is doubtful whether any of the large copper producers would have put up their electrolytic plants in the West had they realized that the conditions of today would prevail, unless it be those fortunate enough to be located on the Great Northern, with the water power of the whole Missouri at Great Falls to draw upon.

Of the fifteen electrolytic refineries in the United States, all are east of Chicago, except three. One-half of the output of the Anaconda is refined in Baltimore, and for the next two or three years all of the United Verde Copper Co.'s output, of Arizona, will also be refined near the port of New York. The entire product of the Canadian Copper Co.'s copper-nickel mines at Sudbury, Ontario, is also refined near New York, and all the copper producers west of the Mississippi treat their material, ultimately, in the East, except three.

Of course, what has been said does not apply to gold milling, nor in so great a degree to lead smelting, although much Western lead is refined in the East.

This brings us to the second division of this talk, and I trust enough has been said to cause you to realize the importance of studying not only topography and fuel supply before deciding where your works shall be, but also the transportation and railway situation.

## II.

The second part of this informal talk has to do with questions of sampling and assaying. While some of you will be mining engineers in practice and some metallurgists, perhaps others of you will stand

between as public samplers and assayers. Since theory is of little value when compared with practice, and since I am asked by your professors to give you the benefit of my experience, you will doubtless pardon more or less personal allusion in what follows.

While the mining engineer and metallurgist—unless, indeed, the electrical engineer can be called a metallurgist—will find their greatest opportunity in the West, the analytical chemist, assayer and sampler, will find, in all probability, his largest opportunity in the East, or at least as far east as the great manufacturing and refining centres of Omaha and Chicago. He must remember, in choosing his location, that not alone is he to be called upon to handle material going to buyers' works, or those of refiners on toll, but also material destined for export to Europe, and, moreover, a commercial laboratory should seek all branches of analysis.

In 1880, when my laboratory was opened in New York, there was very little assaying of ores or metals at this port, excepting iron ores. The chief support of an analytical laboratory was from manufacturers of chemicals, fertilizers, etc. In those days chemists received from \$5 to \$7 for a nitrogen determination, and \$4 for determination of phosphoric acid. Today some are glad to receive one dollar for nitrogen determination, and from \$2.00 to \$2.50 for phosphoric acid. Not only has the price fallen, but the demand for rapid work has become more exacting. One of the first things the chemist discovers on graduation is that he must invent short-cut methods if he would keep his business. I was "brought up" on Fresenius and taught, for instance, that phosphoric acid could only be safely determined after fusion, separation of silica, solution in nitric acid, precipitation as phospho-molybdate, this after twelve hours' standing dissolved in ammonia, precipitated as ammonia-magnesia phosphate—after standing twelve hours filtered, ignited, etc., etc.

This means at least forty-eight hours; but I was startled upon opening my laboratory to have the first man who brought in a sample of phosphate say he must have the results before three o'clock the same day. All business changes. The assayer of the last two decades has seen the testing of chemicals, drugs, etc., almost disappear from his laboratory, if unwilling to accept nominal prices, and sometimes because trade customs have eliminated analysis. For instance, all the bleaching powders and all the alkalis imported used to be sold on American test. Now the European test is accepted on these in spite of the fact that the trade chemists of England still use an admittedly erroneous atomic weight in calculating the analyses of potash compounds. The analyst, moreover, finds keen competition in his business arising from old established firms, nevertheless alive to modern methods, or from other chemists who can, and will perhaps, work more cheaply than he. There are foreigners in this business here, who in some cases live over their laboratories or in them, whose highest ambition is, apparently, an income of \$100 per month, and who have brought the price of sugar testing, for instance, from \$2 per sample down to 25 cents, within my memory. Then there are trade newspapers who, by way of advertisement, have laboratory annexes, and at reduced rates issue certificates of test for dye-stuffs, groceries, drugs and chemicals; and then in some centres there is the additional competition of men employed by manufacturing or other institutions, with assured salaries, but with the privilege of doing outside work, who do not depend upon their laboratories alone for a living, and who can cut prices proportionately. There is nothing whatever in this competition that is unprofessional or unfair, but it must be reckoned with, and a specialty should be chosen, if possible.

While the analytical business has suffered, the assaying of ores and metals has increased in the East, and in the eighties there seemed to me to be an opening for an ore sampling plant at this port. Here again the transportation problem had to be considered. It is vitally important for such works to be on a line or at a point where railway

pools cannot bottle you up, as it is doubtful if your prestige and reputation would be sufficient to bring business to your works, in the face of switching charges or higher freight rates than those obtained over other roads and at other points.

In locating our sampling works, having ascertained the amount of business likely to be brought to the road upon which we located, we interviewed the general managers of several trunk lines terminating at this city. Their reception was characteristic of the roads. The manager of one line did not exactly quote the language of its "Commodore" when he expressed contempt for the general public, but he evidently had no use for ore samplers. Another line offered a piece of ground on the meadows several miles from water transportation, but would make no guarantee against competitive freights. A third road not only gave the land at a nominal rental, but contributed a considerable proportion of the labor and material necessary to erect the works, entered into a contract that it would protect the sampling works against cut rates offered by other roads; and in addition, agreed that ore or other products coming to this port could be stopped not only for sampling but for storage, and upon the completion of the sampling or storage, the road would take them over again and complete the haul and lighterage under the original bill of lading. This is storage in transit. It may be said that this road construed this contract with extraordinary liberality. For instance: When, in 1889, Mr. Secrétan, of Paris, cornered the world's output of copper, buying the entire visible supply, and the entire product of nearly all the mines, sampling was pretty lively at the works mentioned. As the syndicate approached its disastrous end, copper matte began to halt at the sampling works until nearly 8,000 tons had accumulated. Then the syndicate went to pieces, and its creditors fell foul of one another in dividing up the assets. The copper matte was the subject of protracted litigation. It remained in the sampling works most of it—seven years, at the end of which time the original bags had rotted and carloads were inextricably mixed. Upon the settlement of the dispute at law the matte was ordered out. The musty bills of lading and lighter notices were produced, and the railroad sent its empty cars, transported and lightered to ocean steamers some 7,000 tons, seven years after it had started from its Western point of production. These sampling works in turn brought to the Erie Railway for several years a business of 50,000 tons annually. Choose your location with care.

We have found as another bit of experience that not simply must one be sure of the road's ability to meet its obligations, if we are obliged to tie ourselves up to one line, but must forecast as far as possible conditions of routing and export. Some two years ago roads running south-east from Kansas discriminated against the port of New York, and not only did they quote a lower freight to Gulf ports, but via Gulf ports to Europe. The result was, much of our sampling had to be done on the docks at Galveston, New Orleans, etc. This has temporarily been put a stop to by the Cuban war, and New York is again securing the bulk of lead and copper freights, even when the material is produced in Arizona.

Of late years there has grown up in this, as in other lines of business, the endeavor to get rid of the middleman—in this case the public sampler and assayer—and buyers and sellers have entered into contracts in which the sampling is to be done at buyer's or seller's works by representatives of both parties. There have been such contracts recently entered into, and questions are already arising which cause one or both of the parties most interested financially to regret them. Buyers and sellers are necessarily suspicious of one another on general principles, especially in dealing with material of great value, and some are beginning to realize that it is unwise to place themselves under suspicion, however unjust. In one works, owned by the same people who own the mines, such serious differences arose recently between the respective superintendents that it ended in an agreement, not only that they should

revert to independent sampling, but that the material should be sampled on neutral ground. It is perhaps justly said that it is too much to expect of average human nature that impartial sampling shall exist at the works or the mine of an interested party. The office sees so much lead, copper, gold and silver charged on the books and holds the works responsible for this amount either in inventory or shipments. The smelter, therefore, must "protect itself against the office," and if mistakes are made they are apt to be on the safe side where sampling is at either seller's or buyer's establishment.

Neither sampling nor assaying is an exact branch of science, especially when dealing with materials containing the precious metals. Your practice in assaying has shown you what variation you can get in any samples, as you vary fluxes, temperature and time of fusion or cupellation. Let me strongly advise you to make every effort, whether you are a seller, buyer or sampler of ore or furnace products, to have the sales contract specify how the assays shall be made. Let me illustrate: Suppose you are to handle Russell process or other rich precipitates or any sulphide residues.

Shall you determine the loss in slag, the error due to volatilization and to cupel absorption? This will increase your result quite twenty per cent. in silver, under ordinary conditions. Shall you use the all-scorification or combination method on copper-gold bars or mattes? The difference in gold reported will be considerable.

Now as to the sampling methods: In the early eighties our chief export of furnace material was in the form of copper ores. We sampled hundreds of cars of ore from Montana, running 50 to 60 per cent. of copper. The lead ores then, as now, stopped in the West, only the bullion coming to the seaboard for export or refining. Then came a period of enormous exports of copper matte; next began the era of bessemerizing, applied to copper, and converter bars became the chief support of the sampler. These mattes contained less than 30 ounces of silver to the ton on the average, and no silver was paid for unless there were over 30 ozs.

Then the electrolytic refinery came in, and as silver and gold were more easily extracted, the mines sought out gold and silver-bearing ores and run up the values present. To-day, the exports and treatment of furnace products near New York consist of quite two-thirds converter copper bars, as compared with one-third mattes.

I have no time to enter into details of sampling or assay methods, but refer you if interested, to the discussion of those to be found chiefly in the Transactions of the American Institute of Mining Engineers, and in Vol. I. of "Mineral Industry" for 1892.

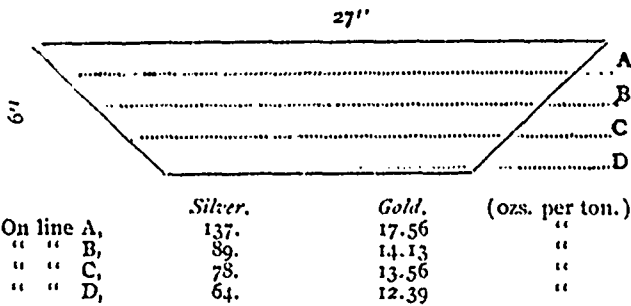
I will give you, however, a few practical examples in connection with copper.

In an article prepared by me in 1892 for the latter work, I dismissed the problem of sampling copper bars with little more than by quoting with approval the requirements of the London Metal Exchange's "Contract J:" the bars to be sampled "by boring half way through on opposite sides near opposite ends." But conditions have changed.

The gold values in the new fields of British Columbia have enormously increased the danger and difficulty of buying and selling on any sample. The converter bars of Trail, B.C., or Northport, Wash., now contain from 97 to 99 per cent. of copper, from 15 to 200 ounces of silver, and from 10 to 20 ounces of gold per ton. They all come East, but how can they be sampled? They are generally cast in molds about two feet long, by 10 inches wide, by six inches deep, tapering toward the bottom—the very worst possible shape to sample by drilling. But, worst of all, the precious metal are very unevenly distributed. Keller has shown that the distribution depends on the impurities present. Boltons, Elliotts, Lewis and other English refiners have proved that silver goes with the sulphur, usually toward the top, and all admit that the variation is influenced by the rate of cooling. A single illustration will suffice:

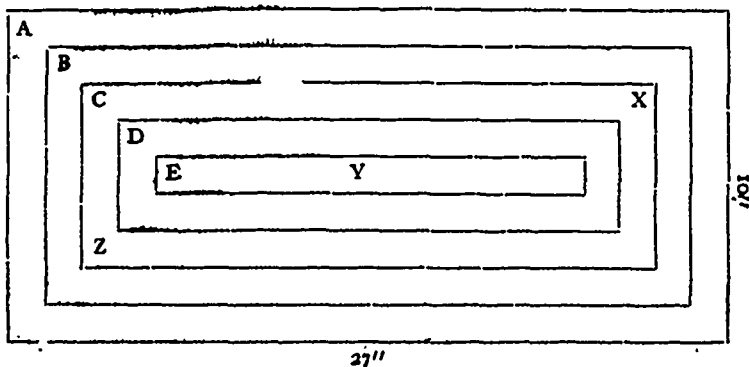
As preliminary to an investigation I am now conducting at the Laurel Hill Chemical Works, the management bored 100 holes on the top and 45 on the bottom of an average converter bar made of Rossland (B.C.) ores, containing about 99 per cent. copper. The borings were taken for separate assays every 1½ inches, with the following results:

VERTICAL SECTION.



Another trial gave the following result :

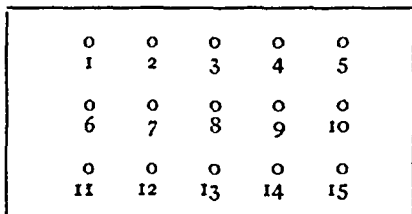
PLAN OF TOP OF FIG.



	Au.	Ag.	3" holes,	Au.	Ag.
Section A, 1½" holes,	14.32	100.		13.45	85.
" B, " "	13.00	94.		12.25	69.
" C, " "	17.48	141.		14.93	105.
" D, " "	21.41	219.		16.35	139.
" E, " "	18.57	173.		24.52	300.

Gold varies from 12 to 24 ozs. per ton.  
Silver " " 69 to 300 " "

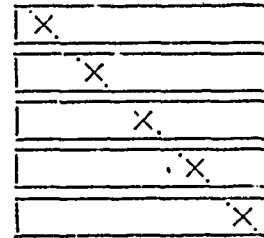
My own experience shows almost as much variation in any converter bars, although the values are not usually so high, and the danger is, therefore, less. Only experiment with each class of product can show you a safe rule for each. The surest generally applicable method is to melt down the bars, take dip samples, cast these into thin plates, and drill the latter. But this cannot be done at a public works, and if done at buyer's works you must be present day and night, see to it that the furnace was cleaned out well, that the bottoms have already been saturated; you must weigh the bars and the anodes or other refined product, weigh and assay the slag, and sample and assay what is left in the furnace, as it is hard to ladle a furnace absolutely dry. The bars in question are sampled by us by boring each thrice, all the way through, at the points marked X, Y, Z, uniting the drillings. These are either ground fine and mixed for assay or, better, melted and cast into a plate, and bored. This is as fair a way as any that can be devised by boring. Bars of less silver and gold contents we bore at points that successively and collectively cover the entire surfaces—top and bottom—thus :



The first bar is bored at 1, the second at 2, the third at 3, etc., and the borings mixed.

Thin plates, like anodes, have an even distribution of values in gold and silver, and no special precautions are needed in drilling for sample. Perhaps the ultimate solution of the problem will be the abandonment of the old Chili Bar mould and of lugs or ears, and the casting of all converter copper into plates, say 24 x 10 x 2 inches in size.

In some English works and in two, at least, in this country, bars are sampled like lead bullion; that is as to the location of the holes. They are laid side by side—three or five in a row. A line is drawn diagonally from end to end, and the sample drawn where this line crosses the centre line of each bar, thus :



I have stated that it was not my intention to repeat details of assay methods, as you have received these in your ordinary course, and you are fortunate in having in your professors men who have come in actual contact with the commercial and business side of these questions, as well as being thoroughly posted in the theory. Nevertheless, as I see that I have a few minutes left of my hour, I will give you one or two more practical suggestions.

Copper mattes are no longer sampled by taking a tenth, as was customary before they were so rich in the precious metals, as is usually the case to-day; but with the exception of non-argentiferous mattes—now the scarcest of all in the market—they are sampled by taking one-third or one-fifth as a minimum, usually by putting the whole through the crusher, rolls and automatic samplers; it is extremely difficult and very dangerous to sample such material by hand, and should only be resorted to when it is impossible to do otherwise. The variation in copper mattes as we receive them is not only due to the carelessness of some smelters in making shipments, which will vary very considerably in richness in the same car; such, for instance, as results when bessemer and reverberatory mattes are mixed. But all pigs of matte vary in their different parts, even more erratically than do copper bars, and when gold-bearing cannot be properly sampled by any method of chipping or breaking off pieces, only by crushing the whole.

Perhaps a word on the subject of weighing may interest you, as this is also a part of the duties of the public sampler to-day. Weigh masters should be sworn in. In some States provision is made by law for sworn weighers. The weigh master goes before a notary and swears that he will conduct the business of weighing impartially, and without favor to interested parties. We have adopted this practice at the port of New York, although there is no law on this subject in this State.

Weighing is usually performed on a beam scale. It is the simplest apparatus that can be devised, and is capable of accuracy even in the hands of the most ignorant weigher. The weight is usually not taken when the beam is level, in weighing ores or crude mattes, but when it just begins to rise, which gives in practice an allowance of a few ounces in each draft of say 600 lbs. in favor of the receiver of the material.

This is the trade custom universally adopted by all public weighers, and probably arose from the fact that ores and mattes, whether bagged or not, cannot be handled without losing something, if nothing more than the dust which sifts through the covering. This loss in material exported in bags is very considerable. The bags must be unloaded from the cars on the dock, transferred to a lighter, transferred from the

lighter to the ocean steamer, and upon arriving transferred from the steamer to a lighter and again to the wharf. It is almost impossible to prevent freight handlers from using hooks, which tear the bags and entail a loss in addition to that certain to arise from legitimate handling.

I have warned all foreign buyers that they must expect a loss of at least 1% in weight on material shipped in bags, as between the port of New York and any port of Europe. Platform scales are frequently used in weighing where the material is handled at buyer's works. A platform scale is a more delicate instrument than a beam scale and weighs closer, but it is much more liable to get out of order, and it is much more difficult to detect an error due to imperfection in the scale than when the ordinary beam is used. No possible error can exist in the beam scale, except that due to the enlargement of the notches by long use, or difference in the weights employed, through constant abrasion. It should be the rule to test the scales by standard weights once every day.

As matte increased in value buyers have begun insisting that it shall be shipped in casks rather than in bags, in many cases being willing to pay the extra cost for such packing.

Of course, questions of moisture are carefully looked after at the time of sampling and weighing, large samples of many pounds being taken and dried in steam-jacketed ovens to determine the loss in water.

Speaking of weights leads me naturally to warn you than in dealings with Great Britain, where tons or ore or furnace material are mentioned, to be very sure what kind of a ton is meant. In this country we know the standard or short ton of 2,000 lbs., or 20 cwt. of 100 lbs. each, and we have the long ton—so-called—of 2,240 lbs. You know also that a "hundredweight" is not 100 lbs., in Great Britain, but 112 lbs.; but, perhaps, you do not know that ores and mattes are sold there by a different ton still, known as the "miner's ton," which consists of 21 cwt. of 112 lbs. each, or 2,352 lbs., so that in buying a ton of ore you would receive 2,352 lbs.

A word also may be said about the Cornish assay for copper. It is unlikely that the coming generation of ore dealers, standing between this country and Great Britain, will meet this relic of ancient tradition. But during the last twenty years the Cornish assay for copper has been very much in evidence in our ore trade with Great Britain. You know that all our contracts in America, as well as those entered into in Germany and France, for copper material, are based upon the percentage of copper which the material contains, as determined by assay, and the assayer is usually left to select his own method, only held closely by both parties to the understanding that his results shall show *how much* copper the material contains. Of course, the electrolytic assay is that most frequently employed, and is, by all odds, the most accurate. But for a century the Cornish method prevailed in Great Britain, and is an attempt to imitate in the laboratory, the furnace operations. A sample of a sulphide ore, for instance, is roasted, fused into a first matte, re-roasted, fused into a second matte, then brought into the form of blister copper, then refined, and the final button of copper is weighed and reported as the "produce" of that particular lot of material. It may differ anywhere from 1/4 p.c. to 3 p.c. from the actual amount of copper that the material contains, but fairly shows the English refiner how much copper he can expect to save out of the material in question, and he bases his prices accordingly. The American buyer, on the other hand, has before him only the total amount of copper which the sample contains and must protect himself in the price he offers against the difficulties in smelting the material bought; if it contains lead, arsenic, antimony, or such impurities, he will naturally give less per pound of fine copper, as shown by assay, than in buying material free from these deleterious substances. Now as to invoices: I show you two account sales, based on English and American methods, respect-

ively, which speak for themselves. The first is an actual transaction in England, in 1886:

ACCOUNT SALES OF 2077 BAGS COPPER MATTE.

Ex. "Baltic," @ New York,	Sold on account of	
1886.	.....	
April 27, Produce, 66 1/4 p.c. Cu. @ 8s. 6d. pr. Unit.	Payt. = 2 Mos.	
	T. cwt. qrs. lbs.	
Contract. Weighing	31 0 0 0 N.	
	cwt. qrs. lbs.	
Mar. 22, Mois., 30 Gns. 2 2 18		
Draft, 3 1/2 lbs.		
pr. 3 cwt. - 6 1 23 .. 9 0 13		
2240 lbs. 20 cwt.	30 10 3 15	
2352 " 21 "	29 1 3 .. @	£28 3 1 1/2 818 17 7
Weighing,	19 6 2 0 N.	
	cwt. qrs. lbs.	
Moisture, 36 Gns. 1 3 26		
Draft,	4 0 2 .. 6 0 0	
	19 0 2 0	
	18 2 2 .. @	28 3 1 1/2 510 3 3
Weighing,	25 5 0 0 N.	
	cwt. qrs. lbs.	
Moisture, 35 Gns. 2 2 3		
Draft,	5 1 1 .. 7 3 4	
	24 17 0 24	
	23 14 .. .. @	28 3 1 1/2 666 7 4
Weighing,	21 10 0 0 N.	
	cwt. qrs. lbs.	
Moisture, 31 Gns. 1 3 17		
Draft,	4 1 26 .. 6 1 15	
	21 3 2 13	
	20 3 2 .. @	28 3 1 1/2 567 16 4
	cwt. qrs. lbs.	lbs.
Empty Bgs. Good 240 wg. 1 3 25 @ 5s. pr. 120 .. 9 2		
" Bad 1837 " 14 3 20 @ 2s. 6d. " 1 14 10 2 4 .		
		2565 8 6

Charges.		
Insurance on £2600 @ 5s. p.c.	£6 10 .	
Less Discount @ 10 p.c.	. 12 .	5 17 .
Plus Stamps,		.. 6 6 6 3 6
April 19— T. cwt. qrs. lbs.		
Freight on 97 12 3 17 G. @ 5s. p. ton	24 8 3	
Primage @ 5 per cent.	1 4 5	25 12 8
	T. cwt. qrs. lbs.	
Pd.—Master portage on 97 12 3 17 G.		
@ 1s. per ton, 70 per cent.	£5 7 5	
Less 15 per cent. for not weighing,	. 16 2	
	4 11 3	
Plus 2 1/4 d. per ton for putting into flats	. 18 4	5 9 7
Dock and town dues on 96 1/4 tons @ 1s. 4d. per ton,		6 8 11
Lighterage from steamer to ore wharf,		5 .. ..
Assaying each lot for copper,		1 10 ..
Interest on frt. charges from 19 April to 30 June,		.. 8 8
72 days,		
Liverpool ore wharf charges for: Receiving, weigh-		
ing, warehousing, stowing in shed, crushing,		
sieving, mixing, sampling, reweighing, deliver-		
ing, rent, etc.: 97 1/4 tons @ 6s. per ton,	29 6 6	
Commission on £2565 8 6 @ 1 per cent.	25 13 ..	105 12 10
Net proceeds due in cash, 30th June, 1886,		£2459 15 8
E. & O. E.,		
Liverpool, 29th May, 1886.		

AMERICAN SYSTEM.

Messrs. ....	Sold for account of	
	Messrs. ....	
93 Bbls. Copper Matte, assaying.....	47.55 per cent. copper	
Silver, per ton of 2000 lbs.....	117.50 ounces	
Gold, " " .....	0.12 "	
Moisture .....	0.01 per cent.	

Weight.....	116,853	pounds	
Less moisture.....	12	"	
Net weight.....	116,841	"	
Copper assay, less 1.3 units.....	46.25	per cent.	
Copper paid for, 46.25 per cent. of 116,841 pounds.....	54,039	pounds	
Silver paid for, being 95 per cent. of all present.....	6,864.41	ounces	
Gold paid for.....	7.01	"	
54,039 pounds copper at 7 $\frac{3}{4}$ cents.....	\$4,188.02		
6,521.19 ounces silver at 67 $\frac{1}{2}$ ".....	4,385.50		
7.01 " gold, paid for at \$20.....	146.20		\$8,713.72

This transaction is dated November 21, 1895.

I call your attention to the curious deductions and allowances in the English account.

First, a "draft" of 3 $\frac{1}{2}$  lbs. is subtracted from every 3 cwt in weighing. There is a charge, for primage, for master portorage, for dock dues, for town dues, etc., etc.

Since silver began to fluctuate in value and have so uncertain a future, it has been quite customary to base contracts on the price obtainable on the date of future delivery of furnace material; sometimes the New York quotation, sometimes the London quotation is taken as a basis.

But my time is up, and if these thoughts, out of many which have suggested themselves, will convince you that there is a field for very careful study which lies between the mine and the furnace, or the furnace and the market, they will serve a useful purpose.

**Mining Haulage.**

By G. W. WESTGARTH.

This subject is of such importance and of such magnitude in our commercial system, that to deal with it in all its varied branches would go much beyond the limits intended by this article. Suffice it therefore to say that from the man who plies with his barrow, the man with his horse and cart, to the shipowner or the railway company, all may be truly classified as "haulers." But it is with neither of these that the writer purposes to deal, but with haulage appertaining to mining, or haulage underground, more from a suggestive than a descriptive point of view, indicating that portion in which the greatest economy may be effected, and to demonstrate how endless haulage installations can be and are rendered most unsatisfactory, by a misapplication of the load; without giving any expression of approval or disapproval of any particular type of engine, rope, clips or pulleys, and without advocating any particular system of haulage for general adoption, excepting in the matter of principle. If justification for such a course is required it may be found in the fact that the conditions under which haulage has to be done vary so much that it would be absurd to advocate any particular system for all conditions. The various formulæ for ascertaining the size of engines, friction, etc., have been published so frequently that they will not be introduced further than may be necessary for the purposes of this article. As the transit of minerals by gravitation, in the writer's opinion, does not, strictly speaking, come under the term of "haulage," it will not be dealt with, although it may at once be said that the transit of minerals by gravitation, where it can be applied, is the most economical system.

The term haulage, as connected with practical coal mining, implies a pulling of the coal from one place to another—i.e., from the place where it is worked to the pit bottom, or, in the case of a level to the surface, contained in trams, tubs, etc., over comparatively narrow gauges of tramways. Prior to the year 1840, this work was done chiefly by horse and manual labor; in some few cases by mechanical power with chains. At about that period mechanical haulage received a considerable impetus, by the introduction of wire rope, by the late R. S. Newall,

and today it may be said that mechanical haulage with wire rope has become adopted universally, as there are very few collieries of any importance at which rope is not used on the main haulage planes. Some idea of the importance of this work may be gathered from the following figures. For the year 1896 the total output of coal, etc., from this country amounted to 208,503,868 tons, and, if we estimate this quantity at say 1s. per ton per mile, the total cost amounts to £10,425,193 8s. As there are some 3,385 collieries, etc., throughout the United Kingdom, it is evident that on such a basis the average cost per colliery for haulage would amount to £3,475 per annum, and that for every 1d. per ton saving effected in this branch of mining a total saving of £434,383 1s 2d. would be secured. Of course these figures are not intended to suggest that the actual haulage cost per ton of coal raised really amounts to 1s, but this is taken as a basis per ton per mile. The actual cost will be more correctly stated at from 6d. to 8d. per ton; the difference between these figures arises from the fact that the haulage which has been termed secondary, generally speaking, does not extend for more than a few hundred yards.

*Apportionment of Cost.*—The apportionment of this haulage bill to its constituent parts is probably the first step towards effecting any economy therein, and a more perfect analyses of the cost of the various items, in what might be termed the main haulage planes, has not been made than that which has been given by the report of the committee appointed by the North of England Institute of Mining Engineers in 1868, by which it was thoroughly established—

1. That in any system of haulage labour absorbs the largest portion of the cost.
2. That the maintenance of the plant takes the next largest portion, excepting in the case of the main-and-tail system, in which the cost of motive power was given as being rather in excess of the cost of maintenance.
3. The cost of motive power.
4. That the average cost per ton per mile by four systems, i.e., main-and-tail, endless chain, No. 1 endless rope, and No. 2 endless rope, amounted to 2.078d., the average apportionment of this cost to its constituent parts being:—

	d.
Labour.....	967
Maintenance.....	549
Coals (power).....	344
Ropes or chain.....	218

Total..... 2.078 per ton per mile

on the main haulage planes.

Having taken 1s. per ton per mile as the average cost, the above figures leave us with 9 022d. still to be accounted for, and this may at once be placed to the debit of the haulage from the place where the mineral is worked to the terminus of the main mechanical haulage planes, which is still largely done by horses or ponies. This factor of cost is substantially supported by a paper on "Haulage by Horses," recently contributed by Mr. W. J. Heppell to the South Wales Institute of Engineers (Vol. xx., No. 5); and further by Professor W. Galloway's paper on "Secondary Mechanical Haulage," contributed to the Federated Institute of Mining Engineers, by which he has made out a very strong case in favour of secondary mechanical haulage in showing an actual cost (by compressed air and small engines) of 1s. 1.056d., and an advantage of 3.823d. per ton per mile as compared with the cost of pony putting, or 6.944 per ton per mile as compared with horse putters, (see page 15 of his paper). However these figures may be subject to modification, there can be no doubt that it is in this section that the largest margin of cost of haulage exists, and in which the most substantial economies may be effected, and particularly so as it is clear, from

\* Journal British Society of Mining Students.

the paper by Mr. Heppell above referred to, that the cost of labour is again the largest item, the average cost per ton over the several branches, having an average distance of 384 yards, being :—

Cost of labour . . . . .	2'79
“ horses . . . . .	2'45
	5'24

*Installations.*—As there is such a great difference between the cost of primary and secondary haulage, in consequence of the higher cost of manual and horse labour as compared with mechanical power, in laying out a new installation of haulage, the point which is naturally of the utmost importance and should be thoroughly and accurately established is, which is the system of haulage that is most capable of distributing the necessary power for mechanical haulage, over the whole area that has to be worked; not only the primary and secondary, but all other branches, and which system will, under the conditions that exist, involve the least amount of manual labour? Generally speaking, in the writer's opinion, the haulage system which is most capable of accomplishing this is the endless rope in series.

1. Because it can be applied to the distribution of steam power, direct from the engine fixed on the surface.
2. That when the planes are well arranged the manual labour should not exceed that obtained by any other system doing the same work.
3. When it can be applied the least amount of powder is required.
4. If electrical power is employed, this system is one by which the load can be most uniformly regulated.

The great objection that may be raised to this system is that it entails a double tramway; but such an objection can hardly be allowed where the double tramway has actually been laid and maintained for some time, and where the main-and-tail has been substituted for the endless system. A case in point will be referred to further on in this paper.

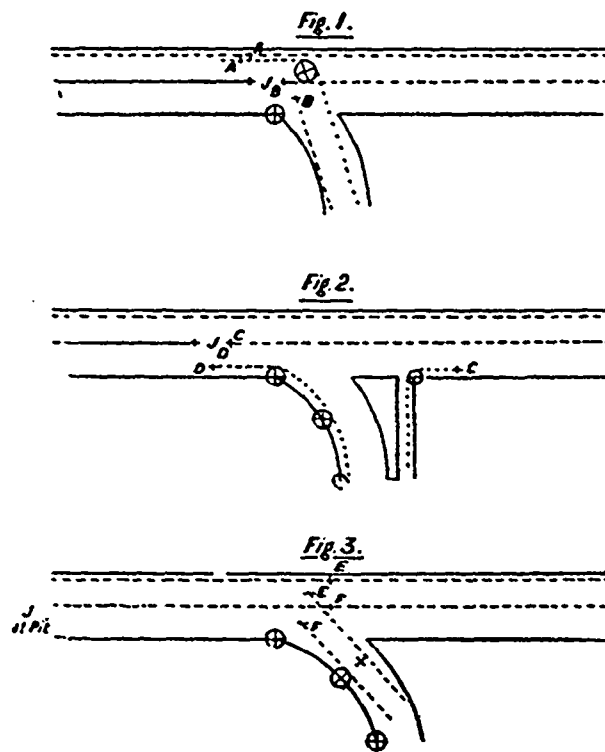
*Power.*—As to the type of power to be employed, steam forms the initial energy, whether it is transformed and distributed in the form of compressed air or electricity. As the efficiency by electricity is the highest, distribution would probably be done best by that agency, if it were sufficiently safe and economical for all conditions of mining; but so far difficulties have arisen through the variations in the load, and the danger in fiery mines arising from sparking at switches, etc

If the power has to be transmitted from the surface to several engines underground at a considerable depth, and to haul over single tramways, which involves the adoption of the main-and-tail system of haulage, compressed air may be adopted with advantage; but if the conditions are such that the work can be done by one engine on the surface driving an endless power rope to a station underground, from which the power can again be distributed to haul over double tramways, which permits the adoption of the endless rope system, then steam power may be utilised direct from the engine

*Haulage Systems.* As the type of power to be distributed is somewhat to be determined by the system of haulage to be applied, the question arises whether the main-and-tail or the endless systems can be adopted—and here we have perhaps the most debatable point of the subject—but to the writer it is evident that each of these systems can be determined by the conditions under which the work has to be done. Each system appears applicable to particular conditions; where the nature of the ground is such that it is only possible to maintain a single tramway, and where the gradients vary to a considerable extent both in degree and direction, the main-and-tail should be applied. Although on this point it may be said that unless the gradient are very acute and alter most abruptly, even if the ground is bad, it is doubtful if it would not be better to arch the heading and lay down a double tramway for

endless haulage; as it can hardly be disputed that a main-and-tail system, hauling “journeys” or “sets” containing a number of trams at a considerable speed over bad ground, will set up a greater amount of vibration, which would shatter the ground more than the endless system of haulage travelling at a very much less rate of speed. Where the nature of the ground is such that two tramways can be maintained, and the gradient is fairly uniform, the endless rope system can be applied with greater satisfaction.

*Main-and-Tail* is one that can be worked either by an engine on the surface or by an engine placed under ground. It entails the use of two drums, generally fixed on the same shaft, and which are thrown into or out of gear with clutches. As the term implies, it entails the use of two ropes, a main and a tail, one being, as a rule, double the length of the other; the main rope being the length of the plane, and the tail rope generally double that length, although there are cases in which the gradient is such that it is not always necessary for the tail rope to follow the journey entirely out, as the empties run in by the gravity of their own weight, and the tail rope is shortened to that extent. By the addition of branch ropes this system is capable of hauling over several planes, although it is generally only possible for one engine to haul over one plane at the same time, therefore any delay in one plane involves a corresponding delay throughout the others. Where this system has several branches to work it is important that the method for disconnecting and connecting the branch ropes should be of the most expeditious type. There are three well-known methods represented by figs. 1, 2 and 3, the latter being the most convenient and expeditious.



In consequence of the time occupied in hauling the empties back it is necessary to travel at more than double the speed at which the endless system is worked, say eight to twelve miles per hour; and although it is one of the greatest advantages of this system that it can be worked over a single tramway, it is to be feared that the high rate of speed at which it is necessary to travel is responsible for a very large percentage of the dropping of coal from the trams, especially when the coal is packed above the tram, which entails so much expense in clearing, &c.

Although it may be a fact that this system is the most suitable for irregular planes, where the engine is fixed on the surface and the ropes are taken down the shaft to haul underground, yet where the gradients

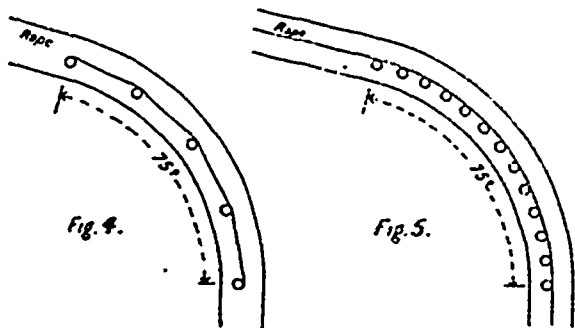


alter abruptly it is very difficult to keep both ropes in equal tension, and unless this is done a dangerous slackness occurs in one rope or the other, and unless the engineman handles his engine very carefully, as the brake must be kept almost continuously either on one rope or the other to prevent slack, it is a very easy matter for him to have the break firmly down against the tail rope with the steam pulling at the main rope at the same moment or *vice versa*. This frequently happens, and there are more breakages from this cause than from anything else in the working of this system. Where the gradient does alter so abruptly it would be advantageous to the ropes to place the engine underground instead of on the surface, but where steam is used the advantages would be more than counterbalanced by the damage done by the exhaust steam.

*Application of Main-and-Tail.*—When it has been determined that it is most suitable to adopt the main-and-tail system, the engine should be designed to work or develop a rope speed of from 10 to 12 miles per hour (this being the highest speed that it is prudent to run the trams at over the narrow gauges usually employed), and of such a capacity that it will be capable of bringing out such a "set" or "journey," without plucking or jerking, as may be necessary to keep the winding engine supplied, or in part, during the time that it may take to run the set of empties back, and to return with another loaded set.

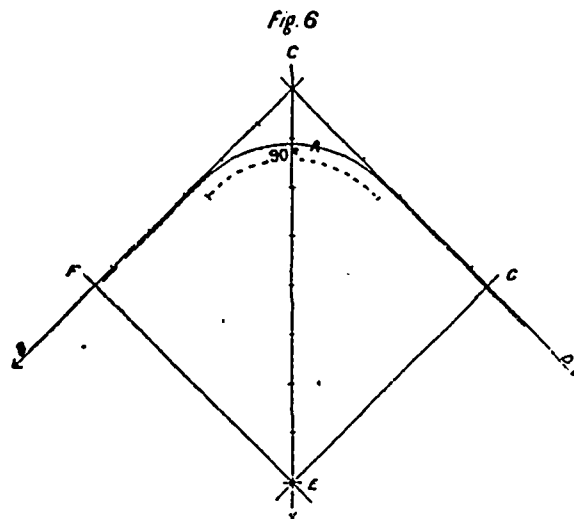
In some cases it may be quite safe to apply the main-and-tail ropes of strengths in the ratio of, say, three to two; but in such cases as these, where there are curves and varying gradients, in consequence of the necessity to keep both ropes in equal tension, and where the load alternates from the main to the tail, it is absolutely necessary that they should be of the same size or equal in breaking strain.

The curves in any system of haulage should be very carefully laid out and geared, and particularly so in the main-and-tail system, on account of the high rate of speed. Where it is possible to apply one large pulley, as in the case of a short curve, it is no doubt to be preferred to several small rollers as the bearings of one large pulley will need less attention, and will be less liable to get out of order than several small bearings, but in either case they should be placed in such bearings as will ensure their revolving freely at the same speed as that at which the rope has to travel. When small sheaves are necessary it frequently happens that the rope is conveyed round the curve in an angular form, as illustrated by fig. 4. Such an arrangement is productive of a most damaging agent to the steel of which the rope may be composed, *i.e.*, vibration, which is immediately set up in the rope between the points of contact with the sheaves, by the speed and tension. This point naturally suggests a question on which views differ considerably, and that is—What distance should intervene between each sheave on a curve. Probably the most perfect arrangement would be to place the sheaves as close as possible, so that the periphery of each sheave would strike the arc line of the curve, as illustrated by fig. 5. It may be



objected that this would entail an unnecessary number of sheaves, and the writer is of opinion that a very practical way of dealing with this point is to first of all ascertain the load on the rope, then ascertain what the pressure on the curve amounts to. Whatever that may be, it should

be distributed so that the pressure on each sheave does not exceed more than one-half of the breaking strain of a single wire of which the rope is composed. The load on the rope will be (gross weight of trams, coal, and)  $\times$  heaviest gradient + friction; then the pressure on any curve may be found by laying out the curve as illustrated by fig. 6:—



Let A be the arc of the curve (90 degs.), then lay down the angle as B C D, and from the point where B C and D C-bisect each other on line C E, set out the load on the rope to any scale—say  $\frac{1}{2}$  in. to the ton—in each direction; then draw a line from F to E parallel to C D, and a line from G E parallel with C B, then from the point at which they bisect each other on line C E, to C, at the same scale gives the pressure on the curve. C E indicates also the direction of the pressure. In the diagram the pressure of a load of  $5\frac{1}{2}$  tons is shown. Then the follow-

ing formula may be taken:— $\frac{P}{B} = N$ .

Where P = total pressure on curve.

“ B = half the breaking strain of a single wire.

“ N = number of sheaves.

If we take, for example, a rope passing round a curve of 90 degs., of say 20 yards radius, with, say, a pressure of 3 tons on the curve, if the rope is, say,  $\frac{3}{4}$  in. diameter plough steel, each wire would be 0.80 in. diameter, having a breaking strain of 1,240 lbs.; the load of 3 tons  $\times$  2,240 = 6,720 lbs; this divided by half the breaking strain of each wire—*i.e.* 620 lbs. = the number of sheaves required:  $\frac{6720}{620} = 10.8$ .

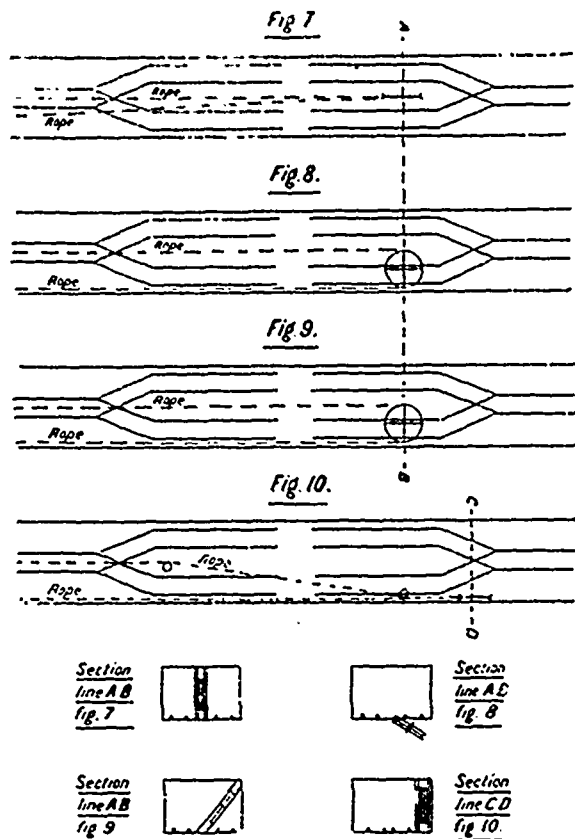
In all cases the axles should be of sufficient strength to stand the pressure without being bent; when they do bend it is impossible for the sheave to revolve, and excessive friction is created.

Where the load alternates in running the journey out, one of the most important details is the return pulley, which in the majority of cases conveys the tail rope over an arc of 180 degs., and the compression or abrasion on the rope is frequently so severe that it is known to have transformed an annealed steel core (of a rope) in the short period of five months into steel so brittle that it rapidly broke into pieces of  $\frac{1}{2}$  in. in length. It is therefore necessary that this pulley should be as large as possible, because the greater the length of the arc the longer will be the bearing of the rope in the tread, and the abrasion will be modified by being distributed over a greater length of the rope; for the same reason the tread of this pulley should not be wider than the diameter of the rope—if anything rather less. It should be placed as the conditions permit, either horizontally or vertically, so that the rope may pass round from the side or the top to the centre line of the main tramway going out, without the application of small binding sheaves.

Where the top rope is conveyed to a pulley placed vertically, as shown by fig. 7 and section, it should be brought at an easy angle from the side to the tread of the pulley, and where the side rope is conveyed the pulley placed nearly horizontally, it should be led down to the

pulley at an easy angle, and in this case the return pulley should be placed at a slight angle, so that the rope may pass round from the side and leave the pulley at the level of the tramway (see fig. 8 and section).

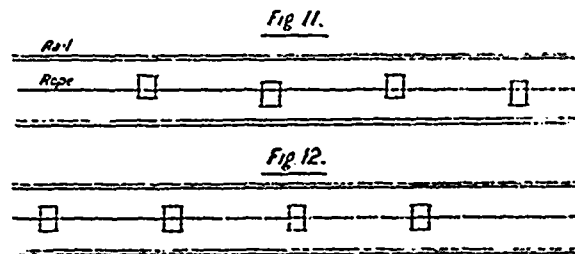
Where the top rope is conveyed along the side and at the top, the pulley may be placed in an oblique position, as shown by fig. 9 and section; in this case a large sheave is required to throw the rope to the centre line of the main tramway.



Such an arrangement as shown by fig. 10 cannot be recommended, because the small binding sheaves are detrimental to the rope

The main feature of the foregoing arrangements is that the rope may go direct from the return sheave to the centre line of the main tramway going out.

As to the carrying sheaves, whether hung from the roof or fixed at the side, they should be placed slightly under the natural line of the rope's travel, i.e., the line when under tension. The roadway sheaves should be fixed in small frames, placed alternately more to one side of the centre line of the tramway than the other, as illustrated by fig. 11, instead of being placed exactly in the centre, as illustrated by fig. 12;



the object of this is that when the roller has been grooved or nearly worn through it may be turned end for end, and a new bearing obtained on the same roller; but care should be taken that the flanges of the rollers do not come in contact with the rope. Acute deflections throughout the main and tail system should be avoided as far as possible.

The endless systems most generally adopted may be classified as (1) endless single, (2) endless in series, (3) aerial endless.

*Single.* The first comprises the use of one rope as the agent transmitting the pull direct to the load from the engine, it is most generally

worked with double tramways, the loaded trams being attached to the rope on one side either in sets or singly, and the empties attached to the other, so that the empties are continually going in at the same speed as that at which the loaded trams are being brought out. The speed at which systems of this type are worked seldom exceeds four miles an hour. There are cases where a single endless rope is worked over a single line of tramway, but in such cases there must either be a "pass-bye" or the load must be brought out in sets, and the empties must be returned in sets by reversing the engine. In the latter case the speed is generally increased considerably; but the best results are obtained from this system when worked over two tramways with the trams attached singly to the rope travelling over the top of the tram, engaging automatically with a clip projecting above the top of the tram.

*Endless Series.* The second type is one which entails the use of two or more ropes. (a) An endless rope transmitting power only from say an engine on the surface down the pit shaft to a pulley fixed on a shaft placed at some convenient position underground, and on which other pulleys may be geared with clutches, and from these pulleys other ropes (b) are worked over the various haulage planes. To these ropes the trams are attached, and from the return pulley at the terminus on each plane a third endless rope may be driven to haul over a secondary branch or plane. Properly speaking this system also entails the use of two tramways on each plane, so that the whole system may be worked continuously at a uniform and slow rate of speed, say from one to three miles per hour. In a few cases it has been attempted to work this system with a single tramway, but as far as the writer knows, without success. Where this system is adopted extensively, unless the rope is applied to travel over the trams, and arrangements made to enable the trams to disconnect themselves on approaching a curve and to reconnect automatically after passing round, extra labour will be entailed in attending to the clips generally used where the rope is applied to work under the tram, and in regulating or controlling the tram round the curves; but such extra labour should be compensated for by the saving in motive power and the uniformity in the delivery of the coal at the pit bottom. One great objection that may be raised against this type of haulage is, that if anything goes wrong with the power rope (a) the whole installation is thrown idle, but with proper care such incidents would be very rare and purely accidental, and the writer is of the opinion that where the conditions will permit of its adoption this system will compare most favourably in the matter of cost with any other system of haulage, and that it is the only system that is capable of distributing power over the several planes and throughout the whole area to be worked, and by which the greatest advantage is obtained by the gravity of the load passing over varying gradients.

*Endless Aerial.* This is accomplished briefly stated—by three methods. (1) By ropes very similar in construction to pit guide ropes, fixed on supports or standards, and acting as rails, over which a "runner" (composed of a pair of small wheels coupled together) travels, the bucket or carrier being suspended from the "runner" and attached by clips to a travelling rope, which transmits the power and controls the speed of the buckets; known as the Otto system. (2) By an endless rope travelling over standards, having the buckets attached to the same rope, the clips taking the form of a saddle A, so that they are able to pass over the sheaves placed on the standards with the rope, without being displaced. This is known as the Roe and Bedlington system. (3) A system quite recently introduced by Don Palacio in Spain, is that where a channel rail [ ] is suspended by a hanger from standards or supports passing through centre of the channel, a runner traversing each side of the channel rail, one carrying the loaded and the other the empty returning bucket, both being connected to a travelling rope. The important feature of this system is that after the loaded bucket has been emptied at the terminus, it makes half a turn on a pivot, and is thus



thrown below the level of the loaded bucket, so that the empty returning bucket does not collide with the loaded bucket going in the opposite direction. The channel rails can be applied practically to any gradient, and the joints are generally fish-plated. As the term implies, all these systems are generally applied for the transit of minerals over the surface at varying heights, and may be applied over the most mountainous and irregular ground, and the chief objection to their application for underground haulage seems to consist in the fact that the minerals are conveyed in buckets instead of trams; but as the cost of construction, especially in the second system, is so small, it has occurred to the writer that where it would not be detrimental to the coal to be transferred from buckets to trams, it might be utilised for secondary planes underground, where the roadways are bad and narrow.

**Application of Endless Rope.**—Where it has been found convenient to adopt the endless system of rope haulage the engines should be designed to develop a rope speed of, say, three to five miles per hour, and of such a capacity as to deal with the probable output per day, whatever that may be; and it should be distributed equally over the total rope travel per day. Thus, if the output be 500 tons per day of nine hours, and the speed of the rope is three miles per hour, the total rope "travel" = 27 miles = 47,520 yards. Now, if it is assumed that a tram contains 1 ton of coal, we get:—

$$\frac{D}{T} = S \left\{ \text{or } \frac{47,520}{500} = \text{say, } 95 \text{ yards.} \right\}$$

D being the total rope travel per day.

T = output per day.

S = the space or distance that should intervene between the trams attached.

The total number of trams attached to the loaded side at any given time is determined by the length of the plane; therefore:—

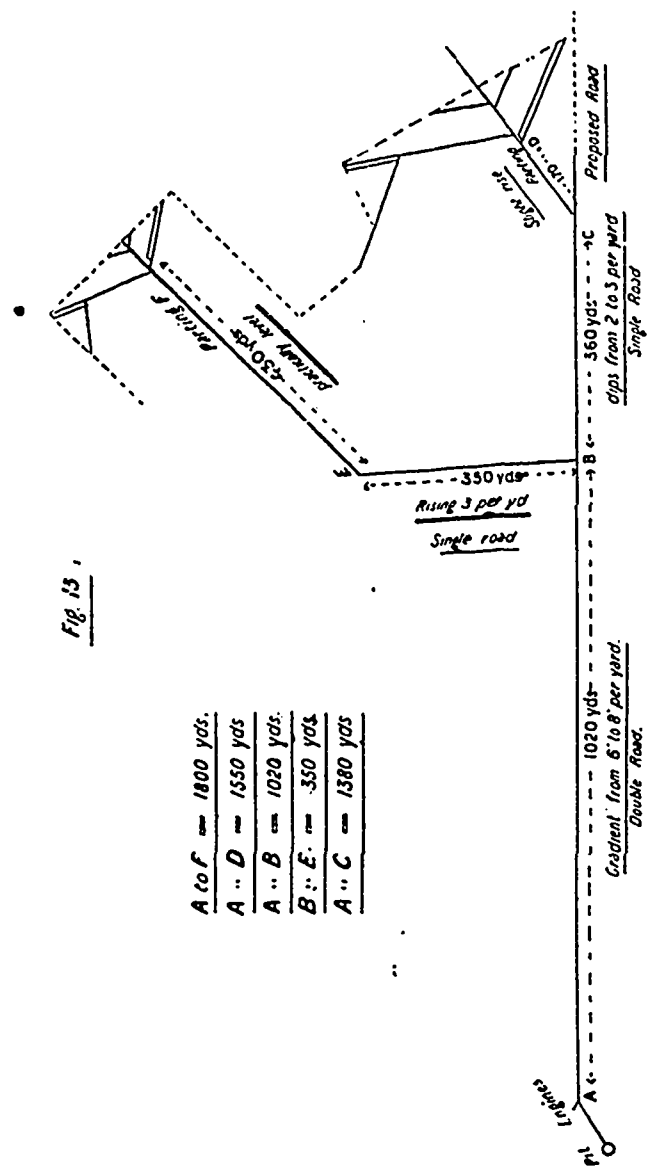
$$\frac{L}{S} = N$$

L = Length of the plane.

S = distance between each tram.

N = total number of trams that should be attached on the loaded side.

As the trams on the empty side will balance the trams on the loaded side, the load on the engine will be the weight of the mineral, multiplied by the average gradient, + friction. It is of the utmost importance that the load on any endless system should be applied in a uniform and systematic manner, and not in an irregular and spasmodic fashion, as very frequently happens. The writer had a case some time ago, where the load was applied in a very irregular way, much to the detriment of the installation. It was only a short plane, but frequently five or six trams were attached to the rope with only one short clip. They were duly delivered at the landing, and for a period of about ten minutes afterwards, although the rope was running continuously, there was not a single tram attached on the loaded side. Now, as a matter of fact, the work could have been done quite easily without there being more than two trams attached at any given moment, if it had been systematically and uniformly applied. When this was clearly proved the excuse given was that the workmen take unkindly to any "new ideas," and worked them awkwardly. To further illustrate how it is possible for an installation to fail through the misapplication of the load, the writer would refer to a case of considerable importance, where the endless system had been abolished, and the main-and-tail system substituted for it. Fig. 13 shows a plan of the haulage planes, the particulars of which are described as follows:—



"A to B (1,020 yards) is a plane which varies considerably in gradient, dipping from A nearly to B from 6 to 8 inches per yard, the remaining portion to B being level. From B to C the plane dips from 2 to 3 inches per yard, from C to D there is a slight rise, B to E is a heading rise about 3 in. per yard, and E to F is practically level. The endless rope system was worked by a pair of 22-in. engines, by double road from A to B, and from B to C by a single road, the trams being put on A B singly, and on B C in journeys of eight to ten. B E was worked by an alternating gear arrangement fixed at B, and worked from the main rope in plane A B C, the trams being worked in journeys along a single road to and from partings at B and E. The ropes travelled at the rate of three miles per hour, and the trams were delivered at ten to fifteen yards interval, this distance being increased or reduced according to the supply of coal at B. The rope from A to B was 7/8 diameter best plough steel, and from B to E and B to C 3/4 inch diameter of similar quality, and the life of the ropes was from twelve to fifteen months. The output was about 435 tons per day, viz., 250 tons from B C and 185 tons from B E.

The cost per ton per mile is given as:—

- Endless system at 2.009d (approximately).
- Main-and-tail at 0.980d (approximately).

From the foregoing particulars it is evident, that with one tram delivered say at every fifteen yards interval, there would be at any given time between A and B  $\left( \frac{1,020}{15} = \right)$  68 trams on the loaded side, and if the gross weight of a tram and coal was 30 cwt., there would be a gross weight of 68 x 15 = 102 tons, and this multiplied by the gradient of say

8 inches per yard, would give a net load of, say,  $102 \times \frac{8}{36} = 22.6$  tons, and this road travelling at three miles per hour would be equivalent to, say,  $\frac{22.6 \times 2,240 \times 264}{33,000} = 404$  horse power.

Now, if we assume that the pit worked eight hours per day the total rope travel would be  $8 \times 3 \times 1,760 = 42,240$  yards, and if a tram only contained one ton of coal, if attached at every 15 yards as stated, we should get  $\frac{42,240}{15} = 2,806$  trams or 2,806 tons of coal in eight hours. As the output was only 435 tons per day, if it is assumed again that every tram contained 1 ton of coal, it will be clear that we have  $\frac{42,240}{435} = 97.1$  yards as the necessary distance intervening between each tram for an output of 435 tons in eight hours. Further it will also be quite clear that that output could have been obtained without having more than 105 trams attached to the loaded side at the same time—i.e.,  $\frac{1,020}{97} = 10.5$ , which multiplied by 1.5 tons is equal to a gross weight of 15.75 tons, and again multiplied by the gradient of 8 in. per yard is equal to, say,  $15.75 \text{ tons} \times \frac{8}{36} = 3.4$  tons as the net load, which at a speed of three miles per hour gives  $\frac{3.4 \times 2,240 \times 264}{33,000} = 60.9$  horse-power.

Probably the disparity that exists between the capacity of this system (calculated from the data given) and the actual output, will be accounted for by the plane A B (although fully charged with a tram every fifteen yards) being stopped for certain periods of time, and that it was not worked continuously.

Where the endless system is worked in such a manner, it is not surprising that the results are by some considered unsatisfactory; and in this instance, if the comparison that has been made of the costs of the two systems has not been made with greater care than is indicated by the way in which the endless system was worked, it can hardly be of much value. A clearer case of the misapplication of the load to an endless-haulage system has not come under the writer's notice.

It is stated that "The endless-rope system was put in when the road had not reached B; after B was passed the roof was so bad that it was impossible to carry a double road further than B, except by putting in large arching, which it was not then convenient to do; hence the unsuitability of the endless-rope system." But, in the writer's opinion, there is no reason why the endless-single could not have dealt with the amount of coal passing over the two branches, if it had been properly applied. The main-and-tail system was worked by "a pair of 22-in. engines," dealing "with the planes under consideration, drawing 20 to 25 tons per journey from A F and 25 to 30 tons per journey from A D, and drawing four journeys per hour if kept going constantly. This gives an output of 210 tons of large coal per hour, and this could, as in the endless-rope system, be increased by increasing the load according to the power of the engines, which in this case could be done."

As such an opportunity rarely occurs of comparing fully the working of these two systems over the same planes, let us analyze the conditions as applied to the working of the main-and-tail system. In the first place, it is clear that the capacity of the main-and-tail system is 1,600 tons per day of eight hours, if kept going constantly. The travelling or rate of speed, say for four journeys to and from F, and four journeys to and from D per hour = A F  $1,800 \times 4 \times 2 = 14,400$  yards  
A D  $1,550 \times 4 \times 2 = 12,400$  yards

Total . . . 26,800 yards per hour, or 15.2 miles per hour and 1,340 ft. per minute. Now, as each journey conveyed, say, 25 tons of coal, assuming that a tram contained 1.25 tons, each journey would consist of 20 trams, and if we take the weight of an empty tram as being 9 cwt., the total weight of each

journey would be  $20 \times 3 \frac{1}{2} = 34$  tons, and this multiplied by the gradient of 8 in per yard gives us  $34 \times \frac{8}{36} = 7.5$  tons, therefore, the power required for one minute =  $\frac{7.5 \times 2,240 \times 1,340}{33,000} = 682$  horse-power.

The output, however, was not 1,600 tons per day, but 435 tons only, and as already shown might have been dealt with by the endless system with 60.9 horse-power at any given moment.

The application of the load to the endless-rope system is of such importance, that the writer would like to refer again to the report on haulage by the committee appointed by the North of England Institute in 1868, wherein the endless-rope system compared unfavourably in the matter of cost with the endless-chain system. The writer is of opinion that the advantage shown in favour of endless chains was the result chiefly of two things.

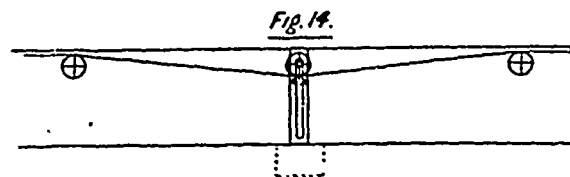
(1) The uniformity of the application of the load, the trams invariably being attached singly.

(2.) The automatic attachment of the tram or tub with the chain.

Those two features implied the minimum of power, and the minimum of manual labour. Further, the increase in the cost of labor by the endless-rope system, which it should be remembered was practically in its infancy at the time of the report, was no doubt the result of the difficulty that existed to attach the trams to the rope; that difficulty has since been considerably reduced by the introduction of more convenient clips, therefore, if the endless-rope system has its load applied with the same uniformity the cost should not exceed that obtained by the endless chain.

*Application of Power Rope.*—The power rope in the endless—in-series type may be arranged to transmit power to two distinct seams; it is generally lapped two or three times round a driving pulley of the bevel or C type, where the rate of speed is slow and the load is heavy. Where the load is light and the rope-speed fast, a V type of pulley will be found satisfactory, as the surging that necessarily takes place on the bevel and C pulleys is detrimental to the rope when the speed is great. From the driving pulley the rope should be led direct to the pulley at the top of the pit, thence down the pit shaft to a pulley placed opposite the seam in which the power is required, thence direct to the tension or tightening gear, and from that point direct to the driven pulley, which should be of the same type as the driving pulley. It should then return direct to a pulley at the pit shaft, to either convey it down to a second seam or up to a pulley at the top, and thence back to the driving pulley. Small bearing sheaves, causing acute deflections, should be entirely dispensed with in gearing this rope.

In any endless system the type and position of the tightening gear is the most important detail; it should be balanced to act as sensitively as possible to any variation that may occur in the load; this is probably most satisfactorily arranged with a pulley placed on a trolley, with a balance weight attached to it. When space will not permit of this type being applied, then it may be arranged at the side of the heading or roadway by the arrangement of three pulleys placed perpendicularly, the centre pulley having a weight attached working up and down in a slot, as illustrated by fig. 14. In this case care should be taken to keep



each pulley as far apart as the conditions will permit, so that the angle of deflection may be as obtuse as possible. Generally speaking the position of the tightening gear for the power rope should be at a short distance from the driven pulley, as the weight of the rope in the pit

shaft is not only sufficient to keep the ropes in proper tension on the driving pulley at the surface, but has a tendency to create a slackness between the pit shaft and the driven pulley underground; this, therefore, is the natural or proper position for the tightening gear. In the case of the endless ropes, which work along the several planes, it should be placed on the light side near to the power or "driven" pulley. In no case should the tightening pulley be placed too close to the driving or power pulley; sufficient length should be allowed to permit of the rope having its natural "sag" between the points at which it has a bearing. Where they are too close together, the rope frequently resembles a straight rod, and the result is that vibration is set up, which every care should be taken to avoid.

As the success of this system largely depends on the permanence of the power rope it should be very carefully spliced, so that it will not draw out. It is therefore advisable that the ends of each strand should be laid in for upwards of 10 to 12 feet, with the ends well lapped with annealed wire to ensure their gripping.

The ropes working the planes may be applied to work either under or over the trams, according to the conditions that prevail. Where the coal is packed above the tram it is necessary to run the rope under, where the coal is not packed above the tram it may be run over the tram. As there are clips which will accommodate either method, where it can be applied to travel over the tram, the cost of labour in attaching the trams to the rope will be less than in the other case.

*Clips*—Clips are made chiefly on the principle of leverage or of the screw, and the amount of power exerted by the clip on the rope is equal to the gravity of weight of the tram and its contents; and where the gradients vary, a difficulty, which is somewhat common, is that, in consequence of the variation in the gradients, the clips relax their grip on the rope. This is no doubt best remedied by the adoption of the clip worked with a screw, exerting a definite grip on the rope throughout, but its adoption entails increased labour; in some cases it is found satisfactory to couple two trams together, with a clip attached at the front of the first tram and another at the back of the second tram.

*Conclusion.* In concluding, if it were possible in every case to lay down double tramways, so that the endless in series could be applied, the writer is of opinion that power could be conveniently transmitted from the pulleys at the termini of the primary planes for the purpose of hauling over the secondary planes by mechanical power, and thereby reduce the cost of haulage by horse-power over those branches to the minimum point. The great difficulty that is stated against the adoption of two tramways is, that they cannot be maintained where the ground is bad. Possibly where the trams are large and the gauge broad this objection is of vital importance, and this point at once suggests the question, where it is only possible to keep a single tramway open for a large tram, whether it might not be advisable to adopt a smaller tram, or one of such dimensions that a double tramway could be maintained without increasing to any considerable extent the width of roadway. By so doing it would be possible to get a greater output at a less expenditure of power and labour, at a slower rate of travelling, with less breakage and droppings, with less liability to accident, and a working system that would approach most nearly to an automatic delivery of the mineral.

Messrs. Wurtelle & Co., Ottawa, have acquired the property formerly worked in the township of Low, Ottawa County, Que., by the Asbestos Manufacturing Co. of Newark. Asbestos of very superior quality is being shipped.

About fifty tons of lead have been taken out of the surface workings of the Hollandia mine at Bannockburn, Hastings Co., Ontario, and the outlook is so favorable that a mining plant has been installed.

### A New Traversing Winding Engine.

At a recent meeting of the Mining Association and Institute of Cornwall held at Camborne, Mr. William Morgans, of Messrs. Thos. and Wm. Morgans, Bristol, consulting engineers to the Dolcoath Mines, read the following notes on a 24 inches  $\times$  60 inches traversing winding-engine which is being built for Dolcoath.

This traversing winding-engine has been designed with special regard to the following objects—namely, economising steam or fuel, reducing first cost, and combining conditions suitable for winding for sinking operations as well as for winding large outputs of mineral in skips or cages after sinking is completed. It is an ordinary double-cylinder winding-engine bolted on a steel frame so as to be self-contained, and independent of masonry foundations. It is mounted on wheels for slow traversing on two short railway tracks, and are traversed whilst winding by means of an ordinary rack and pinion gear. If the traversing gear were disengaged, or if it got out of order, it would simply work as an ordinary self-contained winding-engine. The engine is built of sufficient strength to work at 140 lbs steam pressure, but during sinking operations it will work at a pressure not to exceed 100 lbs. per square inch. The distance of the drum from the shaft will be about 75 feet, and the centre pulleys are intended to be about 65 feet above the permanent pit top. The engine is not compounded, as it will be better in the simple form for sinking, and for pitwork operations. After the sinking is completed it is intended to compound the engine by replacing one of the cylinders with a low-pressure cylinder. The ropes are intended not to exceed 5½ inches in circumference or 28 to 29 pounds per fathom in weight. The cage and loaded tubs are estimated to weigh 6¾ tons, of which the load will be three tons. Allowing two minutes for each wind from from a depth a 3,000 feet (although it may be done in a shorter time if required) and half a minute for changing tubs, the ore raised per hour will be 72 tons, which will supply a large mill. The engine is expected to work with a consumption of about 20 lbs. of steam per indicated horse-power per hour. By the addition of an independent condenser economy of steam will be still greater. The engine is suitable for sinking the shaft to the full depth of 3,000 feet, and if the mine proves to be the great success which is anticipated for its future, another winding-engine will probably be erected, leaving this one in reserve in case of accident. The large diameter of the drums and of the steam cylinders necessary for the ordinary type of winding-engines for hoisting out of shafts of even only about 2,000 feet in depth, are considerable obstacles to economy in first cost, as well as in consumption of steam. By compounding such engines greater economy of steam can be effected, but no reduction of first cost. The adaptation of such engines to Dolcoath shaft of 3,000 feet in depth would require drums of excessive diameter, and would introduce practical difficulties in proportioning the diameter and stroke of the pistons, and these difficulties would be unfavourable to the economic use of steam as well as to economy in the first cost of the engine. The principle of the traversing winding-engine admits of the use of a drum of comparatively small diameter for winding from deep shafts without the overlapping of the winding-ropes, and it enables the ratio of the periphery measurement of the drum to the piston speed of the engine to be reduced to the proportion of three to one, whilst the use of drums of the very large diameter necessary for winding from such shafts usually necessitates the adoption of the less favourable ratio of about six to one. With such a ratio a piston speed of 1,000 feet per minute could not be secured without involving the excessive rope speed of about 6,000 feet per minute. As regards the danger of over winding it is somewhat less in the case of drums of small than of large diameter.

**Colliery Warnings: Their Utility Called in Question.**

By W. FAIRLEY, F.G.S., &amp;c.\*

Although this is a subject which has been treated of in an indirect manner, in a previous issue of this paper, when it bore the name of *Mining* (March 21st, 1896), in an article entitled "The Effect of Atmospheric Changes on Mine Ventilation," it still remains a question undecided by many and especially those who take it upon them to continue to give gratuitous advice to the workers in coal mines, and deserves further consideration: any hint, from whatever source, that would have a tendency of reducing the dangers in underground operations would be gladly hailed by every member of the mining community, and if a colliery warning were of this kind it would be highly acceptable.

This is a question which concerns not only the colliery owner, colliery manager and coal hewer, but every individual who has occasion to descend a mine, every one of whom, who claims to be a man of intelligence, should understand the subject in all its practical bearings for himself: were this the case he would know exactly what value to put upon the admonitions and prognostications contained in the meteorological warnings publicly issued from time to time, by irresponsible persons for the benefit of miners. The writer would strongly urge upon every mining student the necessity of a thorough knowledge of this subject, for the study of which he will have many opportunities if he cultivates an observing eye.

The relative spaces occupied by liquid or gaseous bodies being in inverse proportion to their specific gravities—the relative expansion for three of them for comparison may be given as,—mercury 100, water 1,358, fire-damp, 201,017.

It is well-known that atmospheric pressure has a considerable effect on the quantity of water discharged from springs—the quantity flowing varying inversely with the pressure. In the case, however, of water being tapped by a bore-hole from old working connected with a vertical shaft, it has been observed that the level of the water in the shaft lowered more rapidly with a high than with a low atmospheric pressure.

The phenomena of intermittent springs, the rise and fall of water in wells, the ebbing and flowing of gas in goaves, are in many cases—but not in all—explainable by the changes of atmospheric pressure. The whistling well of Pennsylvania for example, is a case which it is thought may be explained by the rise and fall of the water—due to variation of pressure—alternately covering over, and opening certain subterranean air passages, and thus under certain atmospherical conditions causing a whistling sound. In other cases the rise and fall of water in wells is attributed to the variation in the sea level, like the one at Newton Nottage in Glamorganshire, where the water ebbs and flows synchronously with the ocean; in this case the water rises in the well for three hours after high water, and ebbs for three hours after low water.

The changes which take place in the level of the water in the case of the Newton Nottage well are exactly the reverse of the changes in the bulk of the gas in the goaf of a mine: in the case of the phenomena of the water in the well, they are after the visible indications of what is to take place—in case of the phenomena of the gas in the goaf—they are manifested before the observed readings of the barometer are made known, and which are regarded as indications of what is to take place.

The extreme subtilty or lightness of firedamp in comparison with every other substance that the miner has to deal with—makes it exceedingly rapid in its movements, and dangerous to deal with: there is no instrument yet constructed that can give a warning of its approach—

\* From "Mining Engineering."

this gas itself indicates quicker than anything else that a change of atmospheric pressure has taken place.

A proper distribution of air in a mine is one great means of keeping it free of dangerous gases, and great care should be taken in the first place in laying out the workings, and especially the roads along which the main-currents have to pass with this object in view.

For getting a proper supply of air through the mine the equivalent orifice should be commensurate with the quantity required, and for maintaining this the shafts and main roads must be sufficiently roomy, and there must be a limit to the distance to which the workings are extended from the shafts.

In fiery mines, especially those of steep-lying seams, the ascensional method of coursing the air should be practised—that is the intake air should be taken to the deep workings first and be arranged to ascend in its course through the mine until it reaches the bottom of the upcast; and the practice of carrying heated air down the bank should be avoided as much as possible.

The meteorological authorities—of whose good intentions the writer has no reason to doubt—who publish these warnings, claim that they are the means of preventing colliery explosions, and of effecting a reduction in the number of lives lost: it is a very pleasing fact that there is, of late years, a diminution in the number of lives lost under this head, but the writer is sorry that he cannot give credit to the warnings for it.

The writer would strongly recommend all young miners who wish to have a thoroughly intelligent grasp of the subject, and who may have facilities for doing so, to lose no time in commencing a systematic record of atmospheric fluctuations, together with the condition of the mine, as regards the occurrence of gas, and the state of the ventilation.

Where the ventilation of a mine is properly provided for, atmospheric changes should have no effect upon its safe or healthy condition whatever. In cases where the ventilation is imperfect atmospherical changes have a greater influence on shallow than deep mines, and in such cases, in this country, a low barometer and south wind act very prejudicially.

The task of the ventilating engineer is to keep the mine properly ventilated under all conditions of the atmosphere, and with the appliances of the present day they should not be very difficult, although it must be remembered that there is a limit to what can be done, as regards quality or volume of air in every mine. The manager whose mine is properly ventilated will pay little heed to colliery warnings.

**OUR ROSSLAND LETTER.**

ROSSLAND, September 14.

The principal events of the past month in Rossland have been the closing up of the sale of the Centre Star to the Gooderham-Blackstock Syndicate, of Toronto, for \$2,000,000 cash; the negotiations for the purchase of the Iron Mask for \$500,000 by the same syndicate; the resumption of work on a large scale in the Le Roi; the steady increase in shipments from the War Eagle; the purchase of the Iron Horse for \$75,000 by the Hosmer Syndicate of Montreal; strikes of the first magnitude in the Columbia and Kootenay and No. 1; important discoveries in the White Bear, Nickel Plate and Josie, and most encouraging developments in the Giant, Novelty and Commander.

Shipments of ore from Rossland's mines are beginning to assume respectable figures. The total for last week was 3,374 tons, which beats all previous records. The total to September 10 is 63,212 tons. This is not nearly so much as it was expected to be, chiefly owing to the two long periods of suspension of work in the Le Roi, due to the negotiations and litigation arising out of the sale to the British America Corporation. It is quite likely, however, that before the first of January the output will average 1,000 tons daily. Roughly speaking the ore shipped represents an average value of nearly \$30 per ton, and the number of miners employed at present is considerably over 1,000.

**CENTRE STAR SALE.**

The sale of the Centre Star is the largest ever made in British Columbia, though of course if the Le Roi sale had gone through it would have been eclipsed. In a certain sense the Centre Star is the best developed mine in the province. It has been opened from end to end and side to side down to the level of Centre Star Gulch, giving in some places a depth of 250 feet. Below this level it has been opened only at one point, near the Le Roi end line, to a further depth of 200 feet. It is conservatively estimated that these workings have exposed close to \$2,500,000

worth of ore net, so the price paid would seem to be very reasonable. Much, however, remains to be done before the mine is in shape to produce largely. The bulk of the ore is low grade and must be handled in the most economic fashion to pay. A large working shaft, powerful hoist, and big air compressor are needed before extensive shipments can be begun, but it is the general opinion that within a year, especially if combined with the Iron Mask, the Centre Star will be the biggest producer in the camp and consequently in Canada.

#### THE IRON MASK.

There is no doubt that the control of the Iron Mask is under option to the Gooderham-Blackstock Syndicate for a price in the neighborhood of \$500,000 for the mine. It is said by well posted brokers that their option is on 290,000 shares at \$1.10 per share. While Mr. Blackstock and others have been unceasing in their efforts to depress the stock, and have frequently asserted or insinuated in interviews in the daily papers that the price asked was excessive, it is the firm belief of almost all mining operators in Rossland that they will take the property. The mine has been thoroughly examined during the past week by competent experts, and the result will certainly be known before this reaches the public. As its purchase by the Gooderham-Blackstock Syndicate would put an end to what would otherwise be a bitterly contested and most costly lawsuit, involving, as it does, the vexed apex question with complications, it is sincerely hoped here that the sale will go through. With this property added to those already under their control, the Toronto syndicate will put the British America Corporation quite in the shade.

#### THE LE ROI.

The trouble between the two factions in the Le Roi Company appears to be approaching a settlement. Senator Turner and his friends are once more in full control of the mine, and will evidently continue to control it until the next annual election in January, when the British America Corporation will have a chance, as holders of a majority of the stock, to name a board of directors acceptable to them, though it is quite likely that a sale of the remainder of the stock to ex-Governor Mackintosh may be expected in the meantime.

At present the mine is looking exceedingly well—probably better than it ever did. The shaft is down 760 feet and is being driven as rapidly as possible to the 800 ft. level. The drift to the west on the 700 foot level is a wonderful sight. The pay ore body is 28 feet wide and five machine drills are working alongside each other in the face, most of the ore averaging \$50 to the ton. The production is running over 200 tons a day, and in addition 150 tons a day are being shipped from the dumps which contain many thousands of tons. Nearly 250 miners are being employed.

#### THE WAR EAGLE.

The War Eagle mine is shipping on the average over 200 tons of ore per day. This ore nearly all comes from the No. 1, 2 and 3 levels, the latter being 375 feet from the surface. Some ore is also coming from the 500 and 625 foot levels, but only such ore as is taken out in drifting as no stoping is going on below the third level. The main shaft is now down 675 feet and is still being continued. The longest drift in the mine is on the 500 level, which connects with the Iron Mask tunnel, and measures 2,400 feet from mouth to face. On the 625 foot level the drift is now 100 feet from the shaft. The new boarding house, which will cost about \$15,000, is now nearing completion as are various other buildings. It is expected the new 45-drill electrically operated Ingersoll-Sergeant air compressor and the new hoist will be ready for operation by November first.

#### B. A. C. PROPERTIES.

The British America Corporation is actively developing the Columbia and Kootenay, Great Western, Nickel Plate, Josie and No. 1 mines. These have been divided for convenience in working into three groups, each in charge of a superintendent, the whole being under the personal supervision of Mr. W. A. Carlyle. Cosy cottages have been erected on the Nickel Plate and Josie for the superintendents, and a large and handsome general office building, assay office, warehouse, residence for Mr. Carlyle, and a group of cottages for other officials are also being erected on the Nickel Plate, a portion of which has now been plotted and forms an addition to the town site. A new bunk house and office are being built at the Columbia and Kootenay.

#### COLUMBIA AND KOOTENAY.

Thirty miners are employed at the Columbia and Kootenay under Superintendent D. J. McDonald. Since taking over this property the No. 3 tunnel has been extended till now it is over 1,000 feet long. The No. 4 tunnel has been started and driven over 500 feet, and the No. 5 has also been started and driven 250 feet. The most important developments so far have been in the No. 4 tunnel. Last week this level ran into a big body of ore, which is now being drifted on. The ledge is very wide and assays show an average value of over \$50 for a width of 9 or 10 feet. The No. 5 tunnel has still a long way to run to reach the ledge.

#### NICKEL PLATE AND GREAT WESTERN.

The Nickel Plate is employing 30, and the Great Western about 20 hands. No more sinking has been done on the Nickel Plate and work is being confined to development on the 250 foot level. Some very nice ore, averaging \$60 to the ton, has been found on this level. On the Great Western the 200 foot level has been reached, and drifts to the east and west on the vein have been started. W. S. Haskins is superintendent of these two properties.

#### THE JOSIE.

On the Josie drifting is still being continued east and west on the 250 foot level on the main shaft. The drifts and crosscuts on this level aggregate over 800 feet, and have resulted in disclosing two good bodies of ore, of which the one in the west drift proved to be of good value. Twenty men are employed at present.

#### THE NO. 1.

The vertical shaft on the No. 1 is now down about 100 feet, and will be continued another 50 feet before any crosscutting to the ledge is done. A contract has been let for a big shaft house, to contain a powerful hoist and pumps. The tunnel is in about 300 feet, giving a depth at the face of 200 feet. This tunnel has been good paying ore for a considerable distance, and the No. 1 is recognized as one of the bonanzas of the camp. Twenty-five men are employed. A good wagon road has just been completed from the Josie to the No. 1. J. M. Long is superintendent of both properties.

#### THE MONTE CRISTO.

Nothing but development work is being done on the Monte Cristo at present, but it is the intention of the management to recommence shipping so soon as proper facilities are furnished by the C. P. R., which it is expected will be in about 40 days. During the summer some 500 tons of ore were shipped from various parts of the mine to ascertain the average value of the ore, and it is understood the results were quite satisfactory. One drill is working in the face of each drift on the 300, 400 and 600 foot levels. The first is now 80 feet from the shaft, the second 250 and the deepest nearly 100. Twenty-seven miners are employed. It is the intention to equip the mine this winter with a 30-drill, electrically operated, air compressor, which will enable a very large force to be worked. The mine is capitalized at \$2,500,000, of which 500,000 shares are still unissued.

#### THE VIRGINIA.

The Virginia is now incorporated as a provincial company, with \$500,000 capital, its shares being assessable. It is controlled by the Hosmer syndicate which owns the Monte Cristo and recently purchased the Iron Horse. It is developed by a vertical shaft down 315 feet, with some 680 feet of crosscuts and drifts on the 300 foot level. The War Eagle vein was crosscut at a distance of 170 feet from the shaft about two months ago, showing 27 feet of ore, nine feet of which, it is said, averaged over \$50 to the ton. Drifts have now been run each way from this point for 180 feet, and as a result over 1,000 tons of ore, averaging at least \$30 in gold, are on the dump. Meanwhile the crosscut is being continued to the south to strike two other veins. The first of these—the same which is in dispute further west between the Centre Star and Iron Mask companies—is expected to be cut any day. The second is 80 or 100 feet further south. It crosses one corner of the Virginia and traverses the Butte Fraction—which also belongs to the Virginia Company—for its entire length. When opened by the north crosscut in the Centre Star this ledge showed good values. The management at Montreal now has in hand the matter of ordering a 40-drill air compressor for the mine.

#### THE IRON HORSE.

Work on the Iron Horse was started this week by the new owners, who are understood to have paid \$75,000 for it. A double compartment shaft is to be sunk at once about 250 feet west of the Virginia end line, at a point where the two north veins of the Virginia appear to get very close together. No cross-cutting will be done until at least the 200-foot level has been reached. The mine will be equipped temporarily with a 4-drill Rand air compressor, and the hoist-pump, etc., will be moved from the shaft sunk by the old company some distance to the east. This shaft shows a wide and strong ledge with solid ore of low grade, except for a few feet at one point, where good values were obtained. In about a month the mine will be transferred to a provincial company, it being at present incorporated under the Washington laws at \$1,000,000.

#### WHITE BEAR.

A property which is now attracting considerable attention, and whose stock is in good demand locally is the White Bear. It is a fractional claim covering some 30 acres lying west of the Black Bear and east of the San Francisco. It is capitalized at \$2,000,000, of which 150,000 \$1 shares are left in the treasury, besides about \$10,000 in cash. The principal stockholders are John V. Cole, of Rossland, and Judges McDougall and J. H. Starr, of Toronto. The mine is equipped with a 60 H. P. boiler, 20 H. P. hoist, 4-drill Rand air compressor, pumps, etc. The shaft is now down 242 feet vertically, and has been in more or less ore since reaching the 200 level. At a depth of 230 feet solid ore was encountered and still continues. When the 250 foot level is reached drifts both ways on the vein, which is undoubtedly the LeRoi ledge, will be started. Forty tons of ore are now on the dump, which will average about 30.

#### THE GIANT.

The Giant, which occupies the southern slope of Red Mountain, is one of the most interesting and promising properties in the camp. It is traversed by two veins, one of which is undoubtedly the No. 1 War Eagle ledge. Since work was resumed a month ago regular weekly shipments have been maintained, though no stoping has been done. A crosscut tunnel is being driven to tap the upper ledge, which is already opened to a depth of 50 feet by a shaft which shows from 16 to 20 feet of \$16 ore. On the lower vein the shaft is now down 60 feet, showing a solid body of ore averaging \$12 a ton on the bottom. The crosscut on the 50 ft. level showed the ledge to be over 12 feet wide.

#### THE NOVELTY.

The Novelty has been recently reorganized with increased capital and work has just been resumed. This is due principally to the astonishing development of the No. 1, whose ledge runs through it and into the Giant to the west. Though only a little surface work has been done on this vein the showing is most encouraging, and the stock is a firm favorite with local speculators at five cents.

#### DEER PARK.

The Deer Park continues to be the favorite in the south belt. It is now being equipped with a 7-drill air compressor plant, and has already a good steam hoist and pump. The vertical shaft is down 270 feet, in ore all the way, with drifts at every 50 ft. level except the 250. When the 300 is reached drifts will be run on that level northerly and southerly along the vein. Down to the 50 ft. level the ore contains practically no gold, but by the time the 100 ft. level is reached it assays up to \$40 and \$50, and by sorting \$12 to \$16 ore can be obtained. Values gradually increase till the 150 ft. level is reached, and assays up to \$400 have been obtained from this level. It has been proved that the heavy sulphides do not contain the values. A glassy quartz, showing arsenopyrite, pyrrhotite, molybdenite and occasionally sylvanite, yields the high assays. This ore occurs throughout the mine in bunches and stringers, appearing more frequently as depth is attained, especially below the 200-ft. level where the highest assays have been got. The dump shows about 500 tons of ore which would yield anywhere from \$12 to \$16 to the ton.

#### SUNSET NO. 2.

The Sunset No. 2 on Deer Park mountain, half a mile from the business centre of Rossland, belongs to the Canadian Gold Fields Syndicate, Limited. It is opened by a 525 ft. tunnel and four shafts, the main one being 350 ft. deep with drifts on the 200, 300 and 350 ft. levels. The drift west on the vein on the lowest level is now in 150 ft., giving a depth from the surface of 425 ft. For the last 75 ft. there have



been from 1 to 2½ ft. of ore in this drift of high enough grade to ship. After driving another 200 ft. it is intended to crosscut to the south to the Discovery ledge at a point under the Discovery shaft where a good body of ore is opened up from the surface to a depth of 40 ft. Stopping in the upper level has begun and the management states that regular shipments will now be maintained.

#### EVENING STAR.

Work was resumed on the Evening Star on June 1st and has been steadily prosecuted since with two shifts under the direction of Roy Clarke. The Nichols shaft, then down 85 ft. and connected with the No. 1 tunnel, was out of ore when he took charge, but a drift on the hanging wall soon opened up a foot of \$16 ore. The slope in the Nichols shaft showed about 6 ft. of ore which netted \$27 to the ton and which petered out about the 50 ft. level. A crosscut to the south developed another body of ore which was drifted on 20 ft., after which a short winze was sunk to determine the dip of the vein. Work was then begun in the lower tunnel with a view to tapping the same ore body at a depth of 140 ft. It is expected it will be cut now any day.

#### THE HOMESTAKE GROUP.

The long idle properties constituting what is known as the Homestake group are soon to resume work on a large scale. The three companies have been reorganized—the Homestake with \$1,000,000 stock assessable to the extent of 5 cents a share; the Gopher with \$1,000,000 non-assessable stock, and the R. E. Lee and Maid of Erin as the R. E. Lee Company with \$2,000,000 of stock assessable to the extent of 3 cents per share. The Homestake has levied an assessment of 2 cents per share due October 9, and the R. E. Lee one of a cent per share. The Gopher has sold 160,000 shares of its treasury stock at 5 cents per share, so that the first two companies have development funds of \$20,000 each, and the latter one of \$8,000. The properties have all considerable development work done on them and are all well thought of in Rossland—indeed they are believed to form the best group of claims in the south belt.

#### THE LINCOLN.

The shaft on the Abe Lincoln, which is on Deer Park mountain, adjoining the Sunset group, is now down 170 feet. It is vertical, and has cut four stringers so far. The largest, which is about 18 inches in width, was struck about 120 feet down, and went out at about 140 feet in depth. When the 225 ft. station is reached a crosscut will be driven to the north to top all of these stringers. The mine is capitalized at \$1,000,000, with 150,000 shares still left in the treasury, and the stock is held principally in St. Paul, Chicago, Philadelphia and Washington, D.C.

#### COMMANDER.

Work on the Commander, which lies down in the valley to the east of Rossland, was resumed last week. The company owning it recently reorganized, increasing its capitalization from \$500,000 to \$1,000,000, and putting half into the treasury. None has been sold yet. The shaft, which is nearly vertical, is being sunk from the 200 foot level in mixed ore. Down to the 100 foot level the shaft was in good ore, and this is now being stoped out.

#### EAST ST. LOUIS.

Work on the East St. Louis, near the Lily May, has been resumed, two of the principal shareholders having purchased a large block of treasury stock. This claim has a nice little vein of good grade ore opened to a depth of 50 feet by a shaft. It is all owned in Rossland, except one-eighth, which is held by a Montana capitalist.

#### NEST EGG AND GRAND PRIZE.

Two properties on which work will shortly be begun again are the Nest Egg and Grand Prize, both situated in the South Belt. The former has three shafts sunk on the ledge to various depths in the neighborhood of 50 feet, all showing fair grade ore. The latter adjoins the Deer Park, and as it is supposed to be traversed by the same ledge is quite a favorite with local speculators.

#### RED MOUNTAIN VIEW.

This company has been reorganized with a capital of \$1,000,000, stock being assessable to the extent of five cents a share. The claim is located on Red Mountain, and has a good deal of work done on it, showing up a small ledge of high grade copper ore. The property is considered promising here.

#### GERTRUDE AND CONEY.

These two Red Mountain claims are owned or controlled by a Montreal company, and are being developed under the direction of Major R. G. Edwards Leckie. The former is traversed by three veins, on all of which some work has been done. The new shaft on the lower or No. 1 vein is now down 60 feet in mixed ore. On the latter the crosscut tunnel is in 570 feet, but still some distance from the ledge, which it will cut at a depth of over 250 feet.

#### THE JUMBO.

About the only property working beyond Sheep creek is the Jumbo. So far the lower tunnel has not developed any ore body of consequence, but better results are expected from the drift now in hand.

#### GOOD HOPE.

The Good Hope shaft and crosscut have not as yet developed any good ore, but the showing is so promising that it looks as if only depth were needed to get the desired results.

#### ALBERTA.

The drift to the east from the crosscut tunnel on the Alberta, which is at a depth of 225 feet from the surface, has a nice showing of ore, which has been gradually widening for the past week. It is now about three feet wide, and is said to be good enough to ship.

#### LILY MAY.

The Lily May, the oldest claim in the camp, is to resume work on October first. It is under bond to the British-Canadian Finance Corporation, Limited, a London company about which little is known in Rossland.

#### SOPHIE MOUNTAIN.

The two best developed properties on Sophie Mountain, five miles south-west of Rossland, are the Velvet and Victory-Triumph. Both are owned by London companies, the former by Sir Charles Tupper's New Gold Fields of British Columbia, and the latter by the Kootenay Gold Fields Syndicate. The Velvet has shipped several hundred tons of ore experimentally and is now a mine. It is being further developed under the direction of Captain Morrish. The Victory-Triumph is managed by D. B. Bogle, of Rossland, and while not so extensively opened up or showing so much shipping ore is recognized as being a valuable property.

#### SALMON RIVER DISTRICT.

There is considerable mining development going on in the Salmon River valley, especially in the vicinity of Ymir. Most of the mines in this district, which is a portion of the Nelson mining division, are owned in Rossland. The Dundee, Kenneth and Salmon Consolidated companies, are erecting concentrators on their properties, as is the London company which owns the Ymir. The Canadian Pacific Exploration, Limited, is erecting a 10-stamp mill on the Porto Reco. Many other properties are in a less advanced stage of development; of which the Jubilee is one of the most promising. On the North Fork of Salmon River at least one mine, the Second Relief, which is owned by the Finch Syndicate of Spokane, has been opened up.

#### THE STOCK MARKET.

During the past month the stock market in Rossland has been exceedingly active and the transactions have approached three quarters of a million dollars. As there is no stock exchange only the larger sales became known to the public through the local press, and on that account it is a trifle difficult to give exact quotations. I will, however, confine my remarks to standard stocks.

The most active of all in the local market has been Virginia. Two months ago it was selling at 25 cents. After the big strike it jumped to \$1.05, and has since been sold as low as 73 cents. It is now firm at 80 cents.

War Eagle has been very steady for the past month at from \$2.80 to \$2.95. This is regarded as an investment pure and simple and is no longer speculated in to any considerable extent.

No transactions of importance have taken place in Le Roi, though a number of small blocks have been bought, the large holders at \$6.

Iron Mask has jumped from 60 cents to 98, and has reacted and is now selling at 90 cents. The fluctuation was due to the sale of the Centre Star and the pending negotiations for the sale of the control to the Gooderham-Blackstock Syndicate.

Monte Christo has not varied much of late. It has sold from 27 to 30 cents, and is now steady at 29.

Deer Park has been quiet and inactive on account of large holders in the east disposing of some big blocks. It is now quoted at 20 bid, 21 asked.

Commander has been in very good demand since work was resumed, and has advanced from 8½ to 14 cents.

Giant has been one of the favorites and has been freely bought here up to 7½ cents, at which price it is now firm.

Novelty is coming to the front and is well thought of at five cents, as is evidenced by the large sales at that figure.

Iron Horse was dull at 8 cents up to the time of the sale, and is now selling freely at 17.

White Bear has been active and has advanced from 6 to 8 cents.

Grand Prize has begun to be in demand again, and sales have been made as high as 3½ cents.

Evening Star has been quite inactive and quotations are merely nominal. The same is true of Good Hope, Canadian Gold Fields and Alberta.

East St. Louis, since work was resumed, is attracting attention and several large blocks have been bought locally.

Homestake is selling freely at 4 cents. Gopher and Lee are also coming into demand.

Ymir, Boundary and Slocan stocks are quiet and but little inquired for.

H. W. C. JACKSON.

(By Wire.)

ROSSLAND, B.C., 20th Sept.

Strike of phenomenal richness made in lower tunnel of the Jumbo mine Friday, when nearly 3 feet rich telluride ore cut. This find at depth of 350 feet, tunnel having previously crosscut 180 feet mixed ore of which 20 feet of shipping grade. This showing corresponds with level above except that ore body is much wider. Full machinery plant ordered yesterday and new tunnel started to cut ore body 100 feet lower. Prior to strike stock offered as low as 28 cents, but is now at 60 cents, strong local syndicate having bought up all below that figure. Finch syndicate, Spokane, owning over 400,000 shares, refused offer 65 cents control or whole.

Iron Mask deal has fallen through. Blackstock claims price of \$1 per share excessive; several parties said to be seeking new option. Main reason of Blackstock's refusal to buy is that principal ore body is in that portion of ledge which it is claimed forms part of Centre Star mine.

Showing in Giant shaft has continued to improve and upper tunnel coming into ore. Local speculators bought all stock offered below eight cents.

Novelty looks well too where stripped on surface and stock in good demand here at 5 cents.

Grand Prize sold 50,000 treasury shares at 3 cents in Toronto and starts work Thursday.

## LAKE OF THE WOODS.

RAT PORTAGE, Sept. 19th, 1898.

**The Wilkinson Locations.**—The Cliff shaft is down 46 feet and the Vulcan shaft 49 feet, but at the latter work has been suspended temporarily on account of surface water from the recent heavy rains. Camps are being built. Mr. Lockwood is in charge for Mr. Purchase.

**Gordon James Property.**—The company of Montreal men who lately acquired this property have let a contract for sinking 25 feet in the old shaft. \$4,500 was the exact price of this property, and the money has been paid over.

**The Stella.**—Six men, besides the cook and blacksmith, are at present at work. On Sept. 1st the Stella shaft was down 96 feet, and a further contract for 15 feet had been let. The 200 tons for the mill run is being hauled out to the shore of Lake of the Woods. \$2.10 per ton is the price for transporting it the four miles, and there is not much in it for the contractor even at this price, owing to the bad state of the road, consequent, partly, upon the very wet weather.

**Burley Mine.**—The shaft being sunk inside the coffer dam is now down about 40 feet below the bed of the lake, and it looks as though they might be on to the vein they are seeking, coming from the Sultana shore. About 30 men are employed.

**Hay Island.**—Work has been suspended, and all hands taken away.

**Cameron Island.**—The management are going to put in power drills; they are down over 200 feet now.

**Cornucopia.**—Captain Dan McPhee, who was in charge for Mr. Hay since the early summer, has returned to his home in Port Arthur, and the mine is quite deserted now. Considerable boring with the diamond drill was done, but the results have not been made public.

**The Sentinel.**—After putting the shaft on the large vein down about 67 feet, work was suspended until horse power for hoisting can be procured. A shaft is now sinking on a smaller vein about 200 feet north-east of the other, and is now down over 20 feet. Fifty tons from the dump of the large shaft have just been treated at the Rat Portage Reduction Works, with Mr. Wm. Peters as amalgamator, and the yield was \$12 per ton. The concentrates are worth about \$2 per ton of ore, making the total value \$14 per ton.

**Engledue Concessions.**—Alan Sullivan has brought in his crew of prospectors on the concession on Rainy Lake. Some good finds are said to have been made, including one wide low grade vein. T. R. Deacon, C.E., is continuing the sinking and diamond drill boring upon the other concession situate on Shoal Lake.

**Mikado.**—A cyanide plant is being installed under the superintendence of Mr. F. C. Pengilly, Assoc. M. Inst. M.M. One shaft is now down 250 feet and the other 200 feet.

Probably the most important discovery so far made this season is that of Captain Pritchard, of Norman, in the country east of the Regina mine, near the easterly end of Deer Lake. It appears that there is here a small area of eruptive granite, which has broken through the altered traps, etc., and in the contact region thus produced a number of strong quartz leads have been found, many of which pan gold freely and regularly. Locations have been taken up by Dr. Seovil, of Rat Portage, in association with Captain Pritchard; others have been taken up by Mr. Upton and Captain Pritchard. The locations in the present undeveloped state of the country are somewhat inaccessible to heavy machinery, but if the veins turn out as well upon development as they promise to do at present the drawback arising from their somewhat remote situation will not count for much.

Dr. Hatch, of the Geological Survey of Great Britain, visited Rat Portage and the Lake of the Woods during August. He had previously passed some weeks at Bruce Mines examining that ancient property. Earlier in the season we had a visit from another distinguished mining engineer, John E. Hardman, S.B., of Montreal.

J. M.

## ENGLISH LETTER.

24 COLEMAN ST., LONDON, E.C.,

September 23rd, 1898.

Business in the British Columbian and Canadian mining market has been practically at a standstill during the past month, and indeed the whole section has been characterized by extreme dullness. Much discussion has been aroused over the probable amount of the Klondyke output for the past season, and some very disquieting cables have been forwarded from the other side regarding the progress of events in the northern gold fields. It has been freely stated that thousands of the searchers for the precious metal who have pushed their way to northern British America have decided to return as speedily as possible, and, of course, news of this kind has not been favorable to the market in question. Dawson City Trading, and the rest of the Turner-Pooley group have continued weak, and much consternation was caused by the disclosures at the Klondyke Bonanza meeting. Both the "Goldfields" and "New Goldfields" groups remain quiet, while Hall Mines have continued to decline on the unsatisfactory state of affairs at the mine, and at the time of writing the ordinary shares, which a couple of years ago stood at about £3, are no better than 5/8. British America Corporations recovered a little bit, but are still under par, and it is felt that the minority of the stockholders of the Le Roi may yet cause a good deal of trouble to the big Corporation. B. C. Development, and Fairview, have been unable to re-assert their claims to notice, and Alaska Goldfields have not recovered their recent fall, but the London and B. C. Goldfields group has continued to receive a good deal of support. Vancouver Syndicates remain at a premium, and Lillooet and Fraser River are no better than 5/-.

Mr. Brewer's statement in the *New York Mining and Engineering Journal*, about the Lillooet district, did not encourage attention to this district. As a matter of fact, dealings in this section are very limited indeed, and day by day movements in prices are few and far between, and are produced by insignificant transactions. Many of the quotations are quite nominal, and I have no hesitation whatever in saying that one could not sell a thousand shares in any of the companies, except the British America Corporation, without causing a marked alteration in current quota-

tions, which as a rule are purely nominal. I do not, of course, for one moment believe that this apathy will continue, for British Columbia has a number of staunch supporters in this city, and although they may have been inclined to unduly estimate the more northern region, and neglect the southern mining regions, yet there is little doubt that the solid advantages offered by the Kootenay country will ere long impress themselves upon investors. Speculation will in due course enliven this section, and although I expect the variations in prices will at first be most pronounced in the Klondyke companies, pure and simple, the merits and prospects of such concerns as the B. A. C., the New Goldfields of British Columbia, and the London and B. C. Goldfields, will commend these concerns to the attention of those who believe in supporting groups which are strong enough to finance any of the companies they may form. Bye the bye, there is a rumour that the New Goldfields of British Columbia has been offering some of its new capital to German investors. In this connection it may be as well to point out that continental capitalists have already a material interest in Canadian mining companies, and although their experience in the "Kaffir boom" has taught them a lesson which they will not soon forget, yet there is no doubt that both in Paris and Berlin, the claims of your various mining districts will be accorded all the attention they deserve, and provided they can stand a stiff examination by the experts who will be sent out in due course, Canadian mining will probably receive from the continent of Europe the generous support we all believe their merits justify.

Of course, at this season of the year, when men's minds are more devoted to the examination of holiday routes and time tables, than to the money market and financial business generally, it is, not surprising to find that there has been almost a complete standstill in the promotion and flotation of new Canadian companies. The Kootenay, and the White Pass and Yukon Railway companies seem to have obtained a fairly satisfactory response to their respective debenture issues, but although the Newfoundland Fish Industries, Limited, with its capital of £250,000, will no doubt attract the attention of investors, the prospectus appears at a very inopportune moment. Probably, however, the group in St. Helen's Place, who have brought it out know their own strength, and have made arrangements to secure the success of their latest bantling.

Mr. Brewer's article on Lillooet in the *New York Mining and Engineering Journal* caught the eye of a *Financial News* scribe, who thereupon pointed out to English investors that they ought to read this special correspondent's article in the *New York Journal*, side by side with the *London Times'* Victoria correspondent's long article. I do not think it was quite fair of the *Financial News* to utter this warning, or at all events to confuse Lillooet with the other and more favourable mining regions in the Province. The *Financial News* has been so singularly well-informed, regarding the development of British Columbia's mineral resources, that I was particularly sorry to find it taking up this attitude.

Another financial newspaper, the *Bullionist*, which has devoted considerable attention to the opening up of Canadian mining fields, taking as its text the special article in the *Times*, penned a somewhat elaborate warning for the good of the English investor. While we cannot help thinking that your contemporaries might correct and condemn in advance the "wild catting," which has been so notorious in connection with both South Africa, and West Australia, their jeremiads will act as a wet blanket on the enthusiasm which might have been expected to result from a satisfactory wash-up in the Klondyke this year. It is, however, satisfactory to find that on the whole even those who are most inclined to go for the Anglo-Canadian promoter are still ready to admit that British Columbia has a very great future, and that not only has it enormous mineral resources, but a great and progressive lumber trade, and an enormous fish canning industry quite apart from its potentialities as an agricultural area.

Undoubtedly the most important point this month in connection with British Columbia was the three column letter, from a special correspondent at Victoria, published by the *London Times*. For some time past, British Columbia has been rather neglected, but this splendid advertisement of the mineral potentialities of the Province will do much to revive interest in British Columbian matters. To a certain extent, no doubt, the information which was published was only a repetition of what has already appeared in the more go-ahead newspapers, but all the same it is none the less satisfactory to find the leading newspaper in this country devoting so much of its valuable space to the progress of the Province. Of course, I need hardly tell you that half the newspapers in this country are inspired by the *Times* newspaper, and its powers of influence are enormous, as Mr. Turner, the ex-Premier, now knows to his cost. An article like this will be reprinted in one form or other well nigh all over Europe, as well as in the mother country, for many publications which have hitherto not betrayed over much interest in the doings of British Columbia will quickly take the cue offered them by a contemporary which they recognize adopts extreme care in the fashioning of its policy.

Canada has been prominently before the public this month. Chief, of course, in the matter of public interest was the discussion of the probable outcome of the conference called to consider the outstanding difficulties between the United States and the Dominion. Some surprise was felt at the reported insistence of the United States Commissioners, as a preliminary to any negotiations for reciprocity between the two countries, that the preferential tariff enjoyed by Great Britain and her colonies should be abrogated. It is feared that if the United States Commissioners continue to insist upon this point it will imperil the results of the meeting, which it was hoped would prove beneficial not only to Canada but also to the mother country. Seeing that better relations between the United States and Canada would materially assist in cementing that bond of fellowship which has been called into existence by the recent Spanish-American war, it is to be hoped that a way will be found out of the present impasse.

Regret was expressed at the collapse of the efforts of Messrs. Petersen, Tate & Co. to carry out their contract for a service of fast mail steamers between this country and the Dominion, and it is hoped that the project will be taken up and carried out eventually by a group strong enough to comply with the requirements of the growing intercourse between the two countries.

One of the companies, whose chief object was to carry on operations in Canada, viz., the *British Dominions Exploration, Limited*, recently held a meeting, at which a very doleful speech was delivered by the Chairman. This concern was promoted by a man named Macusick, who runs a big bucket shop in the west of London. I never thought much of its prospects, and therefore was not surprised to find that its assets were considered to be worth about 5/- a share, and would require "very careful nursing" if they were to become valuable. Concerns like this tend to discourage investors from putting their money into Canadian mining enterprises. The wily promoter recognizes that the Dominion is a name to conjure with, and he has already made good use of this new instrument for attracting subscriptions from English investors to dubious ventures. All I can hope is that the markets will remain sufficiently inert to keep in check the zeal of the promoter. Already considerable sums have been advanced for the exploitation of Canadian mining companies, and those of us who believe in the prospects of the country, and consider that it can profitably

employ a large proportion of the capital going abegging in this country at 2½ and 3 per cent. interest, yet believe that some tangible results should be forthcoming before we are called upon to dip our hands into our pockets still further. What we want on this side are a few strong dividend-paying propositions. Mines which have done well in the past will stand a little watering,—for, of course, even a very straight promoter cannot be expected to convert a business without a certain amount of profit—and yet will not collapse immediately they are transferred to an English company. In this connection it has been stated during the month that the Centre Star has been secured by a very strong group, and that \$2,000,000 is to be paid for it. All I can say is that I hope those who are carrying through the negotiations have profited by the difficulties experienced by the Whitaker-Wright group in securing the Le Roi.

The poor unfortunate shareholders of the beautiful Klondyke Bonanza will probably think twice before they subscribe to any other Klondyke scheme. There are too many already in existence, and I shall have a word or two to say about them before the last chapter in their history is reached. Mr. Ironmonger Sola, the vendor to the Klondyke Bonanza, was extensively feted when he was over here last year, and interviews with him were published accompanied by illustrations of wonderful Klondyke gold in jars, gallipots, &c. A book he slung together was also published by a concern calling itself the Mining and Geographical Institute, and for a short season Mr. Sola was quite a small lion. Of course Mr. Sola may yet be able to complete his bargain, but the strong stand made by the company's representative in Klondyke, and Mr. Ogilvie's warning are more to us than the vapourings of any number of returned Klondyke voyageurs. It is also very significant indeed, if true—as reported at the meeting—that Mr. Ogilvie warned the directors to “proceed with great caution before completing the purchase with Mr. Sola,” and also that the Government officials advised Mr. Macfarlane not to pay over the balance of the purchase money. This seems to us to be one of those cases in which the promotion proceedings should be laid bare. I should like to know (1) who was the real promoter; (2) how much did he pay Sola down; (3) the total amount that Sola was to receive; and (4) the total profit to the promoter cash and shares. I do not allege anything against the board, but I think they themselves will see that at the present juncture it is their duty to their shareholders whose interests they were appointed to safeguard, that they should strictly call the promoter to account, and as he was not apparently able to complete his share of bargain, to rescind all contracts and save for the shareholders as much as may remain. It is quite certain that the shareholders should take steps to protect their own interests, and if necessary adopt legal proceedings for breach of contract if such action has not been already guarded against in the purchase contract. I strongly advise the shareholders to insist upon a big jet of light being thrown upon this particular promotion, and they need not wait two months before trying to penetrate the hidden veil, which shrouds this most mysterious transaction. If they move for themselves promptly they will be a little more informed upon the actual state of affairs when they again meet to consider their position. If they are firm they may be able to secure the return of whole of their money.

**Bank of British North America.**—The profits of the Bank of B. N. A. for the half year ending June 30th, including £3,735 brought forward from last account, amounts to £32,489, out of which the directors have now to report the declaration of an interim dividend of 25/—per share payable, free of income tax, on October 7th next, being at the rate of 5% per annum, leaving a balance of £7,489 to be carried forward. The dividend warrants will be remitted to the proprietors on October 6th next. The following appropriations from the profit and loss account have been made for the benefit of the staff, viz:—To the officers and widows and orphan's fund £423, to the life insurance fund £333.

**Ymir Gold Mines, Ltd.**—Registered 29th August by Renshaw & Co., 2 Suffolk Lane, E.C. Capital £200,000, in £1 shares. Objects: To enter into and carry into effect with such modifications (if any) as may be agreed upon, an agreement to be made with the London and B. C. Gold Fields, Ltd., and the company for the purchase of the Ymir Gold Mines, situated at Wild Horse Creek, West Kootenay, comprising four claims known as the Ymir, Rockland, Mugwump and Golden Horn, and sundry fractions and rights appertaining thereto, constituting the Ymir group, to develop and work the same; and further to acquire any other mines, mining, water and other rights, grants, leases, claims, concessions, options of purchase, metalliferous land, alluvial ground, etc., in any part of the world, etc., to acquire by grant and to develop the resources of and turn to account any land and rights in which the company is interested.

**Mercier's Klondyke Co., Ltd.**—Registered 15th August by F. Voules & Co., 19 Eastcheap, E.C. Capital £50,000, in £1 shares. Objects: To adopt and carry into effect an agreement expressed to be made between the Central Finance Corporation, Ltd., and this company, to acquire any mining rights, mineral properties, etc., in any part of the world and to develop and turn to account the same; to develop the resources of such lands as may be acquired by clearing, planting, irrigating and building thereon; also as brewers, maltsters, hop merchants, corn merchants, distillers, wine and spirit merchants, licensed victuallers, etc., as hotel and restaurant keepers, farmers, dairymen, tavern-keepers, etc.

## FROM THE SLOCAN.

NEW DENVER, B.C., 21st Sept.

The mining situation here is improving as it usually does towards fall. We differ a great deal in this respect from the Rossland camp, which appears to take spasmodic flings at prosperity consequent on some immense deal made by a powerful company or corporation. In the Slocan, on the contrary, nothing startling has occurred for many a long day; the steady and persistent output of high grade ore has merely told its tale and compelled quiet though general recognition. Not that we are averse by any means to companies with large reserves of capital appearing in our midst, only we can and have done satisfactorily without them in the past and are content now to await their pleasure, knowing from experience how good a thing they are missing. If the capabilities of the Slocan are not well known by this time, it certainly is not the fault of the ubiquitous collector of ore samples. Specimens aggregating some tons in weight have recently been shipped to London, Paris and Boston by the C. P. R., while the mines will be fully represented at the fairs in Spokane, New Westminster and elsewhere, to say nothing of private enterprise in this respect. Some time since an article appeared in the *Mining World*, a reputable London journal, from the pen of an otherwise trustworthy engineer, belittling the mines of this section in comparison with those of other countries. While of course the under-

ground workings cannot possibly be so extensive or the reserves of ore so large in our mines on account of the short time they have been in operation, as those in older settled districts, there is absolutely no reason to decry their enormous value or to ignore the working profits and dividends declared in the past. I was especially pleased to note a vigorous reply from a New Denver resident denying the imputation that we had no mines worthy of the name and furnishing statistics proving conclusively the contrary to be the case. The unbounded confidence reposed in the future of the Kootenays is made abundantly evident by the activity displayed in railway circles. Apart from operations on the Crow's Nest road, which have been going on continuously for over a year, the C. P. R. are projecting other spurs and connecting links; and now comes the assurance that the K. & S. has been taken over by a London company who will make it their aim to construct the proposed Nelson & Bedlington road, thereby assuring the permanency of Nelson as the railroad and distributing centre for Kootenay. Apropos of railway matters, the restoration of the old passenger rates to the east is not viewed with much favour here, and I am rather inclined to think with the majority that had the cheaper rates prevailed, the company would have found themselves ahead in the long run. The management of the Pilot Bay smelter have not so far exhibited that commendable desire to accommodate the mine owners of the Slocan, by blowing in their furnace, that we were led to expect, although desultory reports are still going the rounds to the effect that the works will immediately resume operations. When it pays for some of the principal mines to ship their ore to Aurora, Ill., for treatment, it seems a pity something cannot be done to foster home smelting and counteract eighteen and nineteen dollar freight rates. Although little has been heard latterly on the subject, the matter of placing an import duty on lead products coming into the Dominion has not been lost sight of, proof of which is found in the fact that a memorial has recently been in circulation for presentation to the Quebec Conference, which may possibly have the desired effect, or at least open the eyes of Canadians to the true state of affairs. The Payne is continuing its shipments at the same prodigious rate, that is to say about 1,500 tons a month, being far in advance of its nearest rivals, the Ruth and Slocan Star, which have shipped respectively 900 and 700 tons since July 1st of this year. It is unfortunate for Sandon that the new Provincial Government has refused the aid promised by its predecessors in office to the projected wagon road into the Idaho basin, which would if constructed, tap many rich mines, including the Idaho, Alamo and Queen Bess. As only one-half the cost was required from the Government, the balance of between three and four thousand dollars being subscribed by those likely to be benefitted, the action taken is somewhat singular, unless, as reported, the C. P. R. was at the bottom of the matter, which would mean to them the loss of the monopoly on transportation from the mines. Of recent deals we must record the sale of two-thirds interest in the Fidelity to Scott Macdonald of the Payne for \$10,000 cash and the second payment of 10 per cent. on the \$50,000 bond held by John L. Retallack on the Slocan Boy, situated in the Washington Basin.

The second payment on the Mollie Hughes, amounting to \$18,000, falls due in a couple of weeks, but although the property is looking well it is hardly likely such a large payment will be met without some extension of time being granted, as dry ore properties appear to require more preliminary expenditure before commensurate returns are shown than do those containing galena. It is to be earnestly hoped that the owners will not prove obdurate in this instance, as the continuance of work on this property means a great deal to the district. The interest is not by any means confined to this one mine, for to a large extent the future treatment by capitalists of the whole dry-ore belt depends on the success or otherwise attending the efforts here put forth. Several shipments have already been made, and the results are reported as quite satisfactory. The other property acquired by the same syndicate, namely, the Bosun, is exceeding expectations. For several weeks the ore-body, which consists of solid high-grade galena, has averaged from 2 feet 6 inches to four feet in width in the shaft, and now similar ore has been encountered in the tunnel. The value of the property may be judged from the fact that three car loads of ore were shipped within three months of the time operations commenced at the grass roots, and all taken out in the course of sinking a fifty foot shaft, without interfering in any way with the magnificent showing. Mr. Sandiford has brought to town two handsome specimens of ore, each weighing in the neighborhood of four hundred pounds, one of which will be shipped to the company's office in London for exhibition purposes. This kind of advertisement does more for the country in the world's metropolis than all the government offices ever instituted. The California continues to hold its good appearance. About forty tons of ore is now being packed from the mine, which will be sent direct to Aurora. The number of smaller properties which are being operated this summer is really astonishing, and there is every probability of some of them at least blossoming into first rate mines by next year. To talk about gold may seem a trifle out of place in connection with the silvery Slocan, but one must remember that we have two series of rocks here essentially different in character and origin: the argillites or slates, which are sedimentary, and the granite, which is of course igneous. It is in this latter, prominent chiefly round the lake section, that we find the gold. The startling assay of over eleven thousand dollars to the ton was obtained from a claim on Eight Mile the other day, but this grade of ore must necessarily be in patches, and the ultimate value of the vein has yet to be demonstrated. By way of variation, extremely rich copper ore is being mined on the True Blue, near Kaslo, which is now I believe under bond to the Hall Mines Co., of Nelson. The ore, which consists of the black oxide of copper melaconite associated with other cuprififerous minerals, occurs in pockets and seams, showing a much higher percentage of metal than is generally met with. It is now being thoroughly exploited under the eye of Hall Mines officials.

The lamentable frequency with which men meet their death or are seriously injured through the careless handling of dynamite or premature blasts, ought in all conscience to serve as a warning to others to observe the directions given for their safety and protection; but unfortunately in this case, as in many others, the old proverb about familiarity breeding contempt proves only too true. Last week three men were killed outright and another badly injured at Brooklyn, the new C.P.R. town above Robson, through one of their number ignoring well established precedents, and tamping with an iron spoon; and again, a man had his hand blown off and received other injuries on Lemon Creek last week through a similar cause. If men stubbornly refuse to observe the rules laid down for their guidance, then the seemingly inhuman conclusion must be arrived at that they deserve the consequences. Nobody can force them, if a sense of their own insecurity does not dictate the reasonableness of so doing. It is highly gratifying to those of us who have stayed with the Slocan through thick and thin to note the return of many who left to try their luck in the Klondyke last fall. Almost without exception they have come back sadder but wiser men, vowing that the Slocan is the country par excellence for the prospector without means, and regretting that they ever allowed their imaginations to run away with them to the extent they did.

J. HOWARD WEST.



## NOVA SCOTIA GOLD.

The gold mining industry in this Province never looked as promising since its inception as at the present time, the returns to the Mines Office showing an increase over the previous year, although the operators are tardy, altogether too tardy, in making returns.

### THE DUFFERIN.

The Dufferin will soon be a producer again. It never should have ceased producing, and would not, had it been managed in a manner worthy the name of management. Ere this it should have contributed to the gold production of this Province two or three million dollars instead of less than one million. But now we hope for better things from its present owners and management. Mr. Bernard Macdonald has certainly started right. His plant, except the mill which is being pushed to completion, is all complete, and the development work in sinking and cross-cutting is most satisfactory. A new lode showing good ore has been cut in sinking, and a large belt of excellent ore has been cut in the south cross-cut. The Montreal and London Company may well be congratulated on the acquisition and prospects of this fine property.

### NEW EGERTON GOLD MINING CO.

The New Egerton at Fifteen Mile Stream will soon be running in full blast again. Manager McNaughton has had a very trying time during the past half year or more, owing to the great number of leads, their close proximity to one another and the manner in which they cut the strata, and the large amount of ground taken out for milling. It was found that a general "creeping" was going on for some time, and the bottom had to be abandoned in the old works. A large Lidgerwood cable hoist was erected and an effort made to work by open cast, but it was found that the great depth and character of the surface precluded this system of working, consequently a new shaft 8 x 18 feet has been recently sunk to a depth of 125 feet, some distance away from the old works, with the intention of hereafter working everything from this main shaft by cross-cuts and drives. Good pay ore was found from the top to the bottom of the new shaft. In the sinking of this new shaft manager McNaughton has set a pace for our Nova Scotians gold miners, for with two ten hour shifts, the total depth of 125 feet was made in 34 working days.

### RICHARDSON GOLD MINING CO.

The Richardson, at Isaac's Harbour, under the able management of Mr. A. B. Cox, is continuing the even tenor of its way, averaging from 225 ozs. to 275 ozs. per month from an output of 2,250 to 2,500 tons of crushing material per month. This is the lowest grade ore-body worked to-day in Canada, yielding a very satisfactory margin of profit. The average yield per ton for some time has been 2 dwt. 63 grs., yet the profits occasionally reach over \$2,000 per month.

### BLUE NOSE AND NEW GLASGOW.

The Blue Nose and New Glasgow, of Goldenville, are under the management of Mr. Arthur McNaughton, and are both making satisfactory returns, 325 ozs. being the yield for August. Hirschfield returns 55 ozs.

### THE EUREKA.

The sale of the Eureka at Wine Harbour has been confirmed, and a contract let for a full equipment, including a ten stamp mill.

### COCHRAN HILL.

The new 20 stamp mill at Cochran Hill, to take the place of the one recently destroyed by fire, is about complete, and operations will soon commence at this seemingly unfortunate mine, which we trust will have better luck in the future.

### TANGIER CONSOLIDATION.

The developments in the old Tangier Consolidation by Mr. Miner T. Foster, far exceeds in value the most sanguine expectations of any one. There are now a number of the old leads reopened and worked and the ore is found to average one and three-quarters ounces per ton. The 20 stamp mill is now running full time. The Boston company organized by J. B. Neily, has about completed the purchase of this Consolidation of areas and will work them on a large scale.

### DR. GILPIN'S LATEST REPORT.

Dr. Gilpin, the Deputy Commissioner and Inspector of Mines, has issued from the Mines Department a handy little brochure containing many interesting facts respecting the gold, copper and lead mining industries of the Province. We hope to make some comment upon the pamphlet in a future issue.

### PROFITABLE GOLD MINING.

Dr. Gilpin, in his opening remarks, says: "Until a few years ago the local capitalist wanted something rich, a fortune without labour, extracted from a golden bunch of quartz or from the pocket of an innocent investor. Now, however, the fact is recognized that gold mining is a business, not necessarily a roseate speculation; and veins and deposits are being profitably worked, on business principles, which a few years ago would have been spurned. Since this principle has been accepted it is safe to say that the gold interests of the Province have an assured future. The guarantee of this is the fact that we have local investors who can mine and mill quartz profitably, on a small scale, when the quartz crushed does not yield over two dollars of free gold per ton." Dr. Gilpin then reviews very concisely the occurrences of gold and the history of gold mining enterprise in Nova Scotia, dealing briefly with the progress of mining as to principal districts, from which we quote the following extracts:

### WAVERLY.

Waverly was one of the earliest proclaimed districts. Rich boulders were found on "American Hill" in the fall of 1861, and shortly afterwards on Laidlaw's Hill, on the east side of the Waverly lakes. The latter place presented a valuable vein in a shape then new to miners, and attracted much attention. The vein was presented in a horse-shoe shape, with its apex pointing to the westward, and corrugated like logs of wood laying side by side. During the next three years about 5,000 tons of quartz were extracted by open work along the crop, and good average returns secured, with some extraordinary yields, in one case of 200 ounces from two tons. Finally

the surface water proved too much for the individual operators, and the workings were abandoned for many years. At present these properties and others have been consolidated, and a tunnel driven in to cut the lode at the level of the lake. As at this level and for some distance lower it is auriferous, it is expected to again prove a valuable property. There are probably other unseen veins below this one which would give large backs above the level of the lake. In West Waverly the Burkner property was for some years a large producer, having yielded nearly a quarter of a million of dollars, as was also the DeWolf property, yielding about 9,000 ounces. Several companies on the American Hill were amalgamated in 1864, and yielded during that year a profit of \$90,000. Other small operators in some cases did fairly well. These results were all obtained from shallow workings, in no case exceeding 300 feet. Some years ago a deeper working was made on the Tudor mine, but operations were suspended, I am informed, on account of causes other than the quality of the ore. A commencement was recently made to re-open and deepen the workings on American Hill, and it is believed by those acquainted with the district that it offers a most promising field. Up to 1867 there had been a yield of about 40,000 ounces of gold from 56,758 tons of quartz, from a narrow strip running through the district. The total yield up to date is 61,308 ounces, from 122,346 tons of quartz, or about \$1,200,000.00.

### MONTAGU.

The district of Montagu sprang into notice on the discovery of a boulder of quartz yielding \$1,600.00 of gold. This led to the opening of the Lawson lode which, after a career unprofitable on an average yield of over two ounces to the ton, fell into the hands of the Lawson Brothers. They worked it for about five years and extracted 10,000 ounces. After lying comparatively idle for a number of years it is being successfully re-opened by the Golden Group Company. This company also controls the Rose and DeWolf properties. The former was discovered by Mr. G. W. Stuart in 1879, and yielded large returns for some time, notably on one occasion 800 ounces from 80 tons of quartz. Finally it was lost on a fault.

The DeWolf property, after an uneventful career for some years, became known as the Annand Mine, and gave large returns for several years, when, owing to the death of the proprietor, little work was done until it came into the hands of the present owners.

The operations of the Golden Group Company, as far as they have been carried, are highly satisfactory. The Symonds-Kaye property has been intermittently worked. In this district operations have been confined to the south dip of the anticlinal, and there is a large unworked but promising field on the reverse or northerly dip. The yield of the district to date is 39,071 ounces, valued at \$742,349.00, from 22,652 tons of quartz.

### OLDHAM.

Work was begun in this district in 1862, and the following year saw eight crushers in operation. Up to 1884 an annual production of about 1,200 ounces was maintained, the yield in 1870 being 2,052 ounces from 2,644 tons of quartz. Among the leads worked during this period may be named the Britannia, Ohio, Sterling, Hall, Bonanza, Mayflower and Frankfort. At times very rich returns were made from small lots of quartz. Veins which passed obliquely from bed to bed were at one time quite extensively worked, and although small often gave rich returns, notably in one case 160 ounces from ten tons of rock. The work in this district having been, during this period, largely in the hands of individual operators on small areas, the surface is greatly cut up, and the veins practically worked only along the outcrop. Some work was done on a cross lead in the eastern end of the district, and in 1883 the Dunbrack lode began to show valuable quartz. Operations were carried on briskly up to 1893, and the following returns were made:—

Year.	Tons.	Ounces.
1885. ....	1,170	2,360
1886. ....	1,026	2,199
1887. ....	2,357	2,599
1888. ....	2,106	1,699
1889. ....	1,391	2,709
1890. ....	1,122	2,774
1891. ....	2,019	2,909
1892. ....	2,259	3,093
1893 (9 mos.)	2,389	3,171

The operations of Mr. Hardman were profitable, and conducted with skill and economy; and this pleasing page in the history of this district is due to his enterprise and energy.

Operations in the leading mines were discontinued from causes other than the impoverishment of the properties, and little has been done since.

### MOUNT UNIACKE.

Mining began here in 1867, and during the next few years several companies were working; however, the returns which rose in 1868 to 3,247 ounces, were maintained for twenty years at figures varying from 100 to 1,700 ounces. During part of time considerable attention was paid to the slate belts which were found to carry regular values over considerable areas. It may be found that in this district the best returns will be secured from these belts which often carry veins, auriferous, but not constant in their dimensions or values.

About this time an important discovery on the Withrow areas at South Uniacke diverted attention to the new district. A vein which yielded excellent returns was worked by the Withrow Company, and its extension was mined first by Thompson and Quick, and afterwards by the Golden Lode Company. All these parties realized profitable returns. Interesting information on the system of mining, etc., carried on by Mr. A. A. Hayward at the Golden Lode mine, has been contributed by him to the proceedings of the Nova Scotia Mining Society. The history of this mine is instructive. After declaring numerous dividends from a rich strike which was followed about 1,800 feet from the surface, it was found that the streak increased in dimensions, but fell in value to about two ounces to the ton. Several thousand dollars were found to be needed to increase the production to maintain the gold output. However, the company would not do this, and the mine after standing for some time has passed into other hands.

### RENFREW.

Work was begun here in 1862, but little was done until 1866, when the return showed 6,423 ounces from 6,003 tons of quartz. The following year showed an increase of 1,500 ounces, succeeded by an increase down to ten ounces in 1874. Since that date the yield has fluctuated up to 1,679 ounces. Among the earlier companies may be named the Hartford, Colonial, Ophir, Renfrew and McClure. It

1883 the Empress Company was started, and worked with much energy and ability. However, operations in the district have practically been suspended for some time.

This is one of the most promising districts in the province, and a part only of the belt has been explored. Judging from the gold in the surface soil there must be other leads in it worth working.

CARIBOU.

This name is given to a district lying to the south of the upper waters of the Musquodoboit River, and includes the two districts generally known as Moose River and Jennings, or Caribou. It was proclaimed in 1870, but mining had been carried on to some extent during the two previous years. The returns, although not large for a number of years, showed good averages, and in many cases proved satisfactory. The North, South, Hyde, Comstock and other leads were worked, often with good returns.

In 1881 the Moose River Gold Company carried on extensive workings, but they were abandoned, as the value of the leads opened diminished. Before closing, however, this company demonstrated that it had extensive deposits of low grade ore on its property. Since then large amounts of this low grade ore have been passed through their ten stamp mill by Mr. McGregor, and show an average of about six pennyweights to the ton. As these operations were profitable on a small scale there should be an opportunity for its systematic working. On the Touquoy and adjoining properties there appear to be similar supplies of low grade ore in addition to workable veins, which are being extensively developed by the Touquoy Gold Mining Company and others. The slate and surface earth of the Moose River district has received much attention so far with satisfactory results, even on a very small scale of working, and in this connection the following figures are interesting. There were crushed in the Moose River mill from 1881 to date, 30,640 tons of slate and low grade ore, with some lots of richer quartz, yielding 9,725 oz., 2 dwts. 21 grains, or an average of 6 dwts. 8 grs.

The returns made by Mr. Touquoy, from his ten stamp mill, from 1888 to 1898, including some lots of fairly rich quartz, show that 60,943 tons of slate and surface ground yielded 8,640 ounces, an average of about 2 dwts. 20 grains. This work yielded a uniform profit, and lower averages per ton will be shown further on to have also yielded a profit.

In Caribou in 1884 the Lake Lode mine was opened by Mr. Stuart, and worked by Mr. Wadsworth and by Mr. Saunders, and is now being extensively developed by the Guffey-Jennings Gold Mining Company. Large amounts of gold have been taken from this property, and a bright future is anticipated for it. In the same locality the Dixon, Truro, Hetherington, McDonald, Elk and other mines have been opened and worked successfully. The scheme for operating a number of these mines under one management, which is said to be in progress, should prove satisfactory, especially as a large mill in common for all would find abundance of low grade ore in addition to the proved veins. Up to date about 106,172 tons of quartz have yielded 40,805 ounces, valued at \$775,295.

SHERBROOKE.

This has been the most important of our districts, although it has had also its seasons of dulness. My space forbids any attempt to give the history of the operations that have been carried on here. Among the veins that have been worked may be mentioned the Cumminger, Hewitt, Hayden, Blue, Palmerston and Dewar. The following table shows the returns year by year from the district :-

Year.	Tons.	Ounces.	Year.	Tons.	Ounces.
1862....	663	2,023	1880....	6,465	4,042
1863....	3,454	3,304	1881....	5,277	2,580
1864....	2,673	3,419	1882....	6,251	2,542
1865....	2,511	3,424	1883....	8,470	3,356
1866....	2,853	5,829	1884....	3,268	2,668
1867....	7,378	9,463	1885....	2,426	1,238
1868....	9,880	7,070	1886....	2,850	1,341
1869....	11,500	5,546	1887....	2,413	585
1870....	11,428	7,134	1888....	2,858	535
1871....	13,882	6,579	1889....	1,618	243
1872....	5,243	4,188	1890....		
1873....	7,187	5,026	1891....	464	119
1874....	5,430	4,037	1892....	893	179
1875....	6,443	5,818	1893....		
1876....	6,205	5,176	1894....	708	552
1877....	8,654	8,237	1895....	3,397	1,942
1878....	9,340	6,843	1896....	7,177	3,287
1879....	9,209	7,389	1897....	12,659	4,181

representing a total value of about \$2,422,576.00.

The quartz mined in this locality has generally been of a high grade, and there can be no doubt that there are many more rich pieces of ground. The district moreover presents several localities which should be profitably worked on a low grade basis.

Crow's Nest and Cochrane Hill are included in this district, but have never contributed materially to its production. The search in these localities has been until recently for rich veins, when its capabilities for extensive low grade areas have been recognized. In this direction there is undoubtedly a future before them, as the numerous locally rich veins are accompanied in many cases by slates more or less mineralized.

WINE HARBOR.

This district for a few years during its early history yielded some good returns, but for a number of years past attempts at development have not been markedly successful. No reason can be given for this, as the geological conditions are apparently the same as elsewhere, and some of the veins were profitably productive. The total returns to date are 29,458 ounces from 43,322 tons of quartz.

SALMON RIVER.

This district was opened in the year 1880, and work commenced in 1881 with a twenty stamp mill driven by water power. The yield for that year was 1,758 ounces. The following year the Hattie mine was opened on what was believed to be the eastern extension of the Dufferin vein, but the operations were not long continued. In 1885 operations had reached a depth of 150 feet, and the vein had been followed for nearly a thousand feet, and the yield that year was 4,924 ounces from 10,880 tons of quartz. Increased power having been secured, the mill which had for some years contained thirty stamps had its capacity increased by ten more.

This vein, which in structure is very similar to the saddle back veins met in the Bendigo gold district, Australia, has been one of much interest to miners. It showed at the surface, and on being followed down it divided, going down on each side of

the anticlinal, and increased in thickness, giving in places over fifteen feet of crushing material. Under this folded vein cross cuts have shown the presence of other veins.

The workings of the mine has been discontinued more or less during the past few years owing to change of ownership and litigation, but at the date of writing it is being reopened and provided with a thoroughly good equipment, and is expected shortly to resume its leading position among our gold mines.

The following are the returns received, almost exclusively from the Dufferin mine :-

Year.	Tons.	Ounces.
1881.....	1,640	1,785
1882.....	3,460	4,315
1883.....	7,602	3,885
1884.....	9,799	3,397
1885.....	10,880	4,924
1886.....	11,628	6,509
1887.....	10,602	3,258
1888.....	9,925	3,354
1889.....	7,633	2,032
1890.....	6,415	2,070
1891.....	5,210	1,406
1892.....	4,220	1,042

TANGIER.

This was the earliest district. For the first few years operations were much hindered by the numerous small areas held by individuals. The greatest production was during the years 1869-70-71, when 6,988 tons of quartz gave 5,099 ounces. During all other years the yield has been under 1,000 ounces. Recent developments in the northern part of the district, and a short distance east of the Tangier River, promise a development on a larger and more permanent scale. The total returns to date are 20,491 ounces, valued at \$721,183, from 43,092 tons of quartz. In this are included the returns from the Mooseland mines in the northern part of the district, which has not yet received the attention it deserves.

FIFTEEN MILE STREAM.

This district, situated at the head waters of the Sheet Harbor River system, has always been largely an object of interest to the people of Pictou County. Its comparatively inaccessible position retarded its development for a number of years, but roads are now built into it, and during the past few years its undoubted value has been shown by the enterprise of New Glasgow capitalists. The following sketch of the principal mine operating in the district will be of interest :-

In 1886 the Egerton Gold Mining Company succeeded the Hall-Anderson Company at Fifteen Mile stream. They worked with a 10 stamp mill for four years and were fairly successful. In 1890 the "Egerton" sold out to the present proprietors, who organized the New Egerton Company, and placed Mr. Jas. A. Fraser in charge as manager. A new 15 stamp mill was at once erected, and the new company were soon on a good paying basis. During the first two years, (1890 and 1891,) nearly 4,500 ounces of gold were secured. Though operations were confined during the next two or three years mainly to developing the property, the yield of gold continued sufficient to meet all running expenses and pay for extensive improvements in machinery, etc. In 1893 an amalgamation was effected with the Stanley Gold Mining Company, which had been operating for some time in the district, and had erected a large dam and a 10 stamp water mill. During the years 1895-96, and the early part of '97, the company was particularly successful, the yield of gold for 2½ years averaging 225 ounces per month. In the summer of 1896 a new 30 stamp mill had been built, thoroughly equipped with new air compressor, etc. The first half of 1897 saw great attention paid to development work under the guidance of an experienced mining engineer. Notwithstanding this the mine continued yielding its regular returns till a severe crush in October caused a temporary abandonment of work. It was deemed advisable to resume operations on the open quarry system, and the past winter was spent in removing the surface and otherwise preparing for this new system of working. On May 1st operations were resumed, working on an open cut with a belt of over 120 feet.

A Lidgerwood overhead cable-way has been put in, succeeding the old-fashioned tramways, as a carrier of rock to the mill. Ten additional stamps have been placed in the Stanley mill, which is now being operated with 20 stamps. This, with the 30 in the "Egerton" mill, makes a total of 50 stamps now operated by the company.

The property of the company embraces 300 mining areas at Fifteen Mile Stream, together with 4,000 acres of woodland from which fuel is obtained.

In 1896 the company was incorporated under the laws of Nova Scotia as the New Egerton Gold Mining Company, Limited. Mr. James D. McGregor of New Glasgow, is president, and Mr. Geo. F. McNaughton is, and has been since 1895, resident manager. Mr. McNaughton's management of the property has been particularly efficient, and has been rewarded with pronounced success.

The returns of the company show that since their purchase of the Hall-Anderson Company property, 35,698 tons of quartz have yielded 17,617 ounces of gold.

Among the other districts that of Central Rawdon is interesting. Here the veins run across the measures, and two of them are found to unite in depth, thus reversing the method in which they are often presented in the other districts. Since 1880, 4,814 tons of quartz yielded 6,648 ounces of gold.

STORMONT.

The returns to date from this district show 48,522 ounces from 109,016 tons of quartz, etc. The history of this district for many years was similar to that given for the others. Some rich leads were worked profitably, and their abandonment left the district non-productive for a time. Attention has however been always directed to it as frequent rich returns were made from new veins, and numerous indications of gold bearing veins were found over a tract several square miles in extent. Finally a new anticlinal system, known as the Richardson, was found to the north of the Mulgrave or Isaac's Harbor anticlinal. A number of mines have been opened on these and on the Country Harbor Narrows and Forrest Hill anticlinals. The Doliver's Mountain and Richardson section present large and strong veins and belts, holding good gold values, and highly mineralized. There is undoubtedly room here for several mines like the Richardson, but worked with more attention to the tailings and concentrates. The workings of the Richardson mine, of which I give a few details further on, are of particular interest, as they have materially added to the proof that we can mine and work profitably deposits which a few years ago were considered beneath the miner's notice.

The output of the Richardson mine to date has been 12,327 ounces from 80,380 tons of quartz—and of the district, 48,522 ounces of gold valued at \$921,918.00.

"Up to the present time this property has produced 43,000 tons of ore, which goes to show that the mining of low grade ores in Nova Scotia at a reasonable cost per ton, has got beyond the experimental stages and is a reality. The handling of the refractory ores has yet to be experimented with, and from the appearance of nearly all the ore I have seen along the Gold group anti-clinal I am of the opinion that material for the experiment is not lacking."

Through the kindness of George A. Pyke, Esq., President of the Richardson mine, I am enabled to give the following interesting figures:—

As promised, I beg to furnish you with an exhibit of the operations of above company for the past year, just closed, as follows:

#### Forty Stamp Mill.

Total tons crushed. . . . .	25,300 tons.
Total gold won . . . . .	2,879 oz.
Product per ton . . . . .	2 dwts. 6 1/2 gr.
Cost per ton, labor . . . . .	\$1 15 1/3
" " " all charges, including renewals to machinery . . . . .	\$1 83 1/3

For the past year, after providing and paying for every dollar of expenditure in connection with the running and thorough maintenance of the property in the highest state of efficiency, and leaving a balance of several hundred dollars on hand, the original shareholders have received dividends equal to 29 1/2 per cent. on their outlay.

Yours truly,

J. W. CRICHTON.

#### BROOKFIELD AND OTHER DISTRICTS.

In the western part of the province Malaga, Brookfield, and Whiteburn have been the largest producers. These districts are comparatively new, and at first some very promising veins were opened and extensively worked, but little is now being done at Whiteburn and Malaga. Brookfield is interesting as it has the first chlorination plant built in the province. This was put up by Mr. W. L. Libbey and associates, and is run in connection with a valuable property owned by them. This plant has been in successful operation for some time. Mr. Libbey is prepared to treat, on reasonable terms, any parcels of concentrates that may be forwarded to him, guaranteeing an extraction of 90 per cent of the assay value. He is also prepared to make working tests of small quantities of ore as to their adaptability for chlorination, etc. This should supply a favorable opportunity to our gold miners to get information as to the values of their concentrates. Mining has also been carried on at Leipsigate, Gold River, Block House, and a number of other places in Lunenburg and Queens Counties, but they have not yet been worked on a scale commensurate with their promising indications. There is no doubt that all these districts would repay proper examination and development, as they differ in no respect, that I am aware of, from these opened to the east of Halifax.

## NELSON NOTES.

NELSON, B.C., Sept. 17, 1898.

Favored by the most perfect weather one could desire, all who can get away are out in the hills prospecting, and many others, who cannot leave their business so long, are taking advantage of the warm, bright days to camp out—generally on the shores of the lake. This absence of so many inhabitants makes things generally rather quiet, and business men are mostly inclined to grumble at their reduced income, but we all feel it is entirely temporary and that a very few weeks will find our pretty town in its usual busy state.

#### NEW FINDS ON ROVER CREEK.

Great excitement has been caused recently by the re-discovery of gold on Rover Creek, some 12 miles or so from Nelson on the Kootenay River, and the idea of a young Klondyke so near home has been the cause of a great rush to stake claim in that neighborhood. Rover Creek has been known as a gold-bearing creek for many years, and to this day can be seen the remnants of sluice boxes and such things appertaining to placer diggings, whilst the adjoining creeks, "Forty-nine" and "Bird," have been worked, more or less, by Chinamen, probably since the first discovery of the precious metal. Bed-rock has not been reached yet to my knowledge, but it may vary from 10 to 50 ft. from the surface—the usual "wash" overlying it to that depth, so that considerable work must be done by those who expect to make their fortune so near home. No reliable details are to hand yet as to the average richness of the ground, but I have peculiarly good grounds for knowing that about \$2.50 was obtained from some 2 or 3 yds of dirt washed, the gold being in very small flat nuggets as usual, and accompanied by the black sand (magnetic iron) that is so common. Larger nuggets are reported to have been found, up to 3 or 4 dollars, and of course such a thing may be expected, as at the head of the West Fork is still the remains of a milling plant which was abandoned some eight years ago and has remained idle since, the reason being given that it was doubtful if there was a real vein or not. Whether this latest excitement will be permanent or merely a transitory affair, time alone can show, but gold is certainly there.

#### SALE OF THE NELSON-POORMAN.

On Eagle Creek, close by, but nearer to Nelson, is the "Nelson-Poorman" mine, a free milling (and concentrating) property, which has been worked pretty steadily by its owners for many years and has returned very handsome profits—it is said, indeed, that the owners would run the concern for a month or two, then clean up, and go to "fresh fields" for the winter on the proceeds. This property has now changed hands, and has been formed into a company who will do far more development work than the former owners could undertake; and there is every reason to believe that the new company will find it an even more profitable venture than it has been hitherto; already, indeed, it is reported that good ore has been struck by a new tunnel, which taps the vein some 200 ft. lower than the old workings, (thus proving the continuity of the ledge,) which returned some \$90 per ton when treated at the Nelson smelter.

#### ROYAL CANADIAN AND GRANITE CLAIMS.

On the same creek (Eagle) are situated the Royal Canadian and the Granite groups, both of which are being energetically developed and are showing very nice free milling ore, averaging, perhaps, some \$50 per ton. A stamp mill will be erected shortly, and it is sincerely to be hoped that everything will continue to pan out well.

#### HALL MINES.

The Hall Mines seems to be determined on having more than one string to their bow, and have recently bonded several very promising claims in both West and East Kootenay, evidently they do not propose to rely on the produce of the Silver King to supply their big smelter, but to have other sources in addition. A good deal of custom ore is now being treated by this company, and likely enough the lead furnace will be blown in again shortly for another campaign, as some of the Silver Cup ore from Trout Lake, and some Ainsworth ores, all leady, are in stock.

#### TOAD MOUNTAIN.

Toad Mountain is still keeping up its reputation as a good mineral bearing locality, the numerous assessments that are being done on the scores of claims continually disclosing fresh bodies of good ore. Some of the latest strikes have been made upon the North Star claim and its extensions, the Great Eastern and Great Western, in all of which good value in gold have been found, and it appears to be partially, anyhow, free milling. The rock is quartz and schist, with auriferous pyrites and free gold.

#### THE ATHABASCA.

Close by is the well known Athabasca group, upon which a very fine showing has been found, very rich in free gold, though this is probably merely a pocket from the description so far given. Still it is such pockets and small veins of very rich stuff that make a paying mine, and with the present careful management there seems no reason why the Athabasca should not soon be in the list of dividend payers. As all these claims are in the immediate vicinity of Nelson, it is obvious that a slight temporary depression of business need not cause the least uneasiness as to the future prosperity of the town.

#### AINSWORTH CAMP.

Ainsworth, that old established mining camp, is rather more busy at present, development work being actively prosecuted on the Twin mine, and several others notably perhaps the Black Diamond, Little Phil, and Highlander also shipping good ore—some of which has found its way to the Nelson smelter.

#### THE FERN.

The Fern mine, often spoken of in previous notes, reports very favourably of the work done and results obtained. A recent clean up showed that from 265 tons milled, the concentrates had a value of some \$40 to \$60 per ton, while the amount saved on the plates indicated an average of perhaps \$25 per ton of ore treated. The plant so long expected for the cyanide treatment has arrived and is being put in to place, when this is completed much better results should follow.

#### ACTIVITY AT YMIR.

At Ymir also, a little further south than the Fern mine, great activity is reported; all the best developed prospects being now equipped, or about to be, with the latest machinery for working the mines. The Dundee is putting up a 10-drill compressor plant, and a concentrator. While at the Ymir mine the foundations are being made for a 40-stamp mill. The Porto Rico is asking for more men, and the saw-mills have their hands full all the time.

#### BIG HORN GROUP.

A big strike is reported from the Big Horn group on Hidden Creek, which is said to be one of the best things found in that good camp, while the Wilson Bros. like the Hall mines, are bonding several claims in that neighbourhood so as not to be entirely dependant on their Last Chance group on Toad Mountain.

Altogether the outlook for West Kootenay in general, and for the Nelson district in particular, is extremely bright, and it is not easy to see what can stem the tide of prosperity that appears now to be setting towards us.

A. H. H.

## CARIBOO, B. C.

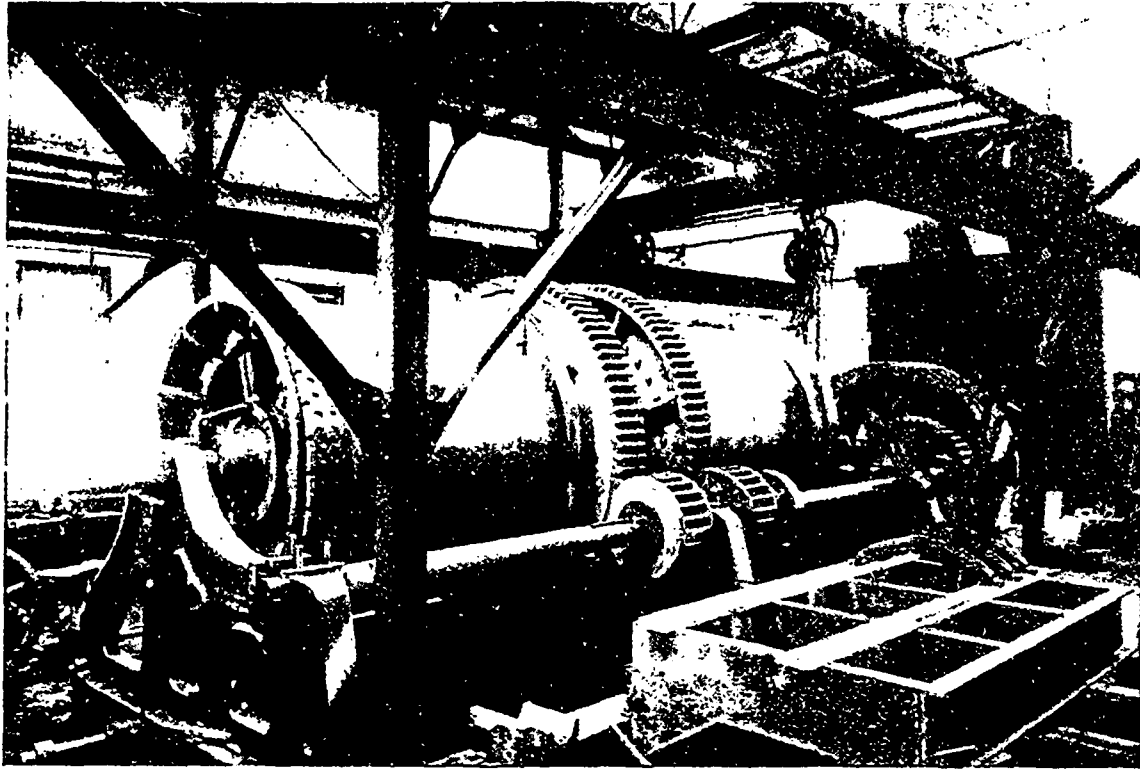
Revelstoke, 1st Sept 1898.

J. Pinkerton has bonded his hydraulic claim on Lowhee Creek to an English syndicate, represented by a Mr. Bremner, for \$4,000 cash and \$40,000 in deferred payments. Mr. Bremner has also bonded the Consolidated Eleven of England gravel property, owned by W. H. Woolcock, H. Jones, F. J. Tregillus, W. S. Beely, A. H. Beely and A. Johnston. The terms are not known, though the amount is large and a cash payment was made. The property comprises about one mile of Lightning Creek, just below the town of Stanley. The creek from two miles above Stanley down to the upper end line of the Eleven of England has yielded \$10,000,000. It seems that the only means of opening the Eleven of England is by a long drainage tunnel, requiring much more money than local people can afford. If this is done a very valuable mine will be developed.

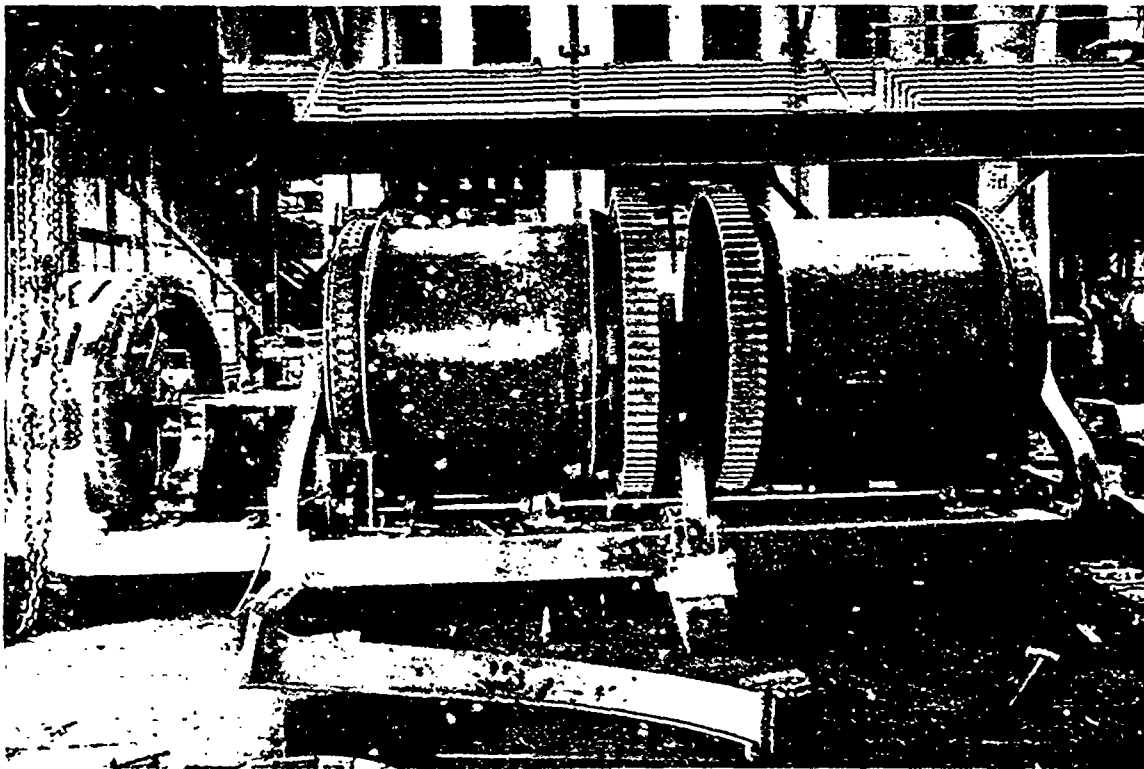
The Lightning Creek Gold Gravels and Drainage Co. has begun a tunnel on lower Lightning Creek near Wingdam Hill, about fourteen miles below Stanley. The scheme, which was promoted by a Major Moore, is being industriously loomed by a British Columbia mining journal. It is locally viewed as a wildcat. There is no known or probable pay drift diggings on Lightning Creek within ten miles of where this company's tunnel will reach bed-rock. The flotation of this operation contains a feature somewhat new: stock is not sold, but bonds, secured by the stock, are offered the public with apparent success.

A subsidiary company of the new Slough Creek Co. is opening a bench hydraulically on Slough Creek near Burns Creek. Some heavy development work is being done including five miles of ditch. S. Mendicott is manager.

The Cariboo Gold Fields elevator on Williams Creek near Barkerville has made a good beginning in rich gravel. The water supply having been found insufficient the trouble is being partially remedied by the construction of a dam at Ground Ho. Lake. With an adequate supply of water this will be a very profitable mine. About \$400,000 has been expended to date.



NEW LARGE ELECTRICALLY-DRIVEN HOISTING ENGINES FOR THE WAR EAGLE MINE, B.C.  
Manufactured by the Jas. Cooper Manufacturing Co., Limited.



NEW LARGE ELECTRICALLY-DRIVEN HOISTING ENGINES FOR THE WAR EAGLE MINE, B.C.  
Manufactured by the Jas. Cooper Manufacturing Co., Limited.

At Slough Creek drifting continues steadily under the efficient management of J. Hopp.

The Cariboo and Yukon Gold Fields, Ltd., is prospecting for the deep channel of Upper Antler Creek near Saw Mill Flat. A tunnel has been driven 150 ft. at a right angle to the creek, and a blind shaft sunk 25 ft. As the tunnel is only 4 ft. above bed-rock at the entrance, it appears that the channel has been found. H. Boursin is in charge during the absence of Mr. Carry, who is in the Yukon country.

The Olsen bucket ladder dredge is working smoothly in pay on Quesnelle river, twenty-one miles above Quesnelle.

At the Waverly hydraulic on Grouse Creek a reservoir is under construction.

The heavy rainfall this summer has made this an unusually prosperous season for the hydraulics.

The Big Valley Creek Mines, Ltd., is to be reorganized and work will soon be resumed.

On a bench on Williams creek, directly opposite Barkerville and overlooking what were formerly the richest pioneer diggings, three Chinamen are taking out on an average of 60 ounces of coarse gold a day, one nugget weighing 35 ounces. They sunk to bed-rock on an old channel, which is 40 feet above the present channel of the creek, and has 8 ft. of gravel above it, and they are now working in a cut 40 ft. wide. This strike has caused a revival of excitement around Barkerville and a number of men have taken to prospecting the upper benches.

The Cariboo Consolidated, which took out about \$87,000 from six weeks' work in its spring run, started its fall run the first of September.

### The War Eagle's New Electric Hoisting Plant.

On another page we reproduce photographs taken from a large electrically driven Hoist built for the War Eagle Consolidated Gold Mining and Development Co., of Rossland, B.C. These were taken at the shops of the manufacturers, the James Cooper Manufacturing Co., Limited, Montreal, during the erection of the machine. The Hoist is remarkable in more respects than one, principally that it is the largest Hoist ever built to be operated by electricity, and for this reason alone should receive a good deal of attention from the mining public. It supplies the first link in a new era of power developed in the Kootenay District. The Hoist is designed for a double compartment shaft 3,000 feet in depth, to lift a load of 8 tons on a single line at an average speed of 750 feet per minute. One photograph shows the Hoist from a front view and the other the back view taking in the operating platform. The drums are 72" in diameter by 5 ft. face, and are of the "Cooper" patent friction drum type. As shown in the photograph they are provided with enormous band brakes of the differential clutch type, which are operated from the platform by hand levers with latches working in a yoke with serrated teeth.

The Motor is furnished by the Canadian General Electric Company, and is designed for alternating currents of 2,080 volts. The Motor runs at a speed of 300 revolutions per minute, which is geared down to 160 revolutions per minute on the main driving shaft of the Hoist proper, by means of cut steel gears and pinion. From the main driving shaft the large gears are operated by pinions. The Motor is reversible and acts in the same way as the link motion Hoisting Engine, a further provision being made for stopping the momentum by providing the Motor shaft with a hand friction wheel, which is operated from the platform by means of both a hand and foot lever.

As clearly shown in the illustration, the drums and Motor rest on a heavy box girder bed frame which underlays the whole machine and carries the side frames for the drums and shaft. As partially shown in the photograph the operating platform consists of a system of girders which carry the segments for operating levers. The platform is raised considerably higher than the base to give the operator a clear view of the whole machine. This platform also supports the controller for the Motor and directly in front of the operator is placed two indicators for locating the exact position of the cage in the shaft.

The whole arrangement is well studied out and arranged to be easily operated by the system of hand levers as partly shown in the photograph.

Both drums are loose on the drum shaft and are entirely independent of each other in operation: they may be thrown in and out of gear while the Hoist is in motion, either separately or together, or one drum may be lowering while the other is hoisting, or both drums may be thrown into gear and the Hoist used as a regular reversible Engine; one load being hoisted while the empty cage is being lowered; this arrangement becomes absolutely necessary in mining where work is progressing at a number of different levels. It is perhaps difficult to get a clear idea of the magnitude of the Hoist from a photograph; some idea, however, may be formed of the size, when it is known that the drum shafts are 7" in diameter, the main driving shaft 6" in diameter and the motor shaft 8" in diameter. The whole machine is of very massive design and calculated to stand the heaviest duty. The Hoist weighs, finished, including the electrical apparatus, about 120,000 lbs., or 60 net tons.

The machine was designed and built at the shops of the James Cooper Manufacturing Co., Limited, Montreal, and it says not a little for a Canadian machinery firm to have executed a work of this magnitude.

During the year ending 1st July the mill of the Cariboo Mining, Milling and Smelting Company at Camp McKinny, B.C., crushed 6,770 tons, yielding \$121,270 in bullion, and \$17,943.64 in concentrates. The property is reported to have been acquired by a Toronto Syndicate, who will operate it under title of the Cariboo Consolidated Mining and Milling Co. of British Columbia. The present battery of ten stamps will be doubled.

The Olive Gold Mining Co. is adding a 10 stamp battery, an air compressor and hoisting machinery to its plant. The outlook of this Seine River property is reported very promising.

## MISCELLANEOUS.

The North Star mine, near Fort Steele, is sinking a new shaft to be put down 300 ft., and an order for new hoisting machinery has been placed.

A rich strike is reported from the Sullivan group near Fort Steele, B.C.

The Mines Development Trust and Guarantee Company recently issued a preliminary prospectus. It has a capital of \$50,000. The prospectus sets forth: 1. That it will act as custodians of pooled stock for the various companies in British Columbia. 2. Act as general stock transfer agents for the facilitation of prompt disposal of shares. 3. Act as vendors (on commission), to purchasers of mines and mining properties and other industrial enterprises. 4. To acquire by purchase or bond, mineral claims or prospects in British Columbia. 5. To develop the same to a limited extent, and thereafter either sell them or incorporate them into working companies. The prospectus claims that there will be no promotion money or profits to the promoters, and that every subscriber to the stock of the company shall be *pro rata* an owner at first cost. No property can be purchased without the report of its consulting mining engineer having been first made. There are 49,000 shares, which are considered as ordinary, fully paid and non-assessable, and 1,000 shares are issued as debentures in multiples of 50, at 5 per cent. interest. The directors are: A. Marsh, H. Gerdwood, E. M. Ruff and George Parker of Toronto, Ont.; secretary, Chas. E. Benn; consulting mining engineer, Charles Parker of Rossland, B.C. The company has acquired some copper properties in Windemere Division, East Kootenay.

In a recent contribution to the *Engineering and Mining Journal*, on the Lillooet District, B.C., the writer refers to the Golden Cache as follows:—"Early in 1890 the placer miners began to give serious attention to prospecting for quartz veins. A half-breed named Copeland discovered some rich float on Cayoosh Creek, which empties into Fraser River about two miles below the town. This led to the location of the "Golden Cache" group of mines on that creek, which was followed by a stampede resulting in the staking of the entire country. The history of the Golden Cache in 1897 is well known. The Vancouver purchasers from the locator stocked the company at \$500,000 capital, reserving one-half of the stock for themselves. They afterward sold a portion of their holdings for \$185,000 cash to a wealthy Englishman, erected a 10 stamp mill, made a run and cleaned up about \$4 per ton. The usual result followed, the stock dropped from \$2 to 10c. per share, and Cayoosh Creek mines received a black eye. Many of the claims staked and recorded were abandoned and bonds held on some properties forfeited. During the spring of 1898 the Golden Cache mines were started up again, the capacity of the mill increased to 20 stamps, air compressor and drills introduced, and at this writing the interested shareholders and public are anxiously awaiting the results of another mill run to be made soon."

A smelting plant is to be erected shortly on the Van Anda mine, Texada Island, B.C.

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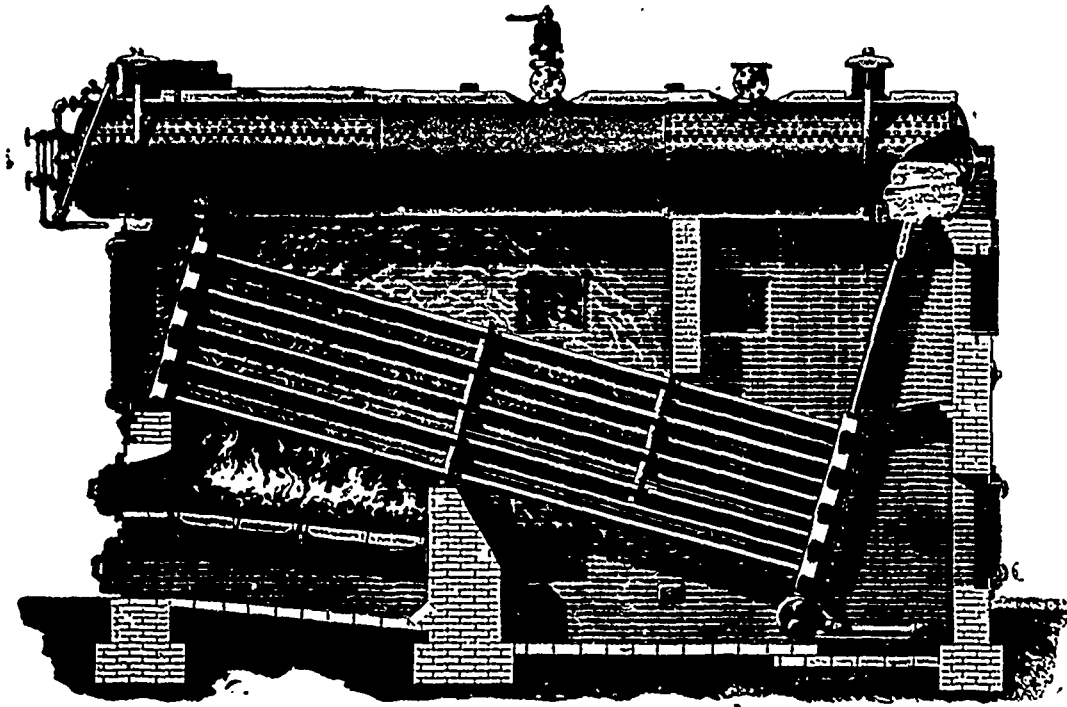
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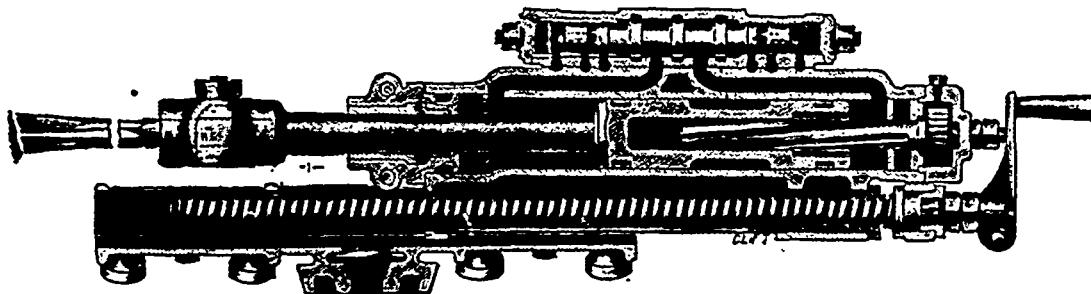
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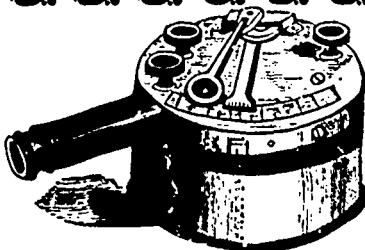
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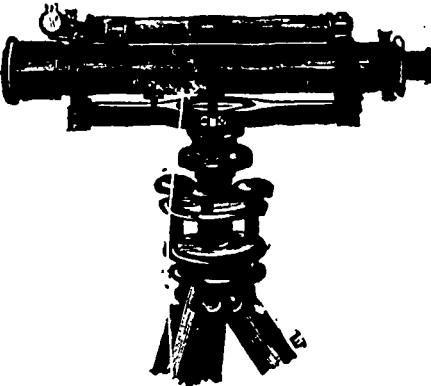
The royalty collected on gold output of the Yukon for the seven months ended July last, is officially reported to amount to \$351,783.

On the Miocene Company's works, on the Horsefly, Cariboo, B.C., the shaft is down about 400 feet, and superintendent Campbell is now driving out from the bottom of the incline to tap the bottom of the channel. Strong hopes of rich ground being found are entertained. The depth of the old channel was much greater than was expected, and the work has been done under great difficulties. It will mean the opening up of a vast field if the company are successful.



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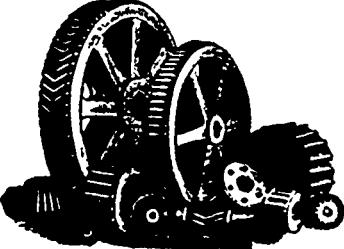
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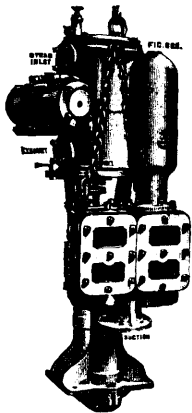


Fig. 620—"Griff"  
Sinking Pump.

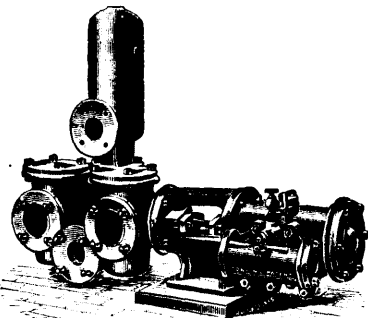


Fig. 598—"Cornish" Steam Pump  
for Boiler Feeding, etc.

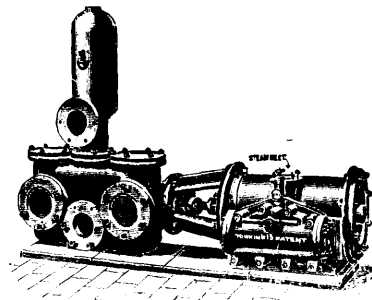


Fig. 600—"Cornish" Steam Pump  
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Fig. 621—"Cornish" Sinking Pump (Ram Type).

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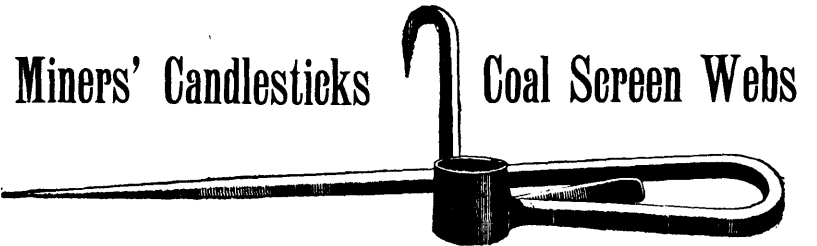
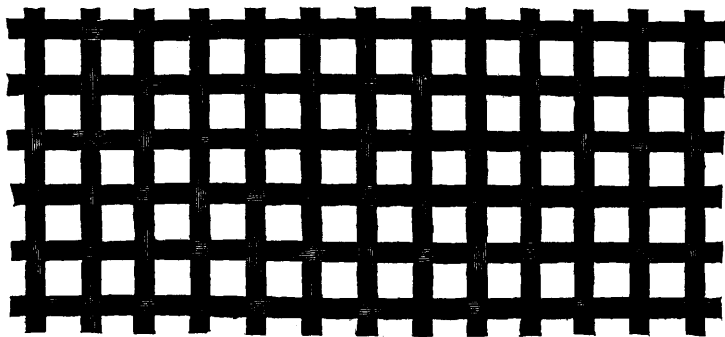
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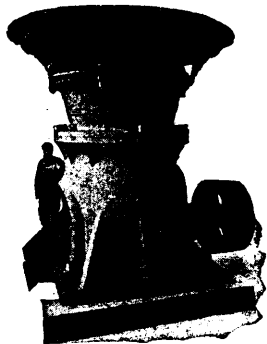
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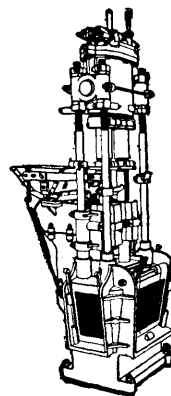
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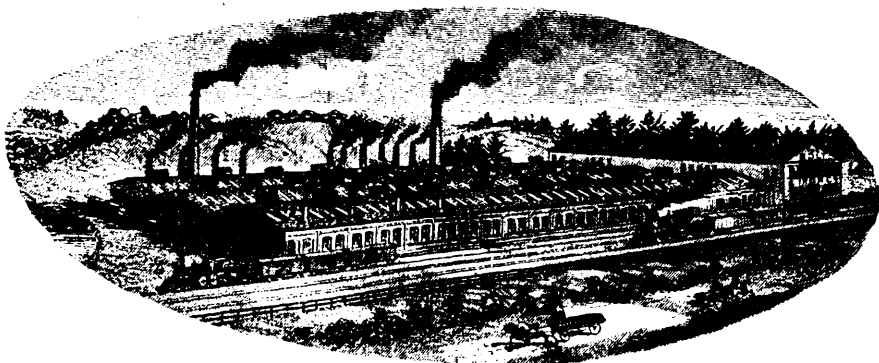
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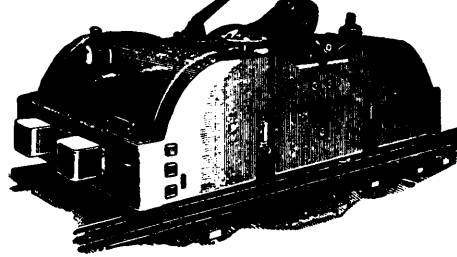
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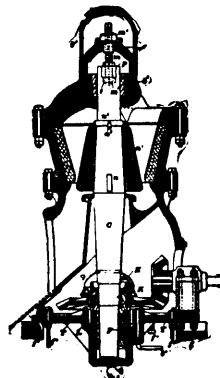
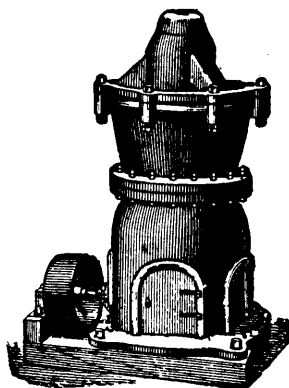
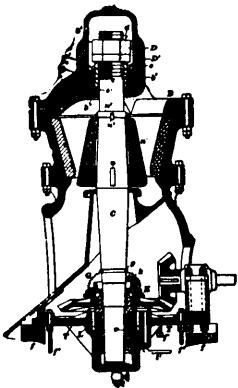
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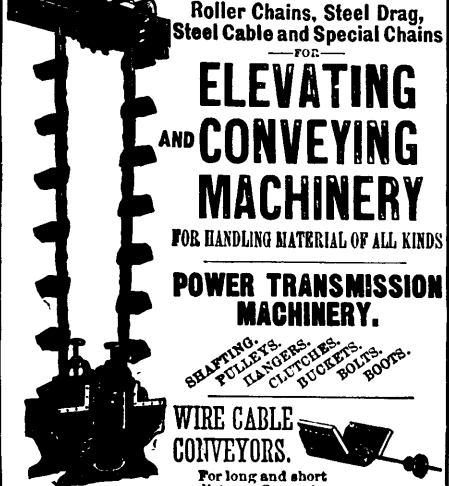
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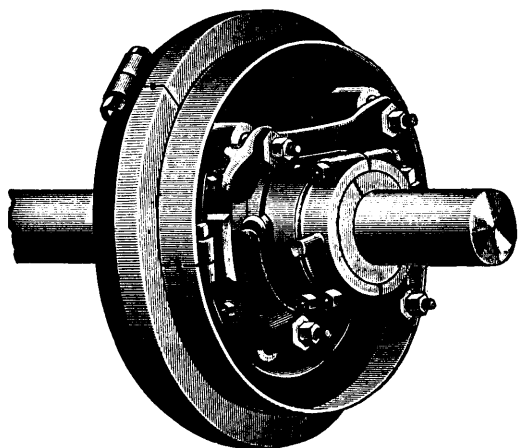
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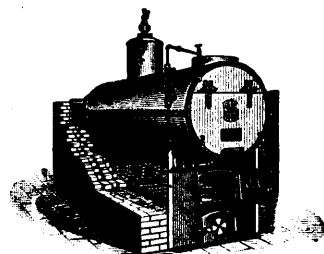
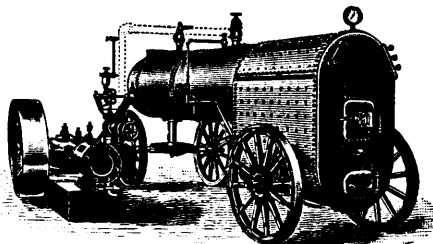
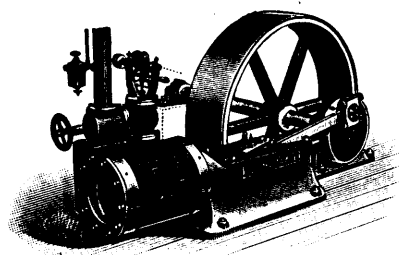
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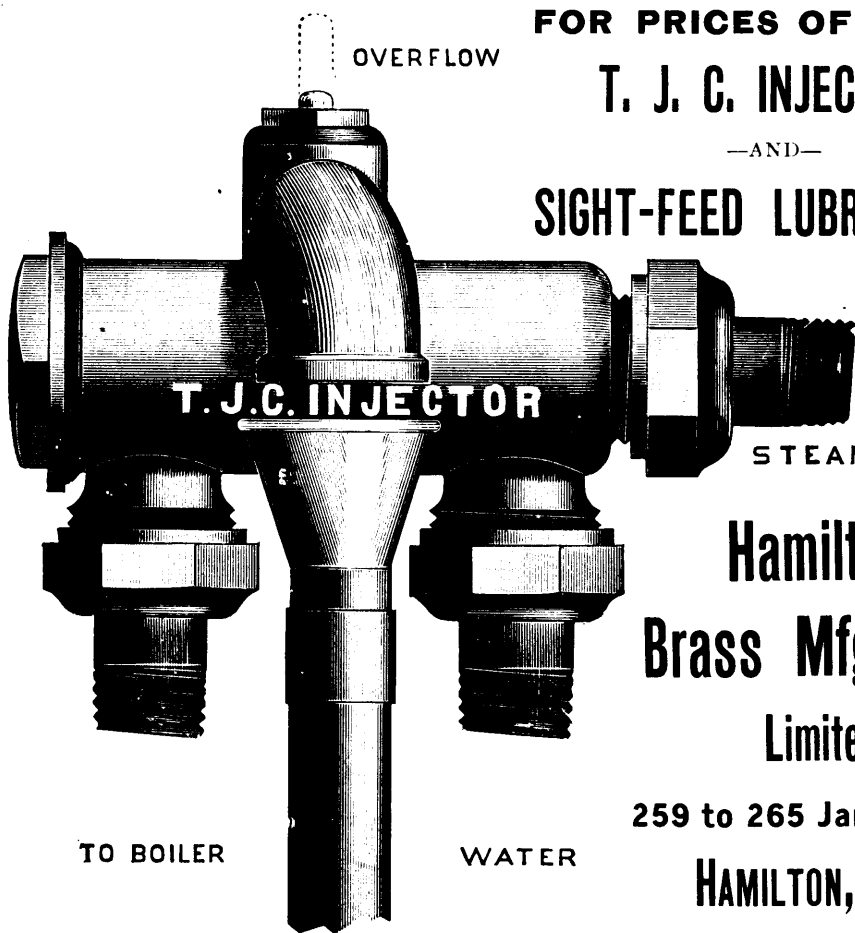
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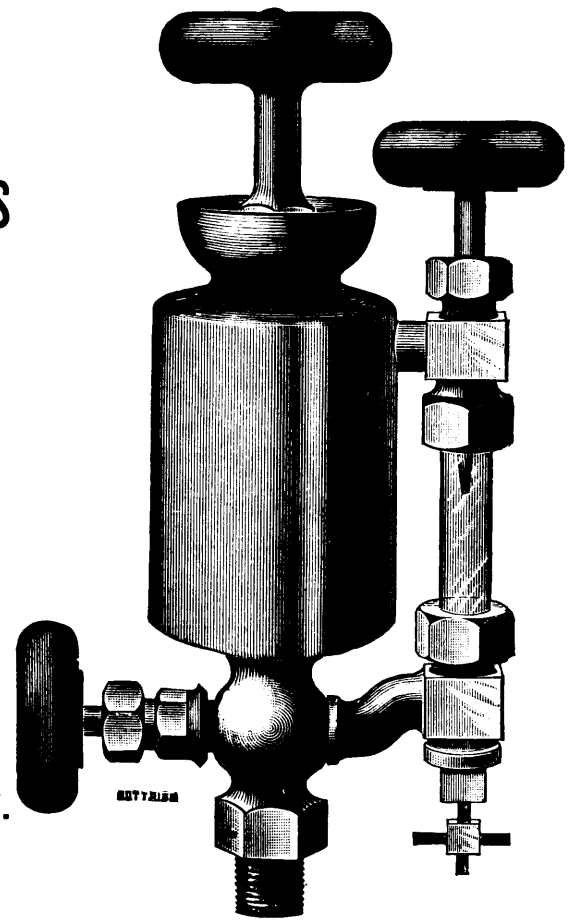
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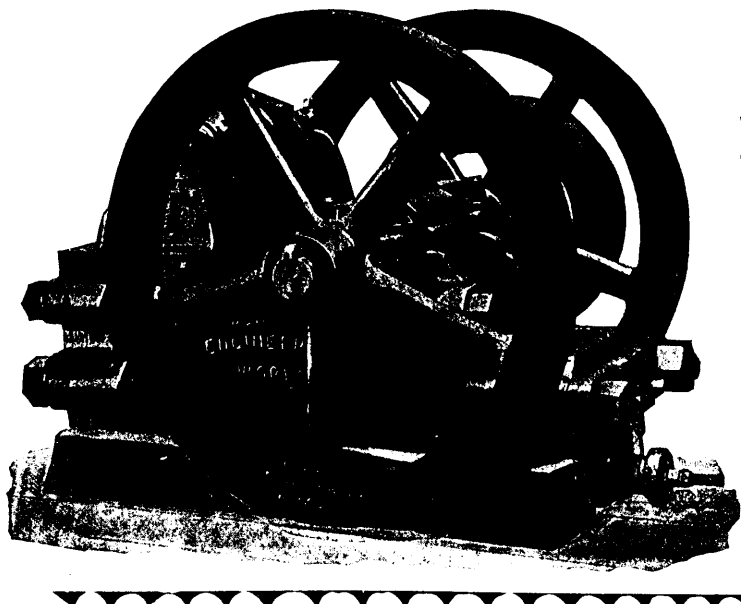
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"LANG'S" PATENT WIRE ROPES FOR COLLIERY AND GENERAL MINING PURPOSES.

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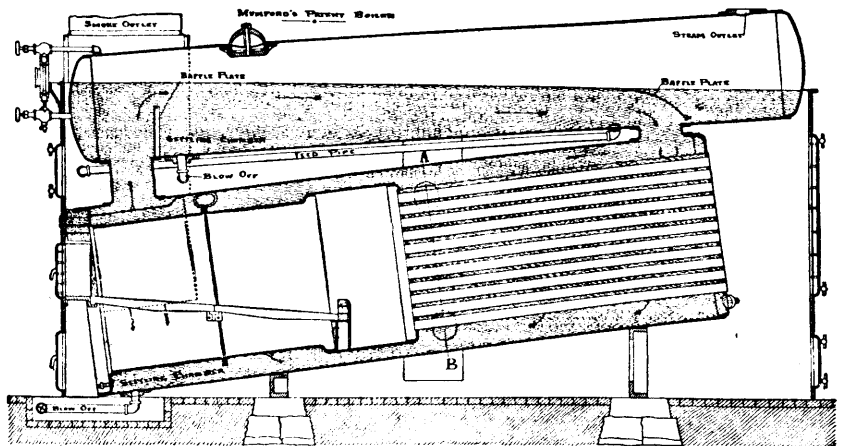
## BLEICHERT TRAMWAYS

### MUMFORD'S IMPROVED BOILER

Is internally fired and the hot gases pass through the tubes and return around the shell, making every foot of the boiler effective heating surface.

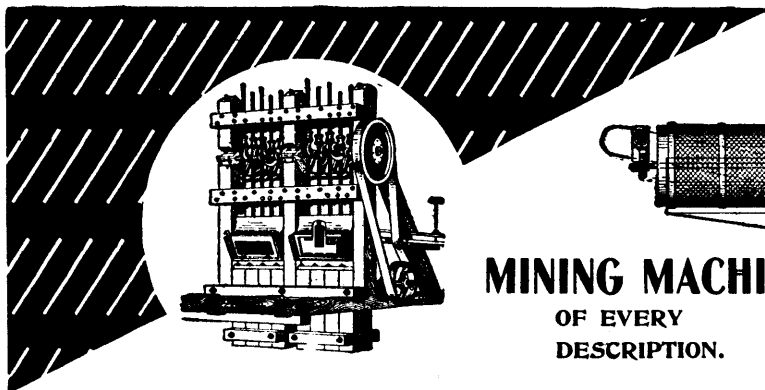
The water circulates rapidly from front to back of boiler, up the back connection to drum and down the front connection to a point below the fire.

Sediment in feed water will be deposited at front end of drum or below furnace and all parts of boiler are accessible for cleaning purposes.



ROBB ENGINEERING COMPANY, Ltd. AMHERST, NOVA SCOTIA.

By Final Decision in U. S. Circuit Court of Appeals, March 3, 1898, we defeat the last claim of the Gates Iron Works on Gyrating Crushers.

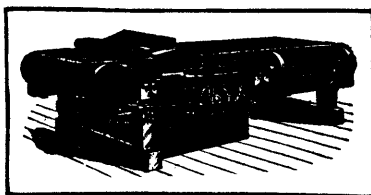


### STAMP MILLS, SMELTERS,

STEEL PIPE, PERFORATED METALS.

Comet Adjustable Crushers.

Frue Vanners.

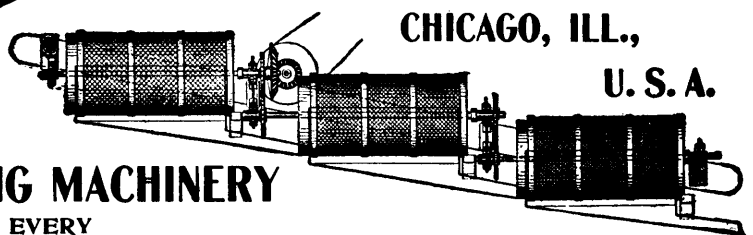


Information and Estimates on Application.

Write for Circular on our Improved Two-Stamp Mill.

### FRASER & CHALMERS

CHICAGO, ILL., U. S. A.

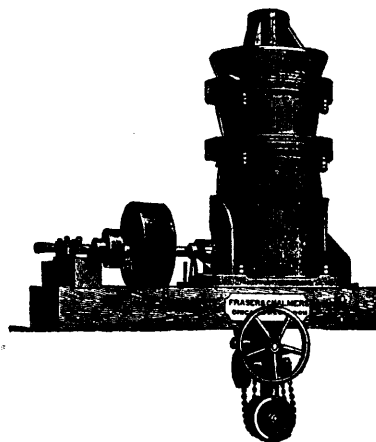


### MINING MACHINERY

OF EVERY DESCRIPTION.

OTTO Tramways.

Hoisting Engines.



Concentration, Cyanide and Chlorination Works.

Huntington Mills.

Riedler Pumps and Compressors.

Engines.

Boilers.

### Fraser & Chalmers

have the best manufacturing facilities for making anything in the Perforated Metal line, placer grizzlies with taper holes, stamp mill screens, trommels, coal screens, etc., etc.

