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The Canadian Mining Review
Established 1882

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

B. T. A. BELL, Editor. Published Monthly. OFFICES: Slater Building, Ottawa.

VOL. XV., No. 3 MARCH, 1896. VOL. XV., No. 3

## The Cariboo and Horsefly Reports.

Elsewhere in this issue are printed in full the second annual reports of the manager and directors to the shareholders of the "Cariboo Hydraulic Mining Co., Ltd.," and the "Horsefly Hydraulic Mining Co., Ltd."

One learns, from reading these reports and scanning the balance sheets, something of the delays and difficulties attendant upon large hydraulic enterprises even when the management is the best to be procured. Doubtless the inability to employ Chinese labor (which was contemplated in original estimates, we believe) has largely increased the cost of construction and preliminary work.

The Cariboo Company, it will be noted, has recommended an increase of its capital by 40,000 shares, which will give it $200,000.00 cash, and make a total share capital of 100,000 shares at $5.00 each.

This increase has been deemed the best way to provide funds for the payment of some $175,000 worth of obligations, and to leave about $25,000 on hand as a working capital fund, The obligations have been incurred to the amount of $120,000 during the past year by the increasing of the water supply by 50 per cent., and the increasing of storage reservoir capacity. $55,000 is asked for to meet expenses until the washing season begins about 1st of June.

The report declares that a permanent and large water supply has now been obtained and that there is nothing to prevent a continuous and regular run during the season of 1896.

In the estimated production for 1896 we note that the yield of the gravel is *assumed* at 50 cents per yard, though the average yield for 1895 was only 28 cents; probably the increased tenure of the lower strata warrant this larger figure. Profits to the amount of $213,000, or over 40 per cent. on the increased capital, are promised for 1896.

The Horsefly Company has also spent nearly double its capital, the balance sheet showing $78,000 of debts and the amount required to carry expenses until washing time comes (June 1st) being $30.000, making a total of nearly $110,000.00.

Instead of increasing its capital, the directors of the Horsefly advise the issue of $150,000.00 worth of 10 per cent. bonds to take up the debt and provide a fund for working capital.

The expenditures in this company have been largely increased by encountering at the mine a bed or layer of hard cemented gravel from 10 to 80 ft. in thickness which, at a distance of from 1 to 3 ft., overlies the richer gravel on the bed-rock.

It is reported that this seam or bed is disappearing, having thinned down to from 1 ft. to 10 ft. thick. In view of this statement it is hard to see the necessity of a stamp mill to mill the cement. A test of 150 lbs. made by Pellew Harvey strikes us as rather insufficient upon which to base a figured net profit of $111,600.00 per year.

We also have our doubts of 20 stamps crushing 200 tons a day, and we have no record of milling, even by water power, at the low price of 20 cents. The Alaska-Treadwell mine, which is exceptionally favored by water power, soft rock, and 240 heads of stamps, cannot show a better result than 80 tons for 20 stamps and a lower cost than 50 cents per ton.

We could also wish that these company reports were made up upon a more liberal basis, giving to shareholders facts and figures which are not discernible from the printed statements, and also gave a classification of accounts which would enable one to follow operating, construction, and other *costs*.

For example, the fact that the gold obtained nets only $16.34 an ounce is not given, neither is there any explanation why it costs 3 per cent. to market the gold (*i. e.*, 3 per cent. between gross value reported by manager and net amount credited in books). To ascertain that last year the Horsefly gravel yielded only 12½ cents per cubic yard, while it costs 16½ cents, requires figuring, as does the yield of Cariboo at 28 cents and the cost at 20 cents, This cost includes construction, etc., but there should be a classification so that the shareholder should know what the *operating* cost per cubic yard is—probably in the above cases not over 9 or 10 cents, although we have no chance to verify these figures.

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Owing to pressure on our space this month we have been compelled to hold over Mr. R. G. E. Leckie's paper entitled, "Notes on the Grand Lake Coal Field, N.B.," and "Notes on Nova Scotia Coals as Steam Producers," by Messrs. Mason and Matheson, read at the meeting of the Mining Society of Nova Scotia.

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The Canadian Rand Drill Co. have opened an office in the Board of Trade building, Montreal, and have moved into their large and commodious new shops at Sherbrooke. Mr. E. W. Gilman, for many years in charge of the business of the Ingersoll Rock Drill Co. of Canada, has been appointed to the management of the Rand business in Montreal. Mr. G. L. Burritt has also, we believe, left the Ingersoll people, and will, in the future, be associated with Mr. Gilman in the affairs of the Rand company.

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Mr. J. D. Sword, M.E., of the Ingersoll Rock Drill Co. of Canada, has returned to Rossland, B.C.

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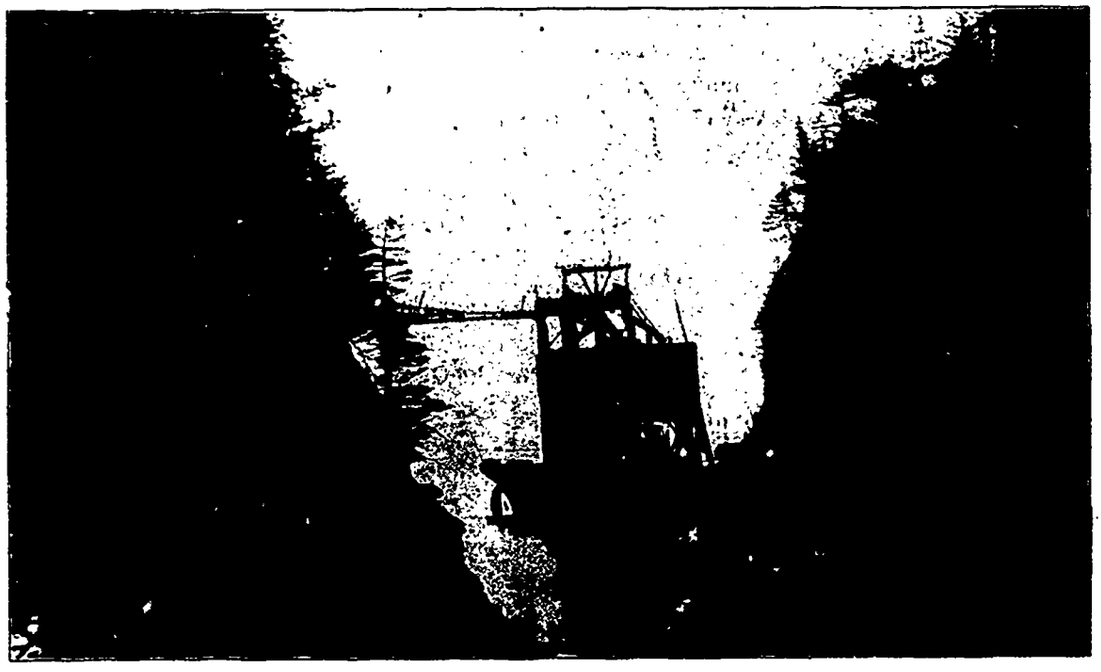
The next meeting of the Ontario Mining Institute will be held at Rat Portage, Ont., in September.

# GOLD MINING IN NOVA SCOTIA.

We are indebted to Mr. W. H. Brown, of the Mines Office, Halifax, for the following returns of some of the companies producing gold in Nova Scotia during the past year. These returns of course do not represent the whole output of the Province during that period, the figures of which have already been given in a recent issue of the REVIEW

| NAME OF COMPANY. | MONTHS IN WHICH CRUSHING WAS DONE. | NO. OF TONS CRUSHED. | | TOTAL YIELD OF GOLD. | | | DISTRICT. |
|---|---|---|---|---|---|---|---|
| | | Tons. | Cwt | Oz. | Dwt | Grs | |
| New Egerton Co. | January to December (inclusive) | 5239 | .... | 2956 | 2 | .... | Fifteen-Mile Stream. |
| Richardson Gold Mining Co. | do do do | 10383 | .... | 1677 | 7 | .... | Upper Seal Harbor, Stormont. |
| W. A. Sanders (Lake Lode | Jan., April, May, June, July, Aug., Sept., Oct., Nov., Dec. | 5149 | 4 | 696 | 2 | .... | Caribou. |
| Dumas Touquoy | January to December (inclusive) | 5174 | .... | 404 | 19 | 12 | Caribou (Moose River). |
| Golden Lake Mining Co. | February to December do | 219 | 9 | 1951 | 7 | 12 | South Uniacke, Uniacke. |
| Modstock Gold Mining Co. | June to November do | 1676 | .... | 998 | 4 | .... | Isaacs Harbor River, Stormont. |
| Oxford Mining Co. | Jan., Feb., April, May, June, July, August | 321 | 5 | 107 | 18 | .... | Lake Catcha. |
| Tudor Gold Mining Co. (formerly West Waverly Co.) | January to September (inclusive) | 4457 | 14 | 989 | 7 | .... | Waverley (West). |
| Thompson and Quirk | Jan., Feb., Oct., Nov., Dec. | 66 | .... | 104 | 10 | 6 | South Uniacke, Uniacke. |
| North Star Mine (James A. Macdonald) | July, Aug., Sept., Oct., Nov. | 133 | 19 | 86 | 1 | .... | Stormont (West Division). |
| Stellarton Gold Mining Co. | Jan., Feb., March, April, May, June, Aug., Nov. | 1930 | .... | 946 | 6 | .... | Sherbrooke. |
| | Total | 34749 | 11 | 10918 | 4 | 6 | |

Months not shown, there were either no returns made—or made as no crushing having been done.



**Shipping Pier, Bell Island Iron Mine, Newfoundland.**

**MAJOR R. G. LECKIE, M.E., Torbrook, N. S.,**

**Chairman, Canadian Mining Institute; President, Mining Society of N. S., 1896-7.**

# GOLD MINING IN NOVA SCOTIA.

The following returns from the mines have been reported for royalty since our last issue.

| Name of District. | Name of Mill or Company. | Months in which Crushing was done and Returns Made. | Quartz Crushed | Yield of Gold. | | | Total Yield. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | No. of Tons. | Ozs. | Dwts. | Grs. | Ozs. | Dwts. | Grs. |
| Sherbrooke | New Glasgow Co. | February | 330 | 110 | 0 | 0 | | | |
| " | Stellarton Gold Mining Co. | February | 75 | 31 | 2 | 0 | | | |
| | | | 405 | 141 | 2 | 0 | 141 | 2 | 0 |
| Moose River and Caribou | W. A. Sanders | January (Quartz 300, Slate 312) | 612 | 48 | 10 | 0 | | | |
| " | A. M. Jack | November and December 1895, Jan. and Feb. | 183 | 136 | 13 | 1 | | | |
| " | Moose River Gold Mining Co | February | 176 | 27 | 0 | 0 | | | |
| | | | 971 | 212 | 3 | 1 | 212 | 3 | 1 |
| Uniacke | Golden Lode Mining Co. | January, February | 50 | 432 | 17 | 10 | | | |
| " | Eastville Mill | October, November, December, 1895, Jan'ry. | 76 | 106 | 10 | 23 | | | |
| | | | 126 | 539 | 8 | 9 | 539 | 8 | 9 |
| Stormont | Griffin Gold Mining Co. | February (Quartz 25, Gravel 122) | 147 | 44 | 6 | 0 | | | |
| " | James A. McDonald | January | 89 | 45 | 8 | 0 | | | |
| " | Richardson Gold Mining Co | January | 900 | 130 | 8 | 0 | | | |
| | | | 1136 | 220 | 2 | 0 | 220 | 2 | 0 |
| Brookfield | W. L. Libbey | February | 427 | 424 | 0 | 0 | 424 | 0 | 0 |
| | | | | | | | 1536 | 15 | 10 |

## Details of the Production of the Different Districts from 1862 to 1891 and 1892 to 1895.

*(Officially Reported to the Review.)*

1862 TO 1891.

| District. | Tons Crushed. | Total Yield. Ozs. | Dwts. | Grs. | Value. | Average Yield per Ton. |
|---|---|---|---|---|---|---|
| Caribou and Moose River | 56,949 | 27,877 | 13 | 20 | $ 543,615 | $ 9 55 |
| Montague | 18,771 | 36,144 | 2 | 16 | 704,810 | 37 54 |
| Oldham | 42,425 | 47,245 | 9 | 18 | 921,287 | 21 71 |
| Renfrew | 46,071 | 31,814 | 13 | 2 | 620,385 | 13 46 |
| Sherbrooke | 167,188 | 119,946 | 17 | 22 | 2,338,964 | 13 99 |
| Stormont | 26,749 | 26,748 | 17 | 11 | 521,603 | 19 49 |
| Tangier | 29,803 | 19,301 | 16 | 6 | 376,386 | 12 63 |
| Uniacke | 39,993 | 27,196 | 2 | 22 | 530,324 | 13 26 |
| Waverley | 97,846 | 55,382 | 14 | 14 | 1,079,963 | 11 03 |
| Salmon River | 44,005 | 13,163 | 14 | 0 | 256,693 | 5 83 |
| Brookfield | 5,663 | 4,858 | 4 | 9 | 94,735 | 16 73 |
| Whiteburn | 5,875 | 9,281 | 2 | 20 | 180,982 | 30 82 |
| Lake Catcha | 8,926 | 8,477 | 17 | 19 | 165,318 | 18 52 |
| Rawdon | 11,389 | 9,060 | 14 | 4 | 176,684 | 15 51 |
| Wine Harbor | 41,798 | 28,639 | 6 | 1 | 558,467 | 13 36 |
| Darr's Hill | 39,909 | 18,715 | 19 | 19 | 364,962 | 9 14 |
| Fifteen Mile Stream | 15,775 | 8,783 | 19 | 5 | 171,288 | 10 85 |
| Malaga | 18,567 | 15,343 | 10 | 8 | 299,199 | 16 11 |
| Unproclaimed, etc | 54,357 | 41,717 | 15 | 13 | 813,497 | 14 96 |
| Totals | 772,059 | 549,700 | 12 | 13 | $10,719,162 | $13 88 |

1892 TO 1895.

| District. | Tons Crushed | Total Yield. Ozs. | Dwts. | Grs. | Value at $20 per oz. | Av. Yield per Ton. oz. | dwt. | grs. |
|---|---|---|---|---|---|---|---|---|
| Caribou and Moose River | 37,000 | 12,039 | 7 | 17 | $ 240,788 | 0 | 6 | 6 |
| Montague | 5,813 | 4,621 | 14 | 18 | 92,435 | 0 | 15 | 21 |
| Oldham | 6,349 | 7,491 | 4 | 9 | 149,820 | 1 | 3 | 14 |
| Renfrew | 2,304 | 2,094 | 14 | 15 | 41,895 | 0 | 18 | 4 |
| Sherbrooke | 4,380 | 2,074 | 1 | 8 | 41,490 | 0 | 9 | 11 |
| Stormont | 48,005 | 15,861 | 15 | 15 | 317,235 | 0 | 6 | 14 |
| Tangier | 5,469 | 1,341 | 9 | 8 | 26,829 | 0 | 4 | 21 |
| Uniacke | 8,006 | 7,889 | 12 | 11 | 157,792 | 0 | 19 | 17 |
| Waverley | 25,346 | 6,174 | 1 | 0 | 123,481 | 0 | 4 | 20 |
| Salmon River, 1892 to 1894 | 9,379 | 2,205 | 10 | 0 | 44,110 | 0 | 4 | 16 |
| Brookfield | 5,352 | 3,760 | 0 | 5 | 75,200 | 0 | 14 | 1 |
| Whiteburn, 1893-94 only | 1,418 | 939 | 4 | 0 | 18,784 | 0 | 13 | 3 |
| Lake Catcha | 5,669 | 3,026 | 16 | 20 | 60,437 | 0 | 10 | 13 |
| Rawdon, Central and East, 1892 to 1894 only | 1,218 | 393 | 14 | 8 | 7,874 | 0 | 1 | 11 |
| Wine Harbor | 877 | 444 | 0 | 22 | 8,881 | 0 | 10 | 0 |
| Fifteen Mile Stream | 10,779 | 5,791 | 6 | 0 | 115,826 | 0 | 10 | 17 |
| Malaga | 6,559 | 4,281 | 18 | 18 | 85,638 | 0 | 13 | 1 |
| Unproclaimed, etc | 3,112 | 1,460 | 9 | 4 | 29,209 | 0 | 9 | 9 |
| Total | 183,935 | 81,892 | 1 | 10 | $ 1,637,724 | | | |

## British Columbia's Blunder.

A press despatch dated March 7th states that the Government of British Columbia announced its intention of imposing a royalty or tax of 2 per cent. upon the gross value of the output of its mines, but that, owing to the outcry against such a measure, has amended its proposition to a royalty o' 2 per cent. upon *net* values, making the arbitrary allowance of $3.00 a ton for expense of obtaining or "winning" a ton of ore.

This, so far as the Government is concerned, is out of the frying pan into the fire. The discussion of the feasibility of attempting to levy royalty upon net values is found in the proceedings of the Quebec Mining Association, and if such a measure is adopted by British Columbia, that province will find it has sown a very pretty crop of thistles.

The arbitrary sum of $3.00 per ton may approximate actual costs of mining and laying down at the shaft's mouth at some of the larger properties, but it is far too low a figure for many of the shipping mines, and for some of the favored ones is too high. In the case of the gold mines of the province, particularly the hydraulic and drift mines, it is simply ridiculous: as for example, by the published reports of the Cariboo and Horse Fly companies, the total costs of mining, washing, management etc., was only 20 cents per cubic yard for the former and 16½ cents per cubic yard for the latter.

Moreover, if the Government is going to allow a deduction of $3.00 per ton from the gross value what becomes of the tax, for example, on the output of these two companies mentioned, which is estimated for 1896 at $390,000? As the value of the gravel is shown to have been (last year) only 28c. and 12½c. per cubic yard, and assuming that a yard weighs no more than one ton, if an allowance for costs of $3.00 per ton be made, where is the Government's tax?

The facts are, that no one at all familiar with the widely different costs in different localities, would attempt to fix upon any given figure as an average for the province—no such average can be assumed without great and manifest injustice, and what is more, without giving a serious set-back to the mining industry of British Columbia.

We had hoped that our western statesmen would have been far-seeing enough to have deviated from the narrow track of the older provinces in this matter of royalty, and that the Government would have declared, once for all, that no royalty tax would ever be imposed in British Columbia.

Nothing will more surely, speedily and effectively shut out both American and British capital than the announcement that hereafter, a royalty tax *in any guise*, is to be imposed upon the profitable mines of British Columbia.

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## Nova Scotia Gypsum.

The extraction of gypsum in Nova Scotia attracts little attention, but this mineral forms an important item in her resources. It occurs, associated with the carboniferous limestones, and is equally wide spread. It is reported from all the counties, except those bordering on the Atlantic, and is especially abundant in Hants, Colchester, Antigonish, Cape Breton, and Inverness counties. Its mode of formation by some union of lime and sulphuric acid in the immediate vicinity of the readily decomposed beds of limestone has been a bone of contention among scientists and is not yet settled.

The gypsum may be divided into hydrous and anhydrous, or as they are locally known, into hard and soft plaster.

The soft or hydrated variety contains,

| | Per cent. |
|---|---|
| Lime | 32.55 |
| Sulphuric acid | 46.51 |
| Water | 20.94 |
| | 100.00 |

The hard or anhydrite plaster contains no water of crystallisation. These two minerals and intermediate mixtures, probably making steps toward a state of total hydration, occur together in alternating beds or masses, forming enormous deposits of great commercial value, and readily accessible for the cheapest quarry methods owing to their frequent outcrops.

In places the run of the plaster deposits may be traced for miles, and they show a corresponding development in thickness. Maitland, Ogdenslake, Port Hastings and other localities present cliffs upwards of 200 feet in height.

Hard plaster has not received much attention, and waits the work of the experimentalist to take its place among our useful minerals. The soft plaster is again sub-divided into blue and white. The blue plaster, which is abundant at Windsor, is valued chiefly for agricultural purposes, it is shipped as "rock" to New York, Jersey City, etc., and there ground and used as a dressing for cotton, peas, etc.

White plaster, while equally adapted for agricultural purposes, is specially valued for yielding, when heated, a soft white powder, the water being driven off. This, when mixed with water, "sets" and becomes hard. This property makes it valuable for "plastering," making casts, cornices, ornaments, etc. The crystalline variety known as selenite or "mica," is often found in the quarries in masses or irregular veins, and is in demand as a filler for paper.

Among the uses to which the ground plaster is put may be mentioned that of manufacturers of fertilizers, who find it adds weight to their products, and by its absorbent qualities, improves the mechanical condition of the fertilizer. It is also largely used for adulterating the cheaper grades of flour in the United States, for coloring material under the name of "Terra Alba," etc., and for various chemical preparations.

Among the numerous uses of Plaster of Paris may be mentioned fire-proof filling, moulds for terra cotta and porcelain ware, for sewer pipe elbows, etc., casts of lay figures; in surgery, to confine broken limbs, in alabastine and other coloring and finishing materials, crayons as a cement, absorbent, to retard fermentation in wines and to increase the proportion of alcohol. Continually new employments are found for this cheap and useful mineral.

The export trade to the United States is chiefly supplied from Windsor, Cheverie, Walton and Hantsport on the Basin of Minas, and a little is sent from the Victoria gypsum quarries, near Baddeck. The last named quarries supply the trade of the Gulf of St. Lawrence. As the uses of this mineral increase numerous other points may be relied on to furnish it cheaply and of good quality. A small amount is burned for local uses in architectural work, or ground for use in fertilizers, etc., but the bulk of the plaster is shipped as "rock" to the States, where large factories work it up. Did the duty on this article allow the manufactured product to enter the States, it would be ground here and the value of the export would be over $500,000 per annum.

In Ontario a few thousand tons are annually mined but the deposits are limited and expensive to work. There are a number of deposits of plaster in New Brunswick, among which may be noticed, one of great purity near Hillsboro, which is ground and calcined on a large scale to supply the local markets.

The effects of plaster as a top dressing on our northern lands do not seem to have been carefully studied yet. It seems however to be established that its use is beneficial to the growth of many of the vegetables, ministering to man's comfort and sustenance, and that conjointly with the limestones associated with it in Nova Scotia it presents the farmer with fertile and permanently nutrient soils. The limestone districts when not associated with plaster do not show equal fertility. There is no doubt that its presence in certain soils is beneficial, and its extended application in this direction much of its future development will be due

The shipments from Windsor from 1832 to 1867 amounted to 1,404,376 tons, the price varying from 58 to 98 cents, and averaging 73 cents per ton. From that date until the close of 1895 about 2,000,000 tons more have been shipped, the price last year being returned at $1.00 per ton. In addition for many years past large quantities have been shipped from Cheverie, Walton, etc., the total provincial shipments reaching in some years 160,000 tons. The price of some of the Basin of Minas plaster is returned as low as 50 cents per ton. Even at these low figures fair profits are stated to be made, and this can be believed when the quarries are seen, above water level, close to shipping, and readily drilled and blasted.

The following table shows the Nova Scotia shipments for the past ten years:—

| | 1895. | | 1894. | | 1893. | |
|---|---|---|---|---|---|---|
| | Tons. | Value. | Tons. | Value. | Tons. | Value. |
| Arichat, C.B. | 1,510 | $ 1,510 | ..... | ..... | 5,025 | $ 5,025 |
| Baddeck, C.B. | 15,610 | 14,052 | ..... | ..... | 13,706 | 13,706 |
| Windsor | 96,035 | 96,035 | 80,006 | $ 80,006 | 62,901 | 62,901 |
| Cheverie | 14,045 | 7,407 | 18,205 | 10,287 | 9,868 | 6,034 |
| Walton | 6,160 | 5,763 | 7,010 | 6,336 | 4,555 | 4,437 |
| St. Anne, C.B. | ..... | ..... | 950 | 900 | ..... | ..... |
| Port Hood, C.B. | ..... | ..... | ..... | ..... | 1,542 | 1,156 |
| Mabou, C.B. | ..... | ..... | ..... | ..... | 11,700* | 11,000 |
| Parrsboro | ..... | ..... | ..... | ..... | 650 | 650 |
| | 133,300 | $ 124,767 | 106,171 | $ 97,529 | 98,247 | $ 95,509 |

*Add Mabou 27,000 bags ground plaster.

| | 1892. | | 1891. | | 1890. | |
|---|---|---|---|---|---|---|
| | Tons. | Value. | Tons. | Value. | Tons. | Value. |
| Arichat, C.B. | 1,660 | $ 1,500 | 510 | $ 510 | 479 | $ 470 |
| Baddeck, C.B. | 11,784 | 10,386 | 16,000 | ..... | ..... | ..... |
| Parrsboro | 60 | 30 | ..... | ..... | ..... | ..... |
| Arichat, C.B. | 1,030 | 1,030 | ..... | ..... | ..... | ..... |
| Windsor | 124,531 | 124,531 | 118,969 | 116,479 | 112,264 | 112,264 |
| Cheverie | 15,891 | 11,722 | 17,330 | 13,433 | 26,071 | 19,533 |
| Walton | 7,165 | 6,519 | 7,125 | 7,001 | 6,300 | 5,750 |
| Halifax | 120 | 390 | 1,200 | 1,312 | 346 | 1,688 |
| Mabou | ..... | ..... | 800 | ..... | 298 | 298 |
| | 162,285 | $ 156,108 | 161,934 | ..... | 145,749 | $ 140,00 |

The above are shipments and do not include plaster used in Nova Scotia.

## Beware of the Fakirs.

THE REVIEW desires to call the attention of its readers to the large number of companies and syndicates which have been been exploiting the larger Canadian cities, particularly Montreal, with a large and diversified collection of mining schemes during the last few months. To our personal knowledge many of these have been "fakes," with absolutely no merit; others have had considerable merit, and some have been *bona fide* propositions on properties of known value.

A large majority of the schemes presented have been from the west, to which, rather than towards older and better known grounds, promoters have lately turned their attention.

THE REVIEW wishes to sound a note of warning to capitalists to thoroughly investigate propositions laid before them, and, in the case of properties presented for purchase, to insist upon examination of such properties by men of calibre and reputation, of whom Canada has a sufficiency for the purpose. The wise and experienced investor will insist every time upon having the opinion of an experienced and successful engineer before concluding his negotiations for mining property.

## Another Choice Prospectus.

There has been sent to us recently the most absurd, extravagant, untruthful and altogether unique prospectus in our experience. It is headed:—

FOR SALE—Thirty-three Shares of the "Modstock" Gold Mine. Price, $3,250 per share

which, as the total number of shares is 100, puts the valuation of this "Modstock" at $325,000.00!!

This is a sufficiently large value to induce one to read details. We thus learn that this most modest valuation is placed upon 42 acres of land in a newly discovered gold district of Nova Scotia, on which two gold bearing lodes have been found and worked, and on which six other lodes show croppings; that the greatest depth yet attained is 100 feet, and that a ten stamp mill has been at work for six months, the last three months of which are reported to have shewn a profit of $7,480.

THE REVIEW, for the past ten years, has had an intimate personal knowledge of some, and an editorial acquaintance with all of the Nova Scotia gold mines, but it never knew of the existence of any one gold mine in that province worth anything like such a sum as $325,000, therefore this circular was diligently perused for information, resulting in the opinion expressed at the beginning of this article. For perverty and badness of grammar, ignorance of the subject, and misleading arithmetic the prospectus is unique, and for truthfulness—there is none.

One is informed at the beginning that the richness of the property "is assured from the fact that 8 parallel veins of gold (sic) run lengthwise" of the property. "Veins of gold" are rare, very rare, but veins of quartz are not, and we have known of properties having many more than eight veins of quartz whose richness was far from "assured." The development (confined to less than 100 feet in depth on the average and to two veins) is said to be "sufficient to establish its present value at half a million," such "establishment" being evidently the product of imagination multiplied by faith, and not reserves multiplied by yields per ton.

A New York engineer, Mr. F. G. Corning, is mentioned as having reported on the property, and while his report is not disclosed, the use of his name might lead the unsophisticated to suppose that he endorsed the statements in the circular, which we cannot for a moment believe. It would be interesting to know whether Mr. Corning is cognizant of this preposterous prospectus.

The statement that monthly profits of $2,400 to $2,700 with a ten stamp mill are unheard of is altogether false, and shows crass ignorance of Nova Scotian mines, the Golden Lode, Egerton, Oldham, Brookfield, Richardson and Oxford have shewn very much larger monthly profits.

The promoter, or broker, or author of this circular, uses very simple mathematics when he says—if 10 stamps show an annual dividend of 7½% on $400,000, all one has to do is to put up 20 stamps and then his dividend is 15%! If it is as simple as this why not put up 40 stamps at once and get your 30% dividend; then if your stock is "worth $400,000," on a 7½% basis, you will have your 30% dividend make your stock "worth" $1,200,000. What wonderfully simple things gold mines, and dividends and———the public are!!

As a sample of the pure reasoning embodied in this circular it is stated that, since the famous "Wellington Mine" at Sherbrooke, distant *20 miles in a straight line*, was worked profitably to a depth of 700 feet, therefore this "Modstock" can be profitably worked to the same depth! As well argue that Modstock may go 2,300 feet, since the Idaho in Grass Valley was worked to that depth. And to say that the *Wellington* is in the same neighborhood and "on the same range" is to state a deliberate falsehood.

The childlike simplicity and utter guilelessness of the statement, "samples (of the quartz) can be *selected* giving almost any assay up to $10,000 per ton ton," is touching, and will be appreciated by our gold mining friends in Nova Scotia, few of whom, we fancy, would have any difficulty in "selecting" samples that would assay 10,000 *ounces* instead of *dollars*.

Men who put such prospectuses and circulars on the market are either knaves or dupes, and no sane person will heed their invitation to bid for "Modstock" shares, though the property is promising, and with further development will undoubtedly demonstrate its capacity to maintain dividends, but not upon such fictitious values.

## Mining Education at McGill.

Mr. W. C. McDonald, of Montreal, has donated to McGill University, Montreal, the sum of $500,000 to be used in erecting, equipping and maintaining a building for the departments of chemistry, mining and metallurgy, and a new departme.t of architecture, yet to be formed. The basement floor will be devoted to laboratories for mining and metallurgical work, which will have an area approaching 9,000 square feet. The upper floors will contain the best series of chemical laboratories possible to build, with lecture-rooms, private offices and provision for the needs of a full architectural course.

McGill has long needed better chemical laboratories, the present ones being inadequate to accommodate more than one-third of the classes in chemistry, while the instruction in assaying has been compelled to be given in a cellar. The mining department has had nothing but a room, a blackboard and some chalk. Now that working laboratories are possible we expect to see a full, modern and *workable* equipment of the mining and metallurgical laboratories which shall be unexcelled. Some technical schools elsewhere have made themselves laughing-stocks to practical engineers by their equipment, and the introduction of experimental and obsolete machines and German models, but we know that this mistake will not be made in the equipment of these laboratories. Mining and its allied industries are among the most important in Canada, and in no other industry are so many and rapid changes and improvements constantly taking place. It is a matter of congratulation, therefore, to our mining public that in a very short time now Canadians can receive as good a technical education at McGill in this important subject as anywhere else in the world. The thanks of the mining fraternity are due to Mr. W C. McDonald.

# EN PASSANT.

The following open letter from Mr. R. L. Bordon, Q.C., solicitor for the Respondent, to the President of the Mining Society of Nova Scotia, should set at rest any misapprehension as to the security of titles to Nova Scotia mineral property which may have been created by the publication of a foolish dispatch to the Montreal *Star* and other papers:—

"At the request of your Society, conveyed to me through Mr. Drysdale, Q.C., I have much pleasure in assuring you that the recent decision of the judicial committee of the Privy Council in Attorney-General vs. Reynolds has no effect or bearing whatever upon the title of any mining area in this Province except the one in dispute in that case. The paragraphs and letters expressing a contrary view which have recently appeared in the public press of this city have been written or inspired by persons who evidently have no knowledge whatever upon the subject.

"The decision of the Privy Council merely dismissed an appeal from the judgment of the Supreme Court of Nova Scotia which was pronounced on the 12th of May, 1894.

"The question in dispute in that case was whether the Commissioner of Public Works and Mines, after the passing of an Act abolishing licenses to work, had any jurisdiction to grant a renewal of a license to work. It was held that he had no such jurisdiction and that the right to obtain a lease had been substituted for the right to take out a license to work or to obtain a renewal thereof.

"The decision in any event could only affect applications for licenses to work or renewals thereof made subsequently to the Act of 1889 which abolished licenses to work. To remove any doubt the Legislature of this Province, by Acts passed in the years 1892 and 1893, declared in effect that any renewals granted by the Commissioner subsequently to the Act of 1889 above mentioned should be held valid unless in the meantime an action had been brought for the purpose of disputing the validity of such renewals. In other words, it was thereby enacted that all such renewals should be valid notwithstanding the statute of 1889, but that such enactment should not affect any action then pending."

Mr. E. D. Ingall, A.R.S.M, chief of the division of mineral statistics, Geological Survey, has issued his preliminary abstract of the mineral production of the Dominion during the year 1895. The figures show a total of $22,500,000, or an increase in production amounting to $1,600,000 over the year 1894. Doubtless when all the returns have been received these figures will be materially increased. Mr. Ingall's summary includes:—Gold, $1,910,921; nickel, $1,360,984; silver, $1,158,633; copper, $949,-229: lead, $749,966; iron, $238,070; mercury, $2,343; asbestos, $368,175; chromite, $41,301; coal, $7,774,178; coke, $143,047; gypsum, $202,608; mica, $65,000 (under estimated); graphite, $6,510; grindstones, $31,532; fire clay, $3,492; natural gas, $423,032; petroleum, $1,201,184; pyrites, $102,594; salt, $180,-417; soapstone, $2,138; ochres, $14,600; mineral water, $111,048; phosphate, $9,565; moulding sand, $13,530.

# THIRD ANNUAL MEETING

OF

# The Ontario Mining Institute

The Third Annual General Meeting of the members of the Ontario Mining Institute, was held in the Rossin House, Toronto, on Tuesday evening, 3rd March. There was a fair attendance. Mr. J. J. Kingsmill, Vice-President, in the chair.

After the minutes had been read and confirmed, the Treasurer, Mr. T. W. Gibson, submitted the financial statement, which showed a balance on hand of $145, with outstanding assets amounting to $203. The report was adopted.

### New Members.

The following were elected Ordinary members.

F. S. Wiley, Port Arthur.
J. P. Williams, Toronto
H. B. Proudfoot, Toronto.
J. Van Sommer, Toronto.

### Student Members.

The following were duly elected student members.—
A. H. A. Robinson, Peterborough.
E. Anderson, Grimsby.
A. P. Tye, Toronto.
George Johnson, Castleford.
W. W. Hull, Georgetown.

### The Federated Board.

THE SECRETARY reported the proceedings and resolutions adopted at the first meeting of the Canadian Mining Institute, held at Montreal, on Friday 10th January, 1896. The report was confirmed with the following recommendation: That with respect to the invitation to the Iron and Steel Institute, the Federated Institution of Mining and Mechanical Engineers, and the American Institute of Mining Engineers, to hold a meeting in Montreal, 1897, the Federated Board be requested to make such arrangements as will not interfere with the meetings of British associations for the advancement of science.

### The Duty on Mining Machinery.

Mr. F. S. Wiley moved, seconded by Mr. B. J. Townsend, that the Secretary be authorized to communicate with the Hon. the Controller of Customs at Ottawa, with a view to securing for another period of years a renewal of the present law, which expires in May, respecting the admission, free of duty, of mining and smelting machinery not manufactured in the Dominion.—Carried.

The remainder of the session was occupied by the discussion on the paper by Mr. J. H. Chewitt, Ba., Sc., C.E., on "The Financial Aspect of Mining," reproduced elsewhere in this issue.

### Meeting at the Parliament Buildings.

The Institute re-assembled on Wednesday evening, 4th March, in the commodious and comfortable reception room at the Parliament buildings, which was kindly placed at the disposal of the Institute. In addition to a fair attendance of members, there were many members of the Legislature present. Mr. James Conmee, M.L.A., Port Arthur, President, occupied the chair.

THE PRESIDENT, in his opening remarks, regretted the fact that there was not a greater activity in mining in Ontario. The cause of this backwardness was not altogether the lack of capital, or skill, but in his judgment was to be found largely in the want of confidence in the mineral resources of the Province on the part of the moneyed men. Our people have taken so small an interest in mining and know so little about it that very few are at ease in investing their money in mining enterprises. He was free to say, and it would be borne out by anyone who had a knowledge of mining in the upper portions of Ontario, that there had never been a gold or silver mine started there and conducted on a business basis that had not been a financial success. Those who had operated their properties speculatively and for the purpose of selling stock had not always been successful. There were few cases where there had been so much actual wealth won for the amount of capital invested, and he knew of none where work had been performed in a business-like manner that had been so well rewarded. There were today a number of mines in Ontario working successfully, among them the Sultana, which had paid for itself from the first. It would be to the advantage of all classes of the community to have this promising industry in Ontario expanded. Nothing would bring greater prosperity or commercial stability to the Province than activity in mining. It would be found that in other countries less favored than our own, those who engaged in mining were better paid than those employed in agriculture. He did not intend to occupy time, as a number of interesting papers were to be read, but he might express the hope that there would be a greater interest taken in the mining industry of the Province, not only by members of the Institute, but by the public men of the country. He believed it would be a good thing if some of the papers read before the Institute were to treat of the best method of mining the metals from the earth and of turning the gifts of nature to commercial advantages.

The following papers were then read:—

ONTARIO AS A MINING COUNTRY
By Dr. A. P. Coleman, Toronto.

THE VALUE OF COMPLETE ANALYSIS OF ROCKS AND MINERALS.
By Dr. W. L. Goodwin, Kingston.

MINING IN THE THUNDER BAY DISTRICT.
By Peter McKellar, Fort William.

EXPLORATORY WORKING WITH THE GOVERNMENT DIAMOND DRILL.
By Mr. T. W. Gibson, Toronto.

IMPROVEMENTS IN THE DRESSING OF GOLD ORES.
By Mr. F. Hille, Port Arthur.

MR. J. J. KINGSMILL, Q.C., Vice-President, expressed the pleasure he had felt in listening to the interesting and instructive paper which had been read by Prof. Coleman, who along with the other officials of the Government, had always been ready to render every possible assistance to the Institute since its work began. He had been asked two or three times: "What is this Mining Institute? Who are you, what are you doing, and how are you doing it?" There were a number of gentlemen present who were not members of the Institute, and for their benefit he would say that the Institute was composed of men who had joined themselves together for patriotic purposes. He had almost said philanthropic purposes, for what they were doing was not for their own benefit merely, but for the benefit of the people of Canada. (Hear, hear.) In the Institute there were no jobs, no mileage, no passes—nothing of the kind. (Laughter.) What they were trying to do was to teach the capitalists of the country that if they will invest their money in a careful, proper and business-like way in the mining industry, they have an opportunity of securing a better return for it than in any other way now open to them. They were trying to assist the men actually engaged in mining by calling their attention to the best and simplest ways of winning the metals or minerals of which they were in search. They were endeavoring to get the Government of the country to realize that there is a magnificent prospect before us, and that there is immense wealth lying undeveloped in our mines. The way in which the Institute sought to achieve its aims was by the preparation, reading and discussion of papers bearing on the various aspects of the mining industry, which were printed not only in the volumes of transactions issued by the Institute, but also in the columns of THE CANADIAN MINING REVIEW, a paper which would commend itself to any one who would take the trouble to read a single issue. The Institute had joined hands with similar associations in Nova Scotia and Quebec, and there was now one federated Institute for the Dominion of Canada. He felt satisfied that the Ontario Institute, though young in years, had done not a little to attract attention to the important industry of mining, which they all so much desired to see in a thriving and prosperous condition. (Applause.)

### Election of Officers.

*President:*

Mr. J. J. Kingsmill, Q.C., Toronto.

*Vice-Presidents:*

W. J. Motley, Regina Mine, Ltd., Rat Portage.
J. Burley Smith, M.E., Rat Portage.
Jas. McArthur, Canadian Copper Co., Sudbury.
Hon. E. H. Bronson, M.L.A., Ottawa.

*Secretary:*

B. T. A. Bell, Editor of the CANADIAN MINING REVIEW, Ottawa.

*Treasurer:*

T. W. Gibson, Bureau of Mines, Toronto.

*Council:*

A. Blue, Director of Mines, Toronto.
John F. Caldwell, Sultana Gold Mine, Rat Portage.
Herbert C. Hammond, Toronto.
J. M. Clarke, Toronto.
W. Hamilton Merritt, A.R.S.M., Toronto.
G. R. Mickle, School of Practical Science, Toronto.
Dr. A. P. Coleman, School of Practical Science, Toronto.
W. Van Sommer, Toronto.
Dr. W. L. Goodwin, Kingston.

*Auditor:*

Mr. J. F. Latimer, Ottawa.

*Delegates to the Federated Board.*

Mr. J. J. Kingsmill, President.
Mr. A. Blue, Director of Mines, Toronto.
Prof. Wm. Nicol, School of Mining, Toronto.
Dr. A. P. Coleman, School of Practical Science, Toronto.

### Secretary's Report.

The Secretary reported that during the past year there had been held two meetings of the Institute, embracing five sessions. On invitation from the General Mining Association of the Province of Quebec, a number of the members of the Institute had also participated in a meeting of that body at Quebec in June, and taken part in a series of enjoyable excursions arranged for the occasion. Six papers had been contributed to the Transactions, and these, together with the discussions upon them, had been published in the Journal of the Institute. The work of publication had been generously assisted by a grant of $300 from the Hon. Mr. Hardy, Commissioner of Crown Lands. The membership had increased to 90, as compared with 79 in 1895, and 37 when the Institute was organized in 1894.

This concluded the business of the meeting, after which the members paid a visit to the School of Practical Science, where they passed a pleasant hour in the inspection of the new mining laboratory and its small stamp mill and equipment for the reduction of ores and minerals.

# Ontario as a Mining Country.

By Dr. A. P. Coleman, Toronto.

How many hundreds of years have passed since the first mine was sunk in Ontario history does not record, for those mysterious ancient miners, mound builders or whoever they may have been, who dug their trenches and mined the native copper of Mamainse with tools of wood and stone, have left no traces either in history or tradition. The first recorded mining operations in the province were also for copper, and in the same region, and date back to 1770, a century and a quarter ago; so that Ontario is not so young a mining country as one is apt to think.

So far as I can discover, it was thirty years after this date before the next mining venture was inaugurated; this time at the opposite end of the province, and for iron. The Bureau of Mines' report for 1892 states that iron was smelted at the falls of Gananoque river about 1800.

Next followed the mining of bog iron ore in Charlotteville township, near Lake Erie, in 1823, the ore being smelted at Normandale in a romantic valley close to the lake. Some years later iron was mined and smelted near Madoc and in Essex county. With the exception of iron mining at one or two other points, no further attempts were made, so far as I am aware, to develop our mineral resources until the Bruce copper mines on Lake Huron began to attract attention about fifty years ago. Since then many mines have been opened and almost as many abandoned.

Gold, silver, copper, nickel, cobalt, iron and lead, among the metals have been obtained by mining at one time or another in our province; as well as a number of non-metallic substances, such as apatite, barite, graphite, gypsum and mica, not to mention liquids and gases obtained by boring, such as brine, petroleum and natural gas.

It must be admitted that several of these products have been mined on only a very small scale. All the cobalt obtained from the Sudbury nickel mines would amount probably to less than fifty tons; but, of course, this metal is a rare one in all parts of the world. The amount of lead mined and smelted in the province would probably amount to only a very few hundred tons if we had the full statistics.

At present I believe the metals mined in Ontario are gold, copper, nickel and cobalt: the last three in the neighborhood of Sudbury only. Of the non metallic minerals, mica and gypsum among the solids, brine and petroleum among the liquids, and natural gas, which I believe has been declared in an American law court to be a mineral, exhaust the list of substances.

Our mines of silver, of copper, except as a by-product of nickel ores, of iron and of phosphate, are in a state of suspended animation, if not entirely dead.

The list is not a cheerful one for a patriotic son of Ontario to contemplate, yet it may be useful to consider why mining matters have gone as they have, and also to enquire into the prospects for the future.

Let us take up the chief products of our mines one by one, beginning with the non-metals and ending with the metals.

### Apatite or Phosphate.

Apatite mining was attempted in 1870 or 1871, but apparently the first shipments of phosphate from Ontario took place seven years later. Most of our apatite was shipped *via* Montreal, a smaller portion going directly to the States, and on this account the statistics given by the Geological Survey reports greatly under estimate the production of Ontario, all that went to England or Germany being included in the statistics for Quebec.

In 1891 they report only 1,551 tons from this province, while the first report of the Bureau of Mines for Ontario places it in the same year at 4,900 tons, worth $50,800. The prosperity of the phosphate mines ended in that year, however, falling to half the amount in 1892, and to only twenty tons in 1893; and since that time there has been no mining of importance, the cheaply mined Carolina and Florida phosphates, though of lower grade, having crowded ours from the market.

Until the best of these southern deposits, which can sometimes be mined with dredges or steam shovels, are exhausted, we cannot expect any important revival of phosphate mining in Ontario; though our mines should find some demand from local manufacturers of fertilizers, as our intelligent farmers begin to make more use of phosphates.

### Barite.

Barite has been worked at only one mine in Ontario, McKellar Island in Lake Superior, where the body of mineral is described in the Geological Survey reports as sixty feet wide, and perhaps the largest on the continent. In 1890 the product is stated to have been 1,842 tons, valued at $7,543; but no further reports have been made, so that mining operations appear to have ceased.

### Graphite.

When graphite was first mined in Ontario I have been unable to discover, but in 1877 we shipped 429 tons of plumbago, having a value of $1,553; and in the following year about twice as much. Since then the amount has greatly diminished, though late explorations with the diamond drill show important deposits that should be worked at a profit. All the mining has been done in the Laurentian of the Ottawa Valley, near the Kingston and Pembroke railway.

### Gypsum.

Most of the gypsum of Ontario comes from the vicinity of Paris on the Grand river, Paris, Ontario, being in this respect at least like the greater Paris in France whose gypsum mines have provided "plaster of Paris" for many years. The amount mined in Ontario seems to vary greatly, 8,560 tons, valued at $11,715, being reported in 1887; but since then the amount has greatly diminished, so far as one can judge from the reports. In 1894 3,253 tons were mined, the value being $9,760.

### Mica.

This mineral is mined in the Laurentian region of the Ottawa Valley, the deposits being very irregular and the output equally so. Mica mining in our province is first mentioned in the Geological Survey report for 1870-71, but no useful statistics can be obtained until 1891, when the Bureau of Mines began its work, since the output of Ontario is lumped together with that of Quebec.

In 1891 it is reported that 240 tons of mica, worth $31,200, were mined. In the following year only seven tons; in 1893 seventy tons, but for 1894 none at all. The new use of mica as non-conducting packing for steam pipes should furnish an outlet for much material that formerly went to waste in cutting dimension mica, and thus help out this industry.

### Petroleum.

All the petroleum produced in Canada comes from the Petrolia region in Ontario, where the industry seems well established and the value of its products steadily increasing. The first important production of petroleum was about 1861, when a few thousand barrels were obtained from wells at Enniskillen; but it is difficult to follow the rise of the industry statistically, since in the earlier years no distinction is made between the oil refined from American and Canadian crude petroleum. Apparently not more than 500,000 bbls. were obtained in any year up to 1887; but since then the amount has gradually increased, until in 1894, nearly 1,000,000 bbls. are reported, affording products valued at $2,146,937.

### Natural Gas.

The closely related fuel, natural gas, though long known to occur in the province, has not been put to use until quite recently. In 1892, gas to the value of $160,000 is reported. In 1893, 2,342,000 cubic feet, valued at $238,200; and in 1894, 1,653,500 valued at $204,179. There

are over one hundred wells producing in the Welland and Essex fields, but most of the gas is piped across the border to Buffalo and Detroit.

### Salt.

Salt was first discovered in Ontario, when boring for oil at Goderich in 1865; and it has since been found at various points in southwestern Ontario, from Goderich to Essex Co., where it has been obtained within the last few months. Practically, all the salt produced in Canada comes from our province. The amount running from 30,000 to 60,000 tons, and the value from $100,000 to $230,000.

No salt is mined in the province, all being made from brine pumped from wells and evaporated; but the amount is unlimited; beds of rock salt from six to one hundred feet thick having been proved to exist under hundreds if not thousands of square miles of territory.

It is to be hoped that the attempts now being made on a small scale to develop the chemical industries dependent on salt as a raw material may be successful. If we produced our own soda, soap, hydrochloric acid and bleaching powder, we should materially increase our home manufactures and add to the demand for Ontario salt

## THE METALS.

Turning now to the metals, we need not refer specially to lead, which has been worked in an experimental way only at a few points in the Ottawa valley; some thousand of tons of ore having been produced in all, but very little of it smelted or marketed.

### Iron.

Iron is of much more importance. Ontario possesses deposits of all the chief ores of iron. The upper Laurentian of the Ottawa valley contains, especially near outcrops of crystalline limestone, many ore bodies, some of considerable dimensions, most of them magnetite but some hematite. Southern Ontario has more or less extensive areas of bog ore, and Western Ontario can boast of immense beds of magnetic ore in the Atikokan and Greenwater lake regions; and of still greater beds of hematite along the Mattawin river; while low grade siderite or carbonate of iron, has been found to the east of Port Arthur.

In the early days of the province iron ore was not only mined but also smelted in furnaces of small and antiquated forms, but producing charcoal iron of excellent quality. A good account of those primitive operations may be found in the report of the Bureau of Mines for 1892, where we find that magnetite was used in the Marmora region and bog ore on Lake Erie. Some novelties were tried, such as the use of wood for smelting in a furnace at Madoc. The iron was usually cast into stoves, potash kettles, etc, and found a ready sale in the province.

No iron has been smelted, I believe, since 1844 or 1845; though similar charcoal furnaces are working, apparently with good success, under quite similar conditions in the Province of Quebec.

These old furnaces were of course immensely protected by the difficulty of transporting such a cheap and heavy metal before railways were available. Probably only a few hundred tons of iron were produced in all, since the furnaces were of very small capacity.

Since those days a considerable amount of magnetite and also some hematite has been mined at various points in Hastings and counties to the east.

Between 1859 and 1873 Ontario and Quebec together shipped 207,000 tons of ore to the United States, much the larger proportion being from Ontario. From 1873 to 1891 there were shipped 423,700 tons; and, in all, Ontario seems to have exported more than 600,000 tons, but since 1891 no work of importance has been done in our mines, the rich and cheaply worked deposits of Minnesota and the imposition of duties in the United States having driven our ores from the market.

The main obstacle in the development of our iron mining industry has been the lack of mineral fuel for smelting, and it will be of much interest to see how the experiment at Hamilton of smelting Ontario ores with American coke will turn out.

It is probable that before long Ontario iron mining will again be of importance, especially in the region west of Port Arthur, where inexhaustible beds of hematite and magnetite form the Canadian extension of the wonderful Minnesota iron region, which now leads the world in production.

There seems no good reason, except lack of capital and enterprise, why some point on the upper lakes, where ores, flux and fuel can be brought together cheaply by water, should not become a Canadian Cleveland with a great iron industry; and we may not unreasonably hope to see this in the future.

### Copper.

The copper mining of Ontario is naturally divided into two periods, an earlier one when the Lake Huron mines were operated, and the present when copper is obtained from the Sudbury ores as nickel-copper matte. The product of the Bruce, Wellington, and other Lake Huron mines, between 1846, when they commenced, and 1876, when they ceased work, is valued in the Report on the Mineral Resources of Ontario at $3,300,000. In 1886 we find copper once more quoted in our statistics, 164,000 lbs. having been produced; in 1892 there were 1,936 tons; in 1893, 1,431 tons. This copper is in reality only a by-product of the ore worked for nickel. There is some chance that the Mamainse deposits, which are really an extension of the famous Michigan region, may be worked before long, but the immediate prospects of copper mining as distinguished from nickel mining are not very bright, the low price of the metal discouraging fresh ventures.

### Nickel.

Ores of nickel were observed many years ago in connection with the copper ores of Lake Huron, but no deposits of value were found until the C. P. R. penetrated the wilds north of that lake in 1882, disclosing the great masses of copper pyrites and magnetic pyrites in what is now the Murray mine, near Sudbury. Before long these ores, first valued for their copper, were found to contain the more valuable metal. Nickel is first mentioned in our statistics in 1889, but the amount produced is not given, since the Canadian Copper Co., the only producer, refused to make its returns public. In 1890, 718 tons of the metal are reported; in 1891, 2,303; in 1892, 2,082; in 1893, 1,642; and in 1894, 2,570½ tons.

We have only one important rival as a producer of this metal, the French island of New Caledonia in the Southern Pacific, which provides an output about one-third greater than ours. The New Caledonia ores are of a totally different character from ours, consisting of garnierite, a green magnesian silicate; while ours are sulphides, chiefly pyrrhotite and pentlandite. There seems no doubt that our ore exists in unlimited quantities, and the only question to be considered is the amount of the metal which the world can consume. At present the supply seems to equal the demand, and, since the initial plant is costly, there is no object in new companies going into the mining of nickel. The price has been steadily falling, and, as satisfactory methods of refining it are perfected, this splendid new metal must take a more important place in the world. The use of nickel steel comes slowly into favor, and the great saving in weight for a given strength should bring this alloy into use for structural purposes, especially in shipbuilding. If the British government could only be convinced of its value in armor plates we should soon have a boom in nickel mining.

With refined nickel quoted at 45 and 47 cents per pound one would suppose there ought to be a market for solid nickel table-ware and kitchen utensils. Imagine a set of silvery kettles and frying pans replacing the present black utensils in the kitchen!

It is most desirable, however, that we should refine at least a part of our nickel in Ontario, instead of shipping all the matte to the United States or the Old World.

### Silver.

The history of silver mining in Ontario is one of the most interesting and romantic in our mining annals. Silver was first found by the veteran prospector, Mr. Peter McKellar, in 1866, at what was afterwards the Thunder Bay mine; but much more important was the discovery two years later, of the most famous mine in the province, the Silver Islet mine. Close to the stormy north shore of Lake Superior, just east of Thunder Bay, a small islet, about 70 x 40 feet in dimensions, yielded to one or two blasts, silver to the value of $1,200. The next season 10 men secured over $16,000 worth of native silver in not more than 14 days of actual work.

In 1870 the Montreal Mining Co. sold out to American capitalists and development was begun in earnest. The little islet was enlarged by crib work and filling until there was room for 7 buildings with some space besides; while shafts were sunk to the depth of 1,230 feet. Some of this sinking was through rock tightly bound together with wiry native silver, which, with a number of rich silver bearing minerals, some new to science, formed the chief ore.

To treat the ore a fifty stamp mill was erected on the mainland, and the now widely-used Frue vanner was invented by Mr Frue, the mine captain. The total production up to the end of 1884, when the pumping engines were obliged to shut down for want of coal, and the mine filled with water, amounted in value to $3,250,000, by far the largest return from any single mine yet recorded in the province.

The product of other mines to the west of Port Arthur brings up the total value of silver from the region to about $4,300,000, according to the Survey Reports. Since 1881, however, the amount of silver obtained has been trifling, and at present no mining is going on in the Thunder Bay district.

The mines, other than that at Silver Islet, seem to be shallow and very pockety. Nevertheless, if silver should again reach its old price it is probable that several of them could work at a profit.

### Gold.

In August, 1866, two prospectors in the township of Madoc found flakes of a yellow metal like copper, which could be beaten out into thin leaves. They were informed by the geologist, Vennor, that the metal was gold. This find was on what was afterwards named the Richardson mine. Other discoveries in the same and neighboring townships followed, and caused a violent attack of the gold fever in the towns to the south. Probably less than $100,000 worth of gold was obtained in all from the region, and five times as much was sunk in useless plant. The failure seems to have been due partly to the pockety nature of the deposits, partly to the refractory character of the ore; for instance, near Deloro, where it is arsenical pyrites, but largely to ignorant and extravagant management. In 1871 gold was found by the McKellars in the western part of the province at the Huronian mine. Since then the yellow metal has been discovered at many points between the Madoc region and the Manitoba boundary. In fact it may be said that few gold producing countries in the world can boast of so wide a stretch of territory that has been proved to be more or less auriferous. Wherever the Huronian rocks appear there is a probability of the occurrence of more or less gold in them.

In spite of all this but one mine, the Sultana, near Rat Portage, can be said to have proved itself a paying venture, though several others begun within the last year or two promise well. The richest specimens come from the Ophir mine and Shoal lake on the Lake of the Woods, and from Wahnapitæ; but up to the present mines showing less brilliant specimens seem more likely to prove of permanent value.

The most hopeful portion of the Ontario gold mining region at present is the Lake of the Woods, where at least two mines, the Sultana and Regina, are producing their bricks of gold with great regularity. The Rainy Lake region, after a year of blank depression, is beginning to revive, and there is a probability that some of the true fissure veins on Shoal lake will be worked energetically during the coming year.

The Manitou region is attracting much attention, but is still only in the prospecting stage. The Harold lake property, opened up by the energetic Wiley Brothers, is also a producing mine and seems to have passed the experimental stage.

In and near Moss township, which has the once famous Huronian mine in its centre, interesting gold discoveries have recently been made, and a very large deposit of gold bearing quartz is being explored by the McKellars near Jackfish bay, on the north shore of Lake Superior, with results that promise well.

The Ophir mine in Galbraith Township, and the Vermilion mine in Denison, show no signs of life; nor are the Wahnapitæ mines doing much more than prospecting work.

The curious McGown deposit of gold and copper ores near Parry Sound is also nothing more than a prospect at present.

In the oldest gold mining region of the province, that of Madoc, Marmora, Belmont and other townships, little is being done, though Mr. Ledyard has shown some enterprise in developing his Belmont mine during the year. It would seem as if some of the deposits of arsenical ore in this region could be worked at a profit with the improved machinery and methods introduced since the shutting down of that costly failure the Deloro reduction plant; but no doubt it will take time before confidence is restored in the region.

In glancing over the results of our mineral industry as a whole, we find that petroleum products give the greatest aggregate returns, far exceeding the results of mining any of the metals. Defective statistics make it impossible to give even a rough idea of the whole produce of our oil wells; but for a number of years the sales must have amounted to more than $1,000,000.

Nickel should perhaps come next, that is, if the value of the refined metal is taken, which is perhaps not fair, since the matte is all exported. Then silver, copper and iron.

Our output of gold has been insignificant, in spite of the immense outlay on plant in the Madoc and Rat Portage regions. The production of salt no doubt far exceeds it in value.

Looking toward the future we may fairly expect well established industries, like the production of salt and petroleum, to continue the even tenor of their way for a long time to come unless some change in the tariff makes a marked change in their conditions. Nickel mining may be expected to increase gradually as the world is able to absorb more of that fine metal. Hand in hand with it, our output of copper will, of course, also increase. The immediate future of iron mining does not look very bright; but there must come a time when our western ore deposits, which are practically limitless, will give rise to an important industry.

There seems no immediate prospect of a revival of silver or lead mining in our province, nor are our large deposits of zincblede to the north of Lake Superior likely soon to be drawn upon.

Gold presents the brightest outlook of all for speedy expansion, especially in the part of the province west of Lake Superior; and I fully expect to see a well established gold mining industry there within a few years, something of a quiet and permanent character like that of Nova Scotia, but on a larger scale, since the extent of our gold field is much greater.

One of the most discouraging features of mining in the province is the lack of intelligent interest and enterprise on the part of our own citizens. Most of the more important mining ventures of Ontario have been in the hands of outsiders, especially our bold and energetic neighbors the Americans, who seem to lead the world of late years as successful miners. Perhaps our canny capitalists, when our cousins from across the line and a few stirring Britishers have got possession of our best properties, will begin to wake up to the fact that we have gold mines worth working right at home, and that many of them will give far better returns than mortgages or bank stocks in this time of depression.

# Observations on Mining in Thunder Bay District

By Mr. Peter McKellar, Fort William, Ont.

Last week, when about to commence to write this paper, I was unexpectedly called away to the Empress gold mine, Jackfish, where I was detained for several days. I will now have but a short time at my disposal, and will not be able to make it so complete as I intended.

Director Blue and Prof. Coleman, of the Bureau of Mines, have made a pretty thorough examination of the mining developments in this district last summer, and will, I understand, read a paper on the matter at this meeting of the Institute. It would be useless for me to attempt to write on that subject, as I have not been through to the Rat Portage mines for a long time; I will therefore confine my remarks to a few observations that relate to mining here.

The district consists of a vast area of rocks which are largely composed of schists and rocks that are favorable for carrying metals and economic minerals. They have been, in many places, subjected to disturbances at various periods that caused fissures to be formed which were subsequently largely filled from solutions with quartz or spars and in most cases with one or more of the metalliferous ores. Examples of these are numerous, as those of the Thunder Bay silver veins, the Huronian gold vein, the Shoal lake and many of the Lake of the Woods gold veins, and the Jackfish bay gold veins, etc. Although, no doubt, there are gold lodes here that are not true fissures, as the bedded lodes, segregated and local gash veins, still I believe that there are more of the gold lodes true fissures than is generally allowed to be. It matters little what kind of a vein it is providing it carries plenty of the valuable ore; but veins, especially small ones, can be relied upon for permanency if true fissure veins, more than if any other kind. I find it a prevailing idea with mining men that a vein is not a true fissure unless it shows, crossing the stratification or slatey cleavage. In the case of highly inclined strata, I would expect to find such a vein conform with the stratification more frequently than otherwise, as forces that would cause fractures would have less resistance along cleavage planes than across them. Take, for example, the McKellar gold lode near Jackfish bay; it appears to follow in the cleavage of the schists for a long way on locations R 567 and R 568. At the Empress mine, R 569, it shows branches, striking out across the schists, and at right angles to the cleavage planes in places. Therefore, I think it probable that many of the so-called bedded or contact veins are true fissures.

I noticed many years ago that there appeared to be some connection between the granitic eruptions and the gold veins in this district Since then, as my knowledge of the formations widened, I am more thoroughly convinced that it is the case. In my pamphlet on *Mining on the North Shore of Lake Superior, 1874*, in referring to the Huronian (Jackfish lake) and Heron Bay gold lodes, I remarked, on page 24, "Having seen the granite in about the same position in regard to each of these gold-bearing lodes, which lie about 150 miles apart, I thought it worthy of mention, as it may or may not have something to do with the presence of the precious metals in these veins." Since then I have noticed in the vicinity of gold lodes that branches from those syenitic granite eruptions pass from coarse grain to fine, then into quartz similar to those of the gold-bearing veins in the vicinity—as at the Huronian, at Rossland, Lake of the Woods, and at Wahnapitæ country and many other places. I am not quite sure that I found them carrying the gold, and I have not now time to look up my notes; but I think it quite probable that they do, and that many of our gold lodes will be found to belong to this class.

In these gold localities, I believe that the quantity of gold in a fissure vein will change agreeably to the character of the enclosing strata, whether the gold is of deep origin or not. So that a portion of a fissure may be rich in passing through one stratum of rock, and poor or barren in passing through another, in the same way as is shown in the Animikie strata in the case of the silver veins, and also in many places in other mining countries. The gold veins traverse the Archean strata, which are almost invariably highly inclined and can be followed down to any depth within the same stratum. Therefore they are not liable to change their character downwards so completely as is the case with the silver veins within the flat lying Animikie beds. Below the Animikie the silver veins will pass through the Archean strata and probably will be, in places, valuable lodes. The results of the developments of the lately discovered silver at Pays Plant will go far in deciding this matter.

In the paper I wrote on *Silver Mines of Thunder Bay* last year, I gave my reasons for supposing a deep original source for the silver of the Thunder Bay mines—the source from which the immense quantities of the native copper rocks were ejected. The silver veins are true fissures and adjacent to the great Lake Superior trough. They intersect the Animikie and Archean rocks and show practically no gold in either. The ores of iron, copper, lead and zinc, seem common to both the silver and gold veins of the district. It does appear that the real silver veins here are only to be found in the vicinity of the great basic eruptions of the Keweenawan age, while the real gold veins are found generally, if not always, in the vicinity of certain granitic eruptions of the Archean age. It seems probable that fissures formed in the vicinity of these eruptions did descend to their sources or liquid pools, and that they received their metallic contents largely from the same.

The silver discovery above referred to was made last fall in Archean rocks, near the mouth of the Pays Plant river. It is similar in kind to the Thunder Bay silver veins—the gangue being mostly spar with the silver both native and sulphide, with galena and iron pyrites, etc., through it. The rich samples, that yield several hundred ounces of silver to the ton, resemble the bonanza ores of the Animikie veins very much. According to the reports of reliable parties, it is large, well defined, and continuous for a long way. It can reasonably be expected to continue its character downwards on account of the enclosing formation. It has been the general belief that the silver in the Thunder Bay veins was due to lateral infiltration and that only in the Animikie rocks need a search be made for silver, notwithstanding several outside veins showed favorable indications. This last discovery in the outside or Archean rocks near the great Lake Superior trough is additional proof in favor of the showing that the silver in these veins has been derived from a deeper source than the Animikie strata.

The splendid showing of the deeper mining of the gold veins of late, as that of the Sultana, Regina, and Shoal Lake mines, is strong proof of the permanency of our gold mines. The cloud that was hanging over them, as being shallow and superficial, is rapidly passing away as developments progress.

In conclusion I would state, that I fully expect the coming summer to be the liveliest season in the mining line that was ever witnessed in this western district.

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**New Use for Asbestos**—It is proposed to use asbestos in the soles of boots, a preparation of asbestos wool being compressed into thin sheets by hydraulic pressure, the sheets waterproofed on one side by a special solution, and portions inserted into the boots as middle soles. It is assumed that asbestos being a non-conductor of heat, its interpolation into the fabric of boots and shoes, in conjunction with a waterproof material, will have the effect of counteracting the influences of heat, cold and moisture. It is said also that asbestos-lined boots cannot creak in wear, and are, besides, many times more flexible than boots made in the ordinary manner.

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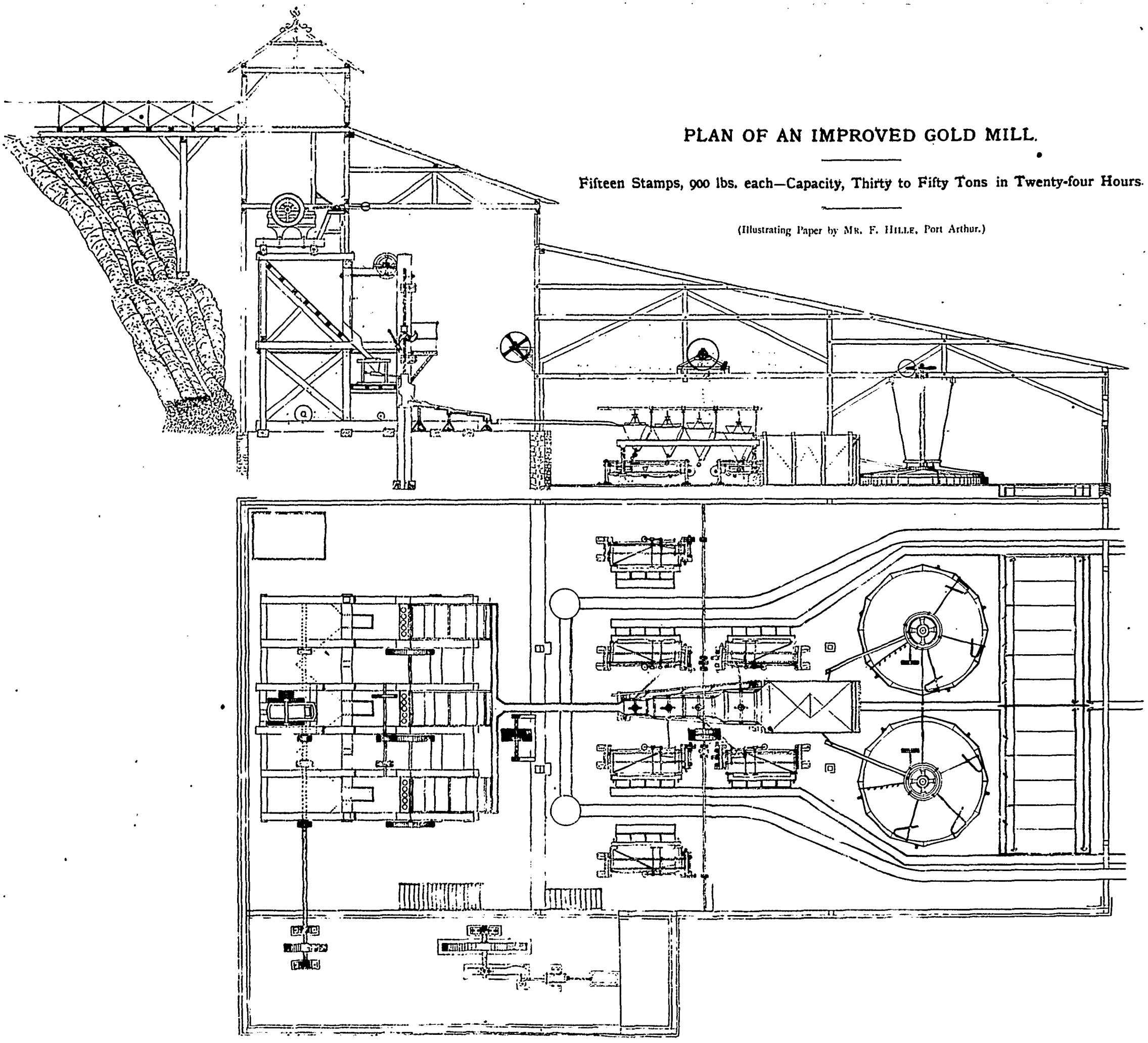
**Canadian Petroleum Shipments**—Following are the shipments of Canadian crude and refined petroleum, reduced to crude equivalent, over the two railways for February:—

| | Bbls. | Bbls. |
|---|---|---|
| Grand Trunk— | | |
| Crude | 14,430 | |
| Refined | 13,775 | |
| Equivalent | | 48,868 |
| Michigan Central— | | |
| Crude | 6,155 | |
| Refined | 2,541 | |
| Equivalent | | 17,929 |
| Total equivalent | | 66,797 |

# PLAN OF AN IMPROVED GOLD MILL.

**Fifteen Stamps, 900 lbs. each—Capacity, Thirty to Fifty Tons in Twenty-four Hours.**

(Illustrating Paper by MR. F. HILLE, Port Arthur.)



# The Financial Aspect of Mining.

By J. H. CHEWITT, BA., Sc., C.E., Toronto.

That such a great country as Canada, so admittedly rich in all kinds of minerals, with its well developed transport facilities, its enormous food producing areas, its magnificent timber and practically unlimited water supply and power, should be so backward in the important industrial branch of mining is cause for surprise and enquiry. The reasons for this state of affairs, and anything that may explain and remedy the lack of development in this direction, are subjects that must commend themselves to every good citizen, and above all to members of the Ontario Mining Institute, for consideration.

It has been stated that in proportion to the capital invested, mining has been less remunerative in Ontario than almost anywhere else.

I do not believe, nor do I think our Institute is willing to admit, that workable ore deposits are so few and far between that it is unwise to attempt development. I think the causes of failure may be looked for, very often, in other directions, and we may examine, a little, certain of these which have, among others, lately attracted my attention. They may be broadly set down under five divisions:

(1) Highly capitalized promotion schemes floated on surface indications.

(2) Application of treatments not suited to the ores.

(3) Untrained and incompetent management.

(4) Premature surface equipment, and buildings.

(5) Bad roads.

Under the first heading the following points suggest themselves as directly bearing on the legitimate capitalization of a mine. "The cash "value of a mine is that which will net a given annuity to the investors; "the amount of this dividend should increase with the risks run." (Ihlseng.) This can only be determined by actual development, which means the expenditure of a certain amount of money. The quantity of ore revealed, its grade, and cost of treatment should then determine the estimated value.

The proper (or justifiable) capitalization will be dependent upon this cash value, and the equipment necessary for production commensurate with the prospective annuity. But as no mine is inexhaustible, its life being calculable, a sinking fund must be provided in order to create a new capital within the period of its life.

On account of the greater risk run in mining investments as against investments, say in Government bonds, or first mortgages on choice lands, a much higher rate of interest is required, ranging from 10% to 50%, according as the risk is considered great or small.

The Banket beds of the Transvaal afford examples of companies with enormous capitals, in many cases from $5,000,000 to $10,000,000, organized on a basis to yield the moderate return of about 10 per cent. This was possible on account of the wonderful continuity in grade and character of the ore beds, now ascertained by extensive workings and deep borings. At the same time it is quite evident the equipment of a gold mine working on a $7.00 to $10.00 per ton ore, capitalized at $10,000,000, with the object of paying 10 per cent., should not cost, even in the Transvaal, over $250,000 to $300,000, or say 3 per cent. of the total capital. And just here comes the vital question: Is the cash value of the workable deposit $9,700,000? To authorize such a capital we see the mine must have a life of 15 years at least to repay the investors, which seems a long period to anticipate a uniformity of all the present conditions. Many things may happen in that time. It is probable the price of labor and supplies will rise, one cause being the immense production of gold going on all over the world. At present between 20,000 and 30,000 Kaffirs, employed in the Rand mines, are satisfied to work for an average wage of $15.00 a month—50c. a day. It is unlikely such wages will continue indefinitely to satisfy these workers, and any increase must affect prejudicially the value, as an investment, of the mines.

Again, until recently, a gambling spirit has pervaded mining. Attractive prospectuses giving glowing accounts of mountains of ore, based perhaps on Indian legends of pure gold and silver almost in bulk, have been put forth rather than the results of honest development, careful tests and examination. Money put into such ventures is speculation pure and simple, and though in one or two cases successful results may have been realized, in the majority of instances the capital has been lost and mining discredited, the only person benefited being the unscrupulous promoter. The result may be put in the words of a Liverpool gentleman to me recently, "Canadian mines stink to heaven"; and we have ourselves to blame, and not our imperfectly examined mineral field, for this state of things.

Secondly, the application of inappropriate treatments is another potent source of failure. Mining men know of many places where rotting timbers and rusting mills form melancholy monuments of misdirected capital. Such failures have been due to both inexperience and lack of technical knowledge. It has too often happened in mining that the man in charge has gained the wisdom of experience at the cost of his confiding employers.

But it must also be allowed that one of the main elements of successful treatment lies in the uniform composition of the ore, and many cases are known of sudden changes, such as galena to bornite, lixiviating ore to lead zinc ore, free milling to smelting ore, &c. These must be guarded against, as far as possible, by cautious preliminary exploitation. As an example of wise preliminary development before erecting a plant, the Hall mines at Nelson, B.C., may be cited. This company has quietly carried on its work of opening up for two or three years, and now with sufficient ore of known composition in sight to keep their smelter going for five years, they are in a position to operate on a most satisfactory and economical basis.

Thirdly, incompetent management has been, nay perhaps still is, the greatest cause of loss in mining investments. Influential directors have been too ready to translate some friend or relative from an office desk to the control of a mine. Untrained and out of sympathy with his surroundings, what is to be expected other than failure.

Fourthly, undue haste in erecting machinery almost before a drill has been struck, has led to much waste of money, where judicious work expended on a shaft, or careful tests with the diamond drill, would have revealed the pockety nature of the deposit, or the barren quality of the ore as depth was gained. It is well to remember that all veins do not widen, or become richer as you go down.

Neither is it necessary to build a palatial residence for the manager, nor to construct permanent houses for the miners, and schools for their children, before the mine has afforded some pretty satisfactory evidence that it will become reasonably profitable.

Lastly, bad roads have played a greater part in many failures than is commonly supposed. I am aware of a mine in Ontario, the road giving access to which is so bad that three barrels of concentrates form a load for two powerful horses; in fact more than once the third barrel has had to be thrown off in mid-journey to lighten the draught. In another case it took about five weeks to take in a 60 h. p. boiler about 40 miles. How can profit be realized when every ton of material brought in or taken out must be handled under such very unfavorable conditions.

In connection with the transport of ore and supplies, I do not think enough attention has been paid to light tramways, upon which a single horse can draw comparatively large loads with ease. Wire cable-ways, particularly over short stretches of difficult ground, also deserve more consideration, their cost of operation comparing favorably with that of light rail and tramways, while the first cost is many times less.

Above all and by way of summing up the whole matter:— "When the plans are being laid the educated mining engineer who possesses the business perception required for the successful conduct of any other manufacturing enterprise, will adopt tried and true processes, even though, as innovations not having the seal of local usage, they may be looked upon with suspicion and resisted by "men of the camp." To such careful, observant management, however, the many mines of Europe owe their continued prosperity after three hundred years of working.

By actual and costly experience the "practical man" learns what the "theoretical man" has been taught, to profit by the experience of others. System will replace obsolete hand-to-mouth methods, and thus many an idle mine may, by one keenly alive to improvements in mining appliances, be converted into a prosperous property.

A compromise between, or a union of theory and practice, in such a manner as to inculcate the principles of technical knowledge, will enable the engineer to bring the rosy anticipations of enterprise to the level of the facts of experience.

# Improvements in the Dressing of Gold Ores

By Mr. F. Hille, M.E., Port Arthur.

Permit me to occupy your attention for a short while with a subject which I consider at this moment to be of great importance to our mining industry. It is this: the successful dressing of gold ores, and their preparation for a subsequent metallurgical treatment; not only for us in our western districts, but perhaps also for all the different mining camp, scattered over the whole Dominion.

Since the depreciation of silver and the closing of so many mines producing this metal, and since the demand for gold by different Governments, especially that of the United States, has increased so enormously, capital and the mining world in general have lately directed their attention greatly to the search for gold. Mines, yes, whole mining camps, which were abandoned years ago on account of their then unprofitableness, are worked now vigorously, and bring in many instances handsome returns. Not less active were the prospectors and miners in our own country, and we hear and read almost daily of new finds throughout the Dominion.

The awakening of this industry has brought forth, I had almost said, another one—a very voluminous literature on the winning of gold. Indeed a number of these papers really deserve the closest attention The dressing of gold ores is especially well considered, and the experience gained with the different machines and apparatus in vogue in the mills on this northern continent, is often very well presented. But exhaustively as the subjects are treated and the pros and cons of the improvements on these old machines propounded, I have missed almost wholly the mentioning of the practice of other nations.

We see in the dressing of ores the same old methods carried on as we have seen years ago: every other branch of our mining industry shows considerable improvements and innovations, but in our milling system we progressed not one step farther. Where some improvements in the saving of minerals are made, or attempted, it is done without the consideration of expense, saving of time, manual labor, or even complete effectiveness: as for instance the blanket process in the California mills. But what are the reasons of this pious retaining of an old, wasteful practice? Many—some of which would often invite severe criticisms, but I shall abstain from detailing them here. Enough that they exist not for the good of our industry. We always should be on the *qui vive* for that from which we could derive an intellectual or material benefit. The Australians are ahead of us in this respect. Some time ago the Government of Victoria appointed a commission for looking into the wasteful operation of the numerous dressing works in that country. This commission has handed in its report, and recommends very urgently the adoption of the so-called "Luhrig system," which these men studied on the European continent, as well as in their own country, in the works at Stawell, in the North German mine at Waldon, and Long Tunnel mine at Walhalla, which they considered "to offer object lessons of the highest value."

Now, gentlemen, I think it is high time that we experience also such "object lessons," and if it were merely for keeping up with the times, not to consider at present the economical advantage derived therefrom. I said above that our ore dressing has not kept pace with the improvements and innovations in the other branches of our mineral industry, and if our inventive genius is not strong enough to think out something with which we can improve these poor conditions in our works, then we should not hesitate to put aside for a while our "American pride," and look into the works of other nations to see if we can detect anything there that might lead to better results and to greater personal satisfaction. I cannot imagine myself in the place of a manager of any works, who does not care for a moment how high the tailings of his mill will go, who is simply satisfied with the result he is gaining, as long as the stockholders do not complain.

The waste in our mills is not justifiable; such working is crude and unscientific, and does not harmonize with the progress of our present age.

I have tried, gentlemen, to show you here with a hastily drawn plan the same system which the Australian commissioners recommended so urgently to their Government and mining world for adoption. It is known under different names: the "Luhrig," from the well-known milling engineer, D. Luhrig, in Dresden; or the "Bilharz," from the not less well known Government mining director, O. Bilharz, in Freiberg, or the "Krupp" system, and this name is taken from a man who needs no introduction to you.

I show also the principal machines in a little larger scale here so that they might be better understood by those who should not be familiar with them. But before I commence their description I would like to say a few words in defence of my assertion as to the inefficiency of our present milling machines, in regard to the saving of minerals and metals, and the separation of the gangue from the former as adapted to the ores of this country.

We all know that most of the gold veins occur here principally in the metamorphic rocks, that is, in the upper series of the Huronian, the so called Keewatin. Most of these rocks are chloritic, talcous, sericitic and hornblendic in character; and even in the veins are found often stringers and bands of rock, of the same composition as the former, which after mining are hardly possible, even by hand-picking, to separate sufficiently from the ore. The minerals associated with the vein stone, which is usually quartz, are zinc blende, copper and iron pyrites and galena, seldom sylvanite or arseno-pyrite. The gold in these ores is mostly fine, sometimes microscopically fine, then again coarse, mechanically or chemically combined or free in the quartz, or in juxtaposition with the former minerals, but principally associated with the copper and iron pyrites.

The percentage of minerals to the gangue varies greatly, amounting often to over 50 per cent.; in most cases, however, much less.

Now, in buying machines for the dressing of such complex ores, we have to consider well what kind we should preferably select for the most complete, the easiest and the cheapest saving of the gold and economic minerals. But we should also consider at the same time the later metallurgical treatment of the ores, or concentrates, which is also an important factor, if we wish to have them reduced by smelting, chlorination, cyanidation, or if not by an electrolytic process would be more advantageous, more economic to the owner.

We should further keep in view our commercial and industrial conditions, and not less so the transportation facilities. This long list of considerations could be multiplied if we would add the many perplexing occurrences on the amalgamating tables and vanners. But the usual practice is to order a mill before the mine is made, before the people know what they have in their mine. This folly has brought many good properties to grief and still a greater multitude of poor stockholders

I have repeatedly experienced the following:—"The enthusiastic mine owners wrote to a machine works to send a stamp mill which would treat an ore as the accompanying 'representative' specimens." The selection was left to the manufacturer, who of course sends one of the "latest pattern." The mill arrives, is put up, the stamps commence pounding in rythmical clacking, the slimes begin to flow over the amalgamating and concentrating tables, everything works nicely and smoothly, and the manager's face reflects his inner satisfaction of the—success. Also the assayer is present ready to take samples from the battery, the concentrates and tailings. A few hours are passed, the manager's face shows a strange metamorphosis What has happened? The tailings are too high! Now begins the experiment with the tables; the inclination is lowered, then raised, then lowered again, soon more water is allowed to mingle with the slimes. Several weeks are passed, the ore dump is giving out, the mill is running only half the time, the tailings are as rich as ever, but the company is getting poorer and poorer, and

dies at last an unnatural death, but has in dying the satisfaction that its mill forms a wide, shining monument to the country's disgrace.

Now, gentlemen, really is it to be wondered at that so many mill owners are baffled when the expected results are not forthcoming? Surely not when you consider what the stamp has to fulfil as a grinder. From no other machine do we expect the same thing. It is expected to work equally well on a multitude of differently constituted ores, may they carry the gold fine or coarse, in chemical or mechanical combination, heavily or not heavily charged with minerals, slime-producing or not, soft or hard, and almost every vein carries a different ore. But all these considerations would not have such a great effect upon the ultimate result if the stamps would only grind a little more uniformly, and if we had a different apparatus or machines in addition to them. It would also be of not much injurious consequence if we used light or heavy stamps, a high or low discharge (although the latter would be always preferable with our ores); further, it would not make a great difference if they acted not only as grinders, but also as amalgamators, if we had a better amalgamating table in connection with them. But I consider the smooth, and often very narrow apron and sluices or tables in use in our mills, under no circumstances favorable to our ores. The slimes pass too, unobstructed, and from the narrowness of the plates in too deep a current over them. The chloritic and especially talcous slimes flow too close and compact over the table and hinder the fine, often floating, gold particles from coming in contact with the quicksilver.

Similarly act heavily mineralized slimes, and when they are in connection with the former muddy slimes there is no preventing loss, unless you increase the plate area of your amalgamating tables in width considerably, and thin out thereby the current of ore particles and give the table the right inclination. Or if you do not like to increase the space of your building, and to increase the work of the gathering of the amalgam, connect hydraulic classifiers directly with the stumps, get rid thereby of the muddy slimes, and acidulous water, so injurious to a successful amalgamation, and change from the Spitzlutten your amalgamating tables, and from them to the vanners. But you need in both cases slime tables, or as they have in Californi: blankets for arresting the fine metallic minerals, which go with the ..mes from the classifiers, and those from the vanners which receive the finest graded product from the Spitzlutten. Because, if you have not these, you might loose as much and sometimes more on auriferous minerals than you have saved in free gold on your amalgamators.

Now I have exemplified only one case and the difficulties which will arise therefrom, but as long as we do not throw the stamp among the old iron, so long have we to put up with it, and have to counteract its defects by applying suitable apparatus in connection with it. I repeat here, I do not consider either our amalgamating table, or the Frue vanner or its relatives, the right apparatus for our mills. The latter might do where the ore carries only one metallic mineral, and if fed with "classified products," but where the components of an ore are many, and of varying specific gravity as is usually the case here, and we wish to separate them, then they are not economic machines, because we receive all the different minerals mixed together in one product. And further, where coarse grinding—30 meshes and under—has to be done to avoid the production of too much fine slimes, a large amount of coarse mineral particles are carried off with the tailings. And again, where fine grinding—40 meshes and over—has to be resorted to with the presence of such slime-producing rocks as ours, a large portion of the fine metallic minerals go with the tailings, then again the Frue vanner is not a desired apparatus. In this latter case it is often the practice to connect three and four vanners together, that is, each following receives the slimes from the one in front of it; or the slimes as they come from the amalgamating tables are divided into three or four currents, and fed on as many tables. This will help somewhat, but is not quite efficient, and gold and valuable minerals are lost in the tailings; while a large amount of gangue matter will be found under all circumstances among the concentrates. How annoying all these defects are to the manager, and expensive to the company, necessitating recourse later on to another process to regain this loss, everybody knows, and knows also that we have to handle for this purpose almost the whole bulk of ore over again. As I said above we can remedy these things considerably by using classifiers, but as long as we do not, that is, as long as we pursue the irrational practice and feed the whole muddy slimes and sands as they come from the stamps with their thousand different physical conditions upon these machines, so long have we to expect such poor results, that is, our tailings high in gold and minerals.

These above-mentioned three kinds of apparatus or machines, excluding the crusher, constitute here usually the whole outfit of a dressing work, of which we read in the papers almost every day, "to be the most modern dressing works in the country." Of course, if a country or nation does not adopt any improvement or innovation on an old fashion, a newly made or manufactured object is always modern with them, because they do not know better. This, I think, will be sufficient in supporting and substantiating my assertions in regard to the inefficiency of the outfit in our dressing works.

I come now to the description of a mill as shown on the plan before you.

In adopting this arrangement and the different machines I was led by the following reasons:—

1. The mill should have a capacity of about 40 tons.

2. Mixed with the ore is talcous slate from the walls of the vein, and from little stringers of the same material mixed with the vein stone.

3. The gold in the ore is partly fine, partly coarse.

4. The ore is well mineralized with copper and iron pyrites, blende and galena.

To crush 40 tons of ore I selected 15 stamps of 900 lbs. each; this not only will furnish me the desired amount, but will also solve the second consideration—as well as it is possible to be done with stamps; a uniform and at the same time coarse-crushing, in using 30 meshes phosphor-bronze wire cloth.

The mortars of the stamps have to be provided with copper plates for retaining the coarse and as much as possible of the fine gold; but for the amalgamation of that part of fine gold going out of the mortar with the slimes, I used Krupp's improved amalgamating tables.

To increase the capacity and enable the concentrating tables to do better and cleaner work, I put Spitzlutten or hydraulic classifiers in front of the former, and to separate the components of the ore I used Bilharz percussion table. Further to concentrate also as closely as possible, I added two buddles, and put in a number of settling pits to save every valuable mineral that should escape from the tables and spitz-kasten.

I had further in view that the ore should be handled as little as possible, from the time that it is dumped into the bin which feeds the crusher.

The accompanying sketch indicates the construction of the mill sufficiently. I might mention only that the crushing part of the works is separated from the building to avoid a rattling and shaking of the whole structure.

I can also pass over an exhaustive detailed description of the arrangement of the machines, as this is readily recognized. Instead of this let us follow the onward movement of the ore, as it passes from machine to machine, until it leaves the mill either as ready products or as tailings.

The ore after being dumped into the upper bin is fed automatically into the crusher, by a very ingenious arrangement, of which O. Luhrig, in Dresden, possesses the right of introduction. This feeder consists of a shoe which moves the ore from below the pointed end of the bin gradually forward on a grizzley, which again moves and feeds that part of the ore coarser than the space between the staves, slowly and regularly into the crusher. The automatic action of this shoe, which can be regulated at will, allows of a reduction of over half of the attendance where

several crushers are in use. The smaller parts of the ore which are separated by the grizzley overhead and by the one below the bin relieves the crusher of a good deal of unnecessary work, and increases therefore the life of the jaws, toggle, and check-plates.

I have introduced, further, a little improvement at the lower end of the bin. In case the automatic feeder should be once out of order, a trap door which swings in a quadrant in nearly the middle of the lower bin-opening, closes the feed opening to the automatic feeder and opens another one right over the grizzley, from which the ore can be fed into the crusher with a hand-rake.

From the bin below the breaker the ore drops into a hopper with automatic feed, which forwards the ore into the mortars of the stamps.

I selected here, notwithstanding the partly fine state of the gold in the ore, a heavy stamp, in order to crush coarse and as uniformly as possible, to avoid a large amount of slimes.

We have seen above that I prevent thereby to some extent the amalgamation of the fine gold in the mortars, but you will see that this does not matter so much, if you have learned more about the amalgamator used here. On the other hand, I have gained by the selection of these stamps some important advantages, through the avoidance of fine crushing: that is, the lessening of the proportion of muddy slimes, and the coarser grinding of the concentrates, which if too fine have partly a considerable floating capacity and partly when in such masses, as is often the case in our ores, crowding the surfaces of the other machines to the disadvantage of the saving of gold. For one who is not familiar with the conditions which prevail inside the mortar box, it sounds strange to say that a heavier stamp should not grind as fine or finer than a lighter, and that the weight should not balance the high drop of the light stamp; but if we know what is going on in the mortar it is readily understood. The splash of the lighter stamp, although having a drop of sometimes up to 16 to 18 inches, is not so effective on the ore lying on the die through the resistance of the deep water which is standing in the mortar. The capacity is further hampered through the slow speed; and naturally on account of the higher discharge, the particles cannot escape so easily through the sieves at every splash of the stamp, and are therefore retained longer in the mortar and undergo the grinding process more frequently. The consequence is a larger amount of slimes, but on the other hand also a more ready amalgamation in the mortar, because the gold particles are left more time to settle and to amalgamate with the quicksilver. The heavier stamp with its lower and faster drop and lower discharge, of which the shoe in some of the mills does not rise over the water at all, exerts by its quick up and down movement, I might say, a wave like motion of the water, and by this action keeping the finer and lighter particles of ore more afloat and more from the die before the crushing moment is reached. It is obvious that we gain by these conditions a less production of fine slimes, and a regular discharge. Another reason which urged me to adopt heavy stamps was, that in passing the oxidation zone of our mines we find the sulphurets increasing and the free gold decreasing, therefore mortar amalgamation does not play in our country, in many of the mines to be opened, so important a part as many might think: then undoubtedly the longest period of our mines' existence will be the one while mining unaltered ore.

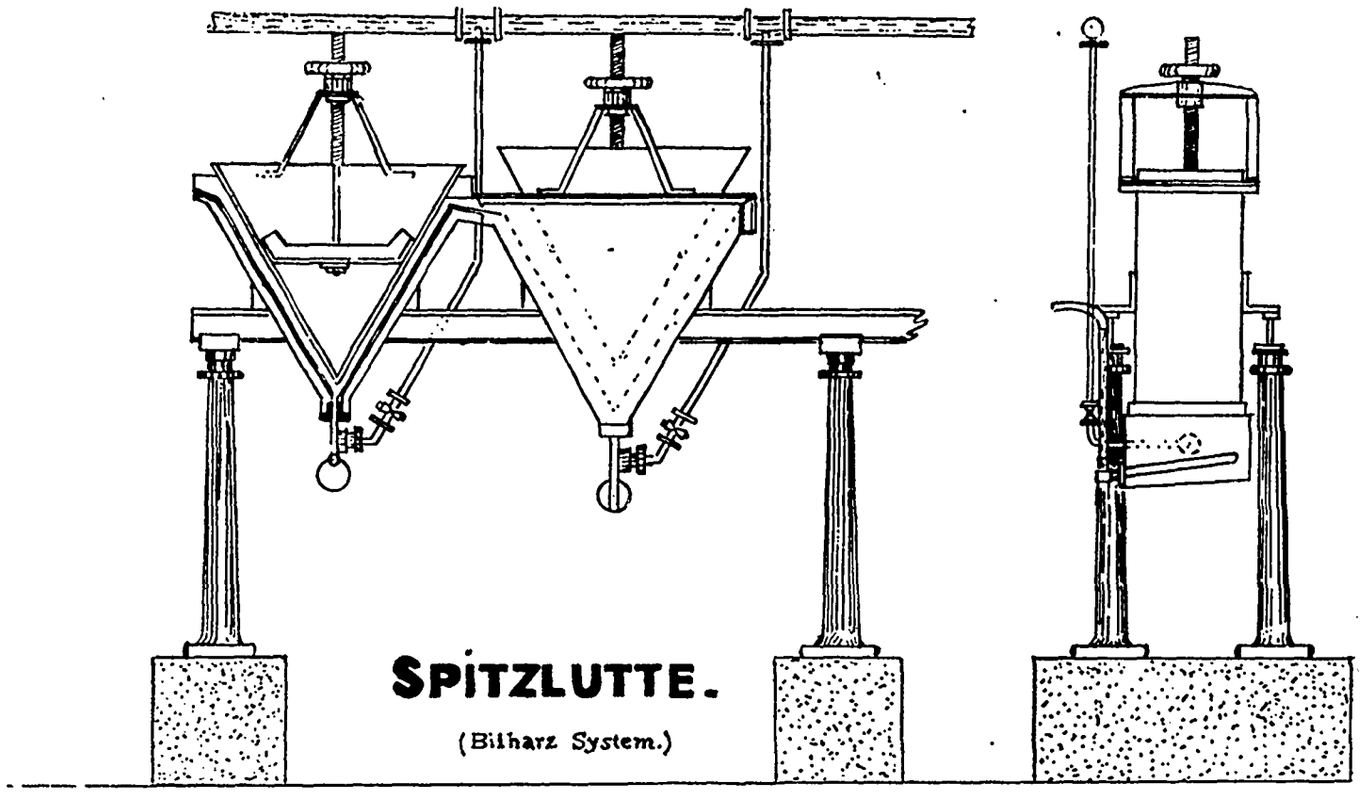
I come now to the amalgamating table. For a better understanding of its construction and *modus operandi*, I show it also here in a larger sketch, by which you will observe, that as soon as the stream of the slimes leaves the feeding-board, it runs against an obstruction, which not only causes the fine, light particles of slime to stay more suspended in the water, but also helps drowning the float gold. The water runs now down and back partly underneath the feeding board over a copper plate. After it has overcome its momentum it flows forward again, and falls upon and runs over a second plate until it finds another obstruction, makes the same back and forward movement as before, and drops then in a little launder which is lined with amalgamated copper plates. For preventing a settling of the sands and minerals, a stirrer keeps the ore pulp in motion, which is discharged over the front side of the box, being somewhat lower than the back part. The slimes in their forward course repeat the same play as before until they are discharged from a launder into the sluices, whence they enter the hydraulic classifiers.

I think it is hardly necessary to comment on this table, as it is easily comprehended that through the frequent interruption which the current finds on its way over the table that the light fine slime particles are not given time to settle so tenaciously on the copper plates, as it is the case on those tables which we have usually in use here. The area of the copper plates on a table of the size shown in the plan—56 x 122 in., without frame, is 61½ square feet, has therefore considerably more amalgamating area than our smooth tables, besides taking less space for placing them.

We come now to the classifiers in which the slimes enter at their smallest side. The little sketch shows that they consist of two prisms, made of sheet iron, sitting one in another, and can by means of a hand-screw be set apart as far as desired. Overhead runs a water pipe from which connections are made to the bottom of the outer prism, pressing a stream of clean water upwards, which holds the floating slimes in equilibrium, except those sands and minerals which resist, or better to say, which are heavier than the force of that pressure. These fall to the bottom of the Spitzlutten, and are discharged through a spigot bent upwards to nearly the middle of the apparatus. The still suspended slime particles flow on into the second classifier, where the prisms are sitting farther apart and lose here the next heavier grains of the ore. And so the process is going on, until all the coarser grains of the sands and heavier mineral particles are separated from the finer slimes. On considering the construction of these classifiers we see at a glance that the presence of the inner prism is a considerable improvement over those where they do not exist, because we are enabled thereby to regulate the weight of the water column standing above the water pressure from below, I might say, so sensitively, that we can grade the different ore particles in their exact weight and size as they exist in the travelling ore pulp. The finest slimes flow now into a Spitz-kasten, which acts merely as a settling box, over which a horizontal current of water passes, out of which the suspended ore particles fall into the pointed, funnel-shaped bottom of each compartment, and are discharged in the same way upon the buddles, as the coarser from the Spitzlutten on the concentrators. The water with the light muddy slimes contain usually only such a small amount of the precious metal and other metallic components of the ore, that they can be allowed to flow out of the mill, but should there be still an appreciable amount of gold or other valuable minerals suspended in it, then it is directed into settling pits, and the settled fine sands and slimes treated on the buddles.

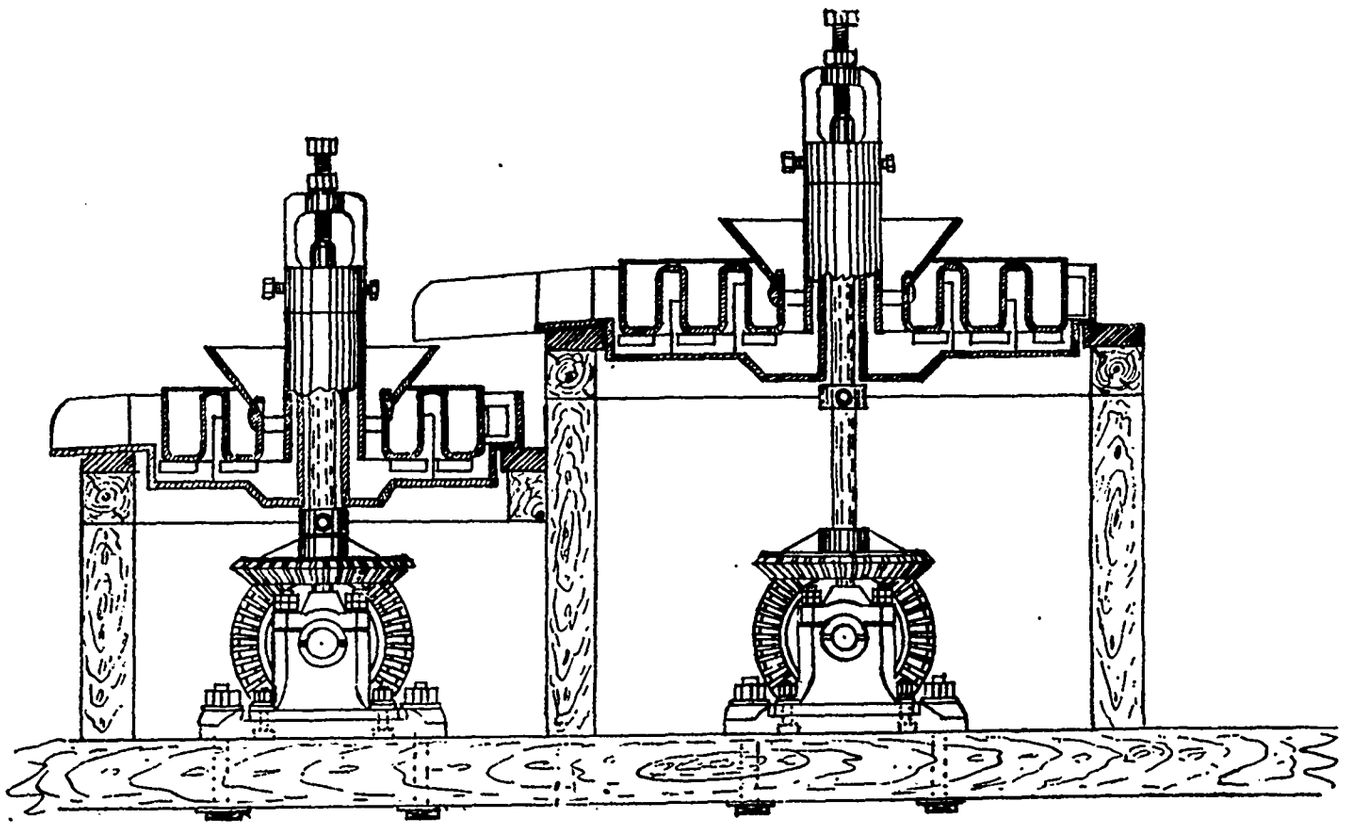
Now we have seen that we receive in these classifiers graded products, that is, coarser sands besides finer mineral particles whose physical conditions differ greatly and when brought upon the table are naturally not only through their different specific weight, but also through their difference in volume, quickly separated. We have to consider that the stream of water on the vanners exerts always one certain pressure, therefore when I regulate that force so that it will act only on the specific lighter, but more voluminous, or more surface-offering gangue grains, so do we receive under all circumstances cleaner concentrates and also cleaner tailings. Charging these classified products on a Frue vanner we can expect better work from them.

But the concentrators shown here—an improvement on the Rittinger table—are quite a departure from the foregoing, they not only separate the gangue from the minerals quickly and cleanly, as soon as they are brought on the tables, but separate also the freed minerals from each other, as far as their specific gravity will allow it. The separation is fast and sharp, the quartz leaves the tables as soon as it is fed from the board and falls into compartment I., the second product, the blende, into compartment II.; the third, the pyrites, go into compartment III.;

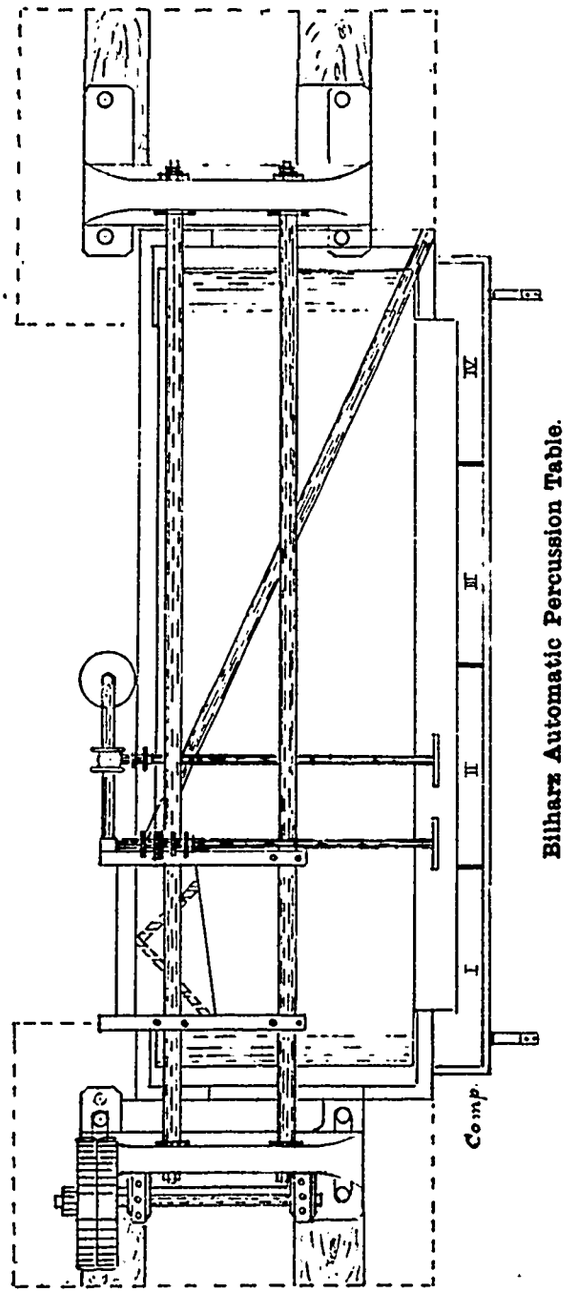


**SPITZLUTTE.**

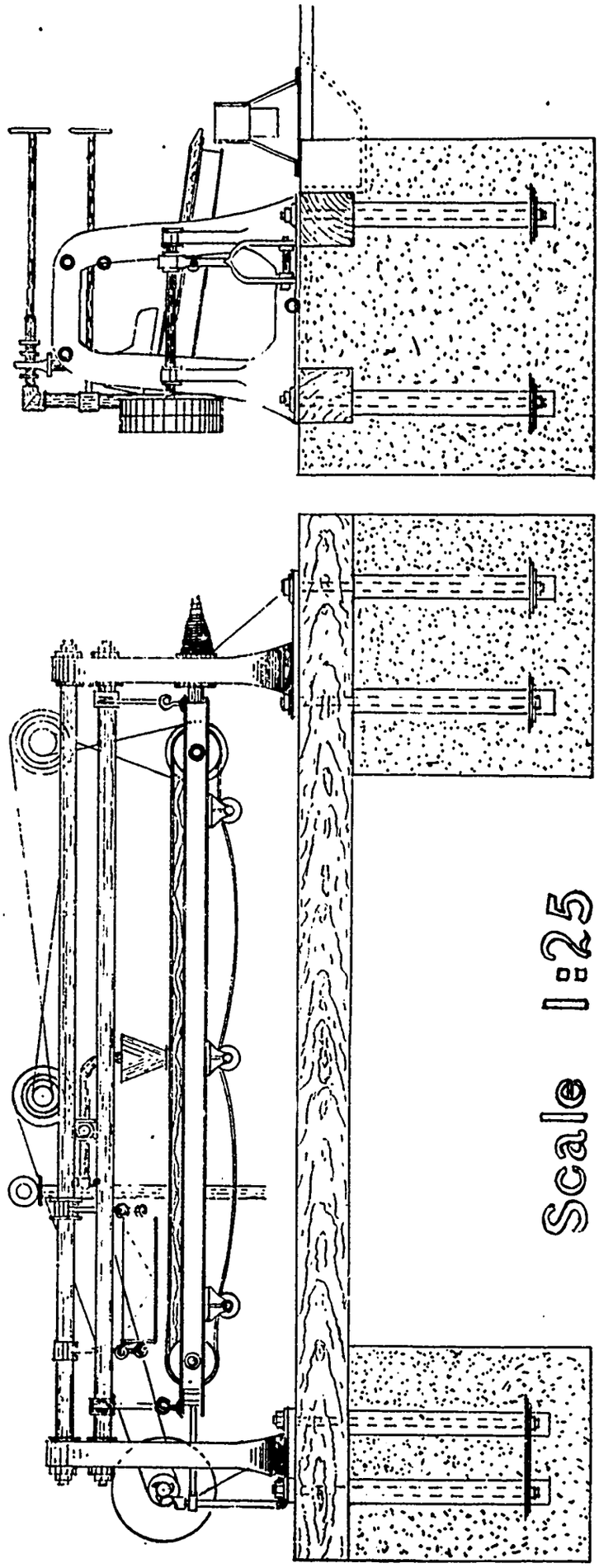
(Bilharz System.)



Laszlo Amalgamator.



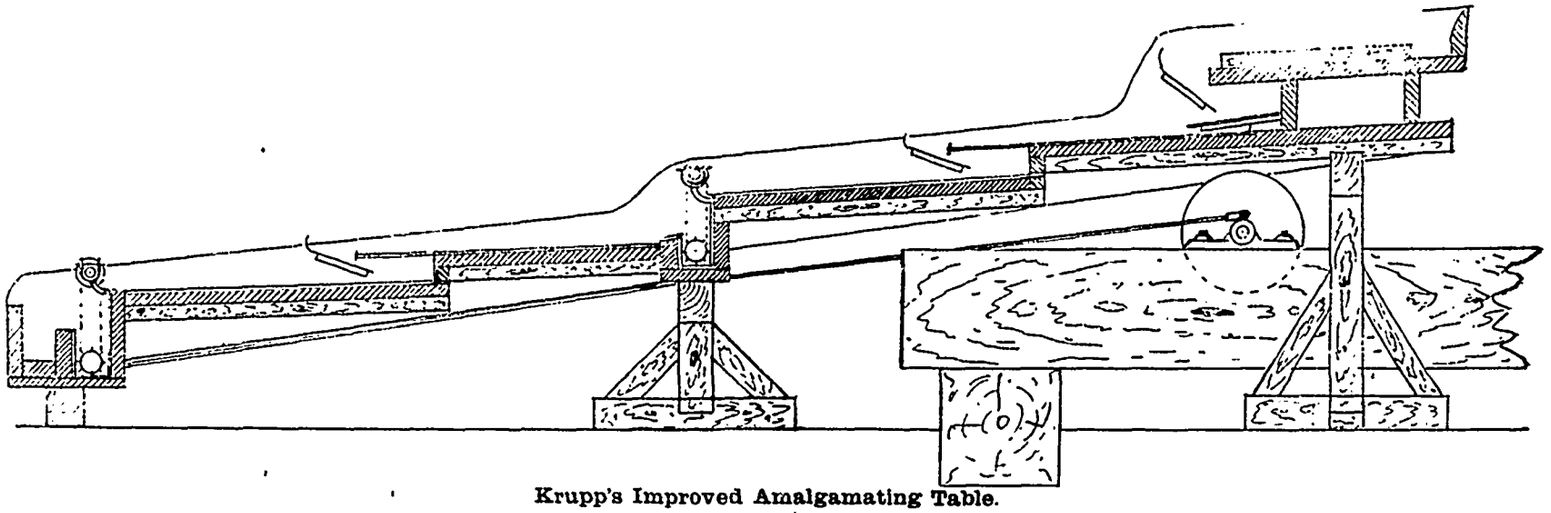

Bilharz Automatic Percussion Table.



and the last in order, the galena, will occupy compartment IV. of a launder and boxes in front of the table. We learn by the little sketch that this concentrator does not discharge at the ends, as is the case with the Frue vanner, but sidewards, to which it can be inclined at any desired angle. The classified pulp is fed diagonally upon a rubber belt which travels against the feed of the ore, and moves over two rollers situated on both ends, of which one of them furnishes the forward movement. It is resting on a table in which grooves are cut, and little streams of water forced through them forming thereby a cushion which hinders wear and tear of the belt. On account of this, the latter is always smooth and level, no sacking occurs, as with the Frue vanner after it is used for some time. This arrangement rests in a stout iron frame which is suspended on two arms on an iron rod, allowing any desired inclination. It receives about 150 percussions per minute by a cam and spring, situated at the opposite ends of the machine; at the same time the belt travels nearly 165 inches, or 2¾ inches per second. By these motions the table is enabled to separate by specific gravity. This is different in the case of the Frue vanner, it receives lateral vibrations, and separation of the gangue and minerals takes place on both ends of the table, that is, the gangue is discharged on the lower, the mixed and heavier minerals, with a certain amount of gangue carried up to the higher end of the table or belt and there discharged. Should different minerals on above described table touch, or run together somewhat near the lines of their discharge these are caught, and kept extra for further treatment on the reserve tables, of which I intended to have two in the mill. They are built of iron, and have a capacity of about eight tons, if the ore is well classified.

may tend to technical perfection, is, however, rarely desirable, because local conditions do not often render it profitable to turn out a variety of products, such as would find a ready sale in the Old World. While the copying outright of mills of German design is not to be commended, there is no doubt that the best thing the western mill men can do just now, is to pay more attention to that one factor in successful concentration which the Germans have done so much to perfect. I refer to proper sizing before jigging. Indifference on this score has been a serious stumbling block to the attainment of good results in mills which were otherwise excellently designed."

But, gentlemen, even if we should not find here a ready market for the different products, for instance, for the zincblende and galena, so is it undoubtedly of vital importance for us here with our poor communications to the market, to reduce the bulk of our shipping ore, or those products which contain the principal value of our ores, as much as possible. Further, we reduce the reduction expenses considerably, first to the smaller bulk, second through the diminishing of the percentage of blende. I have seen in the veins, and have had in my laboratory very high grade of gold ores, having over 4 per cent. zinc, equal to about 6 per cent. blende, which concentrated to 14 to 16 per cent. zinc, for which we had to pay $3 and $4 extra reduction expenses, allowing 8 per cent and taking the plus units at 50 cents per unit. Do you not consider this a big item? Yes, I had lately average samples from a very rich vein which contained over 9 per cent. zinc, and still more lead, and the gold was only in the pyrites. And if we can increase the percentage of the copper in our gold ores, by getting rid as much as possible of the



**Krupp's Improved Amalgamating Table.**

The advantages which accrue from the separation of the components of our ores are so obvious that it would hardly be necessary to detail them here. But I would like to draw your attention to these facts emphatically once more, as they are of vital importance for many of our mines

In most cases the gold in our ores is combined with the pyrites, seldom with galena or blende. Now what an advantage it is if I can send my gold concentrates so enormously reduced in bulk to the reduction works, or if, as we have intended, to give them to the chlorination works. What a saving of expenses in haulage, in space, in roasting, in chlorine! Further, if we save the galena and zincblende, and sell the first mineral which is usually rich in silver, and also the latter, to the one who wants them, we can pay in many cases our milling, if not also our mining expenses with the proceeds therefrom.

Mr. T. A. Rickard, the well known mining engineer and mill expert, speaks in regard to the foregoing: "In the actual pattern of the concentrating mills themselves there is no noteworthy change. The plant of the Smuggler Mining Company at Aspen is designed on the lines of German practice and is probably the most complete establishment of its kind in Colorado. The reproduction of European methods, while it

two former minerals, we increase also our receipts therefrom, being $1 per unit. Is this not also a matter of serious consideration? And everyone of us knows how eagerly the smelters are looking for argentiferous galena for flux; would not this mineral find a ready market? Surely it would, and would also contribute to the paying of expenses. And what is true of charging the jigs with classified pulp is true also to all kinds of vanners. Now in fact the jigs act, I might say, on the same principle as the percussion table above described, they separate also by the difference of specific gravity of the gangue and different minerals.

The treatment of the fine slimes, which is so often considered superfluous in our mills, is an essential feature in the German system, and indeed it must be an annoying fact to the millman to know his tailings assay high in gold, silver or any other metal. With the buddles shown here this is greatly avoided, as they concentrate very close, and the tailings show hardly enough minerals to be worth re-handling; they take the place of the blankets in the California mills. This apparatus furnishes the products similar to the percussion tables, the headings are washed into separate boxes, from those of the middlings which are re-washed on the same tables. These machines are built of iron, the upper part of the table covered by a layer of cement, inclining towards the

periphery. The slimes are fed against a cone, or ring in the centre of the buddle, and washed by a number of water jets.

Now we have seen that from the time the slimes leave the mortars of the stamps, they flow continuously from apparatus to apparatus, as long as they do not form a ready product, even the clean sands from the vanners and buddles are washed through sluices outside the mill. Only the separated metallic minerals, and middlings are handled and carried on a tramway to the store rooms or the latter back to the machines. The muddy slimes, which really constitute the tailings and come from the Spitz kasten, represent no larger volume than perhaps a quarter of a pound in a cubic yard of water. But should they still have a certain value they are directed into settling pits as I showed in the plan, and also those yet recovered. We see these tailings do not consist, as in the American system, of an immense bulk, but of such a small amount that their after-treatment will cost only a trifle. Fifty per cent. of the water which comes from the concentrators can be used right over again without intermitting settling tanks.

By the arrangement of this mill manual labor is reduced to a minimum, consequently also the expenses A few men only are necessary to watch the work of the machines, and the number of those carrying the products to the dryers, or store rooms, depends on the proportion of the metallic minerals in the ore. I could have made the whole operation in this mill automatic, by flushing the ready products through sluices in the storing room, where they had to be unwatered by a suitable arrangement. Also the middlings could have been fed automatically on the reserve tables. In a country like ours, where water is plentiful almost everywhere, it would have saved a considerable expense, but I omitted here and showed the hauling of the products by a tram-road.

Gentlemen, before concluding this paper, permit me to occupy your attention for a few minutes longer for the purpose of describing to you an amalgamator, which may interest you not only through its ingenuity, but also on account of its efficiency, because where it is in use it has proved to amalgamate from 20 to 40 per cent more gold from the slimes than any other apparatus so far in practical use. It is known as the Laszlo amalgamator, and consists of an iron dish contracted at the bottom. On top of it, fastened to a vertical shaft, rotates free of the former an iron casting with a hopper and open circular rings, three on the larger, and two on the smaller apparatus. Between these stand two, respectively, one iron ring, and at the lower ends are fastened a number of scrapers. When the apparatus are in operation and the ore fed into the hopper the little scrapers move the pulp very closely and in ever growing circles over the quicksilver toward the periphery and bring so the free gold particles in contact with the former. Through the frequent revolving of the ore pulp in the dish over the quicksilver, we see that the gold passes over a much larger area of mercury than is the case on the tables. Through this action it is hardly possible that a gold particle should escape amalgamation, unless they are surrounded by films of an oxydation product of any element with which they were combined. The rings standing in the lower dish, and dividing it into different compartments, are for the purpose of making the ore climb over them, and retaining thereby the quicksilver or amalgam which should have been stirred up, by simply falling back again into its former place. These amalgamators, which are always in sets of two, have a capacity of about two tons in twenty four hours; they have not only the advantage of saving a greater amount of gold, but also of saving considerable labor, compared with the tables, as they do not need to be cleaned and re-charged more than from once to four times a month, which of course depends on the richness of the ore. They can be kept under lock and key so that a meddling with the amalgam is prevented.

Now, gentlemen, I would be very glad if I should have succeeded by the description of the machines shown in the plan before you, to convince you that we can improve the conditions in our gold or other dressing works considerably. If so, and if it should bear fruit to the benefit of the country in general, and the mining industry in particular, I would be highly rewarded for my endeavor.

# The Value of Careful and Complete Analysis of Rocks and Minerals.

By Dr. W. L. Goodwin, Kingston, Ont.

This short paper is a plea for an extension of this laborious work, engaged in by too few chemists, mineralogists, and lithologists—too few, because the field of investigation is so vast and the labor involved is so enormous that a large army of enthusiastic, patient toilers is required to carry it on.

I am using the words "rocks" and "minerals" in their scientific sense, a *rock* being defined as the material composing a layer, vein or other distinct part of the earth's crust, and a *mineral* as a more or less distinct chemical species found as a constituent of rocks. In the analysis of rocks it is possible, by taking advantage of differences in specific gravity, to separate the constituent minerals from each other before submitting them to chemical analysis. The minerals composing a rock can also be identified by examining thin sections under the microscope. The identification is aided by characteristic changes in appearance produced by addition of chemical reagents. Valuable information can be obtained by these and similar methods, the object of which is the identification of the minerals composing a rock; but this information must be supplemented by complete qualitative and quantitative analysis of the rock in order that our knowledge of its character may be complete. Such analysis involves an amount of labor which deters, no doubt, most chemists and mineralogists from devoting themselves to its pursuit. A man cannot do very many of them in a year. It may take the analyst six months to complete a research the results of which can be stated in a few lines of print

I shall attempt briefly to show that such work pays both commercially and scientifically. The economic importance of minute chemical analysis of iron ores and fluxes is recognized by those engaged in the manufacture of iron and steel The properties of iron are so profoundly affected by even very small quantities of sulphur, phosphorus, manganese, chromium, &c., that the proportions of these elements in the ores must be known before their reduction is undertaken. The iron industry has been revolutionized during the past fifty years by the labors of chemists and metallurgists directed toward discovering the influence on the properties of iron of minute proportions of various elements. An English writer has recently pointed out that Great Britain has fallen behind Germany in many chemical and metallurgical industries. This he ascribes to greater generosity of the German Government in supporting technical schools. In and about these schools an army of investigators is constantly at work on scientific problems. The spirit of research pervades the land. The Germans understand the economic value of scientific research.

As data are accumulated we may expect exploration for valuable minerals to be aided by systematic and minute chemical analysis of rocks. For example, careful examination of talc found in eastern Ontario shows that it carries a very small quantity of nickel. This recalls the serious competition felt by our Sudbury nickel producers owing to the greater ease with which the metal is reduced from the New Caledonia ore, *garnierite*. Garnierite is, doubtless, talc changed by the infiltration of nickel compounds. At least its composition and physical properties admit of that explanation of its origin. It is at least within the range of possibility that the same process may have produced garnierite somewhere in Eastern Ontario. Nickel is found in small quantities in some of the commonest rocks of this district.

Careful and complete analysis of rocks and minerals may also bring to light the existence of paying quantities of those rare substances, at one time exclusively subjects of scientific investigation, but sooner or later finding their place in manufacturing industry. The manufacturers of the Auer gas burners pay at the rate of from $100 to $150 a ton for the monazite sand, from which is extracted part of the material for the

incandescent mantles The discovery of a considerable mass of material containing a small per cent. of "thorium," the oxide of which enters into the composition of these mantles, would be a very fortunate one. And yet, in an incomplete analysis, it would be very easy to pass over such a quantity of so rare an element. New elements have been discovered because careful determination of all known constituents of a mineral did not add up to one hundred per cent., but fell considerably short of it.

Nearly a hundred years ago the great analyist Klaproth, during an extended research into gold ores, discovered the element "tellurium," which has since been recognized as the cause of serious loss in the extraction of the precious metal. It might be useful for some Canadian chemist to examine a large number of Canadian gold ores for tellurium. He might be lucky enough to discover a new element.

I think I have made out my case for the economic importance of careful analytical research, and will add just another instance which has come under my own observation. A complete analysis of a basaltic rock found near Kingston has shown that it carries over one-half per cent. of nickel. When nickel ores become scarce, this rock, extending for miles through this part of Ontario, may become important. From its appearance no one would suspect it of being a nickel ore.

From the scientific standpoint argument is easier. Rock and mineral analysis, although so tedious, is full of interest, because it is full of surprises. I have just heard from one of my friends working in Leipsic that an odd-looking mineral picked up near Stoney lake turns out to be a new species. This fact was revealed by a fairly complete analysis which fell some fifteen per cent. short of the hundred, when all the constituents commonly determined were added up. The wide diffusion of the elements receives fresh confirmation from the patient labors of the analyst. Such important laws as the regular variation in the proportion of acidic to basic constituents in crossing an eruptive mass have been made out in this way.

W. F. Hillebrand, in a paper read before the American Chemical Society (Journal, 1894, p. 90, urges "greater completeness in chemical rock analysis," as follows: --"The valuelessness to the mineralogist and geologist of many of the analyses of mineral substances made in earlier times is a fact too well known to need substantiation. Defective methods of analysis, the difficulty of procuring pure reagents, and want of time for exhaustive examination have been largely responsible for this condition, but lack of appreciation of the fact, now so well established, that substances present in small amount may have an important bearing on the discussion of results, has no doubt contributed in no small measure to it. . . . Enough instances of totally inaccurate conclusions to be drawn from them (incomplete analyses) have fallen under my own observation to fully justify this plea in favor of greater completeness in rock and mineral analyses for purely scientific purposes."

## Compressed Air at Sydney Mines, Cape Breton.

By R. H. Brown, M.E., Sydney Mines, C.B.

There being two accumulations of water in the workings at this colliery -one of several millions of gallons lying in the workings at 3,590 ft. distant from the shaft bottom and at a level of 209⅞ ft. below it; the other a much smaller quantity, lying at or near the face of the north engine deeps at a distance of 1,700 ft. from the other body of water and at a level of 155 ft. below it—the determination was come to of pumping these two bodies of water to the shaft bottom by using compressed air as a motive power.

One Ingersoll-Sergeant, Class A., straight-line piston inlet air compressor, having steam cylinder 14 in. diameter, air cylinder 14¾ in. diameter, and stroke 18 in., was erected on the surface at 104 ft. from the pit mouth, and one steel tubular boiler, 12 ft. long by 54 in. diameter, having 54 tubes of 3½ in. diameter, and built by I. Matheson & Co., of New Glasgow, was set beside the compressor to supply steam thereto. A steel air receiver, 10 ft. long by 30 in. diameter, was placed on end outside of the compressor house, and was connected with the compressor by a short pipe of 3½ in. diameter.

A small water reservoir, 24 ft. square, was constructed at a distance of about 100 ft. from the compressor, and two sets of 4 in. pipe laid therefrom to the compressor house; these pipes are buried beneath the surface of the ground. One set, 110 ft. in length, leads the water direct to the compressor house, where it is received by a small duplex Blake pump, having 3 in. steam cylinders, 2 in. water plungers and 3 in. stroke, which elevates it to an iron tank placed over the compressor; the bottom of the tank stands 9 ft. 10 in. above the centre line of the air cylinder of the compressor. The water from this tank supplies feed for the boiler, and cooling water for the jacket which surrounds the air cylinder. The other set of pipes, 240 ft. in length, takes this cooling water by a circuitous course back to the reservoir. The water is thus kept circulating, being cooled by its journey through the pipes under the ground.

The intake air enters the compressor through a short length of pipe 4 in. diameter, projecting through the end of the building into the external air. To prevent dust and foreign substances being drawn into the compressor, we built a wooden box or shaft, 22 in. by 12 in. in section, and 16 ft. in height, against the end of the building and enclosing the end of the intake air pipe. The air being thus drawn from a point above the roof of the building, is free from dust and smoke.

The compressed air is conveyed from the air receiver down the shaft and into the workings by wrought iron pipes; these pipes are 6 in. diameter from the receiver for a length of 2,467 ft; thence they are 5 in. diameter for 1,152 ft. farther; thence 4 in. diameter for the next 860 ft., to air receiver No. 2. This receiver, made of steel plates, is 8 ft. long by 30 inches diameter, and near it stands pump No. 1. The pump, situated at 4,479 ft. from the air compressor, is a Northey duplex, having 7½ in. air (or steam) cylinders, 4½ in. plungers and 10 in. stroke; it works at the average 100 strokes per minute, forcing the water to an elevation of 209⅞ ft. through 3,590 ft. of delivery pipe of 5 in. diameter. The water delivered, deducting 5 per cent. from the calculated delivery for slip of pump, is 54⅞ imperial galls. per minute.

From air receiver No. 2, the pipes are continued of 4 in. diameter for 1,150 ft. down the engine plane; thence they are only 3 in. diameter for 400 ft farther to air receiver No. 3. This receiver is of same dimensions as receiver No. 2, and from it the 3 in. air pipes are continued 120 ft. farther, to pump No. 2. This is a Worthington duplex pump, having 4½ in. air (or steam) cylinders, 2¾ in. plungers, and 4 in. stroke. This pump, situated at 6,149 ft. from the source of the motive power, works at 90 strokes per minute, forcing 7⅞ galls. of water per minute to an elevation of 155 ft. through 1,700 ft. of delivery pipes, of 2½ in. diameter; it delivers its water to pump No. 1, which forwards it to the shaft bottom.

It was determined to apply the compressed air taken in bye to such a distance, to the operation of two coal cutting machines, and a winch to assist the underground haulage; as well as to working the two pumps above described. The winch having two cylinders, each 7 in. diameter by 12 in. stroke, was fitted with a drum of 26 in. diameter, on the second motion of 5½ to 1, and was set up in the vicinity of pump No. 2. The wire rope by which this winch hauls 4 or 5 boxes of coal at a trip up an incline of 1 in 6, is only ⅜ in. diameter, of crucible cast steel, made by the Dominion Wire Rope Co. The coal is drawn from distances of 500 ft. to 800 ft. from the faces of the deeps to the engine plane, and the winch takes the place of four horses or more.

The two coal cutting machines are an Ingersoll-Sergeant and a Harrison, our compressor supplying sufficient air to operate them both successfully. They work at the coal faces, about 500 ft. from pump No. 2, the air being led to them from that station through pipes of 1½ in. diameter.

It has been often stated that compressed air is a wasteful power and shows a low percentage of useful efficiency. I can hardly think that such would be found to be the case with our plant. I have not had time to make any calculation of the horse power applied, and the useful horse power obtained in our case. I only know that our compressor is a small affair, but does a big amount of work, considering the great distances between the source of the motive power and its points of application.

In the matter of air used, I should like to say that our No. 1 pump uses 70 cubic feet of free air per minute; the air winch at full work uses 668 cub. ft.: and the two coal cutters, working at 200 strokes each per minute, use 157 cub. ft.; a total of 895 cub. ft. per minute. As the Ingersoll catalogue only claims that our compressor should compress 398 cub. ft. per minute, it appears that the compressor is well up to its work. Of course the delivery of 895 cub. ft. per minute cannot long be maintained, but it can be depended on for a "spurt" when desirable.

The question of pressures is interesting. With a steam pressure of 62 lbs. at the boiler, and the engine going at 83 revolutions per minute, we get a pressure of 80 lbs. of air in the receivers at the compressor, and from 81 to 82 lbs. of air in the receiver at No. 1 pump; and practically 80 lbs. at No. 2 pump, 6,149 ft. distant from the compressor.

With a temperature of 28° Fah., at the intake on surface, 43° in the air at pit bottom, and 51° at No. 1 pump, we find the exhaust from that pump to be 30° at the distance of 12 inches from its exit, and 2° below zero at 2 inches from the exit.

I may add that the consumption of fuel by the boiler which actuates the compressor averages 248 lbs. of slack coal per hour worked.

## Pumping with Compressed Air.

By H. S. Poole, M.A., A.R.S.M., F.G.S.

The use of compressed air as the motive power in mine pumps is rapidly extending in Nova Scotia, and as a general thing the users are content with the advantage gained by the substitution of air for steam in the pumps already at work in the mines. The objections to the use of steam underground—loss in transit by condensation, objectionable heat, crumbling of roof or walls through steam escaping, and trouble occasioned by the expansion and contraction of the piping on long inclines when the steam is on and off,—need not here be further dwelt on. The point that is submitted for consideration is this:— "Is full advantage taken of the compressed air as at present generally applied?" Judging by my own experience, I should say, far from it

Having decided some three years ago to substitute air for steam at the bottom of a long incline, a point 4,000 feet away from the boilers, pump-makers were asked what make of pump they recommended. Invariably they answered, "You cannot do better than use OUR direct acting steam pump." Enquiry of compressor men obtained only indifferent replies. Those asked evidently did not know anything about the *use* of air, or if they did, did not care whether or not the air was used to advantage. All they seemed to know or care was that their particular make of compressor should be adopted.

In this respect surely a great mistake is made, for it certainly would appear to the interest of compressor makers to shew how to use air to the best advantage, as it evidently is to the makers of cotteline to shew consumers how best to use their goods. However, by enquiry and some experience, I am now satisfied that the majority of users of air in Nova Scotia are more wasteful than they suppose, and that a consideration of the question cannot but be beneficial.

1. It is evident that the clearance in the cylinders of direct acting steam pumps, often 12 per cent. of the stroke, represents a large loss.

2. It is very possible the ports also are unnecessarily large

3. It may be that where the mine water has a temperature above 60° Fahr., as in deep coal pits, a water jacket would raise the mean temperature of the cylinder and reduce the tendency to make ice in the cylinder and ports.

4. Then if the air cylinder and the water plunger be not proportioned to the work to be done, and the air has to be throttled down to the required pressure, it is clear there is a loss in consequence of the cooling of the air, unless the throttling is done at such a distance from the pump that the compressed air can recover from the surrounding air the heat which it has lost.

5. The prints in catalogues of compressors seldom shew (I have yet to see one that does shew) the inlet taking air otherwise than from the compressor house, and yet as the air in the house is always warmer, and generally also more moist than the external air, the loss incurred from so taking the air is well worth looking after. At 60° Fah. a difference of 5° is equal to 1 per cent. of the coal consumption, while the actual difference on the mean of the year cannot be less than 20°, or equal to no less than 4 per cent of the fuel consumption in favor of taking in air through a properly constructed duct free of dust.

## Experience with Air Compressing at Drummond Colliery, N.S.

By Charles Fergie, M.E., Westville.

The underground pumps at this colliery until quite recently were driven by steam taken from the surface along an incline having a pitch of 16 degrees and some 4,200 ft. in length.

In consequence, however, of the loss of power in carrying steam that long distance, the great heat produced in the pipe road and pump room, the latter 110 F., the bad effect of heat and moisture on the roof and sides of the roads, and consequent expense of maintaining the same in a safe and satisfactory condition, the interference of heat with the ventilating currents, and the many other sources of trouble due to the use of steam underground led the management to substitute compressed air for steam as the motive power at the pumps.

The compressor used is a duplex, 14 in. x 22 in., built by the Canadian Rand Drill Co., Sherbrooke, Que., has steam expansive cut off, Halsey's positive air valve motion, the air cylinders are water jacketed The boiler pressure is 110 lbs. and steam is cut off in the cylinder at ¼ stroke. The air supplied to compressors is taken from outside the compressor house.

The compressors were purchased with a guarantee to drive two separate pumps at the same time, and each capable of throwing 40,000 gallons in a shift of eight hours, one against a vertical head of 600 ft., the other against a head of 300 ft.

The then existing steam pumps were to be used and consisted of one, the No. 9, duplex compound straight line plunger pump, cylinders 8 and 14 in. x 18 in. stroke; clearance ½ in. at each end; plungers 4½ in. This pump has the 600 ft. head to force against. The second, or No. 11 pump, is a single straight line plunger pump, 14 in cylinders by 12 in. stroke; clearance ½ in., and plungers 5 inches. This works against the vertical head of 300 ft.

The old steam mains are used for the air, are 5 in. diameter for one-fourth the distance and 4 in. the remainder.

The first trial of the air was made on the No. 9 or compound pump, but using the low pressure cylinders only; the pump was set at a speed of 60 ft. per minute, the air pressure was 95 lbs. and the pump did its work satisfactorily. In consequence of the cylinders being out of proportion to the water ends at that pressure the air had to be wire drawn.

The No. 11 pump was then started up to work at the same time as the No. 9, but a sufficient speed to throw the stipulated quantity of water could not be maintained, and the pressure fell from 95 lbs. to 36 lbs. at this pump and to 43 lbs. at the No. 9; the pressure at the surface falling to 40 lbs., the speed of the compressors remaining at 85 revolutions.

So far no difficulty was experienced with freezing. This we attributed to the high temperature of the pipe road, and which had not had time to sufficiently cool down after the use of steam. No receiver had been placed underground up to this time.

The two pumps were run together as above for three or four days, but the work was far from satisfactory as it took 16 instead of 8 hours to pump out the water, and considerable difficulty with freezing was now being experienced.

To overcome the difficulty of freezing receivers were placed, one close to each pump, and this considerably improved matters, but did not altogether prevent the same.

The experiment was then made by running the No. 9 pump alone and maintaining a steady pressure at surface of 85 lbs., but wire-drawing the air at a point some 300 ft. above the pump receiver, with a view to allowing the moisture to drop before reaching the pump. This proved satisfactory and entirely prevented freezing. Indicator diagrams were now taken which showed that the compressor engines were developing 128.49 h. p. as against 16.45 h. p. at the pump, which gives a useful effect of 12½ per cent. only.

A similar test was then made with the No. 11 pump running alone, and here no difficulty with freezing was experienced. The indicated h. p. at compressor engines was 82.13 and at the pump 10.77, showing a useful effect of 13.11.

Having got over the difficulty of freezing, attention was then turned to the more economic problem of finding out by what means the two pumps could be run at the same time and the water taken out in the stipulated eight hours, and without making any change in the cylinders of the pumps, and which are out of all proportion to their work when using air, having been built for low pressure steam. To do this it was decided to try compounding with the No. 9 pump. This, however, was not successful as a steady pressure of 75 lbs. with 90 revolutions of compressors could not be maintained and indicator cards showed that though there was an average pressure of 62 lbs. in the high pressure cylinder, after release it fell to an average of 6.28 lbs. in the low pressure. The effect of introducing "live" air into the exhaust chamber connecting the high and low pressure cylinders, was then tried and proved successful, notwithstanding that by so doing considerable back pressure was thrown on the high pressure cylinders. This also gave a more uniform stroke of the pumps.

Indicator diagrams were then taken both at the compressors and pumps, and showed that the useful effect by the above change had been increased from 12¾ per cent. to 25.93 per cent.

There is no question that this useful effect can be considerably further increased by making use of pumps properly proportioned to their work and expressly designed for the use of compressed air, and of the rotary type. The exhaust ports should be large and as straight as possible and the air should be exhausted above and below.

An interesting feature observed by admitting "live" air into the exhaust passages as mentioned above is that all traces of frost around the exhaust passages disappear. This is no doubt due to the expanding air taking up heat from this "live" air introduced.

Speaking of freezing at the motor it may be mentioned that glycerine has a most beneficial effect in its prevention.

The great objection to the use of straight line pumps is in the large amount of clearance to be found in the cylinders; also that such a pump seldom makes two consecutive strokes alike, and that it is impossible to make use of any expansive force there may be in the air and cut-off before the end of the stroke. In the No. 9 pump above referred to the length of the stroke varies all the way from 16¾ inches to 18 inches, according to the conditions under which it is working. Considering these imperfect conditions is it any wonder so small a percentage of useful effect is found in mine pumps using compressed air.

The question may be asked is the air as economical as was steam, considering that only 25¾ per cent. of the work developed in the compressor engines can be shown at the pumps. In this particular case it certainly is, and as a matter of fact 1 ton 8 cwt. less coal is now being consumed in 24 hours than was the case with steam to do precisely the same work.

There is also the beneficial effect of introducing cool air into the mine and the saving of expense in repairs due to the injurious effects of steam on the roads, etc. The pipe line is not nearly so costly to maintain as with steam, and so much steam sent into the mine means so much extra water to be pumped.

Another important advantage gained at the "Drummond" by introducing compressed air is that the total volume of air circulating through the mine has been increased by 16,800 cubic feet per minute.

This increase is not due to the amount of air delivered by the compressors, but from the fact that when using steam the No. 2 slope could not be used as an intake, whereas now both Nos. 1 and 2 slopes are intakes.

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# A Newfoundland Iron Deposit.

By R. E. Chambers, B.A., M.E., New Glasgow.

In Conception Bay, Newfoundland, about midway between its entrance and its head is situated Bell Island.

This island is eight miles long by two wide, and is about 35 miles by water from St. Johns. Upon its northern shore are stratified beds of hematite, which, on account of accessibility, quality, and ease of mining, are likely to come into prominence during the next few years.

## Geology.

The measures containing these beds consist of shales and hard sandstones, and are said by the government geologists of Newfoundland to be of silurian age. The underlying measures are seen on Little Bell island, Kelley's island, and upon the shore of the bay at Topsail, where the lowest beds consist of limestones reposing at a high angle upon the Huronian and Laurentian formations of Avalon peninsula.

The beds containing the iron ore are even and unbroken, and lie at an easy dip to the northward.

Beneath is a great thickness of white sandstone, while in the immediate neighborhood of the ore are several thick shaley bands of dark color.

## Different Beds.

There are in all five beds of ore exposed in the cliffs upon the northern side of Bell island.

Three of these extend over so small an area, and are so thin that they are not of commercial value, and for this reason will not be here again referred to.

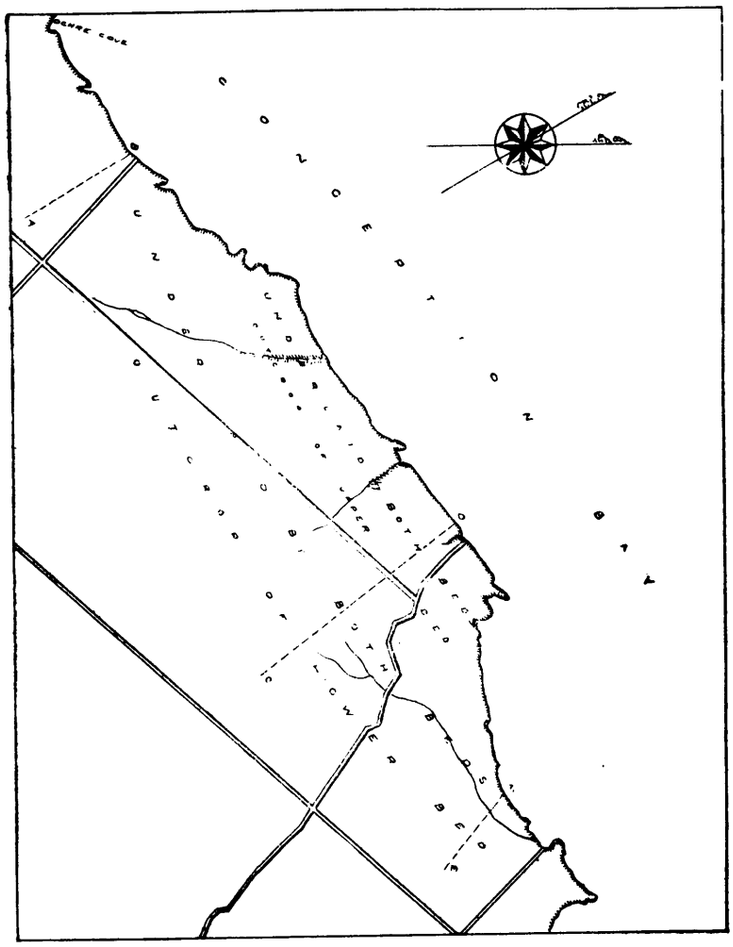
The two lower beds are of larger size and extend over wider areas.

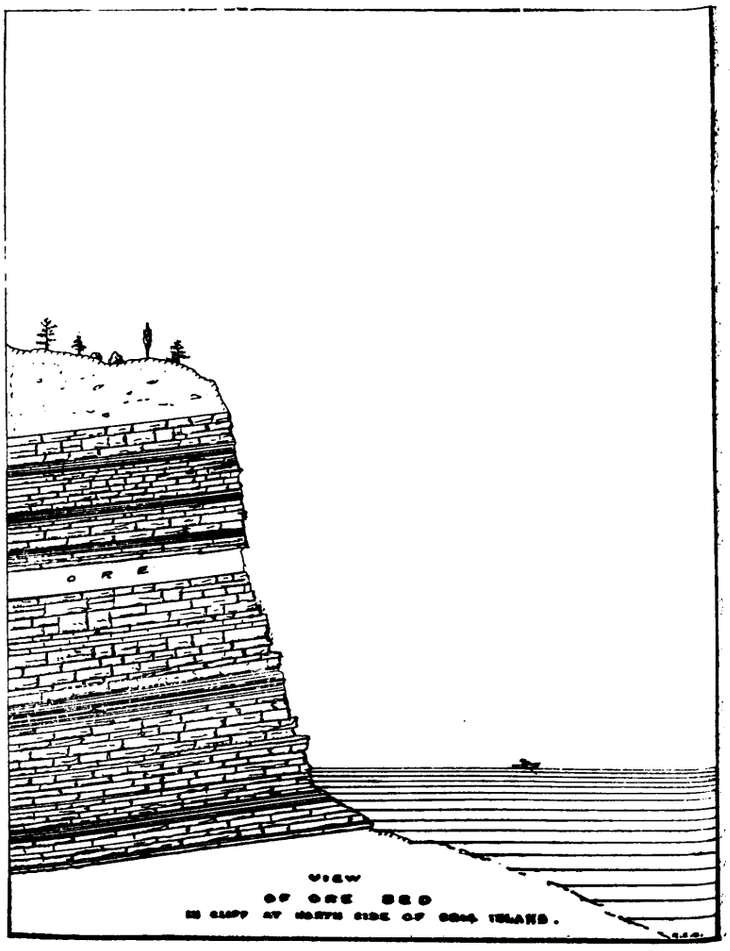
## The Lower Bed.

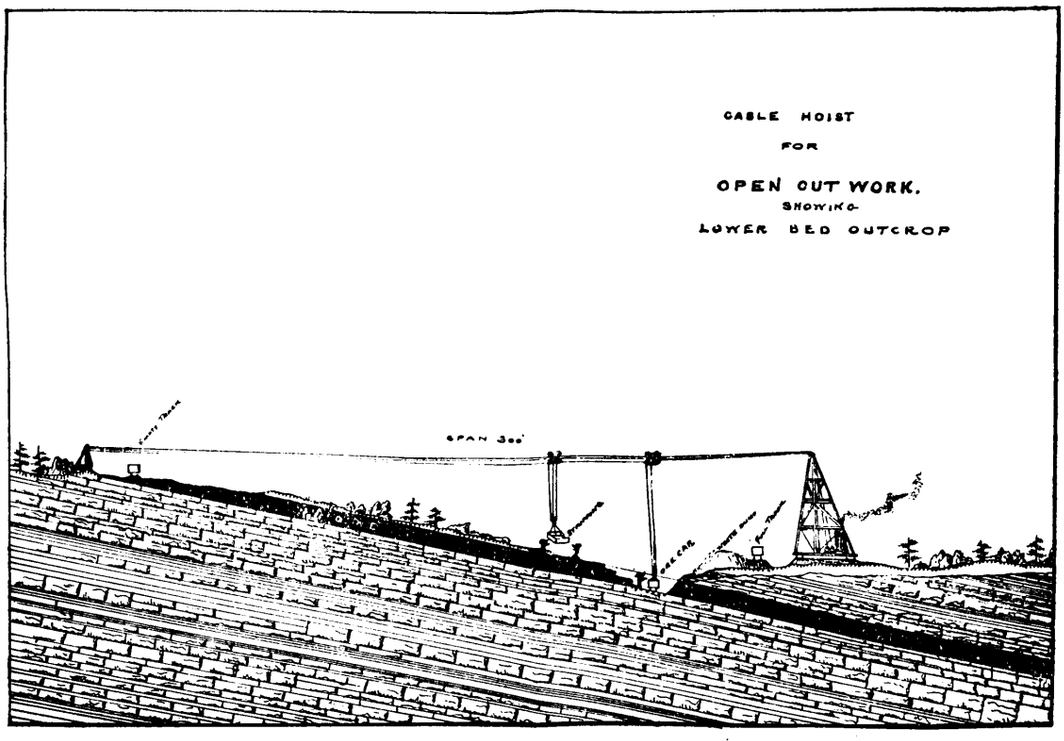
The outcrop of this bed is seen in the cliffs on the north side of the island, its western extremity being at Ochre cove, and its eastern near Gull island head.

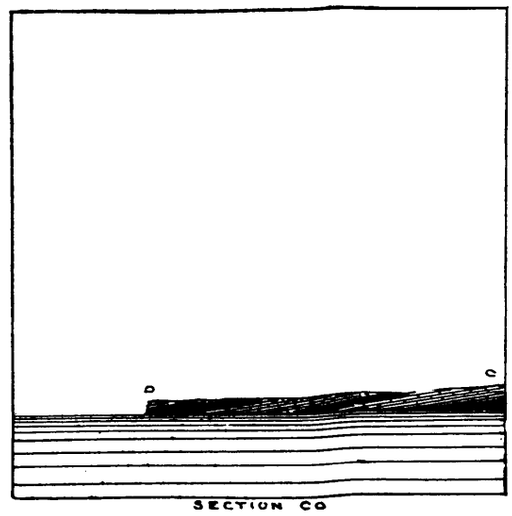
It is first met upon the tramway at a distance of 8,600 feet from the pier. From this point the distance is one mile to the eastern end of the outcrop, and two and one-half miles to the western end. At the open cut near the tramway the section shows ten feet of clean ore. At Gull island head the bed is eight feet thick and at Ochre cove seven feet, the average of the whole bed being probably eight feet.

At the western end the dip is N. 19° E. 7°. This increases a few degrees going east, and the dip changes towards the north. Along this outcrop of 3½ miles not any dislocation of the strata has been found, and the ore is exposed over most of its extent. This gives unusual facilities for open-cut working. There is little doubt but that 200 feet of this outcrop can be mined open-cut over the greater part of this dis-


ONE DEGREE
OUTCROP OF LOWER BED
OUTCROP OF UPPER BED
OUTCROP OF TOWER BEDS


ORE
VIEW
OF ORE BED


CABLE HOIST
FOR
OPEN CUT WORK.
SHOWING
LOWER BED OUTCROP
SPAN 300'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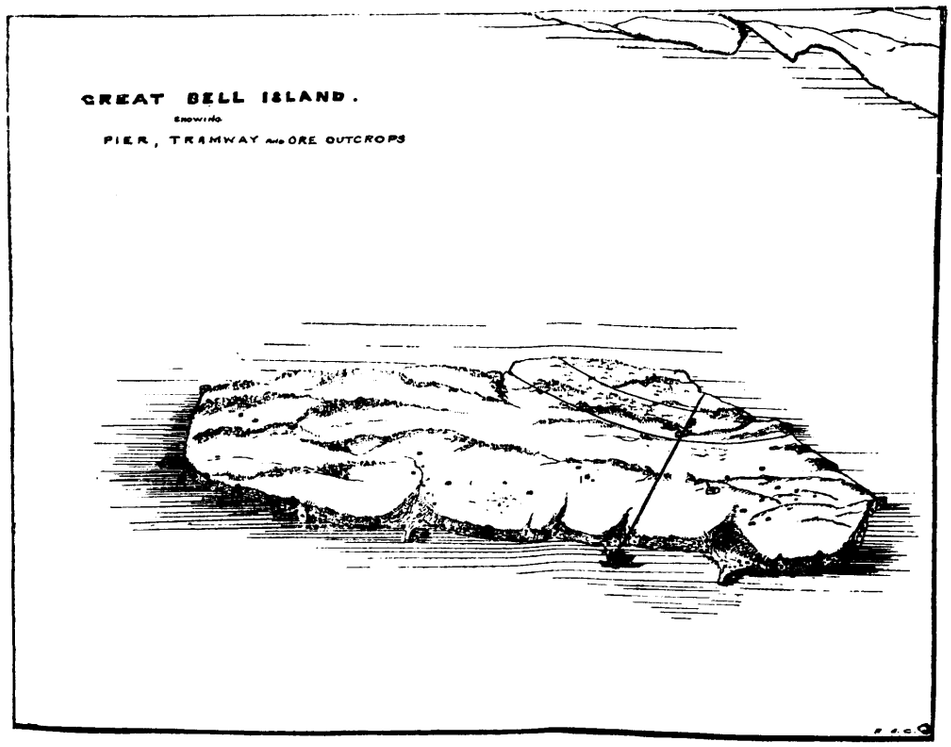
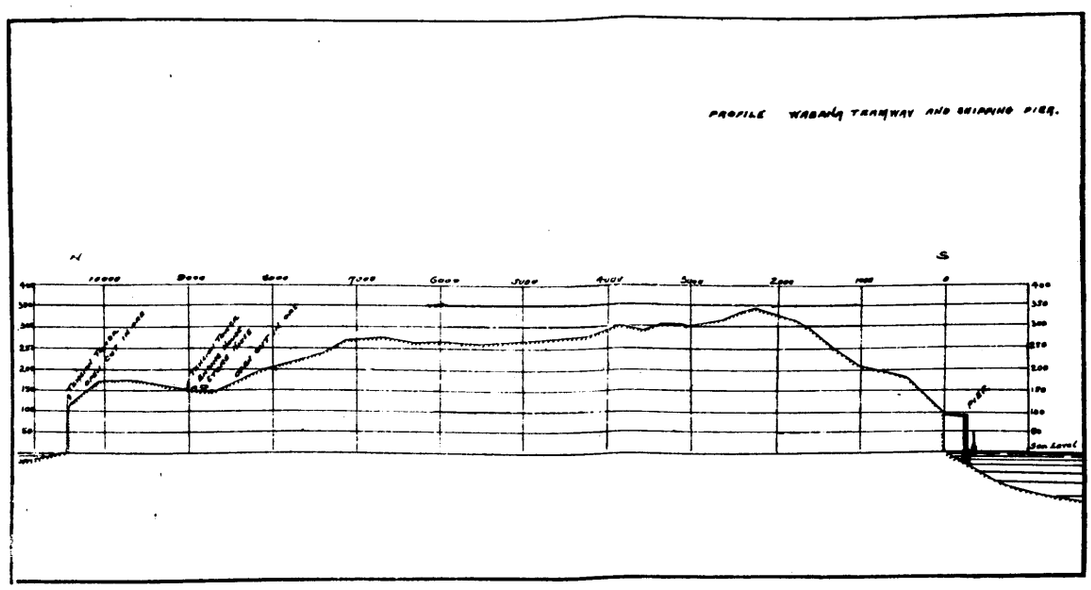

GREAT BELL ISLAND.
Showing
PIER, TRAMWAY and ORE OUTCROPS


PROFILE WABANA TRAMWAY AND SHIPPING PIER.
N
S
PIER
Sea Level

tance, giving 2,000,000 to 3,000,000 tons of ore. When this is worked out many times that amount can be mined underground with natural drainage.

From the open cut near the tramway 3,000 tons have been shipped to the Ferrona furnace of the Nova Scotia Steel Company, giving entire satisfaction in the manufacture of foundry pig iron.

From about 100 analyses made during the past year the composition of this ore is found to be:—

| | % | % |
|---|---|---|
| Metallic Iron | 54.000 to | 59.000 |
| Silica | 5.000 to | 12.000 |
| Alumina | 2.000 to | 4.000 |
| Phosphorus | .500 to | 700 |
| Sulphur | Trace to | 012 |
| Carbonate of Lime | 3.000 to | 5.000 |
| Oxide of Manganese | Trace to | 400 |

### The Upper Bed.

At Station 101 on the tramway the outcrop of another bed of ore appears, overlying the first in stratification and six feet in thickness, the ore is fully equal to the lower bed, the average of eleven analyses from widely separate points giving 57% in metallic iron While not extending over so large an area as the lower bed its boundaries are equally well defined, leaving no doubt as to the quantity of ore it contains. The exposure in the cliffs is quite regular at both the east and west ends, and the ore has been test-pitted along the outcrop between.

Over a great part of its extent this bed is denuded of the overlying strata making it accessible over large areas for open-cut mining.

### Quantity of Ore.

The area of the lower bed upon Bell island is 817½ acres. Counting 10 cubic feet of ore to the ton and considering the bed 8 feet thick, which is a fair average.

$$\frac{817.5 \times 43560 \times 8}{10} = 28{,}488{,}240 \text{ tons.}$$

The area of the upper bed is 240 acres and its thickness 6 feet.

$$\frac{240 \times 43560 \times 6}{10} = 6{,}272{,}640 \text{ tons.}$$

This gives a total upon the island of 34,760,880 tons.

As will be seen from the sketch of the outcrop this quantity can be legitimately considered to be in sight.

The outcrop inland and the exposures in the cliffs give access to the beds from all sides

### Shipping Facilities.

Conception Bay, to the north-east of Bell Island, opens gradually towards its mouth into the Atlantic ocean, so that with northerly winds the side of the islands on which the ore is situated could not be used for shipping purposes, consequently shipping has to be done on the south side. A small beach near the east end and the situation of the island itself form a perfect shelter from northerly winds, and the mainland being close to hand on the south and east no ocean swell is to be feared from that direction; consequently the pier is so situated as to be perfectly safe with the wind from almost any quarter of the compass.

The waters of the bay are deep and free from rocks and shoals, the bottom being mud near the pier affords admirable anchorage.

Near the island the admiralty charts show from 8 to 14 fathoms of water on the southern and from 6 to 20 fathoms on the northern shore.

The bay is navigable from 8 to 9 months in the year.

### Equipment.

The ore being obtained by open cut work from the outcrop an elaborate mining plant is not necessary. Two systems are employed for excavation. In the first the cars are run by gravity along a track of 2 ft. gauge to the working face, whence, after being loaded, they run, still by gravity, to the main tramway. This is made possible by a switch for empties being at the top while the switch for loaded cars is at the foot of a 10 per cent. grade. The track is shifted laterally to keep within loading distance of the receding face.

Another part of the outcrop is worked by a double travelling cable hoist of 300 ft. span. One span is used for stripping the surface, the other for excavating the ore. The towers with boilers and double drum engine are upon trolleys capable of being moved in a direction parallel to the strike as the excavation proceeds. As before the empties are switched from the main tramway at the top of a grade and dropped by gravity beneath the cable. They are then conveyed by the cable carriage to any part of the working face, whence after loading they are again hoisted and placed in the full track leading to the main tramway. Upon any part of the ore being excavated the whole plant is moved upon the supporting tracks to new ground. The accompanying illustration will give a clearer idea of this part of the plant.

### Tramway.

From the mine the ore is conveyed over a double track tramway of 2 ft gauge and two miles in length to the shipping pier; this is operated by an endless steel cable, 1⅛ in. in diameter, four miles in length. The alignment is perfectly straight and the profile is shown in the sketch. The cable is supported by wooden rollers 25 ft. apart, while at the apices of the grades iron pulleys 2 ft. in diameter are placed. The cable is kept in proper tension by counterbalance weights. The power house contains two upright tubular boilers and a double cylinder stationary engine geared 1 to 20 to two 6 ft. 6 in. bull wheels. One of these operates the cable for the line now working, the other is spare, for any road it may be found necessary to construct. At present the tramway has a capacity of hauling 500 tons to the pier in 10 hours and by increasing the rolling stock 1,000 tons could easily be shipped in the same time.

### Pier.

The pier is 45 ft. x 65 ft. and 90 ft. high, constructed of southern pine; it is supported upon 190 bearing piles surrounded by a cribwork of heavy timber filled with stone. There are ten pockets of 200 tons capacity each at a height sufficient to discharge into a steamer by gravity. The shutes for this purpose descend at an angle of 40° and are moved by a counterbalanced winch easily operated by one man. The cars are dumped by an automatic tipple, upset by the weight of the loaded ore, and returned to an upright position by cast iron counterbalance weights hung upon a shaft beneath the floor. In loading a steamer 200 tons have been discharged from one pocket in 10 minutes.

The depth of water at the pier is 24 feet at low tide increasing rapidly away from the shore. The access is easy, unobstructed by rocks or shoals.

The terms of the Newfoundland mineral act are very favorable to the operators in regard to security of title, the only condition being the expenditure of $6,000 for each square mile, no Government royalty being demanded. In this case the necessary expenditure has been largely exceeded in the equipment of the property by the Nova Scotia Steel Company who control it.

This ore will be largely used for the production of foundry pig iron.

The Nova Scotia brown hematite forms a very suitable mixture in connection with it.

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### Th' Drappin' ov th' Stamps.

I've heard many a band ov music siften sweetness on th' air,
An' a fiddler drawin' ov his bow, that jist sounded like a prayer,
I have heard Æolian music, when th' wind was on th' ramps,
But no music ever was so sweet as th' drappin' ov th' stamps.

When I've laid awake, and listened t' th' clink, clink, clink, clank, clank,
As they drapped upon, and crushed th' ore t' put money in th' bank,
Then I'd fall asleep, a-dreamin' ov th' happiness galore,
With my pockets full ov' money t' divide among th' poor.

There is music, and ther's music, but there's nothin' half so fine,
As th' runnin' ov a ten-stamp mill, on a regular payin' mine.
You may talk erbout your "cinches," an' other kind ov clamps,
But t' me ther' is no music like th' drappin' of the stamps.

# How an Abandoned Mine Became a Paying One.

By W. L. Libbey, Brookfield, N.S.

A few days ago I received a letter from our Secretary, suggesting a paper something in line with the above heading. Now the emotions called forth by his modest and courteous invitation, were not only varied, but they gave rise to a train of thought and consideration.

In the first place, it was a fact impossible to disguise from myself that my time had never been devoted to writing "papers," therefore the chances were largely in favor of my being found lacking, if I attempted to perpetrate one on a society which contains in its make up so much more than the average of brain adaptability, all around ingenuity and fertility, as I believe the Mining Society of Nova Scotia to contain. With the reminder that "You'd scarce expect one of my age to appear in public on the stage," I will cease to apologize for my appearance, omitting entirely the usual flattering references to the entertaining qualities and abilities of those who have preceded me and those who are yet to be heard.

One remark in particular in the letter of Mr. Wylde, making his request for a paper, has frequently recurred to me. It is simply this:—"It is very hard to get anything from the gold miners." The question as to why it is so naturally presents itself. In drawing a conclusion, comparisons (always odious) will be avoided as far as possible.

From my limited opportunity for observation it seems to me that the coal mining industry of the province has drawn freely on the best trained practical and technical ability of the world in making up its engineering and executive staff. The results are becoming so plainly apparent as to need no criticism from the writer. But how is it with the industry of gold mining, which should and yet will be regarded as one of the legitimate industries of the province. Have not a large proportion of the investors in and managers of mines been, like the writer, men who from various inducements, have taken little "flyers" in gold mines much as they would take a share in a guess cake at a church fair with little care to the conducting of the enterprise? and would not technical training and methodical attention to business details applied to gold mining make our industry rank with the first of the province? The writer has great confidence that a strict attention to the economical management of the business would have resulted in many mines being kept in operation that are now closed down, and that attention alone in many cases, without more technical or geological knowledge than an ordinary education and an average clear mind would give in addition. This line of criticism, however, may well give place at this time to a brief resume of the preparation for, and the experience of the writer in making an abandoned gold mine pay. And if the relation proves even of passing interest, repayment for the pains will be ample.

From the age of 17 until 31, his life was spent in the American and English Merchant Marine, with about the usual result — experience. The next ten years his faculties received training in the real estate and building business, resulting, of course, with more experience, and among other things, with an interest in the Brookfield mine figuring among his assets or liabilities, some might have classed it at the time. Now, right here attention may be called to the somewhat common desire to get something for nothing or as near to it as possible, and the result of an attempt noted.

After some consideration it was decided to start operations at Brookfield. There were, and still are, over 6,000 tons of tailings, on the dump, which assay high. Just as active operations were decided on, one Professor Kendall, of New York, backed by Erastus Wiman (at that time in good commercial standing) and others, were attempting to introduce to the mining world, his version of the "cyanide process," that is what he said anyhow—but my own belief is that he was only skinning Wiman and other flats he could catch in New York. However, he was sent a half ton of tailings to test. Glittering returns were received from the test and fat profits were just in sight; and best of all, less than $2,000 to be expended, was to divert the golden stream into our yawning pockets. The necessary ducats were promptly and cheerfully produced and a start was made for Nova Scotia in August, 1893. The writer does not believe in ploughing graveyards, or he would tell you the size of the dividends that would be declared every few days, and he would also tell you, how in the style that must be familiar to many in the audience who have seen the capers of gold miners for past years in this province, he, instead of coming here and paying attention to business, took his wife (the only excusable part of the performance) and went to Chicago to the Fair, but it would be too harrowing.

By November, when the writer did get here, it was found that Kendall and his fellow swindlers of the Mechanical Gold Extractor Co. knew nothing about their business. They fled in confusion. Further and expensive experiments with cyanide were conducted during the winter of '93 and '94, resulting, however, in failure, commercially speaking. Recently samples from the dump and other places have been submitted to the Cassel Gold Extracting Co. of Glasgow, who advertise that if samples will be sent them, that reports as to value, etc., will be returned Several samples were sent, but no report definitely was made, except on one ore. This, the report said, contained absolutely *no gold or silver*. The samples of this ore were taken from a 40 ton lot the writer had milled over hungry copper plates at Molega, and there were recovered over $4.00 per ton in gold from the lot.

Finally in June, '94, it was decided to pump out the old workings and go to mining; and by this time it may be remarked that kite-flying had entirely ceased, and work was being conducted with as much regard to economy as is displayed on any hen farm. The history of the mine showed that the lead was a true fissure vein that was opened up and worked in the years 1886-7 and -8 by the methods then in vogue; first, by making a hog-wallow or open cut on the lead, to rob out all surface ore, and finally by sinking shafts every 75 ft. or so on the lead, underhand stoping, shovelling from stopes to shafts and hoisting to surface in tubs, was the underground system; that is, by main strength and stupidity. Finally, a break in the formation was, in the course of time, encountered, the ore pinched out and the mine ceased to pay, and was shut down and allowed to fill up with water. Now the writer has been reminded several times by and through old miners down in Queen's county, that he was a tenderfoot, and he cheerfully admits that previous to his landing here, the only mining education he had was a common school education, five or six months in Colorado and an occasional visit to coal mines; but during this experience he had never heard of any one who had seen the bottom of a fissure vein, and it did not seem credible that the little pod of gold bearing ore contained in a block 240 ft. x 200 ft. x 14 in., was all that the mighty forces of nature had put in the vein. Consequently, when the water was out, work was pushed past the break in the formation which soon resulted in a showing of good ore. A careful survey and plans of the underground workings were made by Walter H. Prest, proving what was already believed, that a well defined pay chute existed. Information as to the expense of mining and milling during 1886-7-8 shows the cost to have been about $9.00 per ton; and it was easy for one experienced in the handling of heavy cargoes and in surface earth work to see that the method of work was radically wrong. Therefore, as soon as circumstances would permit, an incline was made from the surface undercutting the pay chute, equipped with tramway and ore skips, tramways and ore shoots put in where they would facilitate work underground, and the system of mining changed from underhand to breast stoping. Prompt obedience is demanded of employees, and no one loafs below or above ground but the writer. As a result, $4.00 per ton pays every expense in connection with running the mine, not of course including additions to plant, etc. This by hard work on a 14 in. lead.

It is hoped that this sketch of "How an abandoned mine became a paying one," will be interesting to the Mining Society of Nova Scotia, and, perchance, encouraging to tenderfeet.

# Proceedings of the Annual Meeting

OF THE

# Mining Society of Nova Scotia.

The annual meeting of the Mining Society of Nova Scotia was held in the rooms of the Society, Halifax, on Wednesday, 11th March. There was a large attendance. Among others present we noticed:—

Mr. R. H. Brown, (General Mining Association Ltd.,) Old Sydney Mines, C.B.
Mr. W. Blakemore, (Dominion Coal Co., Ltd.) Glace Bay, C.B.
Chas. Fergie, (Intercolonial Coal Co.) Westville, N.S.
H. S. Poole, (Acadia Coal Co.) Stellarton, N.S.
J. T. Burchell, (Cape Breton Colliery) New Campbellton, C.B.
Graham Fraser, (Nova Scotia Steel Co.) New Glasgow.
R. E. Chambers, (Nova Scotia Steel Co.) Bell Island, Newfoundland.
J. Leckie, (Torbrook Iron Co.) Torbrook, N.S
G. E. Francklyn, (General Mining Association) Halifax.
Dr. E. Gilpin, jr., (Deputy Commissioner of Mines) Halifax.
W. G. Matheson, (Matheson & Co.) New Glasgow.
W. L. Libbey, (Brookfield Mining Associates) Brookfield.
James Baird, (Chignecto Colliery) Maccam.
B. C. Wilson, (Acadia Powder Co.) Waverley.
T. R. Gue, (Acadia Powder Co.) Halifax.
Capt. Howard, (Acadia Powder Co.) Halifax.
A. A. Hayward, (Golden Lode Mining Co,) Uniacke.
F. S. Andrews, (Richardson Gold Mining Co.) Country Harbor.
W. A. Sanders, (Lake Lode Gold Mine) Caribou.
F. H. Mason, F.C.S., Halifax.
Duncan McDonald, (Truro Foundry and Machine Co.) Truro.
Clarence H. Dimock. (Wentworth Gypsum Co.) Windsor.
Captain Harding, (Brookfield Mining Associates) Brookfield.
J. H. Austen, (Austen Bros.) Halifax.
Geoffrey Morrow, (Stairs Sons & Morrow) Halifax.
Arthur Drysdale, O.C., M.P.P., Halifax.
B. M. Davidson, Halifax.
A. P. McQuarrie, Melrose.
C. A. Meissner, (Londonderry Iron Co., Ltd.) Londonderry.
Dean S. Turnbull, (Old Provincial Gold Mining Co.) Malaga.
H. M. Wylde, Halifax, Secretary-Treasurer.
B. T. A. Bell, (Editor CANADIAN MINING REVIEW) Hon. Secretary.
Mr. R. H. Brown, M.E., President, in the chair.

The Secretary read the minutes of previous meeting, which were confirmed.

The financial statement showed the receipts for the year to be $1,287.50, and the disbursements $1,527.91, leaving a debit balance of $240.41. The statement was adopted.

### The President's Address.

MR. R. H. BROWN. As a prelude to the few words that I have to say on this occasion, I wish to say that he who has performed the onerous duties devolving upon the President of this Society for a twelve month, ought to be allowed to shake off the cloak of office at the termination of his official career without being required to make any accompanying remarks. As my able predecessors in this place have each treated you to a learned address, anything I might attempt in that line would seem all the weaker by contrast with theirs. I shall therefore confine myself to the few points of interest that may have occurred in connection with this Society during the past year.

The financial statement to which you have just listened shows the Society to be in a satisfactory condition. It has been in existence for four years and now has eighty-nine members, of whom nineteen have joined during the past year. I am sorry to have to note that during that period one member of our Society, the late J. M. Reid, has been called away by death.

At the time of our last annual meeting of committee of members waited upon Premier Fielding to request a grant from the Government towards the funds of the Society. The delegation was courteously received, and in response we were granted the sum of $500 for the year. I am sure you will join in thanks to Mr. Fielding and his colleagues for this grant, as also for its renewal for this year also.

The Society was invited to attend a joint meeting with the General Mining Association of Quebec at that city, at the end of June last. Your council decided to join that meeting, but when the day arrived your Society was represented at the meeting only by Hon. David McKeen and the President, your humble servant.

We there met also members of the Ontario Mining Institute and other celebrities, including our ubiquitous Hon.-Secretary, Mr. B. T. A. Bell, and listened to the reading of some learned and interesting papers. We also took part in the several enjoyable excursions on the St. Lawrence and the Saguanay, and by rail to Lake St. John.

The scheme of federation between the two above mentioned societies and our own, has been carried to a successful terminaton, and the first meeting of the council so constituted was held at Montreal in January last.

There being some discrepencies and incongruities in the mining laws of this province, and it also being desirable that they should be revised and consolidated, a committee of your Society was appointed in 1894 to take the matter in hand and suggest any desirable amendments. A number of such amendments were at last framed, and it was intended that they be brought before the House. However, at the last moment the council deemed it inadvisable to press them during the past short session of the Local Legislature. Some little disappointment has consequently been felt by members of the Society who would have liked to have seen the proposed amendments effected without delay. We must, it appears, now go on as before for the present, with the law, in one instance at least, so standing that compliance with its provisions is impracticable. I trust that our Society will not allow this thing to hang fire, but will, in any case, endeavor to induce the Mines Department to, at least, have the Mines Regulations Act, with its numerous amendments and re-amendments, put into some intelligible form. There would appear to be nothing very unreasonable in such a demand.

I would like here to say a word on the subject of examinations for colliery managers. The questions propounded to would-be candidates by the examiners, seem to be getting almost beyond their depth. At first they were such, that practical men were able to get a certificates; but latterly the questions have become so stiff that men of large experience and liberal education fail to answer them. The examiners would do well to take for their guide, the practical questions put by similar boards of examiners in England. The "*Colliery Engineer*" of Scranton, commenting on some of the questions put by our examiners in March last remarks that, "some of these questions have not the excuse of even remote application to mining. * * and while a mine foreman should be well enoughversed in mathematics and kindred sciences to answer practical mining questions, no government has a right to expect men applying for certificates to have as deep a knowledge of geometry and trigonometry as is necessary to answer some of these questions."

Though the men who constitute this society, probably all live very buisy lives, yet I am happy to see that they can find time to make additions to its literature. This is evidenced by the fact that no less than seven valuable and interesting papers have been contributed during the year now ended.

I feel constrained, gentlemen, to congratulate you on the acquisition of such commodious quarters as we now occupy here. While felicitating ourselves on the possession of such quarters, we all, I am sure, feel the more thankful to Mr. Gue for his great generosity in having gratuitously provided us with the comfortable room that we have occupied during the past three years or more.

I must not omit a passing mention of the evening's entertainment which followed our annual dinner of March 1895. It combined amusement and instruction in a marked degree, such as to reflect great credit upon the committee who conceived and carried out the programme.

As for the results of the year's work of the principal mining industries of the Province; we find in the report of the Department of Mines the quantities produced for the year ending September the 30th last. These figures, compared with those reached at the corresponding date of the previous year, show that in gold mining there has been a satisfactory increase of 2,132 ounces, or about 10½ per cent over the output of the previous year; that coal mining shows an unsatisfactory decrease of 110,990 tons, or about 5 per cent. under the output of the previous year; and that iron ore shows a decrease of 3,876 tons, being about 4½ per cent under the previous year's output.

I hope you will excuse me for not giving any figures regarding the financial results of the year's mining, and allow me to plead want of adequate information on so important a subject.

I observe in the blue book on "Mineral Statistics and Mines for 1893-94," issued by the Geological Survey, that it is stated that, in gold, Nova Scotia makes the largest yield of the five gold-bearing provinces of the Dominion. This is a source of satisfaction to us all I am sure.

I have had much pleasure in reading in the "Transactions of the Federated Institution of Mining Engineers" of Newcastle, issued Feb. 3rd ultimo, a very interesting paper on Gold Mining in Nova Scotia, from the pen of Mr. F. H. Mason of this Society.

In closing I wish to express regret, which I am sure you will all share, that my immediate predecessor in this chair has removed from this Province and gone to perhaps a larger field of usefulness in the province of Quebec. Mr. Hardman was one of the original promoters of our Mining Society and greatly contributed to its present standing by the interest he always took in its proceedings.

On motion of Mr. Blakemore, a hearty vote of thanks was tendered the retiring President for his services during the year.

### Committee on Mining Legislation.

MR. ARTHUR DRYSDALE, Q.C., M.P.P., presented his report of the Committee on Mining Legislation, which after some discussion was adopted.

### The Validity of Titles to Nova Scotia Mines.

MR. B. T. A. BELL.—With respect to the recent decision in the courts in the suit of the Attorney-General vs. Reynolds, a statement has been published in the Canadian press which reflected seriously upon the validity of titles to Nova Scotia mining properties. That statement, if allowed to pass unchallenged, would prejudicially affect the investment of capital in the Province, and as he believed the allegation to be unfounded, he would move that Messrs. F. S. Andrews, Arthur Drysdale, Q.C., and W. L. Libbey, be a committee to report on the matter at a later stage of the proceedings.

MR. DRYSDALE, Q.C.—It is a surprising statement. The particular case in question turned upon the peculiar facts in that case, and judgment could not affect any other leases in the Province.

MR. HAYWARD—As one of the proposed committee it seems to me that no report should be made today, as it would be acting too hurriedly. I move that the committee report at the next meeting of the Society.

MR. BELL—The statement as published is highly injurious to the interests of Nova Scotia mining, and should be contradicted quickly.

MR. DRYSDALE, Q.C.—I have gone carefully over the record in the Attorney-General vs. Reynolds, and it fully bears out my impression that that case has nothing to do with general titles to Nova Scotia mines. It simply amounts to this: Licenses to work were abolished. After they were abolished certain people in the Mines Office here obtained a license to search. They tried to convert that into a license to work after the licenses to work had ceased to exist. The Toronto Coal Co., conceiving that the applicants had made a mistake, came to a simple test as to which of them had a valid title. The result cannot affect a title in the Province. You can get as valid a title in the Mines Office today as any that can be given by the Crown.

The motion was carried.

MR. BELL thereafter moved, seconded by Mr. Morrow:—"Whereas statements have been made and widely circulated that a recent decision in the courts has cast a doubt on the validity of Nova Scotia mining titles: *Resolved*, that this Society respectfully ask the solicitor of the respondent in the case referred to, *i.e.*, the Attorney-General vs. Reynolds, to express to the Society an opinion as to the effect of such decision and whether mining titles are affected thereby."

The motion was adopted.

### Election of Officers and Council.

*President:*

Major R. G. Leckie, M.E. (Torbrook Iron Co.), Torbrook, N.S.

*Vice-Presidents:*

Graham Fraser (Nova Scotia Steel Co.), New Glasgow.
W. Blakemore, M.E. (Dominion Coal Co.), Glace Bay.
Chas. Fergie, M.E. (Intercolonial Coal Co.), Westville.

*Honorary Secretary:*

B. T. A. Bell (Editor CANADIAN MINING REVIEW), Ottawa.

*Secretary-Treasurer:*

H. M. Wylde, Halifax.

*Council:*

H. S. Poole, M.A., A.R.S.M. (Acadia Coal Co.), Stellarton, Past President.
John E. Hardman, S.B., M.E. (Oldham Gold Co.), Montreal, "
R. H. Brown, M.E. (General Mining Ass'n), Old Sydney Mines, "
George W. Stuart, M.E., Truro.
Charles Archibald, Halifax.
C. E. Willis, Halifax.
F. H. Mason, F.C.S., Halifax.
W. G. Matheson, New Glasgow.
W. L. Libbey, Brookfield.
Geoffry Morrow, Halifax.
J. T. Burchell, New Campbellton.
B. F. Pearson, Halifax.

### The Federated Board.

Mr. Charles Fergie presented the report of the proceedings of the first meeting of the Canadian Mining Institute, which was unanimously adopted. The following delegates to the Board were elected for the ensuing year :—

Major Leckie, President.
Mr. R. H. Brown, Past-President.
Mr. Charles Fergie, Westville.
Mr. John E. Hardman, Montreal.

### New Members.

The following new members were declared elected :—
Mr. C. A. Meissner, (Londonderry Iron Co.) Londonderry.
Capt. H. E. Harding, (Brookfield Gold Mines) Brookfield.
Mr. John E. Munroe, Pictou.

### Report of the Committee on the Validity of Nova Scotia Mining Titles.

In accordance with Mr. Bell's motion the following report of the Committee appointed for the purpose, together with a letter from Mr. R. L. Borden, Q.C., Solicitor for the Respondent in the suit of the Attorney-General *vs.* Reynolds was presented.

### REPORT.

*Attorney-General vs. Reynolds, et al.*

THE PRESIDENT MINING SOCIETY OF NOVA SCOTIA :

Your Committee appointed to investigate as to the truth of the statements lately made by a portion of the press of the country, to the effect that the judgment in this cause had the result of prejudicially affecting mining titles generally in the Province of Nova Scotia, beg to report as follows :—

Your Committee has examined the record in this suit and the judgments of the courts therein, including the final judgment on appeal, and after such examination they unhesitatingly report that the said judgment affected only the particular property and the particular parties before the court in that case.

Your Committee further report that there is not the slightest foundation for the assertion that the judgment in this case affects any other titles to mining property in Nova Scotia. The case turned on questions of fact peculiar to the case itself and applicable to none other, and any statement that the judgment in question pertains to or affects the mining titles of or granted by the province must be made in entire ignorance of the record and decision.

ARTHUR DRYSDALE.
WILBUR L. LIBBEY. } *Committee.*
C. F. ANDREWS.

R. H. BROWN, *President.*

Halifax, March 11, 1896.

During the session, which was continued during the afternoon, the following papers, published elsewhere, were read and discussed :—

A NEWFOUNDLAND IRON MINE
By Mr. R. E. Chambers.

THE CALORIFIC POWERS OF NOVA SCOTIAN COALS
By F. H. Mason and W. G. Matheson.

NOTES ON AIR COMPRESSORS
By Messrs. R. H. Brown, H. S. Poole and C. Fergie.

HOW AN ABANDONED MINE WAS MADE TO PAY
By W. L. Libbey, Brookfield.

The session adjourned at 5.30 p.m.

The evening was quietly spent in a social gathering, at which a number of excellent songs were rendered.

# MINING IN BRITISH COLUMBIA.

(From our own Correspondents.)

### Trail Creek District.

The shaft on the Morning Star is going down rapidly, and now, at a depth of 40 feet, the vein shows up stronger than ever, the bottom of the shaft being full of ore, which is a massive mixture of copper and iron pyrites, with a quartz gangue. The remarkable similarity existing between this ore and that found in the lowest workings of the famous Le Roi mine, strikes everybody who sees it. This claim, with the Chance adjoining it on the south, are being incorporated under the name of the Morning Star Mining Co. The incorporation of this company will take place under the British Columbia Act of 1862, relating to Joint Stock Companies. Rossland is named as the company's head office and chief place of business. It has the distinction of being the first and only company operating in Trail Creek, organized under British Columbia laws. One hundred and fifty thousand shares will be put on the market.

The latest strike in the camp has been made on the well-known Josie claim situated on Red Mountain. On the 22nd inst. the big chute of ore, from the surface of which the company shipped many carloads of high grade ore last summer, was broken into, and now after a week's work a face of solid sulphide ore is exposed, which averages on assay $40 in gold to the ton. This strike was made at a depth of 240 feet, and certainly entitles the Josie to rank as one of the big mines of the camp.

Another strike of importance has lately been made, and this time it is in a new locality, being made on the Jumbo, which is situated on Granite Mountain, west of Sheep Creek. In a crosscut tunnel a body of arsenical iron ore, twelve feet wide, has just been cut through. The average grade of this ore is not so high as that struck on Red Mountain, but sixteen dollar gold ore that can literally be quarried out is, with cheap transportation facilities, a veritable mint.

The ore body encountered in the east drift of the Nickel Plate mine is still holding its own in width, and the grade of the ore is unexcelled in the camp, with the possible exception of the ore now being extracted from the lowest levels of the Le Roi. Work in the crosscut to the north on the hundred foot level has been stopped, and an upraise from this level to the surface is being rushed. There is about two feet of good ore in this opening.

The Centre Star is still working the usual force, drifting ahead in the main tunnel, and crosscutting both to the north and south. In the drift the face continues to present a solid front of metal, which it is said is assaying better every day. Both crosscuts are now in considerably over 100 feet, and veins parallel to the main lode, about four feet in width, in which there is considerable good ore exposed, have been cut through in each crosscut. A vast pile of ore is accumulating on the dump, where it will lie until the Rossland and Trail Creek tramway is completed. The machinery at the mine is running to perfection. It is rumoured here that the erection of the matting plant for the reduction of the ores of this mine is now under the serious consideration of the management.

Chinook winds and bright sunny weather have broken the backbone of the winter, and the roads out of the camp are practically impassable so far as the hauling of ore is concerned. Notwithstanding this deplorable state of affairs the Le Roi is still running full blast, and hoisting more ore per diem than ever before. The ore bins are full to overflowing, and now huge piles of ore are being stored at both the east and west ends of the ore bin. All miners working on ore in the War Eagle have been laid off indefinitely, and the daily output of the camp at the date of writing is barely twenty tons. Production will not reach its normal state again until the completion of the tramway, which the contractors say will not be before the 1st of May.

The proposed tax of 2% on the gross value of all ore raised, gained or gotten from mines situated in the province, meets with scant favor here, and mining men of all nationalities say that the proposed impost is a most ill-advised and unjust measure. Similar measures, they say, have been tried in different States of the Union, and always had to be repealed, as they simply paralyzed the mining industry. A large meeting of citizens, mine owners and claim holders was held last Wednesday in the Opera House, and resolutions, most sweeping in their condemnation of the government's action in raising revenue by such means, were passed. A strong committee was elected to go to Victoria and wait upon the government.

Since I wrote you last, the Colville Indian Reservation, which lies due south of the Trail Creek District in the State of Washington, has been opened to mineral location. There was a general stampede from this camp, and many of the prospectors who have returned say that some first-class locations have been made.

I cannot too strongly impress upon the outside investor in Trail Creek mining stocks, the necessity of close investigation into the merits of the various claims that are daily being foisted upon an unsuspecting public. Recently the Nest Egg claim was stocked in Victoria, and Blocks of stock put on the market at 10c. per share, which is a valuation of $50,000 for the property. Now as a matter of fact, this claim, even if it had a clear title, which it has not, and is not likely to have, was never considered to be worth $20,000. Consequently there is nothing to warrant such a price as 10c. per share for the stock. Such reprehensible practices as the above can only result in harm to the camp, and the sooner they are exposed the better. Rossland has good mines, and mines that do not need such booming.

C. W. Callahan, the famous expert, has just left Rossland, after spending a week in the camp. He visited the Centre Star, War Eagle, Cliff, Con St. Elmo, LeRoi, Iron Horse and Deadwood mines, and is most enthusiastic over the prospects of the Trail Creek camp, and says that we have the makings of one of the greatest gold camps in the world. He took 500 pounds of Trail Creek ore to England with him, where he will have expert chemists experiment with it.

The LeRoi mine continues to improve as depth is gained, and hardly a week passes that some new strike does not add an element of wealth to the great property.

The local papers call it the greatest gold mine in the world and openly invite contradiction. The shaft is now down 432 feet, and shows a solid bottom of ore, which the owners say will average $200 to the ton in gold easily. At the bottom drifts have been run both to the east and west, and with cross-cuts have opened up an immense chute of ore, nearly thirty-six feet of solid high-grade ore. The diamond drill has been at work on the east 350 ft. level, boring to the north. It is unofficially stated that a parallel vein of ore, twenty-two feet wide, that averaged fifty-six dollars per ton in gold, has been cross-cut in several places. This vein only lies thirty feet to the north of the present workings. The stock of this mine is hard to get now at $4 per share.

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The War Eagle is working but few men, doing very necessary development work. The ore shipments from the mine are practically nil. The new 20-drill compressor is now in place, all parts fitted together, and the trial run was made on Wednesday last, and the machine in every way worked most satisfactorily. With the exception of the pipes connecting the reservoir with the compressing cylinders everything is ready to begin work. It is by long odds the most handsome piece of machinery in the Trail Creek camp, and is every way up to date. It is a Canadian built machine, being made by the Rand Drill Co., at Sherbrooke, Quebec. It is a compound 20-drill compressor. The engine has a 12-foot fly-wheel, Corliss valve gear, with a vacuum cut off. The low pressure cylinder has a diameter of eighteen inches, and the high pressure a diameter of thirty-six inches. In addition to the ordinary valve gear acting on the cut-off, there is a connection with the air tank also, affecting a governor. The two compressing cylinders have their valve motions controlled by the eccentric, thus insuring a minimum loss in the opening and closing of the valves.

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The Homestake, which is owned by a Canadian Co. of Vancouver, B.C., is looking exceedingly well in the lowest workings. The contracts in the shafts have been completed, and a drift connects the No. 1 and No. 2 shafts at a depth of fifty feet, thus insuring good air and safe exit, in case of accident, to the miners. A drift has been started to the west at the fifty foot level, and in the face there is a showing of solid iron sulphide ore, that the officials of the company say has a total value in gold, silver and lead of $35 to the ton. It is a most noticeable fact the silver and lead values (*i.e.* the galena) is disappearing with depth, and the gold value becomes greater. A contract for fifty feet of work has just been let in No. 2 shaft. Development work will be kept up all spring, though no more ore will be shipped until the completion of the tramway.

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It is a matter of regret that the initial attempt to matte Trail Creek sulphide ores, though not a failure, was by no means a success. The test run of the Trail smelter was made wholly on LeRoi ore, and at this time there is a quantity of ore, very silicious, that has a very good gold value, and right here is the place the difficulty lay. Silica is the exception and not the rule with Trail Creek ore, and it was the excess of silica that caused the trouble. So the freezing up of the Trail Creek smelter can not in reality be called a proof that the sulphide ores can not be successfully matted. The smelter officials also say the blame lies with the coke, which was of very inferior quality. However, lack of iron need not stand in the way of the matteing of ores from this camp, as there are mountain masses of it here, with a small gold value, that are easily obtainable.

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Before C. W. Callahan left Trail Creek, he examined the Deadwood claim in the South Belt, and was so much "taken" with the property that he, in conjunction with C. D. Rand, took a year's bond on the group, which consists of the Old Abe, Junction and Deadwood claims for $35,000. The Deadwood is a high grade galena proposition, with a small gold value. The mine is developed by a tunnel 102 feet in length, from which tunnel a winze has been sunk 30 feet, in which there is a showing of ore. Messrs. Callahan and Rand bond themselves to at least expend $25 per diem in development work, until the expiration of the bond, which is in February, 1897.

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It is a most problematical question, where the north boundary of the famous Trail Creek District really is? The identical formation found in Trail Creek has been found twelve miles to the north on Murphy Creek, and it is a well known fact that there is no radical change of formation in the intervening scope of country. The ore is very similar, and there is a series of fissure veins in the Murphy Creek district with most wonderful surface showing. The Murphy Creek camp is practically in the same condition that Trail Creek found itself in five, even four years ago, isolated and unknown. However, considerable pressure is being brought to bear on the Provincial government, and it is almost a certainty that an appropriation will be made in the estimates for the construction of a wagon road along the north bank of Murphy to the Columbia river, a distance of nine miles. The construction of this road will open up a region, the limit of whose gold-bearing capabilities is yet unknown.

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Champion Creek district, on the opposite or eastern side of Columbia river, is rapidly coming to the front as a first-class camp. A winter's work on half a dozen claims has proved the existence of large deposits of sulphide ore. Men have been at work all winter on the Free Coinage, Eliza Bell, Ethel, No. 1, Leblanc and Blackhawk claims. An especially fine showing is reported on the shaft of the Blackhawk, and in the tunnel and open cuts on the Leblanc and Ethel respectively.

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Work on the Montreal claim, which is situated right in the town, still continues. The shaft is down twenty five feet in plenty of ore. Surface water is becoming very troublesome.

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Work on the Gopher, in the South Belt, is going on apace. Contracts for drifts both ways from the shaft at a depth of 50 feet, have been let. The Gopher has a large chute of ore, that runs especially well in copper.

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Assessment work on thirty-two claims was recorded during the month of February.

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Men crowding into the camp, looking for business openings of all kinds. Rents have taken a decided jump in thirty days.

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Mr. George Johnstone, Collector of Customs at Nelson, B. C., courteously sends us the following:— "The ores of this district are not known by the names of gold and silver ores, but are classed as galena, copper and pyritic, the precious metals being contained in them. The galena carries silver and lead, the copper silver and gold, and the pyritic also carries silver, gold and copper, as well as iron, which is not of any value except as a flux.

ORE SHIPMENTS FOR YEAR 1895.

| | | | |
|---|---|---|---|
| Gold | | Value— | $822,008 |
| Silver | 1,176,360 ozs. | " — | $736,841 |
| Copper | 1,856,653 lbs. | " — | $117,788 |
| Lead | 18,065,317 lbs. | " — | $351,463 |

Total value—$2,028,100.00. Total tonnage—28,202 tons.

## Slocan District.

In the Summary Report of the Geological Survey, just issued, Mr. R. G. McConnell writes:—

A number of mines and prospects in the district were visited during the progress of the work and brief notes were taken, some of which may be of interest here. The granite area south of the main Slocan mining camp, hitherto somewhat neglected, was prospected pretty thoroughly during the past season, and a large number of claims—some of considerable promise—were staked out. Among those visited in this section were the Arlington, celebrated for the richness of its ore, the Nancy Hanks, Tamarac, Dayton and Enterprise.

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The Arlington, on Springer creek, located in 1894 by C. E. Fielding, follows a zone of shattered rock, which as shown in the single opening so far made, has a width of from six to eight feet. The ore occurs mostly in siliceous stringers, ranging in width up to four or eight inches, which run in an irregular manner through the fissured and altered granite, but is also found disseminated through, or in small bunches, in the granite itself. It consists principally of native silver, galena, gray copper and argentite. The lead strikes in a north-easterly direction and is reported to be traceable all the way to Ten-mile creek, a distance of over ten miles. Claims have been staked on it for this distance.

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A large boulder of altered granite, holding stringers of ore resembling that of the Arlington, occurs on the Speculator, the third claim north of the Arlington. The Tamarac is situated on Whittaker creek, a branch of Springer creek. The workings here have exposed a quartz seam, from twelve to eighteen inches in width, holding grains and bunches of galena, argentite, and ores of copper. The seam is very regular and has been uncovered for a distance of 250 feet. The Dayton and Nancy Hanks are somewhat similar in character.

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The Enterprise, situated on the northern slope of the ridge separating Springer from Ten-mile Creek, was located in 1894 by R. Kirkwood. This claim is crossed by a well-defined fault-fissure, running in a north-easterly direction and dipping to the south-east at an angle of 80°. The fissure has a width of twelve to eighteen inches and is filled partly with ore and partly with a quartz gangue. The ore consists mostly of galena with some gray copper, and in common with other ores in the granite belt is high grade in silver. A large number of claims have been staked out in the vicinity of the Enterprise, but little development work has so far been done on them.

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The claims on Eight-mile Creek, north of Ten-mile Creek, occur mostly in an inlier of hard, rusty slate or schist, several square miles in extent, inclosed in the granite. The L. H., Baby Ruth, Los Vegas, Mountain View, Granite Mountain, Daisy, and a number of others are situated on this strip. The L. H. is a gold claim of a somewhat peculiar character. The slates are fissured along an east and west line, and the schistose country-rock adjoining the line of fracture on the south has been altered, silicified, and impregnated in places with ore, along a zone varying in width from 20 to 40 feet. The alteration varies greatly in intensity, in some places being scarcely noticeable, while in others the rock has lost all traces of its original character. The ore appears to consist mostly of native arsenic, mispickel, pyrite, and pyrrhotite, distributed through the vein in an irregular manner. Assays from samples taken at intervals across the whole width of the lead (40 feet) are stated to have averaged $23 in gold to the ton, and others taken across a selected band seven feet in width, to have averaged $125 to the ton.

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The Baby Ruth, situated on a branch of Eight-mile creek, about half a mile below the L. H., shows a well defined fault-fissure a couple of feet in width, filled with a quartzose gangue and bands of residual clay. The Granite Mountain and Mountain View leads appear to consist of narrow tongues of slate penetrating the granite. The slate is partly altered and mineralized to some extent with pyrite, blende and galena. The Los Vegas and Daisy, both reported to be valuable claims, were not examined.

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Small inliers of slate occur in the granite in what is known as the Galena Farm, a plateau south-east of Silverton, so called on account of the numerous galena boulders scattered over it. The principal claims examined here were the Noonday and Currie. The workings on the Currie consist of a small shaft and a short tunnel, both inaccessible at the time of my visit, on account of water. The lead, where uncovered, has a width at the surface of 10 to 15 ft., and consists of a brecciated mass of quartz and angular fragments of slate, mingled with galena, blende and pyrite. It appears capable of yielding a large quantity of concentrating ore. The Noonday, situated near the junction of the slate inlier with the granite, is somewhat similar in character. The known area of the mineralized granite belt was greatly enlarged during the latter part of the season, and now includes all the country drained by the various branches of Lemon and Cedar creeks, and probably extends even further to the south and east. The rough character of the country, and the almost total absence of trails, has prevented much development work being done on the various lodes, beyond that required for assessment work, and it is highly desirable that readier means of access to this promising region should be opened up. A short account of some of the principal mines in the main Slocan mining camp was given in my summary of last year's work. A number of others were visited during the past season, but it will be impossible here to make more than the briefest mention of these. This camp has passed the doubtful stage, and is now in a thoroughly prosperous condition. The workings on the older mines have proved the continuity in depth of the lodes in most cases, and new ore bodies are constantly being opened up. Several tramways and concentrators are in course of construction, and two lines of railway will this winter compete for the rapidly increasing output of ore.

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The principal mines in the Slocan district are situated on the slopes of the long, irregular ridge separating Four-Mile creek from the south fork of Carpenter creek, and on the ridge separating the south fork of Carpenter creek from Seaton creek, or the middle fork of Carpenter creek. The former ridge is known as Silver mountain, and around it are grouped the Alpha, the Reed and Robertson groups, the Canadian group, the Mountain Chief, the Alamo, Idaho, Cumberland, Yakima, Wonderful, Ruth, Slocan Star, Ivanhoe, and many others.

The Alpha is situated on the four-mile slope of the mountain, about two miles east, and 2,500 feet above Slocan lake. The steep slope near the mine is overcome by a gravity tramway 1,600 feet in length, from the foot of which a good waggon road leads to the lake. The Alpha lead has the character of a crushed zone, 20 to 40 feet in width, running through shales and limestones. The strike is N. 24° E., and the dip is south-easterly at an angle near the surface of 35°. The ore occurs mostly in large pockets, one of which yielded 800 tons, and two others about 200 tons each. It consists principally of rich galena, with some blende, and gray copper. Considerable tunnelling has been done at this mine, and at the time of my visit an incline, following the dip of the lead, was being sunk. Farther to the south-east on the same slope, are the Reed and Robertson claims, situated on a strong lead 20 to 30 feet in width, which is stated to be traceable from Four-Mile creek to the summit of the ridge, a distance of over two miles. Still farther east, on the crest of the ridge, are the Chamblet and Britomarte claims.

Among the more important mines on the northern slope of Silver mountain, are the Mountain Chief, from which 1,000 tons of ore has already been shipped, and the Alamo, Idaho, and Cumberland, on the head of Hauser creek. The Idaho was idle at the time of my visit, but good forces of men were engaged on both the Alamo and the Cumberland.

The Alamo affords a good type of the leads in this vicinity. It shows a well-defined fissured zone from 5 to 10 feet in width, traversing the slates in an easterly direction and filled with crushed and brecciated slate, calc-spar, spathic iron, quartz, and ore. The dip is southerly, at an angle of 75° in the upper levels, but lower down it becomes nearly vertical. The lead is situated on a steep slope, and, like most of the mines in the Slocan district, offers especial facilities for being mined by tunnels, four of which have been driven into it at levels about 100 feet apart, in all of which important bodies of pure and concentrating ore hove been exposed. The ore consists principally of galena, with some blende, gray copper, pyrargyrite and pyrite.

A concentrator of 100 tons capacity, was erected by the Slocan Mining Company at the mouth of Hauser Creek during the past summer, to treat the concentrating ores from the Alamo and other mines in the vicinity. A tramway about a mile and a quarter in length, has also been built up Hauser Creek, from the end of which waggon-roads lead to the different mines.

On the north slope of Silver Mountain ridge, are the Slocan Star, Ruth, Ivanhoe, Wonderful, and other claims. A description of the Slocan Star was given in last year's summary. The fourth tunnel, which was incomplete at the time of my former visit reached the ledge at a distance of 500 feet. Drifts—mostly in ore—are now being driven along the lead, and an upraise to conneect with No. 3 level, 300, feet above, is being made. A concentrator of 100 tons capacity, connected with the workings by a tramway 1900 feet in length, is also in course of construction in connection with this mine.

The Ruth lead, has a width of from four to ten feet and strikes S. 70° W., with a dip to the south of 65°. The workings consist of a tunnel 300 feet in length from near the end of which an upraise has been made to the surface. One hundred and fifty tons of ore, principally galena, stated to carry 150 ounces of silver to the ton, has been shipped from this mine, and considerable bodies of ore are in sight.

The Ivanhoe, situated high up on the slope of the mountain, shows several nearly parallel veins. Two cross-cut tunnels—the upper fifty feet and the lower 90 feet in length, connected by an upraise of 70 feet—have been driven, and drifts have been extended along the lead from the ends of both tunnels for varying distances. The workings have exposed an ore-chute sixty to seventy feet in length, with a maximum width of five feet of pure and concentrating ore. A contract for a third cross-cut tunnel, 150 feet below No. 2, had been let at the time of my visit.

The leads on the ridge separating the South from the Middle Fork of Carpenter Creek, are crowded even closer together than those on Silver Mountain ridge. On the south slope, among others, are the Noble Five group, Last Chance, Goodenough, Reco, Deadman and Bluebird, and on the north slope the Best, Antelope, Rambler, Surprise, Antoine, R. E. Lee and Washington. The Payne the first mine staked in the district, is situated on the crest of a spur of the same ridge.

The Noble Five group, consists of a string of five claims, located on the same lead. The strike is N. 60° E., and the dip is to the north-west at an angle of 45°. The lead has in places the character of a true fissure, and in others that of a crushed and fissured zone filled with masses of the slaty country rock, quartz, calc-spar, and spathic iron. It varies in width from a few inches to ten feet or more.

The Bonanza King and World's Fair, two members of this group, have been worked continuously since the spring of 1892. The workings consist of five tunnels, following the lead at various depths, with a number of upraises and intermediate drifts. The three upper tunnels, which have lengths respectively of 120, 240 and 400 feet, pierce an important ore-chute from 60 to 100 feet in length, and from a few inches to six feet in width. The ore body widens from No. 1 to No. 2 tunnel and narrows somewhat at No. 3. A fourth tunnel, at a further depth of 350 feet, is now heading towards the chute, but has not yet reached it. The ore consists mostly of galena and Blende, with their decomposition products, classed locally as carbonates, and some gray copper, native silver and a dark earthy mineral which has not yet been examined, but probably consists largely of argentite. A band of the latter in No. 2 tunnel, three to four inches in width, is stated to have averaged 1,500 ounces of silver to the ton. A thousand tons of ore stated to have averaged 135 ounces in silver to the ton, has already been shipped from this mine, and the owners expect to ship a second thousand during the coming winter.

The Deadman, a parallel lead situated 400 feet east of the Noble Five group, has a somewhat similar character. The ore body has here a length of 40 to 50 feet and a maximum width of five feet. It has been opened up by two tunnels, each about 200 feet in length, and a third tunnel 135 feet lower down has been started towards it. The ore is very high grade in character. The output of shipping ore up to the present, is stated to have amounted to about 300 tons.

East of the Deadman, on the same slope, are the Reco and the Bluebird, accounts of which were given in last year's Summary. The Goodenough, a small but exceedingly rich lead, adjoins the Reco on the south. The ore-chute, varying in width from traces up to six or seven inches, has been followed for a considerable distance on the neighbouring Reco claim. The ore consists mainly of galena and carbonates with some ruby silver and gray copper. A shipment of ten tons of the undecomposed ore from this mine, is stated to have averaged 776 ounces, and another shipment of five tons 817 ounces of silver to the ton.

The Last Chance is situated above the Noble Five mine. The surface appearance of this lead was somewhat unpromising, but an incline run down on it to a distance of 80 feet, resulted in the discovery of a chute of ore, showing from one to three feet and a half of pure high-grade galena, bordered by several feet of carbonates and concentrating ore. The chute was followed for 40 feet, when work was stopped by water, and a tunnel is now being driven toward it at a lower level.

The claims on the northern slope, occur mostly near the heads of the various tributaries of McGuigan's Creek. The R. E. Lee, is situated above McGuigan's Lake near the crest of the ridge. This lead has a width of about three feet and follows a well-defined fissure which cuts sharply through the hardened quartzose slates and granitic dykes which form the country rock. The vein-filling is principally broken slate with some quartz. A tunnel has been driven along the lead for a distance of 100 feet. The first 20 feet proved barren, but beyond that, a layer of ore from three to six inches in thickness resting on the foot wall, was followed all the way. At the breast of the tunnel, ore occurs on both walls. The ore is principally a high-grade galena, shipments averaging 133 ounces to the ton in silver and 75 per cent. lead.

North-west of the R. E. Lee is the Washington. This mine has been idle for some time, but will be worked during the present season. The principal openings consist of a tunnel 300 feet in length, from which an upraise of 180 feet leads to a short tunnel above. An ore body was struck 140 feet in from the mouth of the tunnel, and followed for 120 feet, from which 1,500 tons of shipping ore and about 5,000 tons of concentrating ore have already been taken. A third tunnel, 146 feet lower down has been driven in 300 feet, and will be continued to the ore-chute and connected with No. 2 by an upraise, during the present season. A tramway 1,500 feet in length and a concentrator of 50 tons capacity are also projected in connection with this mine.

East of the Washington is the Surprise basin, occupied by the Surprise and the Antoine claims, neither of which was examined; and still further east are the Best and Dardanelles basins. The ridge between the last two basins, is formed by a fine-grained granitic boss about half a mile in diameter, on which are situated the Best, Rambler, Antelope and Caribou claims. The granite is traversed by numerous small faults and seamed with irregular quartz veins of all sizes, which often carry considerable quantities of tetrahedrite rich in silver. A specimen from the Antelope, assayed in the laboratory of the Survey, ran over 3,000 ounces of silver to the ton. Besides the tetrahedrite, some galena, iron and copper pyrites and blende are also usually present. A number of the ledges in this group have been opened up by short tunnels and shafts, but no extensive development work has yet been undertaken.

The North Fork of Carpenter Creek runs through what is known as the "dry ore" belt. The leads in this district are usually siliceous in character and carry bodies of highly argentiferous tetrahedrite, galena, and other silver ores. Most of the claims are situated north of the area examined during the past year. At the Miner Boy, a fairly regular quartz vein, from a few inches to a couple of feet in width, has been followed over 100 feet by a tunnel, and has also been traced west from the face of the tunnel for an equal distance. Some shipments of rich ore have been made from this mine, but I was unable to obtain statistics of these, as the mine was idle at the time of my visit.

At the London group, north of the Miner Boy, the slates and associated quartzites are cut by several ore-bearing quartz seams, ranging in size from stringers up to a foot or more in thickness. The seams have been opened up by a couple of short tunnels, and a long tunnel is now being driven in to intersect them in depth.

East of the main Slocan mining camp, numerous claims have been located, both north and south of Kaslo Creek, all the way to Kootanie Lake, but only a few of these were examined. South-west from Bear Lake, is the Lucky Jim, situated on what appears to be a faulted line of contact between the slates and a brecciated band of limestone. The ore occurs in large pockets and side fissures penetrating the limestone. About fifty tons have been shipped.

North of Kaslo Creek and east of Murray Creek, is the Wellington. This lead resembles somewhat that of the Alpha, and may be described as a wide crushed zone, traversing the slates in an east and west direction and dipping to the north. The crushed slates hold stringers and pockets of quartz, spathic iron and calc-spar. A shaft was sunk near the lead to a depth of seventy-seven feet, but was abandoned on account of the water, and the mine is now worked by tunnels. The upper tunnel cross-cuts the slates for 170 feet, and a drift then follows the lead for 100 feet. The drift has exposed an ore-chute sixty to seventy feet in length, stated to average two feet in width at the bottom of the tunnel. It was covered at the time of my visit. A second cross-cut tunnel from the surface to the lead, 700 feet in length and 160 feet below No. 1, has just been completed. The Wellington ore consists of a fine-grained galena, with blende and gray copper, One hundred and fifty tons, stated to average 250 ounces in silver to the ton, have been shipped.

Farther east, near the head of Lyell Creek, is the Eureka, situated on a well defined fissure cutting the green schists of the Kaslo series. The workings consists of a cross-cut tunnel 150 feet or so in length, from the end of which a drift follows the lead for 300 feet. An ore-chute twenty feet in length, from which some shipments have been made, was passed through, eighty feet from the end of the tunnel.

On the South Fork of Kaslo Creek are the Montezuma, Daisy and Ben Hur, the first on a tributary and the two latter near the main stream. The Montezuma lead strikes about N. 30° E. At the main showing, the lead divides, one branch continuing on in nearly the same direction, while the other bends more to the south. The southern branch has a width of ten feet. The south-western one is somewhat smaller and narrows in. A tunnel, following ore all the way, has been driven in for a distance of about 100 feet. The ore consists principally of argentiferous galena and blende, with their decomposition products. On the Daisy, two leads are exposed, about 100

feet apart. They strike N. 60° E. with a dip of 80° to the S. E., and are each from seven to eight feet in width. On the upper lead a shaft, following a short ore-chute adjoining the hanging-wall, has been sunk to a depth of twenty-five feet. The ore consists of argentiferous galena, blende, iron- and copper-pyrites, and some native copper. Gold assays up to $4.40 a ton have also been obtained.

The Ben Hur, situated north east from the Daisy, shows two leads each eight to ten feet in width, which are supposed to be a continuation of those on the latter claim.

In the Ainsworth district, the principal mines being worked are the Highland, No. 1 and Skyline. A short description of the Highland mine, which is situated on a well-defined fissure cutting the chists of the Shushap series, was given in last year's summary. The lower tunnel mentioned there, has since been driven in to a distance of 480 feet. Ore was met with 330 feet from the face of the tunnel, and has been followed continuously for 150 feet. An upraise to the surface, along the lead, was also nearly completed at the time of my visit. A large quantity of shipping and concentrating ore is now in sight in the mine.

The Skyline, and No. 1, occur in limestone bands associated with the Slocan slates, and are situated, the former about 200 yards and the latter about half a mile east of the granite area. The deposits worked in these mines are of a somewhat puzzling character, and would require extended study before conclusions of value could be arrived at concerning them. They appear to occupy fractured zones of considerable but unknown width, traversing the limestones and slates in a nearly north- and south direction, and dipping to the west. The zones have been silicified, and impregnated with ore in a selective manner, by ascending solutions.

The ore occurs in flattened ore-bodies, occasionally ten to twelve feet in thickness, which, in the case of the Skyline, according to Mr. Scott MacDonald, the manager, often cross nearly horizontally from the foot to the hanging-wall. The workings on the Skyline include an incline eighty-seven feet deep sunk on the lead, and a shaft farther to the west, 200 feet deep, from the bottom of which a drift 120 feet in length and an upraise of forty feet lead to the incline and the chambers of ore at present being worked. The Syline ore consists of a porous siliceous rock, carrying a dark mineral, probably mostly argentite, native silver and galena, along with some gray copper and iron and copper-pyrites. It averages from forty-five to fifty ounces in silver per ton. The present output of from ten to fifteen tons per day, is shipped directly to the Pilot Bay smelter, its siliceous character rendering it valuable as a flux for the more basic ores of the district.

The workings on No. 1 are somewhat irregular, owing to the different managements under which they have been carried out. The ore consists of a siliceous matrix, holding argentiferous iron-pyrites, native silver, galena and several other minerals which have not yet been identified. The pyrite, when separated from the gangue is stated to assay 700 to 800 ounces in silver per ton, and the galena 200 to 300 ounces. A concentrator of seventy-five tons capacity has been built at this mine, and the output, amounting to about fifteen tons daily, is mostly concentrated before shipment.

Besides the mines mentioned above, some work is also being done in the district on the Highlander, the Lady of the Lake, the claims of the Canadian Pacific Mining and Milling Company at the mouth of Woodberry creek and at other places.

At Hendryx, the Bluebell is in active operation. This mine is situated on a band of crystalline limestone interbedded with the Shuswap schists, which has been fractured in various directions. The ore, consisting mostly of low-grade galena and pyrrhotite with some blende, iron and copper pyrites and their decomposition products, occurs either pure or disseminated through a calcareous and occasionally a siliceous matrix. It occupies irregular chambers in the limestone, some of which are of huge dimensions. The ore-body being worked at present, including some large horses of limestone, measures approximately 70 feet in width by 200 feet in length and 150 feet in height. Forty thousand tons of pure and concentrated ores have been shipped from the mine during the year, and prodigious quantities remain in sight.

### Boundary Creek.

Considerable excitement has been caused here by the opening on Feb. 20th, of the Colville Indian Reservation, Washington, for mineral locations. The boundary line here for about 60 miles (between the Columbia and Okanagan mines), is the northern limit of this reservation. There have been several rich veins known and watched for years, and the interested parties had messengers waiting at the nearest places of telegraph communication, and relays of horses established several days before the expected opening, in order to get the mines and stake their claims before all comers. Some of these are direct extensions of Boundary Creek ledges. Already, in the case of several of these claims, suit has been entered by counter claimants and litigation is sure to result.

There are unquestionably a few good properties over there, and the El Dorado reservation, will for some months, no doubt, take many prospectors in there who would otherwise be in our own hills. Considerable clandestine prospecting has been done there previous to the opening, and no ore bodies have ever been found to at all compare in size and value with our auriferous cupiferous pyrrhotite, in Wellington, Skylark and North Fork camps; our auriferous copper pyrites of Greenwood, or the deposits of cuprite native copper and copper glance in Copper camp.

It is quite right, however, and shows an undeniably hopeful spirit in the Americans to maintain that the imaginery boundary line makes no difference and that they will find just as good and better deposits over there than here.

The marked superiority of our mining laws too, in the prompt suppression of claim jumping; the system of square claims, 1,500 ft. x 1,500 ft., thereby avoiding all extra lateral rights troubles; and in other points offers much greater inducements to capital.

In view of these facts, so far from the reservation opening retarding the flow of capital here, we look, in the coming summer, for not only what we would otherwise have had, but also a considerable diverted supply.

Numerous small sales have taken place in camp during the last fortnight, but the only transfer of importance is that of the Snowshoe Greenwood camp to Mr. Turner, for the Montreal and British Columbia Prospecting and Promoting Co. Ltd. The bond is for $21,000, 10% down, the remainder in equal instalments at end of six, nine and twelve months.

At present this property promises as well as any in Greenwood camp. Considerable work has been done on it, confined chiefly to long cross-cuts, with occasional small safts. From the work done there would seem to be three distinct veins on the property. Cross-cuts are, some of them, in ore for 75 to 100 ft., but what width the veins will be with depth, remains to be seen.

The ore throughout is copper pyrites in calcareous gangue with considerable coarse micaceous hematite. No special pay chute has been found as yet, but the present average value from cross-cuts and shafts may be taken as about 5% copper and $6 gold.

A road from Greenwood city to Copper camp is being rapidly put through, thus connecting both Copper and Deadwood camps with the main stage road.

# MINING IN NOVA SCOTIA.

(From our own Correspondent.)

We regret to have to announce the death of Mr. Reynolds, Mr. Touquoy's foreman, who has been associated with gold mining for many years.

Mr. Yeadon and others have been exploiting the old Musgrave property during the winter and report that a lead of good quartz has been discovered. A trial test in the Mooseland Mining Company's mill is said to have yielded 2 oz. per ton.

February's crushing at the New Egerton mine, 15-Mile Stream, produced a brick of 423 oz.

We recently had a call from Mr. C. F. Andrews, who reports the Richardson mine to be doing well. The cost of mining and milling the ore has been still further reduced, while Mr. Andrews expects with the additional 20 stamps which have recently been erected to be enabled to mine and mill the ore at a cost of not very much over a dollar and a-half per ton.

We understand that circulars are being distributed in various cities in the States with a view to soliciting capital for certain gold mines in Nova Scotia. We are prepared to admit that the gold mines of Nova Scotia are not pushed to anything like their full capacity, but we would remind investors that the yearly output varies from 20,000 to 25,000 ounces, and it is extremely unlikely that one mine in by no means the best district of Nova Scotia is going to suddenly start producing 20,000 ounces a year. It is such wild-cat statements as this that has given Nova Scotia the bad name which it has for a long time held in the eyes of capitalists, but from which we are happy to state it is slowly recovering, thanks mainly to such staple producing mines as Brookfield, New Egerton, the Golden Lode, the Richardson and a few others. We would strongly urge investors to thoroughly investigate any proposition before putting money into it, and consult local experts who have the relative values of each district at their finger ends. There is undoubtedly in Nova Scotia opportunity for legitimate investment in gold mining, but we would say to the capitalist, look with suspicion on any prope ty which is going to produce 20,000 ounces a year, and have the matter thoroughly investigated before investing.

Mr. George W. Maynard, M.E., of New York, is in Halifax. Mr. Maynard was here last fall, when he made examinations of gold and iron properties in Nova Scotia and a chromic iron ore property in Newfoundland, owned by a Halifax syndicate.

We notice that sealed tenders are invited for the plant and property of the Symon Kay Gold Mines, Ltd., at Montague.

Things have been fairly lively at Joggins. The strikers have barricaded themselves in a hall, where they are supplied with food and liquor by sympathetic friends. Some of them are said to be armed with fire-arms. The demands of the strikers that those men who have been faithful to the company through the strike should be dismissed, are hardly likely to be conceded to, and it is likely that the more unreasonable of the strikers will never enter the pit at Joggins again.

The result of the February crushing at Brookfield shows 424 ounces from 424 tons of quartz.

Considering how few mines have made returns for the month up to going to press, the February yield, which appears elsewhere, is very satisfactory.

The sale of the Mooseland property and plant takes place on the 19th inst. The mill is one of the best in the Province, recently built by I. Matheson & Co., of New Glasgow.

The question of the collection and treatment of concentrates (in which our Province has in the past been lamentably behind every other gold producing country in the world) is likely to occupy the attention of several of our leading and more enterprising miners during the coming year, and that it will be brought to a successful issue we have little doubt. We have always advocated the use of concentrating machinery for the majority of our mines, although we know there are a few cases where the tailings are almost valueless.

While on the subject of the treatment of concentrates, it is interesting to note that the Mount Morgan mine, which was one of the first mines to put up an extensive barrel chlorination plant (the Newbury-Vautin process being employed), have removed the whole of their plant and replaced it with vats, in which the roasted ore is leached with chlorine water. It is claimed by this method 96 per cent. of the gold is recovered at a cost of from 12 to 13 shillings per ton. It will thus be seen that while the American

metallurgist has been devoting his attention to the improvement of the barrel for the chlorination of gold ore, the Australian metallurgist, who was the first to use tha method on a large scale, has thrown it over for vat chlorination.

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We wish to strongly impress a few points on those who contemplate treating concentrates. The hydro-metallurgy of gold is a study of itself, and a process which will effectually treat one class of concentrates may be a complete failure on another; so, don't put up a plant without proper advice because some one else is using it successfully, and above all avoid untried patented processes which are claimed to extract "*200 per cent.*" of the gold in the ore. We have had too many of such in this Province.

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A correspondent from Londonderry writes: "With regard to the general work going on here now, you might mention if you wish that all departments (with the single exception of the finished iron branch) are at present employed to their fullest capacity and everything looks favorable to a large business during the coming summer. The puddle bar department started up again early in January after a silence of over three years, while the coke ovens were lit up last summer and have been giving excellent results. About 500 men and boys are employed now, so business in the town is unusually brisk and everything tends to a large circulation of money during this year. The coal employed in the coke ovens comes from Westville, Stellarton and Springhill and forms an important factor of the railway traffic of the district, together with the ore, limestone and other necessary supplies. The pipe foundry has been working throughout the winter for the first time on record, the greater part of the time with a double gang of men; the towns of Digby, Westville, Hartland and others were supplied last summer, while the bulk of the fall and winter's output has gone to the new gas works in Halifax.

# CORRESPONDENCE.

## Silver Mining in British Columbia.

*To the Editor:*

SIR,—Regarding the ouput of British Columbia silver mines, if the desultory operations conducted in Illecillewaet and the Lardeau are not taken into account, silver mining at the present date may be said to be practically confined to Southern East Kootenay. There is, however, one notable exception in Southern East Kootenay, where the North Star mine is now producing some 30 tons a day under the operation of Mr. D. D. Mann, of Montreal. Considering then only the Slocan, Ainsworrh and Nelson mining divisions, there was an output during the year 1895 of 10,177 tons, valued $10,594, giving to silver more than one-half of the mineral value of the whole West Kootenay output, which was approximated at $18,678.65, from 32,456 tons, showing a rate of value per ton greatly in favor of the silver ore.

This output was the result of 34 shipping mines, and to these there have been added some six or seven more since the beginning of the year, chiefly in the Slocan division.

The cost of freight and smelting charges is from $22 to $27 at present for the common clean galenas, the majority of the ore going to Great Falls, Everett, Tacoma and Omaha smelters. A few shipments only have gone to the local smelters at Pilot Bay and Nelson.

Each of these great United States smelters has a representative in the field buying up the ores they want, and lately Pueblo has also entered the list.

Of all these mines now working there is only one operated and controlled by a Canadian company in the Slocan division. This is the Wellington, the property of the Kootenay and Columbia Prospecting and Mining Co. of Ottawa. The ore bodies being usually found in a comparatively soft calcareous slate or impure limestone, are easily mined, but wages being at $3.50 a day for miners, such tunnelling as is contracted for is done at $11 to $15 a foot, and is nearly all single-handed work.

Usually short crosscuts are run in to tap the ledge near its outcrop, thus the mine pays its way from the start, and as time goes on No. 2 and No. 3 tunnels are run in at lower levels, when upraises and overhand stoping are made.

Most of the mines employ during the winter season some 8 to 20 men, but several of the larger companies have 50 or more. The Slocan Star, the presumed greatest mine in the Slocan, employs about 60 men, taking out about 30 tons of clean hand-picked galena a day, besides the concentrated ore which now goes over the dump. The Alamo Mining Company, operating the Alamo mine tramway and concentrator, has turned out from 40 to 50 tons of ore a day with as many men. This ore concentrates 3 to 1 in most cases, and gives a concentrate carrying 140 ounces silver and 55% lead.

In connection with silver mining, the concentrators with a gravity tramway will run during the coming summer in the Slocan.

Concentrators at Woodbury, Ainsworth, are now running or will be very soon. The Pilot Bay smelter runs entirely upon silver ores. It was blown in during March, 1895, and in that year shipped 2,020 tons of lead silver bullion valued at $100 per ton. This was not a continuous run but intermittent, depending upon ore supplies. About 15th January this year the Hall mines smelter was blown in for a short run. The ore, a copper silver one, proved to be almost self-fluxing, with the result that this smelter, built for a capacity of 100 tons per day, can smelt 120 tons. The fluxes used here are limestone, iron and Swansea coke.

A new device which is reported to work well is the granulating flume, which carries away the slag. The ore, worth $42, is smelted into a copper matte worth $240 to $280, a reduction of bulk to one-sixth or one-seventh of the original.

This ore is not roasted, but roasters will be put in to treat outside sulphide ores, such as those found at Trail Creek. Iron for fluxing is obtained from the Iron Hand west of Kaslo. The oxide ores of iron are rare in west Kootenay, and pyritous ores requiring roasting are mainly used for flux. Otherwise the great variety of ore west, dry and pyritous, together with the varied gangue filling, an abundance of limestone, make the district a favorable one for the establishment of smelters.

Another smelter built to treat the Trail Creek pyritous ores for matte has been built at Trail, B.C. Its capacity is to be 150 tons. Several attempts have been made to blow it in, but owing to the nature of the fluxes, or it is asserted, of the coke, no bullion has yet been produced. Upon the 3rd of March it was, however, expected to be successfully started.

This smelter will probably treat no silver ores, and unless the present capacity of the British Columbia silver smelters is greatly increased, the silver must continue to go to the United States smelters almost entirely as it now does from the Slocan.

G. C. GWILLIM.

NEW DENVER, 20th March, 1896.

## The Validity of Nova Scotia Titles.

SIR,—Through your valuable columns, as a reliable mining journal, I wish to emphatically contradict a calumnious report in circulation, representing that a reporter had interviewed me on the question of the effect of the late decision of the Privy Council in the suit "Attorney-General vs. Reynolds and Fairbanks," and that I had stated said decision practically declared every mining title, of both coal and gold, in Nova Scotia, defective.

This report I have just learned has been in circulation several days, and was first published in the Halifax *Mail* and *Herald*, in whose office it emanated. I knew nothing of this report until today, as I do not read either of these papers, as they have tried to do me injury before, and are my enemies, as well as, I believe, the enemies of the mining industry of this Province, and I fully believe there were malicious and ulterior motives in this diabolical report. I have therefore placed the matter in the hands of my attorneys, Messrs. Drysdale & McInnes, of Halifax.

Yours, GEO. W. STUART.

Truro, 12th March, 1896.

## Nova Scotia Certificates.

SIR,—I herewith hand you a set of examination papers, that were presented to candidates at our last examinations for mine managers in this Province, for your perusal, as I am inclined to think you have not read these papers before. You say in your last (February) issue of the REVIEW, "that not more than one-fourth of the questions asked candidates were of a practical character." Now, sir, I beg to differ with you on this point, as I consider they are without exception practical and necessary questions to be answered by any person desiring to become a mine manager in Nova Scotia. Although our coal sales are very limited compared with other countries, we meet and have to contend with all the difficulties in mining; our coal seams lie from nearly horizontal to perpendicular and contain all the different gases that are, or can be found in any other mining country. Therefore we need just as good and as well educated men for mine managers in Nova Scotia as any other part of the known world. *In re* English certificates, you "venture to think the less said about this the better." I venture to think that the less said about English certificates the better for some men holding such.

Yours truly, JAMES BAIRD.

Chignecto Mines, N.S., 20th March, 1896.

# COMPANIES.

**Cariboo Hydraulic Mining Company, Limited.**—The following is an excerpt from the report of the directors for the year ending 31st December last:—"It was the original intention to construct a ditch capable of providing 2,000 miners' inches of water, and the contract was made upon that basis, but while the work was in progress the manager recommended in the strongest terms that the capacity of the ditch be increased to 3,000 miner's inches, in view of the fact that the work could be done cheaper then than at any other time, and that the additional profit resulting from the increased head of water would give a very large return for the investment. Your directors, convinced that the manager was right, authorized the additional work, and arranged to borrow for the company the necessary money to pay for it.

"During the spring months your property was exposed to very serious damage from the torrents from Dancing Bill gulch, and your directors, upon the recommendation of the manager, authorized the necessary expenditure to divert the water passing through this gulch to the ditch, so as to utilize for washing purposes a stream that would otherwise be a continual menace to the property. Your directors also borrowed the necessary money to complete this work.

"The details of these large but necessary expenditures, together with the amount required for a connection to Boot Jack lake, and for other unforeseen works, compelled your directors to incur a total debt of about $120,000. Of this amount $80,000 was borrowed, and the balance is in the shape of bank overdrafts, some of which are guaranteed.

"Your directors estimate that to provide the supplies, explosives and additional equipment, and to pay for labor up to the 31st May, an additional amount of about $55,000 will be required.

"In order to pay off the floating debt and to provide about $25,000 of working capital, your directors recommend that the capital stock of the company be increased to $500,000, and that the new shares be offered at par to the shareholders *pro rata*, according to their holdings when the books are closed.

"Resolutions authorizing the increase of the capital stock of the company from $300,000 to $500,000, and specifying the terms upon which the $200,000 of new stock shall be offered to the shareholders, or otherwise disposed of, will be submitted for your approval."

MANAGER'S REPORT.

As the manager of the Cariboo Hydraulic Mining Co., Ltd., I have the honor of making the following report relative to the work accomplished at the company's mines from April 1st to November 12th, 1895.

*Permanent Improvements.*—Under this heading I place the extension of ditch from Hazeltine creek to Six Mile creek, the construction of dams, gates and other work required to convert both Polley's and Boot Jack lakes into storage reservoirs; construction of ditch to divert water from Dancing Bill gulch to the South Fork pooling reservoir; construction of road and trails, erection of camp buildings, and other work appertaining to the equipment of the company's mines.

*Operating Mine.*—Results of the past season's work are tabulated as follows:—

| | |
|---|---|
| Water used in Pit No. 1 | 19 days, 11 hours. |
| " Pit No. 2 | 25 " 22½ " |
| Total | 45 days, 9½ hours. |
| Gold product of season, gross | $60,306.93 |
| Yield per miner's inch per day (estimated) | 56 cents |
| Pit No. 1— | |
| Quantity of water used | 42,933 inches |
| Gravel removed (estimated) | 60,000 yards |
| Gold recovered (estimated) | $35,000.00 |
| Yield per cubic yard | $58\frac{3}{10}$ cents |
| Duty of water per miner's inch per day | $1\frac{4}{10}$ cubic yards |
| Pit No. 2— | |
| Quantity of water used | 64,731 inches |
| Gravel removed (estimated) | 150,000 cubic yards |
| Gold recovered (estimated) | $25,306.93 |
| Yield per cubic yard | $16\frac{9}{10}$ cents |
| Duty of water per miner's inch per day | $2\frac{3}{10}$ cubic yards |

The full effective duty of the water cannot be attained until the working pits are enlarged to dimensions sufficient to accommodate a proper system of branch sluices, and more room is still required to permit the heavy hydraulic plant to be placed and handled with economy and safety to plant and men.

The greater portion of the expenditure in the mine included under the head of "Operating" has been applied to opening pit No. 2, with the object of so enlarging the working space that the above conditions may be speedily attained, and the continuous working of the mine, day and night, with rapid removal of auriferous gravel may be carried on with safety and despatch.

The duty of the water and the resulting gold product will increase with the further opening of the mine.

| | |
|---|---|
| The estimated gross product for the season of 1896 is..... | $300,000.00 |
| The estimated cost of operating the mine for a period of 180 days during season 1896 is ..... | 87,000.00 |
| (The estimated possible number of working days with water, 150) | |
| Leaving a net estimated profit for season of 1896, say..... | $213,000.00 |

When the present working hydraulic pits at Dancing Bill gulch are sufficiently enlarged, and the lower or bed-rock bench of high grade gravel opened up for working, so as to accommodate the continuous use of the present water supply, and facilitate the rapid removal of the auriferous gravel, the product will be increased and the following result attained :—

| | |
|---|---|
| 2,000 miner's inches of water will remove in 24 hours, cubic yards of gravel. ..... | 7,000 |
| Value of gold per cubic yard..... | 50 cents |
| Estimated daily gross product..... | $ 3,500.00 |
| Deduct daily cost of mining ..... | 500.00 |
| Estimated daily net profit..... | $ 3,000.00 |
| Possible working days per season..... | 180 |
| Estimated annual net profit ..... | $540,000.00 |

This result can be doubled, when desired, by completing the construction of the ditch to Morehead creek, which will add two thousand miners inches to the company's water supply, which can be used in the operation of the working hydraulic pits at Black Jack gulch on the South Fork mine.

*Water Supply*—The water supply upon which the mining operations for the ensuing year must depend, will be derived from two sources, namely :—1st. The early rain and snow-water supply from tributary streams to the main ditch, which supply has been augmented over that of previous years by the construction of a relief ditch for freshet waters of Dancing Bill gulch, which are now diverted into our mine reservoir, placing such water under control for utilization at the mine, and by the additional tributary feeders cut by the nine miles of main ditch constructed last summer. 2nd. The two storage reservoir lakes, known as the Polleys lake and Boot Jack lake, situate at the head of main ditch.

The early supply is difficult to estimate with exactitude, so much depending upon the vicissitudes of a variable climate, where snow fall, rain and temperature materially influence the flow of the tributary streams, that figures made in advance can hardly be depended upon with certainty.

But it is hoped and expected that sufficient water will be obtained to carry on mining operations up to July 1st without drawing upon the reservoirs at the lakes. In seasons of ordinary precipitation this will certainly be the case. In extra dry seasons the reservoirs will probably have to be tapped before that time, and in wet seasons they will not be opened until later.

The reservoirs can be utilized to the following depths of water :— Polleys lake, 8 feet ; Boot Jack lake, 5 feet. Their storage area is not known, but the use of the water this season has given data as follows :

The lakes delivered (measured at the mine) 2,000 miners' inches of water for a period of 46 days time, reducing their level 66 inches, or an equivalent of $1\frac{48}{100}$ inches reduction in depth per day, for such 2,000 inch supply.

The lakes can therefore be counted upon to furnish, without aid after July 1st, on the same basis as above, 108 days continuous water of 2,000 inches volume, or 72 days water of 3,000 inches volume.

In the first case certainly, ample water for balance of season, and in second instance probably sufficient to supply 3,000 inches for all available mining time during the balance of season.

Consolidation of ditch banks and siltage of ditch with ensuing years, will tend to increase above figures, and each and every summer shower of rain will add materially to available water.

The company is now assured of a water supply, that under most unfavorable circumstances can only compel a certain degree of economy in its use.

*The Ditch System*—The water is delivered and utilized through a system of ditches, 17½ miles in length.

The water of Polleys lake is controlled by a double screw gate, each three feet ten inches wide, in a deep cut tapping this lake 8 feet below the high water mark. The water discharged therefrom is conducted into the original channel of Six Mile creek, by a cut 8 feet deep and ½ mile long.

Boot Jack lake has its outlet closed by a crib dam, sheeted with split cedar and covered with earth 7 feet high, and having a double screw gate, each three feet six inches wide, discharging the water into the original creek, which channel it follows about 2½ miles, and finds its way into Six Mile creek, near the outlet of the Polleys lake cut.

One quarter of a mile below this confluence, Six Mile creek is closed by a crib dam, 7 feet high and 100 feet long, (sheeted with cedar and covered with earth) provided with a 19 foot gate, closed in time of use by 3 gates, one of which is manipulated by a screw.

This dam raises the water in Six Mile creek about 5 feet into the head of main ditch, where it enters ditch through another double screw gate, each 3½ feet wide.

The water then flows through 16 miles of ditch to South Fork reservoir.

The first 9 miles to Hazeltine creek is through ditch constructed the past summer, and is a ditch 13 ft. 7 in. x 3 ft. deep and on 5 ft. grade per mile, capable of carrying 3,000 miners' inches when banks slightly more consolidated. It is well built, on even grade and shows but little erosion, has no flumes, is supplied with 12 waste gates, and will be easily maintained at a nominal cost. It picks up the waters of numerous creeks of considerable volume during spring months and at time of summer rains.

The next 7 miles is through the old South Fork ditch, widened and repaired to a capacity equal to the newer ditch of the season. This section has the disadvantage of a broken grade, forced upon this company by the faults of the old South Forks Company's construction.

The weak points have been strengthened by walls of rock and by flumes, and erosion retarded in many places by rock and timber walls, but this portion of the ditch, will, for some time to come, be saddled by more expenditure in maintenance than the upper section, by reason of its original faulty construction.

After the water passes into reservoir, it flows one mile to the sand-box at the head of hydraulic pipe through old ditch previously reported.

The ditch from Dancing Bill gulch, constructed this summer, takes up the water of that creek above the mine, carries it one mile around the hillside, and drops it into South Fork reservoir. This not only permits the control and use of freshet water, but was absolutely necessary for the purpose of keeping the freshet out of the hydraulic pits, through which the original stream flowed in a deep and rugged gulch.

About ½ mile above South Fork reservoir the water of the main ditch is dropped vertically 53 feet. This drop should not have been made by the South Fork company, and it is only a question of time, the sooner the better, when a ditch will have to be extended at this higher level of the mine, a distance of 2½ miles as the ditch would run.

*Condition of the Mine*—The opening of two working hydraulic pits has been commenced.

Pit No. 1 includes the old excavation in the Choo Fan or Bullhonl ease, lying east of Dancing Bill gulch.

Pit No. 2 is being opened into the "Loo Qndng Ching Tong" ground, lying west of Dancing Bill gulch.

The working floor of both pits lies from 50 feet to 80 feet above the bedrock or bottom channel.

Both pits have been operated by one 22 inch supply pipe and distributer. Two Giants have been used in pit No. 1, and one Giant in pit No. 2.

The main and branch sluices placed in pit No. 1 are 5 ft. wide, 3 ft. deep, and 526 feet in length. Those in pit No. 2 are 6 ft. wide, 3 feet deep and 364 feet in length.

In Dancing Bill gulch, immediately below the sluice outlet of pit No. 2, there is placed a section of 3 ft. x 8 ft. flume, 32 feet long.

At the lower end of gulch there is placed a line of sluices, 3 ft. x 6 ft. and 222 feet in length.

The gravel underlying the boulder clay in pit No. 1 is very free and yields readily to the force of the hydraulic streams, and contains a large percentage of boulders and heavy cobbles, but it is extremely rich.

The boulder clay is apparently decreasing in thickness, and is evidently a slide and local, instead of forming a continuous capping as at first supposed.

The gravel encountered in opening pit No. 2, was mainly slide material, but the stratified gravel is now exposed around the south and west sides of the excavation. The gravel has gradually improved as the workings advanced and better results may be expected from the next season's work in this pit. The pay gravel is overlaid by a stratum of sand and a deposit of low grade top gravel. No boulder clay has been encountered in these workings.

The rock, which is apparently the west rim of the channel, has been exposed on the west side of the excavation in pit No. 2.

The bottom bench of gravel underlying the workings in both pits, is of high grade. Two strata, exposed by a slide on west side of Dancing Bill gulch, give prospects varying from $1 to $3 per cubic yard.

No openings have been made to test bedrock.

The workings of the lower bench cannot be attempted until such time as the workings now in progress in the top bench have been carried up the channel about 300 feet from the face of the present workings in pit No. 1.

Pit No. 2 is now in condition to accommodate a separate hydraulic plant of 22 inch pipe. This must be provided so that each pit can be operated independently of the other, and the opportunity afforded for the continuous use of the company's water supply.

With the additional plant referred to, the mine will be in fairly good shape for the use of next season's water supply. The high grade of the deposits makes it appear reasonable to predict a most successful and profitable run for the season of 1896.

The estimates for the additional plant, &c., &c., necessary to facilitate the continuous and profitable operation of the mine during the season of 1896, amount to about $10,000, and the estimated cost of extension of main ditch from drop above South Fork reservoir, around head of reservoir of Dancing Bill gulch, with repairs to dam at South Fork reservoir, will be about $16,000.

The extension of this ditch will be required to facilitate the operation of the mine during the season of 1897, for the reason that the present ditch from South Fork reservoir will be too low for use in working top bench, and must be applied to the working of the lower bench of the bottom gravel, while the hydraulic plant applied to the working of the upper bench must be supplied with water from the main ditch extension, which will deliver the water at a point on Dancing Bill gulch, about 60 feet above point of delivery of the present lower ditch from South Fork reservoir.

(Sgd.) J. B. HOBSON

*Manager.*

CAPITAL ACCOUNT.

*Receipts.*

| | |
|---|---|
| Paid up capital stock, 60,000 shares at $5 each ..... | $300,000 00 |
| Gold taken out in 1894..... | 5,161 85 |
| Balance carried to Profit and Loss Account ..... | 118,760 98 |
| | $423,922 83 |

*Expenditure.*

| | |
|---|---|
| Mine purchases and leases..... | $180,704 10 |
| Moorehead ditch survey ..... | 534 38 |
| Ditches and equipment of mine..... | 163,258 70 |
| Dams, sluices, flumes, sand-boxes, etc..... | 11,324 33 |
| Reservoirs..... | 10,063 98 |
| Mine labor, etc..... | 24,901 00 |
| Buildings..... | 5,182 73 |
| Hydraulic plant..... | 3,753 99 |
| Melting and lighting plant..... | 44 78 |
| Saw mill..... | 2,465 25 |
| Roads and trails ..... | 3,688 50 |
| Pasture lands..... | 1,001 05 |
| Horses and wagons..... | 2,531 67 |
| Transportation..... | 2,485 96 |
| Furniture ..... | 553 70 |
| Operating..... | 3,171 57 |
| Management ..... | 2,500 00 |
| Head office and general expenses to March, 1895..... | 5,757 14 |
| | $423,922 83. |

OPERATING ACCOUNT—EXPENSES OPERATING MINE, SEASON 1895.

*Receipts.*

| | |
|---|---|
| Gold | $58,571 19 |

*Expenditure.*

| | |
|---|---|
| Management | $ 2,250 00 |
| Mining expenses, labor and explosives | 23,725 98 |
| Maintenance of ditch | 9,119 67 |
| do pipe | 56 09 |
| do sluices | 1,711 60 |
| do flumes, sand boxes, etc | 31 70 |
| do hydraulic plant | 465 36 |
| do lighting plant | 111 45 |
| do camp | 634 90 |
| do tools and implements | 655 70 |
| Vagons, harness, etc | 10 85 |
| Stable expenses | 1,020 70 |
| Farm | 350 93 |
| Boarding house | 630 87 |
| Travelling expenses | 982 70 |
| Stationery and printing | 166 85 |
| Telegrams and postage | 98 09 |
| Insurance (accident) | 162 50 |
| Balance carried to Profit and Loss account | 16,385 25 |
| | $58,571 19 |

PROFIT AND LOSS ACCOUNT.

*Dr.*

| | |
|---|---|
| Balance brought from operating account | $ 16,285 25 |
| Balance carried to General Balance sheet | 104,050 58 |
| | $120,435 83 |

*Cr.*

| | |
|---|---|
| Balance brought from Capital account | $118,760 98 |
| Head office and general expenses to December, 1895 | 1,674 85 |
| | $120,435 83 |

GENERAL BALANCE SHEET.

*Dr.*

| | |
|---|---|
| Loans | $ 79,699 45 |
| Bank advances | 40,000 00 |
| Bills payable, outstanding drafts, issued at mine, and personal accounts, *less* cash in bank, etc | 6,250 66 |
| | $125,950 11 |

*Cr.*

| | |
|---|---|
| Balance from profit and loss account | $104,050 58 |
| Stores on hand | 21,899 53 |
| | $125,950 11 |

**Horsefly Hydraulic Mining Co., Ltd.**—The following is excerpted from the report of the directors for the year ended 31st December, 1895:—"As will be observed by the accounts submitted, the present indebtedness of the company now exceeds $70,000, which together with a further sum of about $30,000, reported by the manager as being required for the purpose of carrying on the business of the company until the end of May, makes a total of $100,000 which it is necessary should be at once provided. To meet these obligations and allow a certain amount for working capital it is proposed to issue debentures for a sum not to exceed $150,000, payable in five years, and bearing interest at 10 per cent. per annum. A resolution to this effect will be submitted for your approval."

J. M. BROWNING, *President.*

## MANAGER'S REPORT, 1ST DEC., 1895.

As the manager of the Horsefly Hydraulic Mining Co., Ltd., I have the honor of making the following report relative to the work accomplished at the company's mines during the past season, together with an estimate of the receipts and expenditures for the year 1896.

### PERMANENT IMPROVEMENTS.

Under this heading I place the eleven buildings which were erected this year, and other extensions and additions to the Company's plant, necessary to facilitate the opening and operation of the Company's mines.

### OPERATION.

During the past season a large percentage of the work was applied to opening the mine, extending and deepening the main and branch cuts, extending sluices and making room to facilitate the operation of the hydraulic plant, and the removal of the auriferous gravel.

The time water was used in the mine—86 days.
The quantity of water used—223,442 miner's inches.
The area of bedrock uncovered—15,911 square yards.
The quantity of gravel removed—349,525 cubic yards.
The amount of gold recovered (gross)—2,720 ounces (value, $45,966.23).
The average yield per miner's inch of water—20$\frac{1}{8}$ cents.
The average yield of gravel per cubic yard—13·151 cents.
The duty of water per miner's inch—1·564 cubic yards.
The bedrock uncovered during the summer and fall runs was not cleaned.

### CONDITION OF THE MINE.

The body of cement encountered east of the main cut in pit No. 1, running from 10 to 80 feet in thickness, has greatly exceeded my anticipations. It proved extremely hard, and was an awkward and costly impediment to the progress of opening and operating of the mine, and caused the loss of a large percentage of gold that remained enclosed in lumps of the cement that went to the dumps.

The cement however has apparently decreased, and the tenure of the bottom gravel has greatly improved.

The thickness of the cement clear around the face of pit No. 1 is confined to a stratum varying from 1 foot to 10 feet, and lying from a half foot to 3 feet above the bedrock.

A large percentage of this cemented stratum is of a high grade, and it is believed would pay handsomely for milling.

By reference to Mr. Pelley Harvey's certificate, which gives the result of a working test of 150 lbs. of cemented gravel, it can be plainly seen that a large percentage of the gold inclosed in the cemented gravel passed through the sluices to the dump.

This loss can be prevented, and the output of the mine increased by adding to the plant a water power stamp mill to crush and amalgamate the cemented material.

### ASSAY CERTIFICATE.

[*Copy.*]

Vancouver, B.C., January 8th, 1896.

Dear Sir:

I have carefully tested the samples submitted for my examination, and received from Horse Fly Hydraulic Mining Company, on 7th inst., and append herewith the results.

Yours truly

W. PELLEW HARVEY.

| Mark or No. | Gold. ozs. | dwts | grs. | Silver. ozs. | dwts | grs. | Value per Ton. | Other Metals |
|---|---|---|---|---|---|---|---|---|
| General average all passed 50 Mesh | 0 | 10 | 16 | 0 | 2 | 16 | $ 10.64 | |
| *Concentrate Assay.* | | | | | | | | |
| Concentrated 18·7 tons to 1 ton | 8 | 10 | 1 | .... | .... | .... | 170.04 | Mechanical loss |

Free gold recovered by amalgamation ..... 83·7 per cent.
Gold in sulphurets by difference ..... 16·3 " "
100·0 per cent.

Gold calculated at $20 per oz.

The returns show that $10.64 per ton in free gold was recovered by amalgamation, and about $9.00 per ton in the concentrates; total value per ton, $19.64—a result double what was expended from the sample. Hand mortar tests made at the mine during the past season gave an average of over $4.00 in free gold per ton of cement, but Mr. Harvey's test indicates that a large percentage of the value is held in the concentrates after extracting the free gold by amalgamation. These concentrates can be recovered by vanners, and worked by chlorination or sold to the smelters.

### ESTIMATED RESULT OF WORKING A 20 STAMP WATER POWER MILL ON THE LOWER STRATUM OF CEMENTED GRAVEL.

| | | |
|---|---|---|
| 20 stamps will crush in 24 hours, cemented gravel | | 200 tons. |
| Estimated value in free gold per ton | | $ 4.00 |
| Daily gross product | | $ 800.00 |
| Cost of mining per ton, at $1.50 | $300.00 | |
| " milling " , at 0.20 | 40.00 | |
| | | 340.00 |
| Daily net in free gold recovered by amalgamation | | $ 460.00 |
| To which can be added the product of 4 tons of concentrates at $150 per ton | $600.00 | |
| Freight on 4 tons to smelter at $80 per ton | $320.00 | |
| 80 sacks | 40.00 | |
| Smelter charges | 80.00 | |
| | 440.00 | |
| Net profit in concentrates | | 160.00 |
| Daily net results | | $620 00 |
| Possible number of working days per season, with water power | | 180 |
| Annual net profit | | $111,600.00 |

The ditch was in good condition when the work closed down, and there was nothing to indicate that any breaks would occur, or that any extensive repairs will be required next season.

The season of 1895 was probably the driest experienced in this region since the year 1878. Mussel creek went entirely dry, but we were enabled to keep the ditch full nearly the whole season by cutting beaver dams at the outlet of two large lakes on line of road to 108 Mile House.

The mine is now fully equipped, and sufficiently opened to make it possible to operate the mine close to full time. This condition, together with the improvement in the character and tenure of the deposits, make it appear reasonable to predict a successful and profitable run for the season of 1896.

| | |
|---|---|
| The estimated gross product for the season of 1896 is | $90,000.00 |
| The estimated cost of operating the mine during the same period, say 180 days, is | 52,313.40 |
| Leaving net profit for the season | $37,726.60 |

(Signed) J. R. HOBSON, *Manager.*

CAPITAL ACCOUNT.

*Receipts.*

| | | |
|---|---|---|
| Paid-up Capital Stock, 15,000 shares at $10 each | | $150,000 00 |
| Gold taken out previous to 1895 | | 13,547 18 |
| Boarding house profit to 31st March, 1895 | | 369 15 |
| Balance carried to Profit and Loss Account | | 43,951 17 |
| | | $207,867 50 |

*Expenditure.*

| | | |
|---|---|---|
| Mine Accounts— | | |
| Mine purchases and leases | $ 26,915 00 | |
| Prospecting | 11,568 50 | |
| Ditch and pipe line | 83,093 34 | |
| Dams | 3,368 04 | |
| Flumes, sand-boxes, etc | 1,079 07 | |
| Sluices | 8,344 04 | |
| Buildings | 7,944 01 | |
| Mine labor, explosives, etc | 21,453 39 | |
| Mining plant, saw mill, lighting and melting plant | 14,159 60 | |
| Road to 108 Mile House, etc | 2,354 40 | |
| Farm | 942 56 | |
| Live stock | 6,675 48 | |
| Waggons and harness | 118 00 | |
| Management | 8,221 09 | |
| Salaries, stationery and general expenses | 3,284 72 | |
| Travelling expenses, transportation of miners, etc | 1,428 39 | |
| | | $199,949 63 |
| Head Office and General Expenses— | | |
| Interest account | $ 2,731 40 | |
| Legal expenses | 2,825 79 | |
| Stationery and printing | 164 84 | |
| Telegrams and postages | 66 78 | |
| Travelling expenses | 86 75 | |
| General and incidental expenses | 2,042 31 | |
| | | 7,917 87 |
| | | $207,867 50 |

OPERATING ACCOUNT—EXPENSES OPERATING MINE, SEASON 1895.

*Receipts.*

| | | |
|---|---|---|
| Gold account | | $44,443 33 |
| Boarding house, profit 1895 | | 1,566 61 |
| Balance carried to Profit and Loss Account | | 11,795 63 |
| | | $57,805 57 |

*Expenditure.*

| | | |
|---|---|---|
| Management | | $ 2,900 00 |
| Mining expenses—Labor | $23,790 84 | |
| Explosives | 19,037 60 | |
| | | 42,828 44 |
| Maintenance of Ditch | | 3,623 92 |
| do Dams | | 1,003 92 |
| do Pipe | | 1,008 25 |
| do Sluices | | 35 62 |
| do Hydraulic plant | | 132 95 |
| do Tools and implements | | 632 01 |
| Wages and general expenses of camp | | 981 25 |
| Wagons, harness, etc., repairs | | 35 18 |
| Stable expenses | | 997 30 |
| Pack train expenses | | 1,511 11 |
| Farm expenses | | 1,306 16 |
| Travelling expenses | | 249 25 |
| Accident insurance | | 162 50 |
| Roads and trails | | 6 60 |
| Stationery and printing | | 58 60 |
| Telegrams and postages | | 333 11 |
| | | $57,805 57 |

PROFIT AND LOSS ACCOUNT.

*Dr.*

| | | |
|---|---|---|
| Balance carried to General Balance Sheet | | $58,641 61 |
| | | $58,641 61 |

*Cr.*

| | | |
|---|---|---|
| Balance from Capital Account | $43,951 17 | |
| do Operating Account | 11,795 63 | |
| | | $55,746 80 |
| Head Office and general expenses for 1895 | | 2,894 81 |
| | | $58,641 61 |

GENERAL BALANCE SHEET.

*Dr.*

| | | |
|---|---|---|
| Bank advances | | $70,000 00 |
| Outstanding drafts issued at mine, and personal accounts | | 8,149 45 |
| | | $78,149 45 |

*Cr.*

| | | |
|---|---|---|
| Balance from Profit and Loss Account | | $58,641 61 |
| Stores on hand | $10,858 37 | |
| Lumber on hand | 771 66 | |
| | | 11,630 03 |
| Cash in bank | | 7,877 81 |
| | | $78,149 45 |

**Wallingford Bros. & Co.**—This dividend producing mica company, operating in the Templeton district, Que., produced from their mines in 1895, 177 tons of mica of all grades, nearly the whole of which was sold at a profit. 30 persons were employed. The output of all grades in 1894 was 100 tons. At last reports the mine was looking well. The partners are Edward Wallingford, N. A. Belcourt, Q.C., and T. G. Coursolles. The property contains about 200 acres.

**The Cariboo Gold Fields, Ltd.**—This company is issuing to the shareholders the first annual report from the company's agent and manager at Williams Creek, on the works done up to the end of 1895. It is stated by the secretary that every arrangement has been made as far as possible "to prevent any hindrance to active work being commenced early this coming summer."

**Consolidated Coal Co., Ltd.**—At the annual meeting held at Amherst, N.S., the following directors were elected:—J. T. Smith, president and manager; T. J. Copp, vice-president; C. R. Smith, C. W. Hewson, and Charles Smith, of Port Greville, and Rupert F. Bent, secretary and treasurer. Operations at the Maccan mines are being actively pushed.

**Londonderry Iron Co., Ltd.**—The annual general meeting of shareholders took place recently. The old board of directors was re-elected, viz.: Mr. A. T. Paterson, president and managing director; Mr. James Phymister, secretary; Mr. F. C. Budden, treasurer. The board of management is as follows: Lord Mount Stephen, Sir Charles Tennant, and Messrs. A. S. McClelland, J. N. Greenshields, A. T. Paterson, John Turnbull, and R. Macd. Paterson.

**Cumberland Railway and Coal Co., Ltd.**—At the annual meeting of the Cumberland Railway and Coal Co., held recently at Montreal, the following were elected directors:—Mr. Robert Cowans, president; the Hon. G. A. Drummond, vice-president, and Messrs. David Morrice, E. S. Clouston, J. R. Cowans, W. J. Morrice, E. McDougall, C. C. Colby, and H. R. Drummond.

**Iron Mask Mining Co., Ltd.**—Has been registered under the Foreign Companies Act, B.C., to carry on mining in British Columbia. Head office: Spokane, Wash. Authorized capital, $500,000.

**French Creek Mining Co., Ltd.**—Has been registered with head office at Milwaukee, Wis., and an authorized capital of $2,000,000. To carry on mining in British Columbia.

**Golden Gate Mining Co., of Granite Creek, Ltd.**—Has been incorporated with headquarters at Vancouver, B.C., and an authorized capital of $60,000. Directors: Henry De Pencier, D. G. McDonell, Melville P. Thomson. Formed to acquire the Golden Gate mining claims on Granite creek, Yale district, B.C., and to carry on the business of mining.

**British Columbia Syndicate, Ltd.**—This company has been registered at Victoria, B.C., with an authorized capital of $100,000, to obtain in British Columbia mines and mineral lands and to carry on the business of mining. Head office: Rossland, B.C. Directors: W. G. Johnson, D. M. Simard, and D. G. Marshall.

**Main Quesnelle Gold Dredging and Mining Co., Ltd.**—Has been registered under the Foreign Companies Act, B.C., and headquarters at Tacoma, Wash. To carry on mining in British Columbia. Authorized capital, $250,000.

**Consolidated Alberni Gold Mining Co., Ltd.**—Has been incorporated to acquire mineral claims within the Alberni mining division of Alberni district on Vancouver Island, B.C., and known as the "Alberni," "Chicago," "Victoria," and "Warspite" mineral claims. Authorized capital, $500,000. Directors: J. Dunsmuir, B. H. John, H. Saunders, D. Oppenheimer and Thos. Dunn.

**Machine Mining Scale**—The scale of prices for machine mining in the Pittsburg railroad district under the advance of the pick rate from 64 to 70 cents has been figured as follows:

Harrison machine—Room turning, $2.37, to which the cutter is to receive $1.09 and the loader $1.28. Entry work, 62 cents per yard, in addition to the regular price for cutting and loading in rooms, of which the cutter is to receive 19 cents per yard and the loader 43 cents per yard.

Where paid by ton for entry work, the cutter to receive 5 cents per ton in addition to regular price for cutting in rooms, making 19 cents per ton; the loader to receive 13 cents per ton in addition to the regular price for loading in rooms, making 48 cents per ton. Break throughs shall be per yard, 45c.; but where they are driven entry widths and slate taken down, the price for driving entry shall be paid.

Jeffrey machine—Room turning shall be $2.19, of which the cutter is to receive 71 cents and the loader $1.48. Entry work shall be 56 cents per yard, in addition to the regular price for cutting and loading in rooms, of which the cutter is to receive 13 cents per yard and the loader 43 cents per yard.

Where paid by ton for entry work, the cutter to receive 3 cents per ton in addition to regular price for cutting in rooms, making 11¾ cents per ton; the loader to receive 13 cents per ton in addition to the regular price for loading in rooms, making 48 cents per ton. Break throughs shall be, per yard, 45 cents; but where they are driven entry width and slate taken down, the price for driving entry shall be paid.

**The Health of Colliers.**—The experience of a medical man who has made a specialty of trying to elucidate the causes of cancer, are worthy of being recorded. Mr. T. L. Webb has practised for twenty-five years in a district overlying

the Shropshire coalfield, and during that time he has been surgeon to two collieries; and in an interesting paper on the health of the colliers, he says he has never seen a single case of cancerous disease in a collier who was working in the pits. "Moreover," he says, "an examination of the books of the district registrar shows that of all persons whose deaths are registered as due to malignant disease during the past thirty years, only two are described as 'coal miners.' Of these, one I know positively had long retired from the arduous occupation of coal-getting, and had for many years followed the more gentlemanly occupation of rat-catching. The other died in the workhouse, and had not worked in the pit for some time. It should be borne in mind that in this same locality cancer is very common, and is often seen among the furnacemen, moulders, ironworkers, and general labourers." Another practitioner living in the same district is also unable to recall the case of any collier suffering from cancer. The explanation lies partly, Mr. Webb thinks, in the habitual cleanliness of the collier, who "tubs" daily as soon as he comes home from the pits, and partly in the fact that his habits rarely lead him to drink water from casual sources.

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**The Use of Electric Machinery in Coal Mining.**—By Mr. L. L. Brande. This paper is highly characteristic of the innovations of the time we live in, and the claims of the writer strongly emphasize the use of electric appliances in all the operations in mines where power is applied to do work. He claims that transmitted electrical energy secures greater efficiency and economy and thereby considerably enhances the profits of the mine operators.

The strong points in the paper may be summarized as follows:

*First*—Seeing that the loss by transmission of the current is so small, it may be neglected in the gross result, and therefore the power may be applied through a motor directly at the points where it is wanted, and that may be for pumping, drilling, coal cutting, and hauling, in the most distant nooks of the mine.

*Second*—As electrical transmission has advanced beyond the speculative and experimental period, its reliability and relative efficiency and economy is now undoubted, and stands within the compass of numerical values that can be calculated with certainty.

*Third*—As the principles of action of electric plants are now so well understood, the generators, cables and motors are constructed to secure durability with few repairs.

*Fourth*—Only one prime source of power is required to generate the current for lighting and for the multifarious motors that are located just where the work is required to be done.

*Fifth*—For undercutting coal the electric cutter does the work in one-half the time, and effects a saving of from 10 to 12 cents a ton.

*Sixth*—Mr. Brande gives his experience of eight months at the Nos. 2 and 3 mines of the Essen Coal Co., Hazletine, Pa., and the plant at these mines consists entirely of "Independent" electric machinery. The prime steam power is equal to 200 h. p. and these engines are used to drive three 150 kilowatt generators. There is always one engine and one generator kept in reserve. The three generators have had nothing done to them since last May save cleaning the commutator occasionally, and the oil in the bearings has been changed only once.

*Seventh*—Two electric locomotives are used for haulage, and each of them is capable of hauling 1,000 tons per day. They are giving excellent satisfaction. On a nearly level track the longest train hauled in No. 3 mine was 64 bank cars, each carrying from 25 to 30 cwt. In No. 2 mine the longest train was 38 bank cars, the grade varying from 1 per cent. to 2 per cent. The lengths of the hauls were 3,600 and 4,200 ft.

*Eighth*—All the important partings and tipples of these mines are furnished with the electric light, and each motor has a headlight.

In conclusion, Mr. Brande predicts: "That the time will soon come when the price of coal will be based on the output of machine mines," and then operators will find their interests best served by using, wherever and whenever they can, these labor and time-saving and profit-making appliances.

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**Methods of Closing Upcast Shafts.**—In a recent paper before the Federated Institute of M. and M. E., Mr. A. Reid said:— "The use of the fan pit as a winding shaft was not by any means commendable, but there were many cases where the demand for increased output could only be met by gearing the upcast shaft for winding purposes. In the case of the Ffrwd Collieries, where the shafts had been sunk of insufficient dimensions to allow two cages passing in the shaft, a cage was run in each pit with the headgears in tandem. In these and similar cases the obstruction of the cage in the fan pit had to be tolerated, and a method of arrangement for the pit top became essential. The first method which suggested itself was that of completely boxing in the top of the fan pit in an air-tight chamber, with separation doors, or, again, with automatic sliding doors, which were an improvement, though at the Ffrwd collieries—iron doors having to be employed—excessive wear was caused to the winding rope, and when the doors were open there was a very heavy leakage, causing a perceptible lull in the workings. These plans had been rejected in favor of one designed by himself, which had been working most successfully for two years. A wrought-iron casing fitting the cage with a little clearance all around was built into the pit, and from the bottom of the casing to the landing plates were rendered air-tight. The top of the shaft, flush with the landing plates, was covered with a light wooden door; the joint was made of indiarubber, and the winding rope worked through a hole in the centre. Enveloping the capping of the winding rope was a light wrought iron pipe, 3 ft. long and 6 in. internal diameter, with flanges at both ends. This was carried by a block of timber 1 ft. 3 in. square and 6 in. deep, bolted to the lower flanges of the pipe, which rode on the lowest pair of clamps of the winding rope, which were neatly tooled to prevent injury to the rope, and on the top flange of the pipe was fixed an indiarubber buffer, 15 in. diameter by 6 in. thick. When the top cover of the fan entered the casing the pull of the fan was taken off the top door, the winding rope in lifting the light wooden door received no shock, while the cage acted as a door, closing the door above the fan drift. There was no loss by leakage, and the ventilating current was maintained constant while the winding went on. He claimed for the arrangement the maximum of convenience with the minimum of cost.

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**Bruce Carruthers' Scholarship.**—Gold amalgamators are reminded that the Bruce Carruthers' Scholarship in connection with the School of Mining, Kingston, will be awarded in May. The Scholarship, which is of a value of $200 per annum, is intended to afford one who has had experience in amalgamating the precious metals an opportunity for acquiring education in mining engineering. The conditions of this award will be made known on application to the Director of the School. Here is an opportunity for some deserving mill-man in Nova Scotia.

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**The Products from a Ton of Coal.**—From a ton of ordinary gas or bituminous coal may be produced 140 lb. of coal tar, in addition to 1,500 lb. of coke, and 20 gallons of ammonia water. By destructive distillation the tar will yield 69.6 lb. pitch, 17 lb. creosote, .14 lb. heavy oils, 9.5 lb. naphtha yellow, 6.3 lb. napthalene, 4.75 lb. naphthol, 2.25 lb alizarin, 2.4 lb. solvent naphtha, 1.5 lb. phenol, 1.2 lb. aurine, 1.1 lb. benzine, 1.1 lb. analine, 0.77 lb. toluidine, 0.46 lb. anthracene, and 0.9 lb. toluene. From the latter is obtained saccharine, which is a substance 230 times sweeter than the best cane-sugar, one part of it giving a very sweet taste to 1,000 parts of water.

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**Mine Accidents in Great Britain.**—A summary of the statistics relating to the fatal accidents and deaths which occurred at the mines and quarries of the United Kingdom during 1895 has been issued this week. It appears that in the past year there were 859 separate fatal accidents at mines classed under the Coal Mines Regulation Act, as compared with 813 in 1894; in 1895 the total number of lives lost was 1,033, as compared with 1,127 in 1894. At mines classed under the Metalliferous Mines Act there were last year 45 separate fatal accidents and 53 lives lost, as compared with 39 accidents and 46 lives lost in 1894. In 1895 the accidents at quarries numbered 96, each accident resulting in the loss of one life.

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One of the many interesting things in the recently issued annual report of Mr. Douglas Stewart, Dominion Inspector of Penitentiaries, is the statement that among the 520 convicts in Kingston Penitentiary there is not a printer. But it is not surprising. Printers and all others connected with the production of newspapers are such just and righteous men that one of them, if placed among the convicts in Kingston or any other penitentiary, would be immeasurably more out of place than a fish in a bird-cage.


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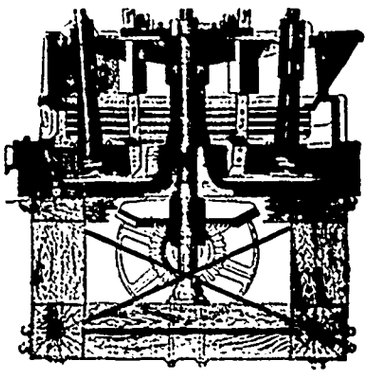

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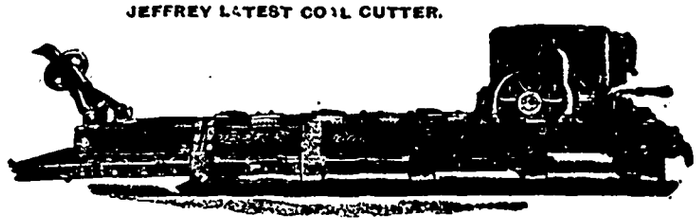

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