Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- [X] Coloured covers/ Ccuverture de couleur
- [ ] Covers damaged/ Couverture endommagée
- [ ] Covers restored and/or laminated/ Couverture restaurée et/ou pelliculée
- [ ] Cover title missing/ Le titre de couverture manque
- [ ] Coloured maps/ Cartes géographiques en couleur
- [ ] Coloured ink (i.e. other than blue or black)/ Encre de couleur (i.e. autre que bleue ou noire)
- [ ] Coloured plates and/or illustrations/ Planches et/ou illustrations en couleur
- [✓] Bound with other material/ Relié avec d'autres documents
- [✓] Tight binding may cause shadows or distortion along interior margin/ La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure
- [ ] Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/ Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.

- [ ] Coloured pages/ Pages de couleur
- [ ] Pages damaged/ Pages endommagées
- [ ] Pages restored and/or laminated/ Pages restaurées et/ou pelliculées
- [✓] Pages discoloured, stained or foxed/ Pages décolorées, tachetées ou piquées
- [ ] Pages detached/ Pages détachées
- [✓] Showthrough/ Transparence
- [ ] Quality of print varies/ Qualité inégale de l'impression
- [ ] Continuous pagination/ Pagination continue
- [ ] Includes index(es)/ Comprend un (des) index

  Title on header taken from:/ Le titre de l'en-tête provient:

- [ ] Title page of issue/ Page de titre de la livraison
- [ ] Caption of issue/ Titre de départ de la livraison
- [ ] Masthead/ Générique (périodiques) de la livraison

- [X] Additional comments:/ Commentaires supplémentaires: Pagination is as follows: [2], i-viii, 201-212, [2]

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

10X	12X	14X	16X	18X	20X	22X	24X	26X	28X	30X	32X
										✓	

The Canadian Mining Review

Established 1882

Vol. XII.—No. 12. 1893—OTTAWA, DECEMBER—1893. Vol. XII.—No. 12.

Geological Survey of Canada.

Annual Report, 1888-89,

VOL. IV.

With Accompanying Geological Maps, Plans of Mine Workings, and other Illustrations; also a Complete Alphabetical Index.

NOW PUBLISHED AND ON SALE.

PRICE, COMPLETE, TWO DOLLARS.

Part A.—Summary Reports o Operations 1888 and 1889, by the Director. Price 10 cents,

Part B.—West Kootanie District, B.C., by Dr. G. M. Dawson. Price 25 cents.

Part D.—The Yukon and Mackenzie Basins, with maps, by R. G. McConnell. Price 25 cents.

Part E.—Lake Agassiz in Manitoba, by Warren Upham. Price 25 cents.

Part F.—The Sudbury Mining District, by Robert Bell, B.A., Sc., LL.D.

Part K.—Mineral Resources, Quebec, by Dr. R. W. Ells. Price 25 cents.

Part N.—Surface Geology, New Brunswick, by R. Chalmers. Price 30 cents.

Part R.—Chemical Contributions, by G. Christian Hoffmann. Price 25 cents.

Part S (a).—Mining and Mineral Statistics, 1888, by H. P. Brumell. Out of print.

Part S (b).—Mineral Statistics and Mines, 1889, by E. D. Ingall and H. P. Brumell. Price 25 cents.

Part T.—Annotated List of Minerals occurring in Canada, by G. Christian Hoffmann. Price 25 cents.

Note.—These and all other Publications of the Survey, if not out of print, may be purchased from or ordered through

W. FOSTER BROWN & Co., Montreal.
DURIE & SON, Ottawa, Ont.
WILLIAMSON & Co., Toronto, Ont.
MCGREGOR & KNIGHT, Halifax, N.S.
J. A. MCMILLAN, St. John, N.B.
J. N. HIBBEN & Co., Victoria, B.C.
R. D. RICHARDSON, Winnipeg, Man.
MOIR & MILLS, Port Arthur, Ont.
THOMPSON BROS., Calgary, Alta.
THOMPSON BROS., Vancouver, B.C.
EDWARD STANFORD, 26 and 27 Cockspur Street, Charing Cross, London.
SAMPSON, LOW & Co., 188 Fleet Street, London.
F. A. BROCKHAUS, Leipzic.
B. WESTERMANN & Co., 838 Broadway N.Y.

or on application to

DR. JOHN THORBURN,
Librarian,
Geological Survey, Ottawa

N.B.—Catalogue and Price List can be obtained from any of the above.

MINING LAWS OF ONTARIO.

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

Locations range from 40 to 320 acres.

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

Locations may be acquired in fee or under leasehold.

Price of locations north of French River $2.50 to $3.50 per acre, and south of it $2 to $2.50 according to distance from railway.

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

Rent of claims, $1 per acre each year.

Claims must be worked continuously.

Royalty on ores specified in the Act, 2 to 3 per cent. of value at pit's mouth less cost of labor and explosives.

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

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

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

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

ARCHIBALD BLUE,
Director Bureau of Mines.

TORONTO, April 24, 1892.

PROVINCE OF NEW BRUNSWICK.

Synopsis of "The General Mining Act," Chapter 16, 54th Victoria.

——LEASES FOR MINES OF——

GOLD, SILVER, COAL,
IRON, COPPER, LEAD,
TIN and PRECIOUS STONES

GOLD AND SILVER.

PROSPECTING LICENSES up to 100 areas, (each 150 feet by 250 feet), issued at 50 cts. an area up to 10 areas, and 25 cts. afterwards per area, good for one year. These Licenses can be renewed for second year, by payment of one-half above amount.

LEASES for 20 years to work and mine, on payment of $2 an area of 150 feet by 250 feet. Renewable annually at 50 cts. an area in advance.

Royalty on Gold and Silver, 2½ per cent.

MINES OTHER THAN GOLD AND SILVER.

LICENSES TO SEARCH, good for one year, $20 for 5 square miles. Lands applied for must not be more than 2½ miles long, and the tract so selected may be surveyed on the Surveyor General's order at expense of Licensee, if exact bounds cannot be established on maps in Crown Land Office. Renewals for second year may be made by consent of Surveyor General, on payment of $20.

Second Rights to Search can be given over same ground, subject to party holding first Rights, on payment of $20.

LEASES.—On payment of $50 for one square mile, good for two years, and extended to three years by further payment of $25. The lands selected must be surveyed and returned to Crown Land Office. Leases are given for 20 years, and renewable to 80 years. The Surveyor General, if special circumstances warrant, may grant a Lease larger than one square mile, but not larger than two square miles.

ROYALTIES.

Coal, 10 cts. per ton of 2,240 lbs.
Copper, 4 cts. on every 1 per cent. in a ton of 2,352 lbs.
Lead, 2 cts. on every 1 per cent. in a ton of 2,240 lbs.
Iron, 5 cts. per ton of 2,240 lbs.
Tin and Precious Stones, 5 per cent. of value.

APPLICATIONS can be fyled at the Crown Land Office each day from 9.30 a.m. to 4.30 p.m., except Saturday, when Office closes at 1 p.m.

L. J. TWEEDIE,
Surveyor General.

CANADIAN MINING & MECHANICAL REVIEW

CONDUCTED BY . . . . . B. T. A. BELL

THE OFFICIAL ORGAN
—OF—
THE GOLD MINER'S ASSOCIATION OF NOVA SCOTIA.
THE UNITED MINING SOCIETY OF NOVA SCOTIA.
THE ASBESTOS CLUB, QUEBEC.
THE GENERL MINING SSOCIATION OF QUEBEC.

THE following Resolutions of Council indicate beyond a peradventure the status of THE REVIEW as the exponent of the Canadian Mineral Industries:—

The Gold Miners' Association of Nova Scotia.

"At the annual meeting of the Gold Miners' Association of Nova Scotia, held at Halifax on 6th March, 1889, THE CANADIAN MINING REVIEW was adopted the official organ of this Association.
(Signed), B. C. WILSON, *President.*
G. J. PARTINGTON, *Secretary.*

The Mining Society of Nova Scotia.

"Moved by Mr. R. G. Leckie, seconded by Mr. C. A. Dimock, That the thanks of the Society be tendered to Mr. B. T. A. Bell for his kind offer placing the columns of THE REVIEW at the disposal of the Society; and that THE CANADIAN MINING REVIEW is hereby appointed the official organ of the Society."
(Signed), H. S. POOLE, *President,*
H. M. WYLDE, *Secretary.*

The Asbestos Club, (Quebec.)

"Resolved: That THE CANADIAN MINING REVIEW is, by authority of the Members and Council, hereby appointed the official organ of the Asbestos Club."
(Signed), D. A. BROWN, *President.*
A. M. EVANS, *Secretary.*

The General Mining Association of the Province of Quebec.

At a meeting of Council held at Montreal on Friday, 6th May, 1891, it was moved by Captain Adams, seconded by Mr. R. T. Hopper, and resolved: That THE CANADIAN MINING REVIEW be the official organ of the Association.
(Signed), GEORGE IRVINE, *President.*
B. T. A. BELL, *Secretary.*"

OFFICES:
Victoria Chambers, 140 Wellington Street, OTTAWA.

Vol. XII. DECEMBER, 1893. No. 12.

The Free Coal Question.

It is amusing to read the articles written both in Canada and the United States on the free coal question and to note how they vary in agreement and conclusion with the interest of parties; how facts and fiction, partial truth and mere assumption are blended together. Taking the experience acquired by the trade previous to the termination of the Reciprocity Treaty in 1866, one party argues for certain results as sure to follow; another contends that the course of trade cannot revert to the old channels of 1865, when New England took some 465,000 tons of Nova Scotian coal, yet again we are told in Boston the coal is no good anyhow. Even Mr. Edward Atkinson, a year or so ago, was made to say that coal from Nova Scotia was very liable to spontaneous combustion and hence was undesirable. Lately, we were glad to see in the Boston *Herald*, that he disclaimed this sweeping assertion which could not be sustained. The experience of years has shown that if only ordinary precautions are observed there is no liability; and the precautions are, storage in drained ground free from wood and hot boiler walls.

That the prospect of free coal is dreaded by many is to be expected; no changes in the Tariff can take place without disturbance of Trade, and loss to some dealers and operators, but we regard the alarm from the west as wholly imaginary. In 1866 Western Virginia had no cheap rail connection with the coast, now excellent bituminous coal can be bought on the seaboard for $2.25 per ton and it can be carried northward to New England in barges at half the present rate of freight from Cape Breton coal ports. Then the understanding that now exists among the railways makes the charges of water-borne coal carried inland vastly higher than on an all-rail route. This must effectually limit the possible area in which the so-called cheap coal of Cape Breton can compete, and when realized silence the anxiety of the West.

In Nova Scotia anxiety is felt lest the removal of the duty on coal entering the United States be followed by a remission of the duty on coal entering Canada, when not only would American coal take all the market west of Montreal, thereby reducing the business at that point some 200,000 tons, but English and Scotch coal brought out by the ocean steamers at ballast rates would take 150,000 to 200,000 tons additional. The Nova Scotia collieries being thus beset both before and behind would positively lose the benefit of the St. Lawrence market and have only the problematical benefit of what they might capture in the United States.

The imposition of a protective duty has greatly stimulated the production of coal in Nova Scotia, the output of the mines of that province having increased from 882,863 tons in 1879, to 2,175,193 tons in 1892. Sales of Nova Scotia coal to the Province of Quebec having in the same period risen from less than 100,000 tons to over 750,000 tons annually. At the same time it must be said that the importation of coal from the United States in the Province of Ontario has enormously increased in spite of the duty of sixty cents a ton.

In British Columbia the interests are not so complex as on the Atlantic seaboard. So far as it is concerned the removal of the duty would be of unquestionable advantage, because its production is practically illimitable and far exceeds the home consumption and under no circumstances would coal be imported. British Columbia intends to keep and to extend the large sale of her coal in San Francisco and other American points on the Pacific Coast. Of late, supplies have been drawn to San Francisco in competition with British Columbia, but the quality of the coal has been proved to be much inferior to that from Vancouver Island and it is not possible to doubt that if the duty is removed by the United States a great impetus will be given to the sale of coal from this province.

EN PASSANT.

The existing tariff on imports of lead ores into the United States is one and a-half cents per pound on the amount of lead in the ores. The silver lead ores of the Kootenay district contain from 40 to 75 per cent. of lead so that each ton of ore pays a duty of from $12 to $22.50. Under the Wilson Bill ores in which the silver value is greater than the lead value will be admitted free. A ton of ore containing 100 ounces of silver and 50 per cent. of lead with silver at 70 cents per ounce, and lead at 3¾ cents per pound, would have a silver value of $70, and a lead value of $37.50 and would pay no duty, whereas an ore assaying 75 per cent. of lead worth $56.25 to the ton and carrying only 80 ounces of silver, worth say $56

THE ST. LAWRENCE COAL TRADE.

The returns of the quantity of bituminous coal deliveries by water to St. Lawrence ports during the past season are now complete and show a very satisfactory increase over former years. The total importation amounts to 737,941 tons, as against 626,087 in 1892. Previous figures show: 1885, 360,000 tons; 1886, 377,500 tons; 1887, 482,103 tons; 1888, 517,539 tons; 1889, 467,525 tons; 1890, 543,656 tons; 1891, 602,323 tons.

The figures in detail for the past season are:—

NAME OF MINE.	MONTREAL.		SOREL.		THREE RIVERS.		QUEBEC.		TOTALS.	
	1892	1893	1892	1893	1892	1893	1892	1893	1892	1893
Dominion Coal Co.....	337,183	466,005	7,436	5,191	.....	.....	27,576	18,137	372,195	489,333
General Min'g Association..	75,547	75,195	1,589	11,494	9,012	9,218	30,472	33,500	116,620	129,407
Intercolonial Coal Railway...	79,155	72,084	4,566	.....	. ....	.....	.....	....	83,721	72,084
Scotch and English.....	32,876	36,074	3,103	1,528	... ..	.....	17,572	9,520	53,551	47,122
Season 1893.....	524,761	649,358	16,694	18,213	9,012	9,218	75,620	61,157	626,087	737,946

to the ton, would have to pay a duty. Most of the ores in the Kootenay district will class as silver lead ores in which the silver value predominates. But there are some large deposits of galena on the shores of Kootenay Lake, notably in the Blue Bell mine, which are high in lead and very low in silver and these will not be able to work profitably in the face of any duty, although the Wilson Bill proposes to reduce the lead duty.

It is evident that a saving of $15 to $20 on every ton of ore shipped is a profit in itself and this change if carried out must be of great advantage to all the high grade silver-lead mines and will give a decided stimulus to mining in the Kootenay district of British Columbia.

The Logan Club, an organization composed of the staff of our Geological and Natural History Survey held a highly successful dinner in the Russell House, Ottawa, on the 14th inst. About forty were present. At the request of the committee in charge, who desired that the proceedings should be private, the REVIEW regrets to be compelled to withhold from its readers a report of what took place. This is all the more regretable as in the many excellent speeches of the evening much was said of interest respecting the urgent necessity of enlarged and more secure accommodation for this branch of the service and particularly for its magnificent collection of national treasures. Surely in view of the dangerous condition of the present building, it is full time the Dominion Government made a move to erect a building more in keeping with the enlarged sphere of the Survey and the national importance of its work. No appropriation could be better spent in the interests of the country.

The General Mining Association of the Province of Quebec commences the fourth year of existence with a series of meetings of an unusually interesting nature at Montreal on 10th and 11th January. Three sessions will be held and many valuable papers will be submitted for discussion. The annual dinner will be held in the Windsor Hotel on Thursday evening, 11th prox. We trust there will be a large attendance to inaugurate a new year's work.

The *Journal* of the General Mining Association of Quebec containing the Transactions of that body for the years 1891-2-3, has been published and issued to members. In some 450 pages is contained a mass of valuable literature respecting the mining practice and mineral resources not only of the Province of Quebec, but of the Dominion at large. Of particular service should prove the history given of the fight against the Mercier Mining Act and other legislative enactments which have proved a feature in the work of the Association. The volume is handsomely gotten up and is carefully indexed for reference.

In these degenerate days, when one of the loudest laments has for its burden the disinclination of young men to marry, some comfort is derivable from an advertisement like the following reproduced from the *Australian Mining Standard*:

WANTED.—By Gold Prospector, Queensland, tidy Girl, used to camp life, view to matrimony; genuine. Address——

This should cause the heart of many a hopeless maiden to glow again, and open up vistas of prospective happiness in the sylvan shades of far off gullies in Bananaland. The ambiguity of the advertisement gives free range to the imagination, but this may not be altogether an advantage under the circumstances. The advertiser is not very clear as to the conditions of the probation he indicates, and perhaps some coy damsels might hesitate even to make enquiries while there is the faintest suggestion of a compromising situation. From the assurance of the advertiser that his communication is "genuine," it would almost appear as if he anticipated some doubts occurring to timid minds, but it is to be hoped that any want of clearness in the advertisement will be compensated for by the "correct" answers of the advertiser to the enquiries of any "tidy girl" who may yearn to lay her head on the manly bosom of a gold prospector in Queensland.

But the efforts of the bold Queensland prospector to get a wife on approval, have been discounted by another aspirant of the male sex, who, if we may believe the same authority, advertises as follows:

MINING EXPERT (bachelor) having discovered very rich gold mine, wants to meet young woman or widow willing to risk £20 to develop the mine, which will probably result in thousands of pounds profit; half-share or marriage. Fullest particulars on application, in strict confidence.

Here is surely a golden opportunity. It should be a game of "heads I win tails you lose" for the lady, for a decent husband would be cheap at the price, to say nothing of the prospect of thousands of pounds from the mine. A suspicious feature about the announcement is the apparent indifference of the advertiser whether he enters the bonds of matrimony with his fair partner or only goes shares, but this may arise not so much from want of desire to link his fate irrevocably with the other member of the firm as to give a chance to ladies to whom marriage would be out of the question.

The *British Medical Journal* publishes a communication from Dr. Fray Ormrod drawing attention to the occurrence of lead poisoning among men engaged at blast furnaces, in which that peculiar form of cast iron which goes by the name of "Spiegeleisen" is produced. This is largely used in the Bessemer process for the manufacture of steel, and is got from a considerable variety of ores, some of which are apt to contain an admixture of lead. When this flows from the furnace, either with the slag or with the reduced metal, it becomes oxidised, and rises in a dense yellowish white fume, containing 94.5 to 74.5 per cent. of lead oxide. This is very poisonous, and to it the men who are engaged at the "slag-holes" are exposed during almost the whole of their working day, and those on the "pig beds" at the time of casting, that is every four or five hours. All these men are apt to suffer from lead poisoning, often suddenly and severely. After a three weeks' holiday it was noticed that four men were soon disabled; A, after working seven shifts, B and C three shifts each, and D four shifts. Some men have been laid up for a fortnight at a time, at least a dozen times in two years. Obviously the men engaged at these furnaces are exposed to even greater dangers than ordinary lead workers, in consequence of the much greater tendency of the metal to volatilise at the higher temperature required for the reduction of the iron.

In an address, at Newcastle, Professor Philipson, the President of the British Medical Association, said that to the heated atmosphere of the coal mine, an atmosphere often laden with dust, and to the strain thrown upon the internal organs caused by the cramped position in which miners are obliged to work, the mucous catarrhs of the respiratory and gastro-intestinal tracts, from which miners suffer, may be attributed. But there are few diseases peculiar to miners. Anthracosis is very rare. Emphysema of the lungs does occasionally occur. The pitman's asthma is well known, but it is a much less frequent disorder now than formerly. Miners are also very exempt from nephritis, which may be attributed to the profuse perspiration which they experience while at work, and to the daily ablution which they practice on their return home. Contrary to what might be expected, rheumatism and rheumatic fever rarely effect the coal miner. The miners of the north of England have an average of three years longer life than the aggregate of Englishmen, eight years longer than the Cornish miners, nine years longer than the South Wales miner, and only one year less than that of the men of the healthiest districts of the kingdom.

The £20,000,000 worh of gold now mined annually is not nearly enough (says *Science*) to meet the world's requirements. The yearly wastage of this metal is enormous. Various kinds of gilding consume a great amount of it. It is reckoned that in Great Britain alone 25,000 oz. more are employed in the same length of time for manufacturing gilt buttons. The finest buttons of this description are produced by applying the gold in the shape of fine dust mixed into a paste with quicksilver. The mercury causes the gold to adhere to the base metal, after which it is evaporated by heat, leaving the gold on the surface. Large quantities of pure gold are utilised for the plating of other metals and for ornamental pottery; but by far the greatest waste of gold is incidental to its uses for jewellery, which consumes more than three times as much of the metal as is coined. Not less than £6,000,000 worth of gold is devoted every year to making articles of ornament. Nearly all of this is eventually lost, not more than one-fortieth of it ever returning to the hands of refiners or manufacturers. With gold

coins the loss by abrasion in the process of circulation is very considerable.

Following up the REVIEW's repeated advocacy of the development of the great iron resources of Ontario, the *Canadian Manufacturer* contains an interesting leader on the subject in its last issue in which it emphasises the necessity of putting a stop to the importation of scrap iron, by the imposition of a heavy prohibitory duty. But the *Manufacture* is wholly in error when it states that this very important phase of the manufacturing interest has been overlooked by the REVIEW. If our contemporary will refer to some of our back numbers it will find that we are quite at one with it in the opinion "that the duty and bounty on pig iron remaining as they are, and the duty on bar iron remaining unchanged, with a prohibitory duty on scrap iron our blast furnace industry would be very quickly developed."

Our esteemed contemporary has also an article on the attitude of the mining men of the country, on the interpretation of the law respecting the admission of free mining machinery. For want of space we are compelled to defer our reply to this until next month. In the meantime the *Manufacturer* would do well to post itself correctly as to what the mining men really want, before giving prominence to the distorted inspiration of some sorehead who evidently desires to own the earth.

QUARTERLY MEETING

OF THE

Mining Society

OF

NOVA SCOTIA.

The December Quarterly meeting of the Society was held in the Rooms of the Society, 129 Hollis Street, Halifax, on the 1st December. Among those present were: S. H. Poole, M.A., Stellarton, N.S.; John E. Hardman, S.B., M.E., Oldham, N.S.; David McKeen, M.P., Sydney, C.B.; R. H. Brown, Sydney Mines, C.B.; F. H. Mason, F.C.S., Truro; B. C. Wilson, Waverley; T. R. Gue, Halifax; B. T. A. Bell, Ottawa; G. W. Stuart, Truro; D. Turnbull, Sheet Harbor; Charles Archibald, Cow Bay, C.B.; C. E. Willis, Halifax; H. G. Stemshorn, Mooseland; John H. Austen, Halifax; Duncan MacDonald, Truro; A. A. Hayward, Waverley; W. Blakemore, Cardiff, Wales; J. J. Penhale, Black Lake, Que.; G. E. Francklyn, Halifax; W. Lithgow, Halifax; Hugh Fletcher, Ottawa; R. G. E. Leckie, Torbrook, and H. M. Wylde, Halifax, Secretary.

Mr. H. S. Poole, M.A., A.R.S.M., President, who occupied the chair, called the meeting to order at 11 a.m.

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

New Members.

The following names for membership were handed in: L. J. Fuller, J. D. Copeland, Alexander MacQuarrie, M. R. Morrow and Hector McInnes.

On motion these gentlemen were declared duly elected.

A Provincial Museum Building Wanted.

A letter from Mr. A. H. McKay was read asking the co-operation of the Society in the relation to the erection of a building designed to provide accommodation for the Victoria School of Art and Design, the Provincial Museum, the Akins library and for meetings of the Institute of Natural Science, the Mining Society and for other purposes.

The President expressed the opinion that the Society should lend its countenance to such a movement.

Mr Gue suggested that it be left to the Secretary to secure the co-operation of such members of the Society as were available when the matter came up.

It was therefore resolved that the Secretary of the Society be a committee with such members as he might associate with him to assist in carrying out the views expressed in the letter of Mr. A. H. McKay.

Effect of a Lightning Discharge at the Scott Pit.

Continuing the Discussion of Mr. Chas. Fergie's Paper, read at the last meeting, Mr. J. G. Rutherford, Stellarton, wrote:—

"In 1835, before a Select Committee of the House of Commons on Accidents in Mines, George Stephenson, of locomotive and safety lamp fame, while admitting that the electric spark artificially produced would explode a mixture of fire-damp and air of a proper degree of inflammability* doubted the possibility of lightning causing an explosion of gas underground, and added 'I have never known or heard of an instance of a mine being fired by lightning.'"

Mr. John Buddle, probably the most practical mining engineer of his day, who was examined by the same committee a week later, in reply to the question, "In addition to the other contingencies, you have expressed a general opinion that those accidents may result from the sudden discharge of electricity produced from natural causes?" said "They may, but that is generally visible. I have never known an explosion from lightning except when it ignited the gas at the top of the pit." In support of his opinion he instanced the Lawson Main Pit, 70 fathoms deep, and not particularly fiery. The ventilation having been deranged from some cause the workings were filled with gas and as he expressed it, "the shaft itself became a gas-pipe and was then discharging what was generated below. This discharge was ascending in a current from the mouth of the pit, when the thunderstorm came on; a flash of lightning ignited the gas and a very heavy explosion immediately ensued." He stated that he had no connection with the colliery, but happened to be near the pit when the explosion occurred, and what is of further interest, he said "I went to see the havoc that had been made at the Lawson main pit, and had been there a short time, with a great number of other people, when another explosion, a most furious one, took place, when I was within 18 feet of the top of the shaft." This explosion occurred about an hour and a half after the first. He also informed the committee that his father had seen lightning descend the pumps in an engine-shaft, and while doing no more harm than alarming an engine-wright in the shaft by its "rattle," spent itself in the water in the sump below. Buddle's opinion was that had the pit bottom been foul an explosion would have immediately taken place.

At Tanfield Moor Colliery†, in the County of Durham, on July 12th, 1880, a flash of lightning passed down the working shaft, 216 feet deep, struck the flat sheets and then divided and passed through the workings, where over a distance of 70 chains it was seen by several men at various points. A committee of the Institute carefully investigated the matter and was satisfied from the evidence taken that the report was correct. No damage resulted on this occasion. There were two columns of steam pipes in the shaft, the exhaust extending 25 feet above the mouth. A heavy peal of thunder was heard underground simultaneously with the lightning. The characteristics of the discharge as observed were a flickering, unsteady light on the rails, accompanied by a noise resembling the explosion of gun-caps.

In the course of a long discussion which followed, Mr. D. P. Morrison mentioned a similar case occurring at Acomb, Hexham, at a pit that had been closed for two years. The wire-rope guides and ropes had been left in the shaft when abandoned, as well as the cages and the mouth of the shaft railed off, and it was impossible for anyone to be below, on the Sunday afternoon when in the midst of a thunderstorm and simultaneously with a flash of lightning, the pit blew up and the cages, ropes, etc., were thrown to the surface.

Mr. Henry White described a case of lightning descending the shaft of the West Thornley colliery on December 11th, 1883,‡ where on two previous occasions a similar electrical discharge had been observed. This colliery was 1000 feet above sea level and was sheltered on one side by a hill 50 feet high. The shaft was 25 fathoms deep, had steel ropes and cages, iron rail guides, iron buntons, four rapper-wires and three columns of steam pipes. According to the evidence of those employed at the shaft bottom, the lightning appeared to have descended by a rapper wire and then glanced to an uncovered portion of a steam pipe. There was a brilliant light and "a noise like that of the firing of a gun." The winding engine man saw the lightning strike the pulleys and the colliery chimney was struck and much damaged at the same time, but there was no damage done underground.

On the two previous occasions when the pit had been similarly visited, slight shocks were sustained, in one case by a banksman who had his hand on the cage's neck, and in the other by the underground engineman who had hold of the throttle valve handle and who also saw the lightning. It was supposed in both cases to have struck the rope and passing through the steel cage continued its way by the iron guides to the bottom and thence along the rails where on the first occasion it was seen on the rails 80 yards from the shaft.

On October 21st, 1886,* the same colliery was again struck despite the fact of a lightning conductor having been placed on the chimney which was only 68 feet away from the pulleys and 25 feet higher. On the day of the discharge a severe thunderstorm with much rain prevailed and the lightning went down the pit twice in five minutes. An onsetter close to the cage said the lightning appeared to come down the rope; another further away but within 18 inches of the steam pipe, saw the light and received a slight shock in his elbow and the hauling engineman, 40 yards from the shaft, stated that his engine house was lighted up and he heard a sharp report which led him to suppose that some part of his machinery had broken. While examining his engine he saw a second flash. Two lads attending a landing 660 yards from the shaft saw the place lighted up and heard a fizzing sound which was repeated five minutes afterwards.

Discussion.

MR. R. H. BROWN—Referring to the paper, said that at the time of the explosion the pit was full of gas which was issuing from the mouth of the pit. Half an hour afterwards a second explosion took place. The probability was that the first explosion did not ignite more than half of the gas in the pit, and, when a further supply of fresh air entered, the fire caused by the first explosion ignited the remainder of the gas. The gas could not explode without a sufficient admixture of oxygen.

MR. CHARLES ARCHIBALD asked whether the explosion occurred at a time when there was a low temperature.

THE PRESIDENT—No. The pit was ventilated by means of a fan. This was not in operation and had the effect of closing the pit.

MR. CHARLES ARCHIBALD said that the air must have got in some way. The probability was that the explosion occurred at a time when the conditions were most favorable.

MR. R. H. BROWN said that the lightning, in entering, followed the rail. In the English instances it had followed the cage.

MR. W. BLAKEMORE said that he had never heard of a similar case in South Wales. At all events there was no case on record in recent years. He asked whether he understood correctly that the mine was closed and that there was an accumulation of gas.

THE PRESIDENT said that the mine was closed in consequence of the fan, which was not in operation, but there must have been some slight current of air. The pit was temporarily closed for the want of water.

MR. W. BLAKEMORE said that if there was no circulation of air the gas would not explode. He had never met with such a case either in South Wales or in the Midlands of England.

Government Aid to Mining.

THE PRESIDENT suggested that the paper by Mr. J. E. Hardman on the subject of "Government Aid to Mining," be read before the Mines Committee of the House of Assembly. He thought it would be well if a resolution was moved to that effect. The Society should ask permission to appear before the Committee of the House and lay their views before it.

MR. G. W. STUART moved that the Council of the Society send a committee before the Committee of the House of Assembly on Mines and Minerals.

MR. J. H. AUSTEN seconded the motion, which was agreed to.

THE PRESIDENT said it would be well for members of the Society who had any suggestions to make to do so now, so that they might be embodied in a letter to the Provincial Secretary.

The Duty on Mining Machinery—Free Explosives Wanted.

MR. B. T. A. BELL—In view of the visit of the Right Hon. Sir John Thompson and Sir Charles H. Tupper to Halifax this week, would it not be advisable that a deputation from the Society obtain an interview and explain the necessity for some clearer interpretation of the law relating to the imports of free mining machinery?

MR. CHARLES ARCHIBALD—This would be a good opportunity to bring the matter before the Government.

MR. B. T. A. BELL—I may add that the General Mining Association of Quebec has been notified by the Hon. the Comptroller of Customs that the resolution of that body asking for an extension of the language of the Act will receive consideration by the Government when it revises the Tariff.

MR. G. W. STUART did not think that any of the gold mining men had difficulty in getting in free of duty gold mining machinery which could not be manufactured in the country. At least he knew of no instance where duty had been paid on machinery which could not be manufactured in the country. But so far as gold miners were concerned, there was a subject of even greater

*NOTE.—This idea is now known to be erroneous.

†Transactions North of England Inst. of M. and M. E. Vol. xxx, Part I, p. 31.

‡Trans. North of England Inst. of M. and M.E. Vol. xxxiii., Part iii. p. 81.

*Trans. North of England Inst. of M. and M.E. Vol. xxxvi. Part 1, p. 47.

importance than that of the duty on machinery. He referred to the duty on explosives. The bill for explosives, year in and year out, was far in excess of that of machinery. There was another difficulty. There was not a railway in the United States that objected to carry dynamite, while the I.C.R. would not carry it under any consideration and the manufacturers suffered as well as the consumers in consequence. He thought that any committee appointed to interview members of the Government should discuss these matters as well.

MR. BELL—With the general tenor of the Customs Law there was no great objection. Unfortunately, however, members of this Society who had to import such specialties as coal-washing and briquette-making machinery had been given a ruling that according to the language of the law plants of these and similar kinds were manufacturing and not mining plants. An altogether erroneous construction. The government had promised to consider the matter and a quiet talk with the Ministers explaining the situation would doubtless be of benefit to the stand the Society had already taken in the matter.

MR. STUART asked whether Mr. Bell objected to having the question of explosives dealt with at the same time.

MR. BELL said that he had not considered the question.

MR. JOSEPH AUSTEN said that his firm had been in communication with the Comptroller of Customs in relation to the duty on wrought iron pipe of over two inches in diameter. This was mining machinery in every sense of the word as no pump was complete without it, but the Comptroller of Customs said that such pipe, above two inches in diameter, could not come in under the head of "mining machinery." His firm had imported a quantity of six inch pipe for the New Glasgow Coal, Iron and Railway Co., and different mines imported large quantities of pipe ranging in diameter from three and four to six inches. This was a very important point.

MR. DAVID MCKEEN, M.P., thought Mr. Bell's idea a good one. It was very much in a line with the contentions recently made by the Dominion Coal Co., Limited. He would be more than pleased if a committee of the Society could have an interview with the Ministers and have the matter fairly represented to them. Instances continually arose where officials maintained that machinery of a certain description was not mining machinery. The trouble was that they did not understand it and he thought it would be well to have a schedule of such machinery as might be required made out and presented to the Ministers. In respect to wrought iron pipe he was rather of the opinion six inch wrought iron pipe was admitted free of duty. The Dominion Coal Company imported some the other day and he did not think that they were required to pay duty after representing the matter. In view of the unsettled state of the tariff question he thought it might be premature to make a demand for concessions. There might be some very material changes made with respect to machinery.

MR. BELL said the question was merely with respect to the interpretation of the present Act.

MR. HAYWARD said that to gold miners the question of explosives was a very serious one, and if the Ministers were to be waited upon he would like this question to be brought up.

MR. HARDMAN thought it would be better simply to appoint a committee and instruct them on various points rather than pass a resolution defining what the duties of the committee were to be.

MR. MCKEEN said there could be no use in giving any detailed instructions to the committee. It could only be a *pro formæ* matter in any case. A committee would be appointed and certain contentions would be brought to the notice of the Ministers, and, for the present, that would be the end of it. If one member of the committee who favored a change in respect to explosives was appointed and another who favored a change in respect to the duty on mining machinery the views of all parties could be brought out.

MR. STUART—Why do you object, Mr. Bell, to adding the question of explosives to your resolution?

MR. BELL—Mainly because the Society has unanimously put itself on record respecting the mining machinery question, while the subject of explosives has not been before the Society until to-day. In the order of business, he thought Mr. Stuart should put his resolution separately and have it discussed by itself. Personally he knew nothing about the explosive question further than he was strongly of opinion that the home manufacturer should be encouraged. He would move the following:

(*a*) "Resolved, that a deputation from the Society obtain an interview with the Right Hon. Sir John Thompson during his present visit to the Province respecting a more liberal interpretation of the law relating to the importation of mining machinery not manufactured in Canada."

(*b*) "Resolved, that the same deputation urge the necessity of the carriage of explosives on Government lines of railway."

The resolutions were respectively seconded by Mr. John Hardman and Mr. Frederick Taylor.

MR. STUART moved, seconded by Mr. Hayward that the discussion be adjourned and be resumed at 2.30 p.m.

THE PRESIDENT put this resolution which was declared lost.

MR. HAYWARD then moved in amendment to Mr. Bell's resolution, seconded by Mr. Archibald, "that the committee be also instructed to urge the reduction of the duty on explosives imported into Canada."

MR. STUART said that the cost of explosives here was a hundred per cent. more than it was in the United States, and he failed to see why people operating mines should be placed under such a burden.

MR. HARDMAN said that the effect of a reduction of the duty on explosives would be that dynamite would be imported and would not be made in this country as it could be. The question in respect to machinery had been before the Society for three years and had been before the Quebec Association for the same length of time while the question as to explosives had never been brought up before. There was no connection between the two questions and no reason why they should be embodied in the same resolution.

MR. BELL said that dynamite and other explosives were made in the country and he was in favor of making them as cheaply as possible.

MR. HAYWARD said he did not see that any further discussion as to the duty on explosives was necessary. He had not heard any valid reason given for refusing to incorporate that matter in the resolution.

MR. BELL said he would agree to the two clauses of his resolution being consolidated, but he could not consent to adding free explosives.

It being lunch time the Chairman put the resolution which was carried, together with Mr. Hayward's amendment.

AFTERNOON SESSION.

Amendments to the Mines Act.

The members assembled in the rooms at 3.30 p.m.

The Society proceeded to the discussion of amendments to be submitted to the Committee of Mines and Minerals of the House of Assembly in relation to coal and gold mines.

MR. G. W. STUART thought that deputies should be appointed for the different gold mining districts. Many outlying districts suffered from being so far from the the head office.

MR. J. C. MCDONALD contended that deputies should be appointed for the various districts to place people living in the districts in as good a position as people living in Halifax. People in the city took up areas and held them for sale only.

MR. J. E. HARDMAN thought that the best policy would be to abolish the present deputies. He thought the Government would probably do that more readily than they would appoint others.

MR. STUART proposed the amendment of chapter 122 of the Revised Statutes (4th series) "of the partition of lands" so as to make it applicable to gold areas held by two or more persons who could not agree as to the working of the areas. He read a draft Act which had been prepared with this object; also an Act to amend the Act to consolidate the Acts relating to mines, making areas held by two or more persons subject to the Act in respect to the partition of lands.

MR. HARDMAN thought that the remedy proposed would meet the case.

MR. FREDERICK TAYLOR said that the chapter of the Revised Statutes referred to, at present only applied to real estate. The amendment making the chapter applicable to mining areas, he though, was exactly what was wanted.

MR. GEORGE STUART said that there were many good properties lying idle because the parties owning them could not agree either to work or to sell.

MR. C. E. WILLIS asked whether if a property was sold under the Act one of the parties could not buy it in.

MR. STUART—Certainly.

MR. A. A. HAYWARD thought that if one of the parties was a man of means, and the other a poor man, the enforced sale will give the former a strong lever against the latter.

MR. HARDMAN said the parties would no doubt try to come to an amicable arrangement rather than allow the property to be sold.

MR. B. C. WILSON said that there was a great unfairness in the law as it stood at present. He thought the remedy proposed would be satisfactory. He had had some experience of the working of the law in connection with real estate.

MR. J. C. MCDONALD asked whether there was any provision for sale in any other way than by public auction. Such a sale was often a poor criterion of value.

MR. B. C. WILSON it would be the duty of the arbitrators to make a fair division if they could, as in the case of real estate. If the parties could not agree among themselves, and a fair division could not be made, there was no alternative but to sell.

MR. J. E. HARDMAN said that the effect of the amendment proposed, practically, was to make mining areas real estate.

MR. B. C. WILSON said that if the chapter was made applicable the properties would be divided with the minimum of injustice.

MR. A. A. HAYWARD thought that present ownerships should not be disturbed.

MR. G. W. STUART said that many properties which should be productive were now lying idle.

MR. C. E. WILLIS did not think there was any advantage on one side more than the other.

MR. JOS. H. AUSTEN said it would be a good argument for the poor man to address to the arbitrators that his co-owner was trying to freeze him out.

MR. JOHN HARDMAN said that the fact that such an Act was found to be necessary in the case of real estate showed its necessity in the case of mining property.

MR. JOS. H. AUSTEN thought that while there might be an occasional injustice the remedy proposed would be of great assistance.

On motion of Mr. Stuart, seconded by Mr. Taylor, it was resolved that the amendment proposed be brought to the notice of the Committee of the House of Assembly on Mines and Minerals.

MR. JOHN HARDMAN moved that the Council be instructed to embody in a communication to the Government the views presented at this and past meetings relative to amendments to chapters seven and eight of the Revised Stututes. (The Mines and Minerals Act, and the Mines Regulation Act.)

MR. B. C. WILSON seconded the motion, which was passed.

The meeting then adjourned until 8 p.m.

EVENING SESSION.

At the evening session which, was held in the St. Julian Dining Room, Halifax Hotel, there was a large attendance, probably the best since the Society was organized, the President in the chair. The meeting proceeded to consider the following paper:

Iron Making in Nova Scotia Early in the Century.

By MR. H. S. POOLE, Stellarton.

The successful establishment of Iron Works at Ferrona, in Pictou County, according to the most modern practice, makes all the more interesting to record an early trial, made over sixty years ago, to produce pig iron from ores of that county.

When the General Mining Association obtained the mineral concessions granted the Duke of York, the coal pits at the Albion Mines, now called Stellarton, were opened on a greatly extended scale. A large brick building was put up in 1828 for foundry, machine shop and milling purposes. Power was obtained from a condensing engine, which is still on the ground.

At the same time the sum of £1,000 was put aside for the purpose of experimenting in iron making. A furnace was erected on the north side of the foundry in front of an archway, now bricked up, that led into the casting house. No plan of the furnace has been found. It was probably about forty feet high and eight feet in diameter at the boshes. It was lined with special brick a foot thick, made key shape to suit the circle, and backed with a course of stretchers, between which and the casing there was a space of four inches filled with sand. The casing was eighteen or twenty inches thick, built with a batter and hooped. The hearth was built of special brick set on end. This furnace was not pulled down until 1855. An inclined way, laid with iron rails, led to the top of the furnace for charging purposes.

The season of 1829 was spent in experimenting with the several ores of the district. A small quantity of limonite was obtained from the Fraser-Saddler property at Bridgeville, but the bulk of the ore tried was red hæmatite brought down McLellan's brook from the locality now known as Iron Mines Post Office, where it is naturally exposed, and was easily got by open quarrying. The clay ironstone nodules, which occur in the coal were also carted down from the pits to the foundry, and roasted in open heaps. In the search for iron ore Coal Brook was well explored and a surface trench followed up the brook for 800 feet. This trench was timbered, and when opened a few years ago, much of the timber was found to be sound.

The blast for the furnace was got from the foundry engine erected in 1828, and which continued in use until 1871, when new machine shops were put up. The engine was condensing and the pressure of steam carried was about five pounds, regulated by a tank of water placed at the necessary height. When in the course of time leaks in the boiler occurred, temporary repairs were effected by a layer of horse manure covered by a plate of iron.

Besides the plant referred to preparations were made for operating on an extended scale, and a blowing engine was imported. The air cylinder of this engine remained lying on the river's bank, where it had been landed half a century before, until 1884, when it was broken up. But the steam cylinder and beam were utilized in Gordon's pumping engine at the bye pit of the second lift of workings, afterwards known as the "Crushed Mines," and the blast pipes found service as a conduit for the first fill on the South Pictou or Albion Railway below New Glasgow, where doubtless they may still be found.

It is said that in all some 50 tons of metal were made, but of a quality that was useless for foundry purposes; it was hard white iron, pieces of which still lie about the yard. Of what was made part was used as ballast for the slip at Shipyard Point, on the East River. Weights about the colliery were made of it. The "baby" on the rope used in the Foord pumping pit is still on hand, and current report confirms Professor How's statement that stampers of a quartz mill at Waverley, made of it, had been pronounced to be ten times more durable than Belgian iron.

Mr. Joseph D. Fraser, chemist at the Ferrona Iron Works, who has interested himself in these early operations, interviewed James McDonald, now 85 years old, one of the prospectors for ore, and his story is:—That the Rev. Dr. McGregor, on whose farm the coal of the Albion Mines was found in 1818, accompanied Mr. Richard Smith, the manager at the Albion Mines, in 1828 up McLellan's Brook, and obtained samples of hæmatite ore which were sent home to be analysed. The report received was favorable and accompanied by a snuff-box,

pen knife and razor, made from the sample. Mr. McDonald was then employed getting out ore at Blanchard, where it was found solid at a depth of 13 feet, and was blasted out for transportation to the Albion Mines.

Haliburton in his history, page 428, speaks of an experiment having been "made at the Albion works to reduce some of the clay ironstone, mentioned in his mineral section, viz.: - No. 4, 144, 156 and 158, into iron in a crude state, by means of a small cupola erected especially for melting pig iron for foundry purposes only, and which is not at all calculated for smelting ore. The cakes having been prepared in the ordinary way, and the ironstone calcined, the proper proportions of each were gradually introduced into the cupola, to which was also added a little limestone for a flux. In a few hours this small melting pot (for so it may be termed) produced a result of 35 per cent. of metal, which was so lively and fluid in its nature, that the workm employed cast from it some delicate ornaments, and the remainder was formed into pig iron of No. 1 quality, presenting a fine smooth face, and yielding freely to the file and drills."

This experiment can hardly refer to the special furnace elsewhere mentioned, but it may have led to the trials in the large furnace which local tradition says were protracted and met with many difficulties. On one occasion it is reported the metal in the bottom cooled and had to be cut out by hammer and chisel. Certain it is the furnace first used was rebuilt.

Mr. Fraser also furnishes an analysis he made of the metal cast in 1829 at the Albion Mines:

Silicon	0·409
Manganese	0·504
Sulphur	1·238
Phosphorus	0·788
Combined Carbon	1·295
Graphite Carbon	0·668
Total Carbon	1·963
Metalic Iron	95·098
	100·000

Of the ore got from McDonald's,* at Blanchard, an analysis was published in the Mines Report, page 81, for 1874, as follows:

Oxides of Iron	60 71
" " Manganese	0 18
Silica	29 97
Sulphur	0 09
Phosphoric Acid	0 63
Yielding Metallic Iron	42 50

An earlier attempt at iron making than this in Pictou County, Haliburton, page 163, tells us was made at Nictau many years before he wrote, in 1828-9. He further tells us that in 1825 the Annapolis Iron Mining Company obtained a charter and bought iron lands in Annapolis County, at Nictau and other spots; finally selecting the right bank of Moose River, eight miles from Annapolis for the site of their furnace and erections. Dr. Gesner, in his Industrial Resources of Nova Scotia, 1849, describes the works, page 255, but speaks of what they were, how that "the smelting, casting and manufacture of iron commenced under the most favourable auspices, and both the ore and the iron produced from it proved to be unexceptionable," but for reasons he enumerates "the trip hammers ceased to move, and the pretty village of Moose River was deserted by all its inhabitants."

Dr. How, in his Mineralogy of Nova Scotia, 1869, page 100, quotes from Knight's Prize Essay on the Resources of the Province, that smelting operations were resumed at Clements after a stoppage of thirty-three years, and on the authority of the Bridgetown Register that in 1862, five tons of iron a day were being turned out. In a year or so the works were again closed and so remained until 1874, when a partial attempt to re-open was made.

Messrs. Jackson and Alger, in their Mineralogy and Geology of Nova Scotia, 1832, describe what they saw of the Province in 1827. They mention that "the bed of ore at Nictau has been opened to the depth of eight or ten feet, and some hundred tons of the ore have been removed to the smelting furnace, situate on the southern shore of Annapolis Basin." Again they say, page 9, when referring to the ores of the South Mountain, between Nictau and Clements, "Should the spirit of competition among iron manufacturers in Nova Scotia ever equal that which characterizes some quarters of the United States, it is believed that no part of this range will long remain unexplored or fail to produce abundantly that article, on which depends so many other arts and manufactures." A spirit of competition, as is well known, has arisen in the Province, but it still leaves this district of country practically untouched. In this section of country the ores are all highly metamorphosed by proximity to masses of granite, but eastward of Nictau river, on the extension of the same range, as distance from them is attained, the effect decreases. At Wheelocks, only some of the bands of shell ore are magnetic, while at Torbrook, still farther away, the ore is altogether red hematite. Of the deposits at the latter place and the district in general, we have an interesting paper by Mr. R. G. E. Leckie, published in Part 2 of Volume 1. of our Transactions. Messrs. Jackson and Alger also refer, page 96, to the closing of the establishment at Clements.

But the connection of both these authorities with the early iron making in Nova Scotia is more clearly explained in a letter of October, 1855, by the former to Mr. Charles D. Archibald, respecting the Victoria Mines at Nictau. In the letter in question written from the State Assayer's office in Boston, Dr. Jackson says:—"The ores from Nictau mines were smelted under my observation at Clements, N.S. in 1827, and I had then an opportunity of seeing the excellent iron which they produced, both pig iron for foundry purposes and bar iron. Mr. Cyrus Alger, the distinguished iron founder, began the enterprise of working the iron ores of Nova Scotia at the Annapolis Iron Works, and met with all the success that could have been expected in the business though the works suspended operations ultimately, owing to political causes." He then speaks of the advantages possessed by Nictau for making charcoal iron, of the inexhaustible supply of iron ores at that locality and the quality of the ore. Concerning the latter he says:—"It will be seen by my analysis, that there is between 5 and 6 per cent. of lime in the ore, nearly enough to form a fusible slag with the silica and allumina, with a little oxide of iron. This ore is certainly the most remarkable of any known in America, both for its abundance and its singular constitution. It is one of the very best known in the country for the production of the finest iron, both foundry and forge pig."

Dr. Jackson was accompanied on his visit in September, 1855, by Mr. John L. Hayes, of Washington, who also made a report on the property. Among other things he said: "Fortunately the excellent qualities of this ore and the facility with which it is worked in the blast furnace have been practically demonstrated. Bar iron was made from this ore in a small catalan forge some fifty years since, and several hundred tons of it were smelted in the blast furnace which was formerly in operation upon Moose River. * * * Having been personally engaged in the manufacture of charcoal iron, and having visited nearly all the charcoal iron establishments east of the Alleghany Mountains, I know no locality in the United States which presents advantages equal to those of Nictau. * * * I have conversed with Mr. Alger, who erected the furnace at Moose river, and he confirmed the statements I have made that the Nictau ore was worked in the furnace with more facility than any other ore which could be found."

Mr. R. F. Mushet is also made to speak in the same unqualified terms of the excellence of the iron made and the "unrivalled" character of the ore for iron making. With such recommendations the Acadian Iron Mining Association succeeded in raising in London the necessary capital to float the Acadian Iron Company, which built works at Nictau, and according to Professor How, exported in 1858 some 744 tons of iron, and in 1859 some 1,125 tons.

Dr. How also describes the shell ore with distinct polarity, a most unusual feature, and he adds, with reference to the phosphorus in the ore which the Rev. Dr. Robertson informed him "is supposed to depress the marketable value of the iron": "I have learned from another source that the ore contains phosphorus and the quality is said to be injuriously large." And yet the analyses of Dr. Jackson do not show either phosphorus, sulphur or titanium.*

Dr. Harrington gives notes on the iron ores of Canada in the Geological Report of Progress for 1773-4:

One of the furnaces built at Nictau was 35 feet high, 9 feet in diameter at the boshes, and 4½ at the throat. The second furnace was of the same diameter but 3 feet higher.

At Clementsport the furnace that was repaired in 1874 was "35 feet high, 4 feet in diameter at the hearth, 9½ feet at the boshes, and 7 feet at the throat. It had three tuyers, and the blast which is hot and has an average pressure of 1¾ to 2 lbs. to the square inch, is produced by water power; and the wheel, a breast wheel, is 30 feet in diameter. The blowing cylinders, three, are of cast iron, 4 feet in diameter and 5 feet stroke. The blast is heated by burning the waste gases from the furnace in a hot blast oven containing 17 siphon pipes, through which the air is made to pass. The oven is on a level with top of the furnace, and is of brick, bound with iron. The ore, called 'grey magnetic," is from the Potter mine and yields 45 per cent. of pig iron, but of poor quality, unless an equal weight of Bloomfield bog iron ore, which carries 26 per cent. of metal, is used, when the quality is improved. The fuel is charcoal. 130 (Winchester) bushels making one ton of pig. The limestone used as flux is from St. John, N.B."

The report of the Department of Mines for 1873 by the writer, states that in that year 630 tons of ore were smelted, and the metal produced only 180 tons; part of the ore having been taken from the Miller mine. Analyses of the Nictau ores were given in the Report for 1874, page 81, and for 1875, page 61, showing sulphur from ·05 to ·09, and phosphorus from ·16 to ·79 per cent.

DISCUSSION.

MR. R. G. E. LECKIE said that he hoped to be able in a short time to prepare some notes to add to Mr. Poole's paper.

MR. H. S. POOLE said that Mr. Fletcher of the Geological Survey was present. Mr. Fletcher, if not already familiar with the country referred to, would work over it shortly and the Society would be glad to hear from him.

MR. HUGH FLETCHER said that he had visited the country some few years ago, and had taken some notes, but Mr. Leckie, no doubt, was much more familiar with it than he could be, after such a short inspection.

MR. B. T. A. BELL moved a vote of thanks to the President for his valuable contribution to the literature of the Society. The paper, together with that read at the June meeting by the Rev. Dr. Patterson, on the Early History of Coal Mining in Pictou County would be exceedingly valuable for reference.

MR. JOHN HARDMAN took pleasure in expressing his concurrence in Mr. Bell's remarks and in conveying to the President the assurance that the paper read by him was one of the most valuable contributed to the Society.

Gold Chlorination—A Description of the Newbury Vautin Process.

By F. H. MASON, F.C.S., Truro.

I will first draw your attention to the chlorinator used by the Newbury Vautin Co., of which I have made a rough sketch and colored it equally roughly, but it will enable you more plainly to see of what the different parts are constructed,

The figure represents a front elevation of the chlorinator with the cover in section. The main body of the chlorinator is made of wood bound together by bands of wrought iron, and is swung on trunnions which are supported on V shaped castings; both the covers are detachable and are fastened on by bolts and nuts, the joint is made of asbestos cloth, soaked in melted paraffin or sometimes of rubber; the whole of the inside is coated with paint, the body of which is made of ferric oxide, which has been found to be capable of resisting the action of chlorine, but the continual abrasion of the ore against the sides of the cylinder, renders it necessary to renew this coat of paint fairly often, and this I consider one of the weakest points in the construction of the machine.

In the centre of one of the covers is a tap made generally of glass lined iron tubing, with a stoneware or vulcanite cock, in some cases the whole tap is made of stoneware.

The filter bed, a section of which you see, is made of wood, with grooves turned in it and holes are made in these grooves right through to the other side, the whole of the wood is coated with the paint already mentioned; a piece of stout closely woven canvas is stretched across this and forms the filter. The crests of the corrugations (if I may use the expression) support the canvas and enable it to carry the weight of the ore, while the auriferous solution percolates through the canvas into the troughs from whence it runs away down the holes.

Having described the machine I will now by the aid of this skeleton section through a chlorination works, metaphorically speaking take you over it and point out the methods of conducting the processes as we go along. The concentrates are brought into the sampling room, where they are thoroughly mixed and laid out into a square of uniform thickness, string is stretched across this square from pegs, placed around the sides at equal distances from each other, thus dividing it into a series of little squares, from each of which a box capable of holding two pounds is filled and placed on one side to form the sample; this if properly carried out should form a fair sample, which is sent to the laboratory where a pot assay is made of it, it is then roasted in a small roaster placed outside the laboratory, the loss of weight through roasting noted, and an assay of the roasted concentrates made, the increase in the percentage of gold in this second assay should of course be directly proportional to the loss in weight through roasting. From the roasted ore quantities of about three pounds are taken and placed in stoneware bottles made for the purpose, it is then made into a thick mud with water, and chloride of lime, and sulphuric acid added, the proportions of these last two substances varying in each bottle, (thus supposing four experiments were made one might contain ½ % of chloride of lime another 1% and the others 1½ % and 2% respectively) these are placed in a cylindrical box connected by a belt to the main shafting and rotated at from 10 to 12 revolutions per minute for a given length of time. The contents are then turned out and thoroughly leached with water and the tailings assayed; the best of these experiments, viz., the one taking out the gold with the least chloride of lime is repeated in a miniature chlorinator constructed exactly similar to the larger ones and capable of holding about 100 lbs. of ore; if this result is the same as in the smaller experiment, then the quantities of chloride of lime used in this experiment will also be used in the actual chlorination. The ore is now taken from the sampling room, placed in trolleys and run up the lift to an elevated trolley line running along the centre of the roasting room (I could not very well show it in the sketch) and is shot through a chute into the roasting furnaces of which there are four, two on each side; when roasted perfectly sweet it is removed, placed in trolleys sent up the lift to the top floor, and from there shot through hoppers into the chlorinators of which there are ten, five on either side, each of which is capable of holding from one and a half, to two tons of ore; from the bottom of the hoppers there is a canvas pipe to let the ore right into the chlorinator and prevent dust getting about the building.

After the first trolley of ore has been shot into the chlorinator, the chloride of lime is put in, then the remainder of the ore and sufficient water to make the

*Fletcher's Geological Report, 1892, p. 182, P. Patterson's History of Pictou, p. 425.

*As these notes only relate to iron making early in the century, reference to the operations at Londonderry, in Colchester County, begun in 1849, is purposely omitted.

whole into a thick mud; the cover is now put on and a turn or two given to the chlorinator to thoroughly mix the contents, then the sulphuric acid is added and the cover fastened firmly on, air is pumped in through the cock until a pressure of 60 lbs is obtained; the chlorinator is then set revolving at from 10 to 12 turns per minute.

When the chlorination is completed the required time being known from the results of the small experiments, the chlorinator is stopped with the cock uppermost, and any excess of chlorine is allowed to escape outside the building through a rubber pipe attached to the cock; the chlorinator is then turned over, the cover taken off and replaced by the filter bed, the machine is once more turned over, the lower cock opened and water forced through the upper cock, if difficulty is found in filtering a suction pump having an intermittent action is employed under the filter bed, by which arrangement it has been found that the ore is less liable to clog. The leaching is continued so long as the solution contains any gold. Any silver there may have been in the concentrates will have been converted into chloride, and if there is sufficient to pay for extraction, either a saturated solution of brine or a solution of hyposulphate of soda is put into the chlorinator, and it is set revolving again. The silver solution is afterwards leached out and the silver precipitated on metallic copper, which in its turn is again precipitated on scrap iron. When the leaching is finished the top cover is removed and the chlorinator turned over the ore falling into a hopper below, and is washed away down a chute to the outside of the building where it is either taken away by trolleys wanting to receive it or run directly into a stream. Now comes the recovery of the gold from the auriferous solution, and here I want to bring to your notice a precipitant which is not I believe generally known. The gold chloride is passed up through a stoneware or glass pipe containing powdered grey sulphide of copper and directly it comes in contact with this substance it is instantly precipitated, mainly as metallic gold together with sulphur, copper chloride going into solution; this copper chloride flows out of a small exit at the top of the pipe, and is run over scrap iron on which it is precipitated as cement copper, this is afterwards dried and fused with sulphur which once more converts it into sulphide of copper. When the copper sulphide has become sufficiently charged with gold to necessitate a "clean up" it is simply melted in a crucible and poured into a mould. The gold by virtue of its higher specific gravity sinks to the bottom, while the copper sulphide forms a regulus above it, from which it is easily detached. For some reason which I hoped to have been able to explain to you but have not had the time to devote to it, the gold always carries a certain amount of copper down with it, but in a chlorination works it is a simple matter, to refine this by the Miller process with which you are probably all acquainted. I think the probable reason for this is that the leachings always contain a certain amount of free chlorine. This being a powerful oxidizing agent converts some of the copper sulphide into sulphate, and these two react on each other in the crucible with the formation of metallic copper and sulphurous anhydride.

$$Cu\,SO_4 + Cu\,S = Cu_2 + 2\,SO_2.$$

The sulphide of copper from which the button is detached always retains a small quantity of gold, but as this retention is not accumulative it is a matter of small moment because it is ground up and used once again as a precipitant, so no gold is lost. To chlorinate roasted sulphurets it requires on an average from 1 to 3 per cent. of a good chloride of lime (having over 30 % of available chlorine) and about double that amount of sulphuric acid, that known in the trade as B. O. V. or brown oil of vitrol being used.

The duration of the process lasts from two to six hours and depends of course mainly on the coarseness of the gold particles and on the quantity of gold present; the addition of pressure in the chlorinator considerably reduces the time necessary to complete the process.

I hoped to have been able to give you the results of experiments on several sets of Nova Scotian concentrates but owing to circumstances over which I had no control, I am unable to give you the results of experiments on more than one set of concentrates; two or three gentlemen promised to let me have concentrates from their mines, but owing no doubt to pressure of work failed to fulfil their promises, however our worthy Vice-president was kind enough to let me have a sample of the concentrates he is saving at Oldham and the result of my work on them will I think clearly show the advantage of saving such concentrates. There are I believe several mines in Nova Scotia to-day, which are letting valuable sulphurets go merrily away with their tailings and to them, or rather to their owners, the old adage of "what the eye does not see the heart does not grieve after" particularly applies.

The results of my experiments on the tailings from the mines of Messrs. Hardman and Taylor at Oldham, I will give you in a tabulated form:

Pot Assay.	Loss per cent. on Roasting.	Assay after Roasting.	Tailings Assay after 1 Chloride of Lime 5 hours.	Tailings Assay after 2 Chloride of Lime 5 hours.	Tailings Assay after 3 Chloride of Lime 6 hours.
3 oz. 8 dwt. 14 grs.	32	4 oz. 19 dwt. 23 grs.	4 oz 11 dwt. 11 grs.	6dwt 12grs.	Trace.

The cost of roasting and chlorinating this ore would, I estimate, roughly range somewhere between $5 and $7 per ton which would leave a very handsome profit. The plant of which I have given you a skeleton sketch would be capable of chlorinating 30 tons of ore per day of 10 hours, but the number of roasters would have to be increased if only sulphurets were treated. The original cost as well as the running of the plant as you will readily see is not a very heavy one.

I am convinced that if the gold miners of Nova Scotia would combine and start a central plant, it would not only pay handsomely itself but would add considerably to the value of their mines.

In conclusion, I am afraid I have given you the opportunity of saying that this paper is like the road to heaven "paved with good intentions," but I hope at some future date, to add a rider to it, going into costs minutely, and clearing up one or two points I have left rather in a haze.

DISCUSSION.

MR. HARDMAN said he was sure that the people who were interested in gold mining were under great obligations to Mr. Mason for his paper. The suggestion contained in the last part of the paper that the mines should combine in the erection of a central plant was a good one. When the number of mines that there were in this province were considered, and it was remembered that there never yet had been a successful attempt made to treat the sulphurets, language failed him to say what the state of mind of the gold miner should be. Mr. Mason had demonstrated that the sulphurets obtained were of sufficient value to pay handsomely for treating them.

MR. C. E. WILLIS said that he had thought that a concentrating plant would be a good thing, but recently, in looking over the returns in the Mines Report, he was led to the belief that the thing was smaller, perhaps, than it had been thought. The mines of Nova Scotia were scattered over a large extent of country, and a good deal of the stuff to be concentrated would be of low grade, while the facilities for carrying it were not good and the question was whether it would pay, providing every ton was saved. It would be impossible to get all. About one-third might be taken off, which would reduce the quantity available to 1,000 tons. Would this pay?

MR. HARDMAN said that he would be glad to buy all that was offered. He did not think there was any doubt that if 1,000 tons could be obtained it would pay very well to treat it in a central plant.

MR. MASON said that the plant was not expensive.

Cast Iron Tubbing in the Shafts at Sydney Mines, C.B.

By MR. R. H. BROWN, Sydney Mines.

I had first intended to confine myself to a description of the Cast Iron Tubbing put into the shafts known as the Princess Pits of the Sydney Mines, the property of the General Mining Association of London; but it seems desirable also to give a short account of the sinking of those pits, as intimately connected with the subject of the tubbing.

There are two pits sunk to the coal, namely: The B pit or winding shaft, of 13 feet diameter and 682 feet in depth; and the C pit or pumping shaft, of 11 feet diameter and 709 feet deep to the bottom of the sump, 22 feet below the seam of coal; there is also a staple or auxiliary pumping pit, sunk to a depth of 389 feet from the surface. A drift from the bottom of the staple connects it with the C pit. In pumping, the water is raised from the sump in the C pit a height of 332 feet to the drift, whence it flows into the staple sump, and is pumped thence, a height of 346 feet, to the delivery drift, situated at 42 feet below the surface. The water runs through this delivery drift, a distance of 516 feet, to the shore of Sydney Harbour.

The sinking of these three shafts was commenced in the spring of 1867, and when in the year 1868 a depth of some 200 feet had been reached, a feeder of water was met with, which made it necessary to provide pumping power. A set of 8 inch pumps, worked by a small horizontal engine, was then erected, which coped successfully with the water for a time; but soon more water was encountered, so that sinking operations had to be again suspended until the main pumping engine should be imported and set up. Sinking was then recommenced and progressed until a heavy feeder of salt water was met with in the pumping shaft at a depth of 267 feet from the surface. This water came through fissures in the thick bed of sandstone direct from the sea; it was therefore found necessary to shut off the water by lining the shafts with cast iron tubbing.

A quantity of tubbing was then cast, and after 192 feet in depth of the pumping shaft, and 150 feet in depth of the staple, had been tubbed, and the upper feeders of water first met with had been thus shut off, a struggle was made to sink through the water-bearing strata, the extent of which in advance was unknown. Our pumping engine, of the Cornish type, with cylinder of 62 inches diameter by 9 feet stroke, had been erected; and now a sinking set of pumps of 20 inches diameter, with the necessary outfit of pumping spears, ground spears, ground ropes, sheaves and crabs, was fitted up. The sinking was then pushed on, and during many months we had as much as 650 gallons of water per minute to pump day and night, while the sinkers worked putting in their shots around the windbore or suction pipe; the water rising two inches in the shaft after a stroke of the pumps before another stroke could be taken. The buckets and clacks had always to be changed by drawing them up through the pumps, for the influx of water rising in the shaft at the rate of 13 inches per minute, gave no time for taking off bucket or clack doors for changing in the usual way.

At length the wet beds of sandstone and shale were passed through, and a bed of dry solid sandstone was reached at a depth of 323 feet down from the surface.

A wedging crib was bedded in this sandstone, and the shaft was tubbed up thence a distance of 92 feet to the bottom of the tubbing that had previously been put in.

When the pumping shaft and staple had been tubbed, they were sunk almost dry for the remainder of the depths, to completion. The sinking of the winding shaft was then resumed; the feeders of water met therein, being passed to the pumps in the C shaft by means of a borehole from the bottom of the former. The tubbing of this shaft was effected as soon as the wet strata had been sunk through and the balance of the sinking was completed dry to the coal.

The tubbing is cast in segments of 24 inches deep, except where closers of a less depth are required, and in length convenient for handling, and depending upon the circumference of the pit; thus, 9 segments complete the circle in the B, or winding shaft; 8 segments in the C, or pumping shaft; and 5 segments in the staple.

The tubbing is put in by lifts; a lift consists of a crib, and from 5 to 50 courses of tubbing built up thereon.

The situation of each crib depends upon a good hard stratum of rock being met with suitable for a crib bed.

This bed has to be dressed down with chisels with much care, and cut to a perfectly level and even surface.

When the crib, of 8 or 9 pieces as the case may be, has been laid thereon and wedged up securely, the segments of tubbing are built upon it, breaking joints with each other like bricks on edge. Each segment of tubbing has a flange of 4 inches in depth all round it as a support for the wedging. Glats of pine wood ½ inch thick, are inserted between both vertical and horizontal joints, and each course of tubbing has a backing of wood wedges driven behind it to keep it firmly in place, and to resist the force necessary in driving the joint wedging.

When a number of courses of tubbing have been set up in place, then all joints are wedged up; that is, small wedges of red pine are inserted in the glutting and driven in until the wood becomes compressed so hard, that the chisel edge cannot any longer be driven into it.

Air would collect behind the tubbing, and by its elasticity under pressure, would subsequently tend to blow out some of the wedging. To guard against this, there is a brass 4 inch valve placed in each crib at the back of the tubbing, to allow the air to pass freely from the lowest to the highest lift. Also each segment of tubbing has a hole of 1¼ inches diameter through its centre, to let the air escape during the process of wedging; these holes are plugged when the wedging of the joints is completed.

The quantity of tubbing used in shutting off the feeders of water in the shafts was considerable.

In the C, or pumping shaft, 284 feet in depth were tubbed in 5 lifts, using 40 segments of cribs and 1,128 segments of tubbing, the weight being 569,639 lbs of cast-iron.

In the B, or winding shaft, 273 feet 4 inches in depth, were tubbed in 4 lifts, using 36 segments of cribs and 1,233 segments of tubbing, the weight being 658,724 lbs.

In the staple shaft, 283 feet inches, were tubbed in five lifts, using 25 segments of cribs and 711 segments of tubbing, the weight being 323,975 lbs.

This quantity of tubbing, over 776 tons, of 2,000 lbs. to the ton, in all, was cast at our own colliery foundry and consumed 419 tons of pig iron, imported from England, and 419 tons of scrap cast iron obtained in this country.

As there were 19,923 linear feet of joints in the tubbing to wedge up, and as about 24 wedges were used for every foot, it can be seen that quite a quantity of pine timber had to be cut up for this purpose, as well as for the glutting.

I may add that, finding the untubbed portion of the pumping shaft beginning to waste away, owing to the disintegrating action of the water from the pumps and the heat from the partially condensed exhaust steam from our haulage engines, we have, during the last two years, lined other 309 feet in depth of that shaft with cast iron tubbing. This was put in three lifts, using 340 segments of cribs and tubbing, weighing 388,316 lbs.

This tubbing, not having to resist a pressure of water, was made lighter than what had been previously put in above, the joints were not wedged further than was necessary to keep the tubbing in place, and the cavities in the sides of the shaft behind the tubbing were filled up with fine gravel from the beach.

Again during February last we lined the sump portion of the staple shaft for eight feet two inches in depth with tubbing, using 27 segments or 8,121 lbs. in width.

Thus altogether a depth of 1,158 feet eight inches of these shafts have been lined with cast iron tubbing weighing 974½ tons.

The pumping shaft is fitted up with buntons and guides for the cages by which the colliers and others descend and ascend to and from their work. The buntons are placed at intervals of six feet apart vertically in the shaft. In casting the tubbing this was kept in view and pockets were formed on the segments at proper intervals to receive the buntons. This was found to make a much better job than the plan before adopted of having to spike cleats to the wedging of the tubbing for the reception of the ends of the buntons.

I omitted to state above that in casting the tubbing the thickness of the plate or back is made to correspond with

the pressure it has to bear; for the lowest lift, where it had to withstand the head of 284 feet of water, it was made ⅞ inch thick and was reduced as it ascended and had less pressure to bear.

DISCUSSION.

MR. H. S. POOLE said that the experience at Sydney Mines would be valuable to others who had to adopt this method of keeping back water. He remembered going down the shaft and seeing the stream of water that was coming in. He would like to ask Mr. Brown what per centage of the tubbing broke under the hammer when the sections were being tested, preparatory to putting them in.

MR. R. H. BROWN replied that he did not think any was broken in that away. Some sections were spoiled by cinders getting in when the metal was being melted. They had a first-class foundryman, and a great deal of the credit for the success was due to their engineer.

MR. H. S. POOLE mentioned a thrilling experience in connection with this mine. A tub was going up with a man in it and caught on the edge of a bracket when it was 70 feet from the bottom. The man was thrown out and fell to the bottom of the pit, landing on his feet, and, singular to say without any serious injury.

MR. R. H. BROWN said there was no doubt that the man fell the entire 70 feet. He was laid up some three weeks with sore ankles but, otherwise, escaped injury.

MR. W. BLAKEMORE, (Cardiff) said that he was pleased to have heard such an eminently practical paper. In England the greatest difficulty arose not in passing through wet rock, but in going down through running sand, of which there was a great deal in the old country. Before tubbing was resorted to, it was extremely difficult to get through it. He remembered one pit in Staffordshire that they were working at for ten years. In that case they drove piles around the shaft as best they could. This was superseded by tubbing in connection with piling. He knew of one case where wooden tubs were used, but where there was any considerable depth the only system was that of cast iron tubbing. He would like to ask whether at Sydney Mines the tubbing had been tested by hydraulic pressure?

MR. R. H. BROWN replied that it had been tested only by hammer.

MR. BLAKEMORE said that in 1873, in England, a Belgian process had been tried. The bed of coal to be reached lay under conglomerate and the cost of sinking was very great. The sinking was done without pumping the water out. The implement used was a huge cross-bar filled with as many as 20 or 30 steel drills, 3 feet in length, and two inches in diameter. This apparatus was continuously dropped and hoisted again. By this process a shaft 170 yards deep was sunk through heavily watered conglomerate and the core bored out, leaving a clear cylinder. The process was perfectly successful in carrying the work down, and in achieving all that the Belgian engineers claimed for it. When they got into dry ground the tubbing was let down a little at a time until the whole was lowered to the bottom and seated in the dry ground. The company had expended £110,000, and were anxious to get coal as quickly as possible, and when they got 6 or 9 feet into the dry strata they wanted to know if that was not enough. The engineers wanted to go down much deeper, but when they got down 12 feet the company commenced to blast at the bottom, and the force of the blasts combined with the pressure of the water had such an effect that the next morning the water was at the surface, and there it was to-day. Although experimentally the system was correct, it was not an economic success and would never be repeated. Since then shafts had been sunk in the same way that Mr. Brown had described. This had been done with perfect success and at half the cost of the Belgian process. It was gratifying to him to learn that the same difficulties which were met with at home were successfully dealt with here, and in the way that was regarded in England as the best possible.

MR. CHAS. ARCHIBALD said that in the district that here presented, they were not troubled so much by the quantity of water as by its quality. It was too acid.

MR. H. S. POOLE said he understood that at one of the pits of the Dominion Coal Company, Mr. McKeen had adopted the plan of building up a wall of cement to keep back the water.

MR. DAVID McKEEN, M.P., on being called upon, said that there was not much to relate. When they got to hard rock they found that there was a large inflow of water, and decided upon walling the shaft with concrete. The work was carried through very successfully, and it was believed that it would be perfectly tight and substantial. The shaft was 24 feet long, and 10½ feet wide. It was intended for hoisting coal and lowering and hoisting men, and for taking down compressed air pipes for ventilation purposes. He was interested in Mr. Brown's paper as one of the most valuable seams of coal of the Dominion Coal Co. was near the sea shore. In connection with their work generally he would add that the Stanley coal heading machine had been used with very satisfactory results. It cut a very complete roof and there was little danger of the roof coming in. Besides this it was found that coal could be cut and delivered at a less rate than if taken out of the ordinary boards. The machine was driven by compressed air and he thought it would work quite a revolution in our mines. The coal could be cut in six foot tunnels and put into the tubs for 22 cents a ton where the miners were paid 41 cents. In some places 60 cents was paid. That did not include interest on capital. If the Society could make it convenient to meet in Sydney next summer he believed he was voicing the sentiments of all who were interested in the mines in saying that they would be pleased to show members who came the works and seams, and he believed that there would be novelty enough about it to make it interesting.

MR. R. H. BROWN said that he would be most happy if the Society would come down.

MR. B. T. A. BELL at the same time took the opportunity of inviting members of the Society to attend the meeting of the General Mining Association of Quebec at Montreal on the 11th and 12th of January.

The Asbestos Fields of Port au Port, Newfoundland.

By C. E. WILLS, Halifax.

The metamorphic rocks, and serpentines, of the Eastern Townships of Quebec, and the Gaspe Peninsula, in which the Canadian asbestos, or more correctly speaking chrysotile, is found, dip under the Gulf of St. Lawrence, appear again on the west coast of Newfoundland, and extend many miles inland, probably entirely across the island, though in places, especially on the great elevated central plateau, they are capped with granitic rocks, and seemingly have disappeared.

Here and there, also, are great mountains of magnesian limestone, and in the region of the Grand Lake, and other isolated sections, are found carboniferous basins, with small seams of very good bituminous coal. Still this entire area, extending about 100 miles north and south and the entire width of the island east and west, can be safely called a sepentine country, and contains according to Mr. James P. Howley's estimate, 5007 square miles of serpentine rocks.

The region is exceedingly rugged and picturesque. Cut by deep gorges and ravines, with towering and precipitous mountains, and craters of extinct volcanoes, with streams and lakes of the most crystal clearness, and everywhere cascades, of from a few feet to many hundreds of feet in height, combine to make a district of surpassing grandeur and interest, not alone to the mining engineer, but to anyone who loves nature in its wildest moods.

The serpentines, with the granulite dykes which everywhere intersect them, contain vast deposits of minerals, and are to-day nearly virgin fields, except on the immediate coast line, for the prospector and miner, and certain to become in the immediate future, the seat of great mining operations.

That the country has not long ere this taken a first rank as a mineral producer is due to its former isolated position, difficulty of access, except in small sailing vessels, and other ulterior causes; but now, with regular and frequent steam communication, the prospector and engineer are forcing their way into the country, and soon it will be the scene of prosperous mining camps, and a large mining industry.

The minerals met with are copper, which is found everywhere, magnetic hematite chromite and specular iron ores, coal and petroleum, gold, silver and lead, nickel, iron pyrites, antimony, marbles, gypsum, mica and asbestos; and it is to the latter that I shall devote a few remarks.

The existence of asbestos in this great belt of serpentine has long been known, or supposed, and several well known geologists, in their writings as far back as ten and fifteen years ago, have predicted that it would be discovered in quantities sufficiently large to be of economic value, but it has only been within the past three years that the attention of the miner has been turned in this direction, and it is now attracting much interest in the island.

On the eastern coast of Port au Port Bay, rising out of the sea to a nearly vertical height of 1,800 feet, is a mountain known as Bluff Head.

This mountain determines the southern boundary of the serpentines.

For many miles north the coast line is precipitous and lofty, culminating at Cape Gregory in a bluff nearly 2,500 feet high.

At Bluff Head, and extending for about one mile north, the beach is composed of conglomerate, very hard, and highly polished on the surface by the action of the surf which breaks upon it. The beach is strewn with bowlders of all sizes which have fallen down from the cliffs, and nearly all of them contain seams of asbestos, while the conglomerate of the beach itself is filled with it.

It was here the asbestos first really attracted much notice.

Long known to the fishermen of the neighborhood as "cotton rock," it came to the knowledge of the Hon. Daniel Cleary of St. Johns, who, some three years ago, equipped a small expedition to do some prospecting in the neighborhood.

The success met with was so immediate and marked, that other claims were immediately secured, till in a short time some 30 square miles were taken up by prospectors, and speculators, and the past summer has witnessed a large amount of development work.

Much of this work has been of the most satisfactory nature to the owners, and proves the field to be a large and valuable one, but from my observations a very large part of the district now held under leases and license, will be valueless as far as asbestos is concerned, but this always is the case in a new mining country where speculators rush in and secure claims, without having previously been on the ground.

About one year ago I visited the district, and secured claims on what promised to be valuable asbestos ground, and with this as a basis to start on, the Halifax Asbestos Co., Ltd., was organized.

The property consists of two areas of 640 acres each, each containing one square mile, and situated on both sides of a deep gulch or ravine, the dividing line being lengthwise through this gulch.

The ravine mentioned runs in nearly a true north and south course, from the shore inland for about five miles, where it is cut at right angles by the valley of the Fox Island River, and terminates at the inner end in this valley.

The sides of the gulch are very precipitous, having more slope where we have been working this summer than elsewhere, and rise to an elevation of 1,700 feet on one side, while on the other they in places reach to a height of over 2,000 feet. The walls are nowhere, I think, in the entire length of the valley, less than 600 or 700 feet high. It might be said of the property, that it is an ideal one for mining, as no hoisting engines or pumping will ever be required in the future operations of the company.

The claims are about three and one-half miles from the sea by the gulch, though but little more than two miles in a straight line from the shore; we will, however, reach the shore in the future through the valley of the Fox Island River, which, though it makes a somewhat longer route, brings us to the shore at a fine shipping point, and admits of the building of a road with very easy grades, in fact none whatever to speak of.

The government of Newfoundland being keenly alive to the necessity of fostering its mining industries, has undertaken to construct a good road by the route we desire, to connect with the point of shipment, the government railway, now under construction, and the settlements of Port au Port and Bay St. George. This road will accommodate all the claims in the district.

Active development work was started on the 7th July and continued till late in October, with the most satisfactory results. The work extended over many hundreds of feet along the gulch, and some ten or twelve large cuts were made in the mountain side, through the surface drift. In each opening quantities of asbestos was found as soon as the rock was reached, while the surface drift, which varies from three to twelve feet in depth, is everywhere filled with loose fibre, entirely free from the matrix, the result of the decomposition of the serpentine, through the action of the frosts and weather.

The fibre runs up to 2½ inches in length, and is of the most beautiful quality, and difficult to distinguish from the Canadian product.

In fact, the peculiar green tinge of the asbestos, the color and composition of the serpentine, the granulite dykes and many other geological peculiarities, go to prove the remarkable similarity of this region with the Eastern Townships of Quebec, where the Canadian chrysotile mines are located. The company is much pleased with the success which has met its first efforts, and will begin mining operations on a large scale in the early spring.

In many places where the cliffs are denuded, seams of asbestos can be seen running through the rock, and as these exposed places can be found from the foot to the top of the hill, it proves the entire mountain side to be asbestos bearing.

There are three remarkable water-powers on the property, from any one of which a head of from 1,000 to 1,200 feet can be obtained to operate power drills and necessary machinery for dressing the short fibre.

While we have been developing our property, we have had as neighbors the Newfoundland Mineral Syndicate, an English company, who own the areas next our own, who started operations a short time previous to our beginning.

They also have met with most satisfactory results, and I was informed by the engineer in charge, they were more than satisfied with their season's work. Their areas also contain very large deposits of copper, hematite and specular ores. One vein of specular, some 20 feet wide, is cut in many places by seams of asbestos, which, to myself at least, is unique, and I should be glad to hear if such a thing has heretofore been observed.

A large amount of work has also been done on the Cleary claims, where a like satisfactory result has been met, while owners of other areas have been looking over their ground, and have done some prospecting on a small scale.

The summer's work proves the value of the field beyond question, and it will at once come to the fore as a factor in the world's supply.

Labor is abundant and cheap, and supplies can be readily obtained, and landed from vessel within a short distance of the mines.

With water transportion at hand for the product, cheap labor, and being much nearer the European markets than the other sources of supply, will enable the operators to successfully compete with mines in other countries.

DISCUSSION.

The Chairman asked Mr. Fletcher whether any rock of a similar character had been noticed at Cape North, C.B.

MR. HUGH FLETCHER said that he had listened with much pleasure to the paper read. In reply to the question asked by the President, the chrysotile found in Nova Scotia differed from that described in the paper in being derived from hornblende and in not being true asbestos. It was found between Sydney and Louisburg in Cape Breton, and also on the north side of the Bay of Fundy, at Harrington River, and at Lynn. He thought that the fibre was too short to be of any economic value, and that the rock was found in too small quantity. His attention had been called by Mr. John Rutherford of Stellarton, to the occurrence of asbestos in the trap rock

at Clementsport on the Bay of Fundy, Mr. Rutherford examined it, but did not see a sufficient quantity.

MR. B. T. A. BELL said it had given him great pleasure to hear Mr. Willis' description of this new source of asbestos. The paper would be scanned with much interest in England and in the United States. The Canadian asbestos industry as they all know, was confined to a comparatively small area in the Eastern Townships of Quebec, and had for a number of years proved highly remunerative, although during the past two years owing to competition from other sources the prices realized had fallen very considerably. Italy, Russia and South Africa, were each contributing to the world's supply, but he ventured to say that the quality of the fibre from these countries was vastly inferior to that produced in Canada. The sample of crude from South Africa on the table would illustrate the great inferiority of that product compared with Canadian, yet manufactured goods were being made from it and sold in England at one-half the cost of Canadian and Italian. A new source of asbestos is also reported to have been found in Arizona in United States. So far, however, the quality of the asbestos from these different fields is of much lower grade, and we doubt not but that the Canadia. product will continue to hold its position of first place against all other competitors. Murray in one of his reports to the Geological Survey, pointed out many years ago the likelihood of asbestos being found in economic quantity in Newfoundland. Dr. Ells of the Survey had also more recently visited the colony, but he was not aware that his report had been published. He had seen samples from the Cleary mine, Port au Port Bay, but developments there and indeed at any of the mines had not yet demonstrated that any serious fears need be entertained by the Canadian producer of the quantity or quality of asbestos to be produced from this new source.

MR. JOHN J. PENHALE (United Asbestos Co.) Black Lake said that he heard of the Newfoundland asbestos two years ago, but the people who were looking into it then were not so frank as Mr. Willis. He had seen samples taken from the Newfoundland deposits and thought they were good, and somewhat similar to the Canadian samples. He understood that the work done so far had been purely of a preliminary character and that nothing but the surface deposits had been opened up. It should be remarked, however, that experience had shown that no material improvement in quality was found at depth, the fibre being much the same.

A National Museum Wanted.

MR. B. T. A. BELL—Those of the members of the Society who participated in the proceedings of the Mining Convention at Montreal will remember that one of the resolutions unanimously adopted there related to the necessity of larger and more adequate accommodation for the magnificent collection of the Geological Survey at Ottawa. The building was not only too small for the wants and uses of this most important branch of the public service, but its surroundings endangered its destruction by fire. Only during the past few days the building had been found to give indications of falling in and a force of men were at work putting in additional support. The time had arrived when the Dominion Government should provide a building more suited to the requirements of this valuable public collection. The Boards of Trade in Upper Canada were pressing the matter on the attention of the authorities, and he thought the Society might contribute its influence to the same end. He would move a resolution to that effect and that a copy of it be forwarded by the Secretary to the Hon. the Minister of the Interior and also to the various members of Parliament in the Province.

MR. JOHN HARDMAN seconded the motion which was carried unanimously.

McGill Mining Society.

At the second annual meeting of this Society, October 5th, the following officers were elected:—Hon. President, B. T. Harrington, Ph.D.; President, W. A. Carlyle, Ma.E.; Vice-President, A. A. Cole, B.A.; Secretary-Treasurer, O. C. Hart.

All of the meetings (every second Thursday evening) have been well attended, and very interesting and practical papers have been read by gentlemen actively engaged in mining and metallurgical work. The blackboard has always been freely used to illustrate with sketches the subject under consideration, and many questions have been asked that led to discussions. The first paper was given by Mr. Mathewson, Superintendent of the P. S. and R. Works, Pueblo, Colo., one of the largest smelting works in the west, on the "Smelting and Refining of Silver and Lead." The western methods were succinctly described, beginning with the sampling and purchase of the ore from the miners, the "bedding" of the various classes of ore so as to make the best mixtures for smelting in the blast furnaces, the operation and habits of those water-jacketted furnaces, the treatment of the resulting "base bullion" and slags, the refining and production of certain by-products. Mr. Mathewson is a graduate of McGill and is known in the west as a very successful smelter-man, having worked up from assayer to his present excellent position.

The next paper was on "Coal and Coal Mining in Montana," by Mr. H. Walker, B.A.Sc., of this college, late engineer for the G.N.R.R., at their coal mines at Land Coolie, Mon. With a sketch map of the west on the board, Mr. Walker first gave some idea of the vast extent of the coal measures in the west and the amount of mining work being done. The coal is in the formation of the Cretaceous age as in our Canadian North-West and though containing 15·20 per cent. ash, makes a good fuel for steam purposes, and in parts for coking, but this coke is not nearly as good as that from the eastern ovens as it is not as strong and bright and crushes easily in the furnace. The system of mining is by "board and pillar," good mining plants are erected, and all of the coal is burned after screening, all of the slack or culm being used under boilers, or in the large Bruckner roasting furnaces. Mr. Walker also described the great copper-silver reduction works lately completed at that now famous town on the Missouri river, Great Falls. A large dam across the river gives almost unlimited power, and with coal from Land Coolie at $1 50 per ton, the copper silver ores from Butte are now being treated at a great reduction in price. These heavy sulphide ores, after being crushed, are roasted in a battery of the largest sized Bruckner roasters, reducing the sulphur from 30·40 per cent. to 8·11 per cent., and then the calcined ore is smelted to matte which is run, when at a very high heat, into converters like those used in producing Bessemer steel. The product of this copper-Bessemerizing is copper 98·99 per cent. pure, a product hitherto unattainable with so few operations, and the pigs of this copper are then treated electrolytically by a secret process with so pure results that this copper now ranks in the markets next to the famous "Lake" copper from the Lake Superior mines.

Mr. C. B. Kingston, B. A. Sc., of Aspen, Colo., at our third meeting, gave a very interesting paper on "Silver Mining in Colorado." First the geology of that region in which the great mines of Leadville and Aspen lie, was explained, it being shown that these vast ore bodies of silver and lead are found in the lower carboniferous limestones in close relation with intrusive shuts and dykes of porphyry or igneous rock. Mr. Kingston is connected with the "Della S. Mining Co." of which Mr. D. W. Brunton, one of the finest mining engineers in America, is manager, and the lecturer was able out of his experience in this large mining work, to clearly discribe the various methods of extracting the ore, of timbering and prospecting. Much of the mining is being done, or was before the price of silver dropped out of sight, by leasers or tributers who bid for the different sections, *i.e.*, offered what royalty they would be willing to pay besides doing a certain amount of prospecting work and doing and keeping all work in good order. It is claimed of one eager Swede that he bid 110 (?) %. This method of mining is found to have many advantages, if the leasers are held by well-termed leases and then carefully looked after. The mine is developed at a lower cost than otherwise possible and still many of these leasers make very good pay.

In another larger mine in Aspen, this plan has been found to give great satisfaction to both mine owners and miners. The mine furnished transportation for ore and waste, candles, powder, etc., at cost, or at much less than the men themselves could obtain; the men were bound to do a certain amount of development work, and if no ore was found, an agreed but low price was paid for such work so that the work was not an entire loss to the men. The scale of royalties increased with the value of the ore mined as determined at the public sampling works. By giving the leases only to good steady miners, and then on fair and reasonable terms, adjusted every month to its conditions, the mine was worked by good men in the best possible manner, as they felt the company was doing the best by them, and with such profitable returns as had never been got before. Mr. Kingston returns to Aspen as soon as its mines open up again which will be when the miners realize that they must work for less than $3 for an eight hour shift.

Mr Whiteside, a fourth year undergraduate in mining read the fourth paper, on "Coal and Coal mining in Pictou County, N.S." This paper showed that the writer had kept his eyes and ears open while working in these mines during the summer last past, and he was able to tell and describe much of great interest relating to the nature of these coal seams and the excellent mining being done in some or all of these properties. It might be said here that on a paper similar to this one, Mr. Whiteside has been lately awarded the prize of $25 given for the best essay on mining or chemistry work done during the summer vacation. All the meetings are well attended, and certainly with profit to our mining students who are thus brought into greater knowledge of the mining work being done in those mining centres, where many of them will yet be engaged.

C.

Screens at the Levant du Flenu Collieries—The screening arrangements at the Levant du Flenu collieries in Belgium are capable of dealing with 600 to 700 tons of coal in ten hours. The screening device consists of two superimposed screens, both 15 feet long by 4 feet wide. The upper screen is composed of bars set ⅝ inch apart, centre to centre, and the lower is of steel plate perforated with ½ inch holes. The screens are hung by two pairs of rods at an angle of 13°, and are vibrated at a low speed by a connecting rod. Three sizes are made, and the coal is received from the screen on two travelling belts which deliver it into trucks. The belt for the larger size is adjustable in height at the tail end, so that the coal is not broken by falling into the waggons—*Colliery Guardian*, vol. lxiii., p. 699, one illustration.

Canadian Iron Manufacturing Industries.

The following comparative statement showing the status of the various iron manufacturing establishments of the Dominion has been kindly furnished the REVIEW by Mr. *George Johnson, Dominion Statistician*. The figures are given in advance of the last Census Report, now in preparation.

INDUSTRIES.	Establishments.	Employees.	Wages.	Value of Raw Material.	Value of Products.
Agricultural Implements	221	4,543	$1,812,000	$3,130,966	$7,515,693
Blacksmithing	9,404	12,060	3,193,646	2,717,352	9,028,116
Boiler Works	30	450	163,884	468,825	877,819
Car and Locomotive Works	19	5,018	2,215,524	4,640,043	9,460,525
Rawcy Switches, Etc	1	34	10,400	22,000	35,000
Cutlery	22	81	29,525	25,100	74,300
Edged Tool Works	40	873	326,744	490,368	1,071,604
Engine Works	18	1,257	534,091	651,516	1,575,159
Fireproof Safe Works	7	180	79,000	47,050	187,950
Fittings and Foundry work in Iron, Brass, Lead, Etc	53	1,374	554,420	1,120,755	2,192,200
Foundry and Machine Work, Stair Mfg. included	625	12,918	5,178,357	6,867,392	16,285,680
Gun Making	41	67	19,947	17,705	56,150
Lock Making	23	194	78,135	60,660	171,15
Nail and Tack Factories	12	405	152,000	457,600	744,150
Rivet Factories	1	30	10,560	40,000	70,000
Rolling Mills	6	2,006	843,500	1,890,834	3,163,930
Saw and File Cutting	18	333	140,232	237,441	537,680
Scale Factories	9	126	47,565	82,930	170,200
Screw Factories	2	17	6,980	8,000	19,200
Sewing Machine Factories	12	897	295,953	193,853	790,870
Spring and Axle Factories	8	242	100,420	185,470	378,600
*Steel Making					
*Steel Barb Fence Factories					
Tin and Sheet Iron Works	226	1,339	443,606	873,012	1,893,841
Wire Works	50	871	331,473	938,355	1,973,660
Totals	10,848	45,315	16,568,032	25,214,227	58,273,600

*Under other heads.

The Duty on Explosives, Etc.—Interview with the Premier at Halifax.

On the 11th instant, in accordance with resolution, a deputation from the Mining Society of Nova Scotia had an interview with the Right Hon. Sir John Thompson and Sir Charles H. Tupper at Halifax on the subject of the duty on explosives, its carriage on Government railways, and the importation of mining machinery. Sir John Thompson and his associate took much interest in the views of the Society as presented by the deputation and at his request the following memorandum of the case was prepared and forwarded to Ottawa:—

The Right Honorable Sir John S. D. Thompson, Premier of the Dominion of Canada:

The Memorial of the undersigned humbly showeth:

In accordance with your permission the committee from the Mining Society of Nova Scotia, whom you so kindly received on the 11th inst., at Halifax, beg to present their petition in writing. On the subject of dynamite, which is the explosive exclusively used in the prosecution of the gold mining industry in this province, we are compelled on account of the excessively high local cost to ask your Government to give us some relief in the way of a reduction in duties, and to have this article carried as freight over the Intercolonial Railway as it is upon all other railroads throughout the continent. To make our handicapped situation clear to you we take the liberty of quoting selling prices of dynamite in the United States, and in other parts of the Dominion. Prices in the United States, delivered f.o.b. vessel New York or Boston for an article carrying from 40% to 75% nitro-glycerine guaranteed, 12 cents to 19 cents per lb. The prices in Ontario and Quebec for 35% to 50% nitro-glycerine guaranteed, and delivered f.o.b. cars at St. John, N.B., are 12 cents to 18 cents per lb., while the Nova Scotia manufacturers prices are from 30 to 50 cents per pound and no percentages of nitro-glycerine guaranteed or named, much of the stuff sold being of a very inferior quality. The duty of five cents specific and 20% *ad valorem* per pound, making nearly 60% duty on the first cost, and the restriction on the rails gives the local sellers a monopoly, and makes our case peculiarly hard—our industry therefore suffers, and we are convinced that its future success depends *chiefly, if not entirely, on the working of our large* belts of low grade ores, which will not permit of the use of a high priced explosive. Could we obtain the article here at the same price as it is obtainable everywhere else, the number of men employed in the industry would quickly be increased, as the cost of explosives is the heaviest next to that of labor.

While this hardship refers more particularly to gold *mining, it also applies to iron and all other branches of* mining in Nova Scotia apart from coal.

We therefore earnestly desire you will give us that relief that consistently lays in your power. We might say, while we claim the danger of transportation by rail of dynamite is reduced to a minimum, we desire you would submit this question to scientific investigation. The privilege of conveyance granted us would we believe, prevent the practice of small consumers, in spite of the vigilance of officials, carrying it over the road in their grips.

We also submit some points which we hope may assist in proving that *wrought iron pipe* in sizes over two inches and not manufactured in Canada, should be admitted as mining machinery under the Act.

Large wrought iron pipe is used in coal, gold, iron and other mines as both suction and discharge pipes to the pumps, and the pumps would be of no service whatever without such pipe. The pipe is just as necessary to the pump to enable it to free the mines from water as the coal would be to the boilers in order to generate steam; in fact the pumps are utterly useless without the pipe.

All mines, in Nova Scotia at least, are at considerable depth, and trouble from water is a very serious difficulty—pumps of from 4 to 6 inch suction and pipe of the same size is what is generally used, therefore large quantities of the pipe is imported and the duty which is imposed is a very serious tax upon the industry employing an army of labourers and millions of capital. We therefore respectfully submit that the free entry of the pipe should be allowed as a fair interpretation of the Act which allows mining machinery not made in Canada, to be admitted free.

A number of letters bearing on this subject from the managers of coal and other mines were sent some time since to the Controller of Customs, and a perusal of the same will show you that their sentiments are heartily in accord with ours on the subject.

Dated at Halifax N.S., December 20th, 1893.

G. W. Stuart,
M. R. Morrow,
Geo. Franklyn,
Wm. Lithgow,
A. A. Hayward,
Geoffrey Morrow,
J. Howe Austen.

Committee appointed by the Mining Society of N.S.

CORRESPONDENCE.

Photography and Mining Reports.

To the Editor of the Review:

SIR,—The art of underground photography has of late made such progress as to deserve the special attention of mining engineers. By its aid they may now illustrate their reports with pictures plainly showing the exact appearance of ledges, ore-bodies and other features of importance. And if the practice of employing such illustrations once become general, the value of mining reports will be considerably enhanced. Indeed, I doubt not that in the near future no mining report will be considered satisfactory if it be not fully illustrated by means of photography.

As an example of the excellent results now obtainable, I send you a copy of a report I have justmade upon the Mayflower and South Mayflower Mines, on the great "Mother Lode," in Amador County, California. This report, as you will observe, is illustrated by some exceptionally fine photographs of points underground; and I trust you will permit me to add that in the event of any of your readers being desirous of having a copy, I shall be very happy to supply the same free of charge, as I think that by so doing I shall be aiding mining engineers in general.

Your obedient servant,

STEPHEN H. EMMENS.

165 Crocker Building,
San Francisco, Dec. 15, 1893.

MINING NOTES.

[FROM OUR OWN CORRESPONDENTS.]

Quebec.

Township of Templeton.

The property of Wallingford Bros. seems to improve to the depth. About 2 months ago, when the main shaft had attained a depth of 25 feet, the vein crossing the shaft 8 feet in wide, contained a large amount of small crystals. The present dimensions of that shaft are 50 feet deep, 20 feet long, and 10 feet wide, and the vein continuing in a regular width of 8 feet contains a large amount of crystals yielding 4 x 6 feet and over. The average daily output of rough mica amounted to 2 or 2½ tons. 9 miners have been steadily employed since the spring; 5 men are cutting the mica for a large electrical concern at Boston. As the vein shows a regular continuance also in the walls, it may be safe to say, that this mine has to work for a long time to come.

Ontario.

Belmont Township.

Developmets have been steadily continued at the Ledyard Gold mine (E ½ lot 19 in 1st con.) with a force of 8 to 10 men.

The shaft is now down 46 feet and the vein is widening again after having been pinched for a few feet.

The vein has been traced for about 200 yards west of the shaft, where it strikes a large knoll upon which there is an outburst of quartz, into which another vein having a north and south direction appears to run. A considerable quantity of gold-bearing quartz has been obtained in following the veins along the surface, in some parts mixed with sulphurets. The sulphurets are rich in gold, crystals of pyrites having assayed respectively $47, $96 and $127 in gold per ton, and some pyrites not crystallized $210 per ton. About 100 yards west of the knoll a powerful quartz lead, about 100 feet wide, has been discovered which shows the same kind of gold-bearing honeycomb quartz that has been found in other parts of this property. Three tons of ore from the shaft were treated by Messrs. Rickets & Banks, of New York, and produced by actual mill test $25.40 per ton. An analysis was made recently of samples taken from this property, and writing under date of 13th inst., to the Director, Mr. G. C. Hoffman, analyst of the Geological Survey, writes:—

"The sample of ore from the Ledyard gold mine on the east ½ lot 19, in 1st con Belmont, Peterboro county, has been examined and with the following results:

"The material, which weighed some 25 lbs., consisted of a white sub-translucent rust-stained quartz carrying a somewhat large quantity of iron pyrites. The whole was reduced to fine powder and a fair average sample of the latter submitted to assay. The result showed this particular sample of ore to contain: gold at the rate of 4·608 ounces to the ton of 2,000 lbs.; silver, none."

Lake Nipissing.

Mr. John McKay of Eau Claire is working his lot No. 9 in the 1st Concession, Township of Calvin for white mica. The crystals are irregularly distributed in veins of a coarse granite, which have a general north-east south-west direction, and vary in width from 4 ft. up to 25 ft. One vein with elliptical section shows a length of 110 ft. and an average width of 15 ft. The crystals taken out of this vein have a light green color and the single laminæ contain frequently green spots, they are not very large in size but yield a good average of clear sheets. The vein has been tested by a shaft of 25 ft. depth and it seems to continue regularly. Another vein in the north part of the property has a width of 25 ft. and has been traced for about 450 feet. The output for 3 months with an average labor of 5 men amounted to 3,500 lbs., which have yielded 25 per cent. of trimmed mica.

Mr. F. B. Hayes of Ottawa, has been working for about 2 months on his Lot No. 16, 2nd and 1st Concessions of the Township of Calvin. 6 parrallel veins containing white mica crystals distributed have been uncovered. The principal opening consists of an open cut of 30 feet by 10 feet wide on a mountain slope. Work has been suspended for the winter on account of the heavy snow fall. The quantity and quality of the mica taken out gives reason to believe that the property if developed can be worked with success. Operations will be resumed next spring.

Sudbury District.

Up to December 1st the Canadian Copper Company report that it has produced 300,000 tons of smelting ore, and 40,500 tons of matter equivalent to about 6,500 tons of copper and 5,600 tons of nickel.

British Columbia.

Vancouver Island.

Whilst the removal of duty on coal is regarded with general approbation here, it will not, in the opinion of Mr. S. M. Robins, result in any great improvement in the coal market, as far as Nanaimo is concerned. Mr. Robins has said that until the new tariff goes into force, providing it passes Congress in March next, there will be very little sale for coal and he anticipates very dull times in this line for the next few weeks.

The shipments of coal by the New Vancouver Coal Co. (Ltd.), for the month of November amounted to 20,927 tons.

Kootenay District.

Mr. Pugh and his associates of the San Francisco Pyritic Smelting Company have 14 men at work in the War Eagle mine and expect soon to double the force.

Twenty tons of ore from the Dardanelles mine in the Slocan country came out to Bonner's Ferry a few days ago for shipment to Great Falls, Mont., and twenty tons more will arrive shortly. The first shipment was the fifth carload sent out from that mine. The lowest returns were 248 ounces of silver and the highest 500 ounces.

The men and corporations operating mines in Nelson and Trail Creek districts have cut the wages of miners and laborers from $3.50 and $3.00 a day to $3 and $2.50 a day. No reasons are given for making the cut, other than that any number of miners and laborers can be gotten to work for the reduced wages.

Edward Haney, owner of the Nickel Plate, who is now in the city, states that he would have had a carload of ore ready for shipment November 1st had plans not been interrupted by the accident that resulted in the death of William Varker. He now contemplates shipping ore on the 10th. His shaft is down 34 feet. The vein is about 20 inches wide and the average assay, all the way across, is $105, according to the report of parties sent to Montana to examine it, without any knowledge on his part of their purpose. The lowest assay that he has ever received was $105.40 and the highest $141. It also goes 40 per cent. iron, worth $4.50 per ton and 15½ per cent. copper.

Development work is in progress by William Austin on the Bonanza King, Mr. Aspinwall on the Kootenai Bonanza and John R. Cook on the Consolidated St. Elmo.

The Reed and Robinson group on Four Mile creek was recently bonded by John Finch and Patsy Clark for $40,000. A further bond of $10,000 has been placed by the same parties on the Jenny Lind, an adjoining claim. The Reed and Robinson was bonded by Messrs. Jewett Chadborne for $10,000, on behalf of a London company, but it was dropped at the beginning of the silver slump.

The Silver King has probably more ore ready for shipment than any other mine in Kootenay; that is more ore in ore sheds. It is being brought down to the wharf at Nelson at the rate of ten tons a day. The management has not decided how many tons will be shipped this winter, but if a good rate can be got over the Nelson and Fort Sheppard the shipments may aggregate more than those of any other mine in the district.

The McDonald hydraulic mine, in the Lillooet district, on the Cayuse Creek, was sold a fortnight ago to British capitalists at a figure which is not given to the public, but the McDonald Bros. are supposed to have made a good thing out of the property. Mr. William Tietjen, of New Westminster, has refused $50,000 for a claim he has on the Lillooet. It is understood that a wagon road is to be built in the spring, crossing the river at Spuzzum and thence running up the north fork of Siawash Creek. This will reduce the cost of operating the Siawash Creek claims, which promise large returns to the owners.

The returns from the Le Roi mine of 17 tons of ore shipped to the Tacoma smelter have just been received, as follows: Yield in gold, $42 per ton; cost for mining, $3; transportation to trail from mine, $5; railroad freight and smelting charges, $19; total, $27 per ton, leaving a profit of $15 per ton. This mine is now working 26 men. The main tunnel is in ore, iron and copper pyrites.

Texada Island.

The provincial government has made a grant for roads on the island, and they are now under construction. The roads are 10 feet standard width and will make the mineral claims accessible, and put them in communication with Victoria, Nanaimo and Vancouver. Five claims have recently shipped sample lots of ore to the Mechanical Gold Extractor Company, New York, for mill tests. The veins are generally large, running from 5 feet to 50 feet in width. The last assay from the Nutcracker claim showed 10·56 oz. of gold to the ton.

CANADIAN COMPANIES.

Cariboo Hydraulic Mining Company (Ltd.) has been incorporated at Victoria, B.C., to acquire the placer mining claims, leases and property held by the "Bullion," "Hop E. Tong," "Bonanza" and "South Fork Hydraulic Mining Company, Limited Liability," either for money or fully paid up shares of the company. Also the acquisition by gift, pre-emption, purchase, exchange, or any other lawful means, of any mineral claims, or placer mining claims, or leases, or other mining property, whether the same may be shall by pre-emption, purchase, lease or fee, or howsoever held, for any consideration whatsoever, including, but so as not to restrict the generality of the foregoing words, fully paid up shares in this company and the bonds, debentures, shares, stocks and securities of any other company or corporation. Authorized capital $300,000, divided into 60,000 shares of $5. Head office, Vancouver, B.C. Directors, J. M. Buxton, John M. Lefevre and J. D. Townly.

Nelson Hydraulic Mining Company.—The prospectus of this new B.C. Company has been issued. Capital $100,000, in 20,000 shares of $5, $15,000 being preference

shares entitled to dividends of 10 per cent. The property is to be purchased by the allotment of 9,000 fully paid up shares. Head office, Nelson, B.C. The syndicate at date consists of J. A. Kirk, J. F. Ritchie, R. B. Dongan, F. M. McLeod, John Elliot, J. F. Hume, R. J. Bealey and G. W. Richardson. The property to be acquired is known as the Boulder Placer Claim on Forty Nine creek, about eight miles from the town of Nelson, B.C. The property consists of one and one-quarter miles in length along the course of the Forty-Nine creek channel, and the banks on either side for a width of 700 feet. The present channel varies in width from 50 to 90 feet, with a probable average depth of 15 feet, filled for the most part with compact gravel, a large portion of which is heavy boulders. The bed rock is a coarse-grained granite, in irregular layers, forming a very uneven bottom, making natural riffles favorable for arresting the coarser particles of gold.

Tests made in an open cut in the channel gravel for a distance of 70 feet gave returns of one half cent per pan, or about 60 cents per cubic yard. The uneven nature of the bed-rock and the character of the gold distributed through the entire deposit, point to rich deposits in favored places on the bottom.

The channel gold is heavy, of a flat, angular shape, comparatively coarse and of a character to save in the sluices. The rim bars, or banks, on either side are in places extensive deposits that vary in depth and extent, in some places showing a depth of from 40 to 60 feet, and extending over several acres.

Samples taken from over a large area including the surface sides, and foot of the banks, and the surface of the channel, gave an average of 20 cents per cubic yard.

Pictou Charcoal Iron Company, Limited.—At a meeting of the board of directors of the Pictou Charcoal Iron Company, Ltd, held at the Vendome Hotel, New Glasgow, Messrs. Jas. D. MacGregor and M. H. Fitzpatrick were elected members of the board. Subsequently Mr. MacGregor was elected President. D. R. Grant finding that his mercantile business at Bridgeville required his whole time, tendered his resignation as Secretary-Treasurer, and A. C. McDonald, of Pictou, was appointed in his place. This company having secured the celebrated Grant property of Bridgeville, spent some $80,000 in erecting the necessary plant extensive enough to produce fifteen tons of charcoal pig iron per day. After the furnaces had been in operation some months the company discovered that it was necessary to secure additional capital in order to carry on the work successfully. The matter was placed in the hands of G. R. Chisholm, of the Merchants' Bank, Pictou, who successfully disposed of $50,000 of the company's stock assuring immediate resumption of the work on a sound financial basis.

The Middle River Alluvial Gold Mining Co., (Ltd.) is applying for charter of incorporation, under the laws of Nova Scotia. Authorized Capital, $5,000. Directors: J. A. Watt, Halifax; E. J. Treen, New Glasgow; A. D. Ross, New Glasgow; F. W. Wright, New Glasgow; and Jas. McArthur, New Glasgow. Head Office: New Glasgow. Formed to acquire, purchase, hold, possess, lease, convey and transfer mines and mining properties, and natural deposits of gold and other minerals, rock, ore, quartz and earth bearing gold, and gold and other mining areas, licenses, rights and privileges, in the County of Victoria, or elsewhere in Nova Scotia.

The deductions drawn from these tests were: (1) the gold is more readily extracted that the silver; (2) under the same conditions the percentage of extraction is increased —(*a*) by the fineness of the pulp—(*b*) by the duration of treatment—(c) by the strength of the cyanide solution; (3) the greater the amount of cyanide added to the ore, the higher will be the percentage of extraction, but in this case the total values extracted for each pound of cyanide consumed are less than when a smaller amount of cyanide is used for each ton of ore treated; and (4) when the same amount of cyanide is used for each ton of ore treated the percentage of extraction is greater when the weight of the solution is equal to that of the ore taken.

His conclusions are that there are no flattering indications of the process being a metallurgical success with the pyritic ores under consideration. With high-grade ores, which are under no circumstances adapted to this process, the percentage of extraction under the most favourable circumstances is low, lower even than the results obtained by amalgamation. However, the total values extracted for each pound of cyanide consumed are relatively high.

With low-grade ores, even where the low value of the tailings will admit of their being thrown away, the total values extracted in a majority of instances are less than the cost of cyanide consumed, to say nothing of milling expenses. In these experiments the percentage of potassium cyanide varied from 0·5 to 1·5 per cent. The treatment lasted from 12 to 60 hours. The extraction of the gold ranged from 2·31 to 84·62 per cent. The extraction of the silver varied from *nil* to 88·88 per cent. The proportion of the potassium cyanide added per ton of ore represented from 5 to 60 lbs., and its consumption rose from 3·2 to 50·8 lbs. per ton. The lowest value extracted per lb. of cyanide consumed was 0·28 dollar and the highest 53·72 dollars. The latter result was obtained in treating an ore which assayed 145·90 ounces in gold and 458 ounces in silver per ton.

Modern American Rolling Mills.

The first rails were rolled in the new Edgar-Thomson mill in 1888 (Iron Age, vol. xlviii, pp. 882-884). The blooms on their way from the blooming mill to the rail mill pass through re-heating furnaces. The rail train is divided into three sets, the first two with three high rolls, the last with but two, all of 24-inch pitch, each set being driven by its own engine, and provided with automatic tables. In the first or roughing rolls five passes are made. The bloom is then carried by driven rollers to the second or intermediate train, in which it receives five more passes, and is then carried to and through the finishing pass in the two-high set. These trains are placed in echelon and far enough apart to permit three 30-foot rails to be rolled. The mill is a very simple one, and has many mechanical arrangements which make roll-changing the work of but a few minutes, while every part of each set of rolls is easy of access. After the rails leave the cambering machine, they are carried down the hot bed by power, and automatically distributed to the cold straightening presses. This arrangement is simple, substantial and inexpensive in operation. The mill has made 781 tons of rails in twelve hours, 1,558 tons in twenty-four hours, and 33,181 tons in one month.

The old blooming mill has been replaced by a 40-inch mill which rolls ingots weighing 4,500 lbs. into 7-inch blooms in nine passes. This mill has an auxiliary feed-table which is placed in front of the table of the train. An ingot is placed upon this table while the one preceding it is being rolled. As soon as it leaves the last pass, the ingot waiting on the auxiliary table is fed to the train table by simply raising the former, thus saving the time which is otherwise lost in getting the next ingot into place on the feed-table. This saving is stated to be as much as 15 per cent. A number of other modifications have also been introduced among which is a simple device for causing one waggon to pass another on the same track. It consists in placing at the point where the two waggons meet a track section, the two legs of which form an obtuse angle, and which rests on trunnions at a sufficient height above the stationary track to allow one waggon to pass clear under it. One set of legs of this false track rest upon the stationary track at the upper portion of the incline, thus causing the descending waggon to mount it, while the ascending waggon is passing under it on the stationary incline track. As soon as the descending waggon has got beyond the trunnions, its weight tops the false track until the other legs rest upon the lower part of the incline track, the tipping at the same time clearing the way for the ascending waggon. The waggon once passed, the balanced track resumes its original position.

The South Chicago rail mill is divided into two sections, each having two sets of rolls in three-high housings, its section being driven by its own engine, and provided with automatic tables both before and behind the rolls. These trains stand in echelon with the blooming mill, which is a 40-inch three high train. The rail mill rolls are of 27-inch pitch.

In this mill the practice is to cast the ingots in the ordinary upright position, and then to charge them into gas-fired soaking-pit furnaces of the Forsyth-Hainsworth type. After the ingot is reduced in the blooming mill it is carried by power rollers towards first the rail-train, and through a shear by which the end which as the top of the ingot is cut off and the long bloom sheared in two, each half making two or three rails, according to weight of intended section. The first half at once passes through the rail-roughing rolls, the second one being held for a few seconds, or until the first has made three passes, when it is also sent forward. If from any reason the bloom when sheared should have become too cold to be safely and successfully finished, a power over head traveller is provided to carry it at a right angle into a wing at the side of the mill, in which heating furnaces are placed, with a Wellman charging and drawing crane in front of them. When sufficiently heated the same crane conveys the steel back to the table rollers.

By this arrangement cold cobbles or other rail blooms can be heated and delivered to the rolls. In the roughing rolls the bloom receives five passes in three-high rolls. It is then passed to the second roughing tables, and is given three passes in three-high rolls. The partially formed section is elevated to the rear tables of two-high rolls, and making one pass through them, reaches a dummy table in front, from which it slides down on to driven rollers, and is by them carried back to the three-high set of rolls, which are in line with the first roughing rolls and driven by the same engine. In these it receives four passes, making in all thirteen rail-mill passes. It is now a finished section, long enough to cut into three 30-foot rails. This is done at one operation by four saws. After passing through the cambering machine the rails are carried by power down the hot beds. When sufficiently cool they are taken to the cold straightening presses, and are unloaded on to the beds by an automatic arrangement of arms and levers which receive their power from steam taken from the locomotive boiler.

The Shenandoah rolling mill in Virginia is intended for the manufacture of muck and bar iron. The plant comprises a puddling furnace building, containing 12 double-puddling furnaces, each being equipped overhead with a return tubular boiler, 54 inches in diameter and 18 feet long, pierced by 18 flues 6 inches in diameter. The furnaces are arranged for both natural and forced draft. The squeezer is designed for the delivery of an 8-inch bloom, being operated by an independent engine 20 by 20 inches.

The muck mill is a two-stand three-high 22 inch train, driven by a 30 by 48 inch engine. The muck shear is driven independently by a 9 by 12 inch engine. An overhead travelling crane is provided over the roll train to facilitate the changing of rolls, &c.

The bar mill department consists of an 18 inch and a 10-inch three-high train, the former containing two stands and the latter four stands of rolls. Each mill is driven by an independent engine, that attached to the 18 inch mill being 30 by 48 inches, and that connected to the 10 inch mill being 20 by 24 inches. Cooling beds are provided for each mill, and the shears are driven by independent engines. The shear engine for the 18 inch mill also drives the underground saw used in connection with this mill. To simplify the handling of rolls a travelling crane is provided over the bar mills. (Iron Age, vol xlviii, p. 1072, with plan of mill.)

An illustration is published (Ibid, vol. xlviii, p. 921) of a taper-rolling machine which will roll 1⅜ inch metal to any length of taper, and to an extreme width of 5½ inches. On the front of the machine is a sliding table for squeezing and straightening the blank. This table is operated by a cam projection formed on the side of the gear driving the upper roll through a pinion on the shaft carrying the driving pulley. The stroke of this table is adjustable. The lower roll of the machine is driven by gear from the upper one. The faces of the rolls are so formed and so placed in relation to each other as to give the ends of the blank the taper desired. This action of the rolls spreads the ends and increases the width of the plate; the excess being removed by the sliding table moving transversely in front of the rolls as described above. The machine performs the operations of tapering, squeezing, and straightening at one heat.

In 1882 Mr. Garrett patented and built a wire rod mill arranged to take a billet of a large enough section to permit its being rolled direct from the ingot without any re-heating. He decided upon four inches square as being that size. To accomplish this he went beyond the Belgian mill by introducing three separate trains of rolls, placed in echelon, and driven at progressively increasing speeds. Hence the billet rolls could run at all speeds suitable for the workmen to handle the billets without interfering with the speed of the finishing trains. This arrangement not only permitted the use of the larger billet, but made it possible to have several distinct pieces in the rolls at the same time. The present practice is four pieces, and sometimes five rods will be reeled off simultaneously. (Iron Age, vol. xlviii., p. 883, 1892-i.)

In the Gautier rolling mill the billets are heated in two open hearth furnaces. The 10-inch train is driven from a tandem compound Southwark engine by belts. The mill consists of one 18-inch roughing train, and one 10-inch train with seven sets of rolls, and an inclined disappearing floor. The bars are delivered to a Baldwin stretcher; from this they pass to a rotary cooling rack and straightener, and thence to the cooling beds. Between the shipping department at the end of the mill and the mill itself is a depressed line of rails, bringing the waggon to the level of the mill. This track is crossed by four drawbridges, so counterbalanced that they can easily be moved by hand. For heating the mill the Sturtevant system has been adopted. (Ibid, vol. xlviii., p. 1062.)

The West Superior rolling mill contains two trains of rolls. One train, driven by a reversing engine, consists of separate stands of roughing and finishing plate rolls, 30 by 90 inches. The other is a three-high train of 20-inch rolls, intended for a varied product, embracing I-beams up to 12 inches, channels up to 12 inches, angles and tees of all sizes, flats up to 8 inches by 1½ inch, and rounds and squares up to 4 inches. To render this train of rolls as automatic as possible, feed tables are used to handle the ingots and slabs, and power tables carry away the completed plates to the shearing shed. The structural mill is a 20-inch train with housings of extra strength, having both top and bottom screws. When rolling the larger sizes of beams and channels steel roughers will be used, the ingots for such work having been previously bloomed down on the roughers of the plate mill. Owing to the varied product of this train, an automatic feed could not be arranged, but an overhead mechanism has been provided, which supports and largely directs the movements of the hooks on either side of the rolls. The hot beds are arranged like those of a steel-rail mill, with driven rolls and power traverse for the more expeditious handling of the product. (Iron Age, vol. xlix., p. 197).

Surely not Dobson—The Salmon river miners are having a quiet laugh over the fact that it cost Gorkow, the Spokane brewer, $7,000 to discover the difference between a graduate from a school of mines and one from a penitentiary.—Nelson *Tribune*.

Large Crystals of Canadian Mica—At the World's Fair the exhibit of mica from Canada took first place, the Lake Girard Mica System, of Ottawa, being notably to the front with a magnificent collection of large sized crystals. Probably the largest crystals—certainly the largest the REVIEW has ever seen—have lately been taken out of the mine now being opened up by Messrs. Clemow & Powell in the township of Hincks. Here are the measurements of some now on view in Ottawa: No. I, weight, 363 lbs.; size, 2 ft. 10¼ in. by 2 ft. 10¼ in., showing cuts, 8½ by 18, 7½ by 16, 7 by 14 and 8 by 9. No. II, weight, 237 lbs.; size, 2 ft. 7 in. by 1 ft. 10 in., showing cuts through, 8½ by 21, 10½ by 16. No. III, weight, 265 lbs.; size, 4 ft. 2 in. by 2 ft. 8 in., showing cuts all through 14 by 24, 4 by 10, 10 by 16. No. IV, size, 4 ft. 1 in. by 2 ft. 8 in.; showing cuts all through, 14 by 26, 4 by 10, 3 by 12, 5 by 7.

Novel Gold Extraction—J. A. McConville, who lives near Butte, Montana, killed one of his chickens, and on cleaning it found some small gold nuggets in the crop and gizzard. Having about thirty more chickens on hand, he began killing and examining them. In each of them he found nuggets, the total amount gathered from the thirty-one being $387.55, an average of $12.50 a head. The gold was sent to a bank and pronounced 18 carat fine. Mr. McConville bought thirty more chickens and turned them out in the goldfield in the vicinity of his hencoop. Later, as an experiment, one of them was killed, and $2.80 in gold was taken from it. McConville expects to be a millionaire—if the chickens hold out.

Making Large Steam Pipes—At the New York meeting of the American Society of Mechanical Engineers, Mr. C. H. Manning read a paper in which he described a method of manufacturing large steam pipes he employed 11 years ago for several thousand feet of 20-inch pipe, with very satisfactory results. The pipe was made of mild steel ¼-inch thick, double riveted, and ...in die forged flanges ⅜ and ½ inch thick. The pipe was riveted with an Allen pheumatic riveter having 70-inch reach of arms which limited the length of sections. The longitudinal seams were placed quartering 45° from top of pipe, with the laps pointing up so as to be readily accessible for calking. The quarter turns were made of two 5-16-inch sheets curved on a cast iron former, and having a row of rivets along the back and another row along the throat. The tees were made of three sheets, shaped over similar formers, and the rivets were all on the sides. A serious difficulty had been previously experienced in keeping the roundabout joints tight. Leaks had been caused by condensed water being retained by these seams, which caused unequal expansion, as the portions covered by them heated much slower than the unprotected or dry surfaces. This was remedied by making the section conical, and bringing all the laps in one direction, and then laying the pipe on a down grade with the smaller ends the lowest, so that the water ran out. The last course of the pipe was not coned, to avoid having two sizes of flanges. Mr. Manning has never known a riveted pipe to give out under water-hammer, and a hammer that would completely wreck a cast-iron pipe or split a welded pipe would only strain the longitudinal joints of a riveted pipe.

The new plate train of the Wellman Iron Company of Thurlow, Pennsylvania, was started in December, 1891. It has rolls 132 inches in width, is driven by a 40 by 60 Corliss engine, and is served by a 30-ton Morgan electric crane. (Ibid., vol. xlviii., p. 1127.)

A skelp train at Wheeling, United States, with three stands of three-high 21-inch rolls, is being erected at the Riverside Iron works. It is to be driven by a 36 by 48 inch engine. The train is intended to roll skelp up to 22 inches in width, the works making a specialty of slitting skelp to various sizes for use in the manufacture of steel pipes. The train is fed by two heating furnaces having four producers. Their capacity is estimated at three tons per heat and seven heats per day. They are to be served by a crane 26 feet in height with 32-foot jib. (Ibid., vol. xlviii., p. 684).

The new billet mill of the Cambria Ironworks, Johnstown, Pa., is three-high, with 26-inch rolls. It is in line with the blooming mill. The heating furnaces are sufficiently large to store two heats if required. The engine has 36-inch and 75-inch cylinders, with an 66-inch stroke, and a 90-ton fly-wheel. (Ibid., vol. xlviii., p. 1062.)

The agreements governing the rate of wages paid in the blooming department of the Columbia Steelworks, Uniontown, Pa., are printed in full in the Iron Age. (Vol. xlviii., p. 684.)

Mining in Cariboo, B.C.—The Slough Creek Co., are going into hydraulic mining, having already landed two boilers at Ashcroft. They will develop early in the spring. One claim, the discovery on Mosquito Creek, paid a dividend of $1,500 to the interest this year, and lots of claims in the neighborhood have paid even better than that.

These are only a few instances which point to a revival of old times in the Cariboo country.

There are about 600 miners in the Cariboo district of British Columbia. Of these it is estimated that 400 are between the ages of 51 and 80, and that the mean average does not vary far from 60. They nearly all went into that country while young men during the early gold days, and despite the many hardships endured, retain their youthful vigor to a remarkable degree. Although many of the members have accumulated snug fortunes, few have ever married.—Kamloops *Sentinel*.

PROVINCE OF NOVA SCOTIA.

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

—AND—

PRECIOUS STONES.

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

GOLD AND SILVER.

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

Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19 an ounce, and on smelted gold valued at $18 an ounce.

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

MINES OTHER THAN GOLD AND SILVER.

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

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

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

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

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

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

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

THE HON. C. E. CHURCH,

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.