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The Canadian MINING REVIEW
Established 1882

Vol. XII.—No 7. 1893—OTTAWA, JULY—1893. Vol. XII.—No. 7.

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.

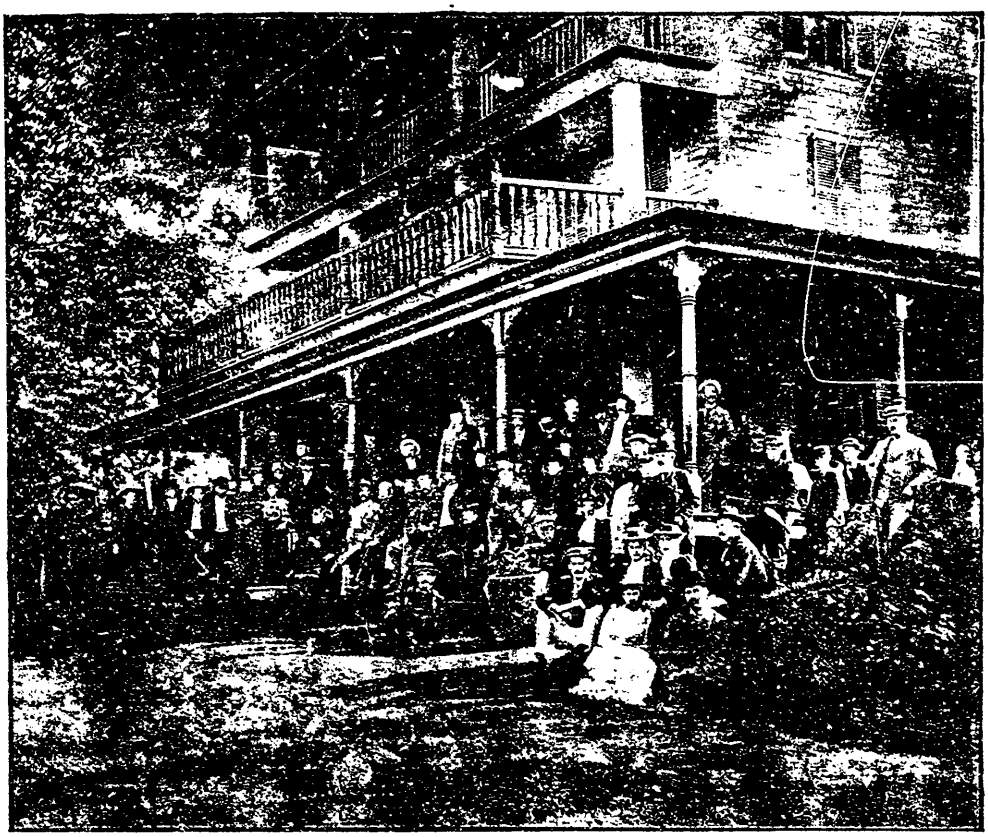
LEASES.—On payment of $50 for one square mile, good for two years, and extended to three years by further payment of $25. The lands selected must be surveyed and returned to Crown Land Office. Leases are given for 20 years, and renewable to 80 years. The Surveyor General, if special circumstances warrant, 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.



Excursion of the General Mining Association of the Province of Quebec. Photo of Group taken at the Owl's Head, Lake Memphremagog, Que.

SUMMER MEETING

OF THE

General Mining Association

OF THE

Province of Quebec at Sherbrooke.

The summer meeting of the General Mining Association of the Province of Quebec, was held in the Art Hall, Sherbrooke, on Wednesday, 5th July. There were present: R. T. Hopper, (Anglo-Canadian Asbestos Co.), Montreal; F. P. Buck, Dominion Lime and Marble Co.), Sherbrooke; Col. Lucke and J. S. Mitchell, (Beaver Asbestos Co.), Sherbrooke; John J. Penhale, (United Asbestos Co.), Black Lake; L. A. Klein, (American Asbestos Co.), Black Lake; Capt. John J. Williams, (New Rockland Slate Co.), New Rockland; S. L. Spafford and A. W. Elkins, (Nichols Chemical Co.), Capelton; John Blue, (Eustis Mining Co.), Capelton; F. C. Thompson, Sherbrooke; John McCaw, Sherbrooke; George R. Smith, (Bell's Asbestos Co.), Thetford Mines, Que.; John W. Jenckes, Sherbrooke; and B. T. A. Bell, Ottawa. In the absence of the Hon. George Irvine, Q.C., president, Mr. R. T. Hopper was called to the chair.

Election of New Members.

The Secretary read the names of the following gentlemen who had been elected to membership since last meeting:—

Frank Gilbert, Gilbert Engineering Co., Montreal, Que.
James S. Mitchell, Beaver Asbestos Co., Sherbrooke, Que.
S. L. Spafford, Nichols Chemical Co., Capelton, Que.
A. W. Elkins, Nichols Chemical Co., Capelton, Que.
J. N. Greenshields, Q.C., Danville Slate Quarry, Montreal, Que.
Wm. King, King Bros., Thetford Mines, Que.
D. L. Lockerby, Montreal.
J. R. Woodward, Sherbrooke, Que.
Fernando Wadsworth, American Gold Co., Gilbert River Gold Mines, Que.
C. N. Martin, Eustis Mines, Capelton, Que.
F. C. Thompson, Sherbrooke, Que.
Frank Gundry, Sherbrooke, Que.
Capt. W. Prideaux, Black Lake, Que.
John McCaw, Sherbrooke, Que.

Invitation from the Mining Society of Nova Scotia.

The Secretary read the following telegram:—

"HALIFAX, 5th July, 1893.

"Mining Society of Nova Scotia will hold September meeting in Halifax, and extends to General Mining Association of Quebec cordial invitation to participate."

[Signed] H. M. WYLDE, *Secretary*.

He would move that the September Quarterly Meeting of the Association be not held, and that the invitation of the Mining Society be accepted.

MR. F. P. BUCK—What is the date in September?

MR. BELL—The date is left open.

MR. BUCK—Accept the invitation and get as many as we can to attend.

MR. JOHN BLUE—I second the motion.

MR. G. R. SMITH thought that the Association might easily arrange to run a car from Montreal.

The Date of Meetings.

MR. F. P. BUCK—We should meet twice a year instead of four times. If this were done, greater interest would be taken in the proceedings, and the attendance would be increased.

MR. BELL—In order to effect such a change, notice would have to be given to amend the Constitution.

MR. KLEIN—Three-fourths of the members present can decide the point.

MR. BELL—No; notice of motion must be given.

MR. JOHN BLUE—I think we ought to have three meetings; one in the Ottawa district, one in the Townships, and one in Montreal.

MR. WOODWARD agreed with Mr. Blue that three meetings only were desirable.

MR. BUCK having expressed himself as agreeable, Mr. Blue gave notice of motion to amend the Constitution in this particular.

The Duty on Mining Machinery.

THE SECRETARY read the statement of the various classes and kinds of mining machinery manufactured in Canada which had been prepared by sub-committee at a meeting held in Sherbrooke on 12th May. This had been forwarded to the Mining Society of Nova Scotia, who had added to it, and had returned it duly confirmed. The sub-committee recommended that the Association ask the Government to have the language of the Act changed to read: "That all machinery and appliances for mining, quarrying, smelting, concentrating, refining and treating ores or minerals of a class or kind not manufactured in Canada, be admitted free of duty." They would remember that the Act as at present worded restricted the free entry to machinery for mining purposes only. The committee was also of opinion that steel rails exceeding 25 lbs. in weight for use in mines and quarries should be admitted free of duty. At the meeting of the Mining Society of Nova Scotia, Mr. J. F. Stairs, M.P., had stated that all rails over 25 lbs. were admitted free of duty.

MR. MITCHELL—That is rails for railway purposes only; not tramways.

MR. BELL—I understood the Act read for railways and tramways.

MR. WOODWARD moved that the report of the sub-committee which met in Sherbrooke on 12th May be adopted, and that a copy of the resolution containing the clause relating to steel rails, be forwarded to the Minister of Customs.

MR. BLUE—I second Mr. Woodward's motion. The motion was carried.

The Powder Magazine Law.

THE CHAIRMAN—Some time ago, when the Association was discussing the powder license question, the point was incidentally introduced that as the law stood at present no mining magazine in the province was constructed according to the Act, and that any accident would probably render the owners responsible for damages in the event of loss of property or lives, as well as render them liable at any time to the payment of a fine for not complying with the requirements of the Act. At the time, this suggestion received scant consideration, as it was generally considered by those present that the Act was not intended to cover the storage of mining explosives, but, rather was meant to regulate the storage and sale of explosives in the neighbourhood of large cities. Some time ago one of our workmen was slightly injured by an explosion of our powder house during a thunderstorm, and he brought an action to recover damages. A judgment was given in our favor in the court of first instance, on the ground that the non-compliance with the Act above referred to, subjected the company to a fine for such non-compliance, but did not render us liable to damages for injuries resulting therefrom. In the Court of Review, however, judgment has recently been given reversing that of the court below, on the ground that notwithstanding the fact that the accident was caused by lightning, and, therefore, beyond our control, still that the company was responsible for the damage because they had not erected a powder magazine in accordance with the terms of the Act.

MR. MITCHELL—If lightning struck a building built according to this law at your place, what would have been the result?

MR. HOPPER—Great destruction of life and property would have been inevitable.

MR. KLEIN—I saw the report of Provincial Revenue Inspector Poston, when he was around inspecting the powder houses. He recommended that the present style of powder house, built of boards and shingles, as the only proper style. The Government has evidently accepted this opinion of Mr. Poston and have issued licenses for 1891 on this report.

MR. HOPPER—The law has not been changed.

MR. WOODWARD—Then the law should be amended according to Inspector Poston's recommendation.

MR. JOHN PENHALE—The man suing for damages in this case had no business on the property at all, and yet Mr. Hopper's company was held for damages. Might not such a thing occur to any one of us, even if the inspector accepted our license cheque, and passed, in his report, the construction of our magazine?

MR. BUCK moved, seconded by Mr. G. R. Smith, that Messrs. R. T. Hopper, J. S. Mitchell and John Blue, be named a committee to watch legislation respecting powder magazines and licenses. The motion was carried.

After some discussion about the publication of the Proceedings of the Association, which the Secretary promised would be ready for distribution before the next meeting, the Chairman called upon Mr. John Blue, Capelton, to read his paper on

The Eustis Mine.

MR. JOHN BLUE—The copper deposits of the Capelton District occur in the Pre-Cambrian formation, which comes to the surface over a large extent of country. The formation also contains beds of dolomite limestone, bands of dioritic rock and soft clay slates, and the whole is crossed with trap dykes which do not cause any displacement of the strata.

The ore deposits in the district are all found running in a north-east by south-west direction, with the stratification, which is composed of crystaline schists, generally of a talcose or micaceous nature.

In the records of the Geological Survey of Canada for 1863, Sir William Logan gives as his opinion that "the origin of the copper veins are contemporaneous with the rock formation, having been reduced to the state of sulphurets, and precipitated at that time with the sediment." At the time this opinion was advanced, comparatively little mining work had been done; but now that the formation has been exposed by some 25 or 30 years work, the generally adopted theory of the origin of the veins is attributed to segregation.

But whether formed by precipitation or segregation, the veins are undoubtedly irregularly stratified deposits, following the bedding, and interposed between the associated rocks.

In the district there are a large number of different and distinct veins running parallel with each other, and at the present time work is being done in four of them. On a number of the others more or less work has been done, but only on or near the surface, so as yet they can only be considered as but very imperfectly explored.

The vein on which is located the Eustis mine of the Eustis Mining Co., and also the Albert mine, operated by the Nichols Chemical Co., has been worked for some 30 years off and on, and continuously for the last 15 years. It is, so far as known now, the strongest and most persistent deposit in the district, extending laterally for over two miles, and in depth on the slope of the vein in the Eustis mine, to over 2,000 feet at this time, and at the lowest point the ore body is as strong and solid as ever, and has every appearance of continuing so for an indefinite depth.

The foregoing remarks being given as the general characteristics of the Capelton and surrounding mineral district, the notes to follow will refer specially to the subject of this paper, "The Eustis Mine."

The Eustis Mining Co., originally the Orford Nickel and Copper Co., and later on the Orford Copper and Sulphur Co., commenced operations in 1879, on lot 2, Range, 9, Township of Ascot, nine miles south of the city of Sherbrooke, Quebec Province, leasing the shaft known as No. 5 Hartford, which was sunk to a depth of 500 feet, in the property then owned by the Canadian Copper and Sulphur Co., and now by the Nichols Chemical Co. of New York.

At that time the only means of reaching the ore bodies in the Eustis Mining Co's lands was through this No. 5 shaft, for the reason that the vein crops out on the surface about 200 feet north of their line, and crosses it at 500 feet from the surface, measuring along the slope of the vein.

Under these circumstances—being at the mercy of a foreign corporation, who might at any time refuse to renew a lease of their shaft, and so stop all operations, and for other important reasons—it was decided to take steps to confine all operations within the company's own boundaries, and to do so it was necessary either to sink a vertical shaft to strike the vein, or reach it by a cross-cut into the mountain. After mature deliberation, a cross-cut or tunnel, as it is called, was agreed upon as the best method, and subsequent operations have confirmed the soundness of this decision.

This tunnel is nearly 1,000 feet in length, about seven feet high, by seven feet wide, and has a descending grade from the inside of six inches per 100 feet—enough to carry off the water from the upper workings.

The vein, as already mentioned, is an interstratified bed, running in a north-east and south-west direction. The dip is to the south-east and is very irregular, in places being almost perpendicular, and in others nearly horizontal. The average slope is between 35 and 40 degrees from the horizontal. The irregularity of the dip may be accounted for at the period of disturbance by unequal pressure at different points, thus producing a partial folding of the stratification.

The hanging walls generally are smooth and regular, conforming to the bedding of the associated rocks; but in the footwall numerous depressions or crevices filled with ore occur. These are found in many different forms, sometimes having the appearance of branch veins running up and down the slope, others apparently branches running laterally across the vein, and again some are basin-shaped hollows or "squats" occasionally 20 to 30 feet deep, but all of them coming to an abrupt termination, and all showing the extreme irregularity of the bed on which the vein matter was first deposited.

Horses of country rock and boulders of greenstone are of frequent occurrence in the vein.

Four trap dykes running almost parallel with each other in a N.E. by S.W. direction, cut vertically through the vein, but do not disturb or affect it in any way, a proof that they have had their origin subsequent to the formation of the vein, and in all likelihood since the stratification was tilted up into its present position.

Slides or displacements of the vein are met with in three places, one of them being an up-throw of 25 feet, the others causing displacement of only one or two feet. These do not change in any way the general characteristics of the vein or vein matter, and are also disturbances which have taken place since the stratification assumed its present position.

The ore occurs in large bodies or lenticular masses, narrowing down laterally to small dimensions. The vein is continuous between these masses, but is too small to work and is besides usually low grade in quality.

The deposit being worked has a length of about 350 feet, and varies in width from 3 feet at the extreme ends to over 60 feet at the widest part of the chamber.

The ore is copper pyrites, and varies in copper contents from 2 to 30 per cent. The sulphur varies also according to the amount of copper and silica in the ore, some samp-

S. S. Spafford, Capelton, Manager
Nichols Chemical Co.

Mr. John Blue, Capelton, Que.
Manager Eustis Mines.

Mr. J. S. Mitchell, Sherbrooke,
(Beaver Asbestos Co.)

les showing 48 per cent. and others only about 30 per cent. An analysis of an average sample of the whole deposit would show about 42 per cent. of sulphur, 4 per cent. of copper, also 3 ozs. of silver, and about 40 cents worth of gold per ton of 2000 lbs.

The ore is bi-sulphide, burns very freely, and is admirably adapted for making sulphuric acid.

The method of mining now in use was adopted to suit the peculiarities of the deposit, and differs from the ordinary plan of sinking shafts, driving drifts, sinking winzes, etc., in that two shafts are sunk in the ore body on the slope of the vein, about 175 feet apart, each of them carrying down from 40 to 50 feet in length of the vein, and the full width from foot to hanging wall: the shaft work in this way being practically underhand stopeing. The

Mr. F. P. Buck, (Chairman Local Committee), General Mining Associatien of Quebec.

shafts diverge from the same landing till the necessary distance between them is obtained; from this point a curve in one shaft allows of their running parallel to each other.

The reserves of ground opened up by this system of sinking consist of the body of ore between the two shafts about 125 feet in thickness or length, and the two bodies outside of the shafts, each from 50 to 75 feet in length.

The advantage claimed for this system of working is economy—first in sinking shafts, always an expensive part of mining work, but in this case costing it may be said absolutely nothing, as the ore can be obtained from the shaft work at as little cost as from any stope in the mine of the same character. Again, drifts are dispensed with except in special cases, such as connecting the shafts for ventilation, for exploratory purposes, or for some peculiarity of the formation, and winzes or rises are unknown except in the case of working around pillars.

The reserve ground is worked out by breast and underhand stopes; back stopeing being resorted to and only possible from the exploratory or ventilating drifts.

The skip tracks are protected from the blasting operations by heavy timbers, lagged to the hanging wall and put in alongside the tracks and running parallel with them. These timbers are necessary in any case, as the hanging rock is of a slatey, seamy nature, liable to wind and break off when exposed to the action of air and moisture.

One of the objections to working out the deposits by the usual method of drifts and winzes, is the closeness to each other that it would be necessary to have these drifts or levels; this being caused by the irregularities in the footwall, and the numerous steps or flat places on which the broken ore would lodge, making it necessary in many cases to handle the ore several times before it finally reached the levels.

With the system in use each or any of these steps may be utilized as a level, along which the ore is conveyed to the plats or bins at the hoisting tracks. About the only serious objectionable feature in the method of working is the difficulty in keeping the skip tracks in place in the bottom of the shafts, these being frequently broken or displaced by the blasting operations, although protected by heavy timbers. But this difficulty is more than counterbalanced by the many advantages of the method, of which the easy handling of the ore after it is broken, is one—this being practically loaded from the blasts into the cars.

The roof of the mine is supported by pillars of ore left standing in suitable places, and also by timbers, but the grouud is usually firm and solid and easily held in place, except in places where the strata is cut through by slides or dykes, and at these points heavy ground is always met with. In all other places protection is needed only from the bands of slatey rock that are partially loosened by blasting and exposure to air and water.

The mining work is all done on the contract system—all contracts being renewed at the beginning of each month. By this system, the miners having to pay for all the supplies they use, economy is ensured, and at the same time a fair day's work has to be done every day or the miners feel the effects of it at the edn of the month.

The average wage made by miners is from $40 to $50 per month, and occasionally $60 is made—the difference being due to the greater or less skill and abiljty of the men in their way of working.

Labourers are paid at the rate of $1.25 per day of eight hours—three shifts being worked in the 24 hours.

There are about 200 hands in all employed in and out of the mine. Of these about 20 are boys employed in ore dfessing.

The mine is remarkably free from water; five or six hours pumping per week keeping it dry. The pump used is a Deane, with 6in. cylinder and 10 in. stroke. The suction is 3in.; discharge, 2in.; vertical lift, about 175 feet.

Nearly all of the water comes from the surface and upper stopes, and the greater part of it is caught and carried out of the tunnel without pumping. The bottom of the mine is so dry that miners occasionally have to carry down water for drilling purposes.

The water is so strongly charged with acids and copper in solution, and is so destructive to iron, that it is necessary to have the water end of the pump, piston, piston rods, etc., made of brass.

The water, when it leaves the tunnel, is caught in troughs and run over scrap iron, on which the copper in solution is precipitated. About two tons of cement, carrying 50 to 60 per cent. of copper is collected in this way yearly.

Two air compressors, one a straight line Ingersoll, 20in. x 30in. cylinder, the other a Rand compound 14in. x 22in. cylinder with condenser, and each of 10 to 12 drill capacity, furnish the compressed air for drilling. Rand and Ingersoll-Sergeant power drills are used, and eight of them are kept running night and day.

Hand drilling is resorted to only in very small veins or inaccessible places.

The compressors with two boilers 18 ft. by 6 ft. diameter to run them are set up outside the mine, and the air carried from them through the tunnel and down the mine in 4½ and 4 inch pipes to a point where it is diverted in smaller pipes to the different workings.

The mine is ventilated by diverting the air which goes in through the tunnel, and confining it by a tight brattice or dividing along the west side of the mine till it reaches the working stopes. It is there scattered through the workings and naturally finds an exit on the top of the mountain through Nos. 5 and 7 shafts. The exhaust from the drills also contributes to the ventilation of the mine.

The hoisting machinery is all set up in the mine at the inside end of the tunnel, and consists of two engines with 14in. x 26in. cylinders, coupled on to opposite ends of the main shaft. Three drums 6ft. 6in. in diameter are geared to this shaft, two of them being in use, and the third kept as spare in case of breakage. Two boilers 4ft. x 16ft. furnish the steam to run the winding engines. The smoke from the boilers and the exhaust steam is carried up to the surface through the old workings of No. 5 shaft, partly in an iron smoke stack 26ins. diameter, and partly in two columns of vitrified clay pipe, each 18ins. diameter. The total length of this chimney is 520 feet.

The rope used on the winding drums is made of the best crucible cast steel. It is 1in. diameter, has six strands with 7 wires in each strand, and hemp centre. The breaking strain is 25 tons; load about 4½ tons.

The skips or ore cars in use are made of steel, 5ft. long, 3ft. wide and 2½ feet deep, and hold about two tons. These cars are taken directly from the landing by horses, and hauled to the dressing shed, a distance of about 2,000 feet. The ore is dumped out of the cars on to a series of screens, which size it into roughs, pickings and fines. The rough ore and pickings are dressed by hand, the latter being first washed. The fines, which includes all that goes over a ¾in. screen, is taken to the jigging plant, and is first put through a revolving screen, dividing it up into coarse pea from ¾in. to ½in.; fine pea from ½in. to ¼in.; and fines, taking in everything under ¼in.; each size being put through their own jigs and shipped separately.

The ore, after dressing, is taken directly in cars carrying about 9,000 lbs., to the Boston and Maine railway siding, and is there loaded into cars for shipment. The distance from the dressing shed to the railway is 2,200ft., and in that distance there is a fall of 180 feet. In the first 400ft. from the shed, the cars are let down 80ft. by means of a counterbalance tramway, the loaded cars going down taking the empties up. The rest of the way has a descending grade of 4½ft. per 100, down which the loaded cars run by their own gravity—the empties being hauled back by horses.

The ore is all shipped in the raw state to different places in the United States, and the first treatment is in converting the sulphur contents into sulphuric acid. The cinders from this process are then smelted and refined, the copper, silver, and gold being all extracted in the final process.

The output of the mine at the present time is at the rate of about 3,000 tons of dressed ore per month, and has averaged this quantity for a year or two back.

The mine, since it was first opened, has produced somewhere about half a million tons of ore, and judging from the general appearance of the vein in the bottom, it will in all likelihood produce as much more, and possibly be a long way from being worked out then. At any rate there is in sight in the mine to-day over one hundred thousand tons of ore, and the vein in the bottom of both shafts is strong and solid as it ever was.

If there is anything in the old miner's theory that a vein continues in depth as far as it does in length, then the ore that may be expected to be produced will have to be counted by the millions of tons.

There is a smelting plant on the property, but it has not been in use for some years, consisting of roasting ovens of a capacity of 1,200 tons a month; two water jacket cupola furnaces, with engines, boilers, fans, etc., capable of smelting 2,000 tons of ore monthly.

MR. J. R. WOODWARD moved a vote of thanks to Mr. Blue.

MR. S. L. SPAFFORD, seconded.

THE SECRETARY then read the following contribution from Mr. A. A. Dickson, Toronto, on the subject of:

Peat Fuel by the Dickson Process.

Peat is a vegetable substance and is produced in several ways, viz:—By the decomposition of forests, by the growth and decomposition of grasses, and the decomposition or disintigration of the Sphagnum moss, but the best and purest peat found in Canada is produced from the Sphagnum moss which grows on ponds and comparatively shallow lakes.

Peat produced by the latter process forms very rapidly, the moss making very rapid growth, and can be found in bloom at the top while it is disintigrating or decaying at the bottom. This moss grows on the top of the water and as it is gradually disintegrated by the action of the water its own weight makes it gradually sink, and if the growth is old and the depth of the water in the lake not too great it will in time descend to the bottom. It is not generally known that the average peat bog is floating on the top of the water like a plank or board, sinking only as its own weight increases, but such is the case. I know of one large bog in the province of Quebec, covering about one thousand acres, which some seventy-five years ago was an open lake. I have conversed with an old resident who when he was a boy used to fish and shoot water fowl on the then lake. At the present time there are three lines of railway running through it. Such has been the rapid

Mr. John M. Jenckes (Secretary Local Committee), General Mining Association of Quebec.

growth of the Sphagnum moss. In some places the peat reaches a depth of nine or ten feet, the whole, with the exception of that portion close to the shores, floating on the top of the water.

Its Calorific value as a fuel.—The elements of peat are essentially the same as coal, save and except the sulphur and phosphorus, viz:—carbon, hydrogen, oxygen, and nitrogen. Its freedom from sulphur and phosphorus is a very essential matter, especially for the smelting of ores. It does not require coking or reducing to charcoal, but can be used direct from the machine, although it will stand to be coked and charcoaled equally well with coal. It is extensively used in an air dried state only in Norway and Sweden for the reduction of iron ores, and some of the finest brands of iron are smelted with peat. It makes

more homogenous iron than coal, being very similar to a charcoal iron. In some of the European countries it is being used exclusively for railway purposes. They find it cheaper than coal, the only disadvantage being its bulk. They require specially built vans to carry it in its crude state. It is very dirty to handle as well as bulky, but its freedom from clinkers and cinders and the absence of sulphur, which creates sulphurous acid to eat up the fine boxes and grate bars, is very important. In an experiment made on the Grand Trunk Railway some years ago, the details of which I have before me, air dried peat, containing 20 per cent. of water compared favorably with bituminous coal. The peat stood 80 as to 100 of coal, or one ton of peat being equal to four-fifths of a ton of coal. Compressed peat is however so far ahead of the old air dried material that it may be classed as coal. Its specific gravity is 1.49 weighing 93 lbs. per cubic foot, anthracite coal weighing 93.5 lbs. per cubic foot, its specific gravity being 1.5, and bituminous coal weighing 86.89 lbs. per cubic foot, its specific gravity being 1.39—thus it will be seen that peat produced by the Dickson process will not occupy any more space than the best grades of coal; consequently it will be readily seen that the one great objection which has prevented the more universal use of peat for fuel has been entirely overcome and done away with. In a very severe test made at the John Abell Engine Works, in Toronto, the details of which I have before me, 457½ lbs. of Dickson's compressed peat was tested against an equal amount of anthracite lump coal. The test was made on a coal burning grate which is not quite suitable for the burning of peat, inasmuch as the surface is entirely too large. The temperature of the boiler house when the peat was used stood at 69 above zero; when the coal was used it stood at 82 above, making a difference in favor of coal of 13 degrees. When the peat was used the weather was dull, when the coal was used the weather was bright and sun-shining,—this to those acquainted with steam is a very material difference in favor of the coal; notwithstanding, the 457½ lbs. of compressed peat kept steam up steady at 85 lbs, exactly two hours, while the anthracite coal kept it steady at 85 lbs. for two hours six and one-half minutes only. Under similar conditions of temperature, with the proper type of grate, peat would have done as well if not better than the anthracite coal.

Compressed peat fuel produced by the Dickson process is equal to coal in its specific gravity, equal to coal in its calorific power, free from cinder and clinker, cleanly to handle, free from sulphur and phosphorus, contains all the volatile combustible elements found in the bog, cheaply and easily produced, filling the greatest want of the present day. We are looking forward to this new industry keeping millions of dollars in our own country, which at the present time is sent to our neighbors on the south of us; for whom however I entertain the highest regard, but until a closer union is established between the two countries, politically or commercially, we must look to the welfare of our own people. Time will not permit me to go further at present, but if you so desire it I will be pleased to furnish more particulars at another time.

On motion of the Secretary, a hearty vote of thanks was tendered to Mr. Dickson for his contribution, and to Mr. F. P. Buck and his associates of the local committee, for the admirable arrangements made for the reception and entertainment of visiting members of the Association during the meeting.

Excursion to Lake Memphremagog.

On Friday morning visiting members and their lady friends, together with many prominent citizens of Sherbrooke, in all a party of some seventy ladies and gentlemen, participated in a delightful excursion to Newport and lake Memphremagog. Leaving Sherbrooke by the Boston and Maine Railway at eleven o'clock the party reached Newport at noon, dinner being served on arrival in the Memphremagog House. The wants of the inner man having been satisfied, the party embarked on the steamer "Lady of the Lake," which had been chartered for the occasion, and the remainder of the afternoon was spent in the pleasures of a cruise about the lake, the enjoyment of the great picturesque beauty of the scene being greatly enhanced by splendid weather, the bright sunshine being tempered by delicious breezes. A brief stop was made at the foot of the Owl's Head mountain, where the photograph, which we reproduce on another page, was taken. Dancing, too, was heartily indulged in to excellent music provided by a string band. Returning to Newport, the party spent an hour or two before train time, in the enjoyment of a dance at the hotel, or in strolling about the beautiful American summer resort. Everyone returned to Sherbooke benefitted by the enjoyment of an excellent outing, and with a keen appreciation of the care and forethought displayed in all the arrangements made in behalf of the members and their friends, by the local committee.

Coal in Newfoundland –During the past year, according to an official report, valuable seams of coal have been found in the vicinity of St. Georges Bay. The strata in this district have previously been thought to belong to the Carboniferous limestone and Millstone grit series. Sir William Dawson thinks that these seams are similar to those of Eastern Cape Breton, with which they may be continuous under the gulf. A thickness of 27 feet of coal has been discovered, and analysis shows that it is similar in quality to the Cape Breton coal. Large deposits of magnetite exist in the same locality.

SUMMER MEETING AND EXCURSION

—OF THE—

Mining Society of Nova Scotia.

An attractive programme and splendid weather was the means of drawing together a large and representative attendance of the mining men of Nova Scotia at the summer meeting of the Mining Society, which opened at New Glasgow on Thursday, 29th June.

The principal feature of the proceedings on this date was an excursion to the iron mines and works on the East River of Pictou, Pictou county, operated by the New Glasgow Iron, Coal and Railway Company and the Pictou Charcoal Iron Company. The main party arrived by the Halifax train at Ferrona Junction shortly before twelve o'clock, where it was augmented by the Stellarton and Westville contingent headed by President Poole. Here, too, Mr. Graham Fraser, Mr. John F. Stairs, M.P., Mr. D. C. Fraser, M.P., along with other prominent members of the New Glasgow Iron, Coal and Railway Company were waiting to receive and escort the members to the various points of interest. A short run over the East River Railway brought the party to Bridgeville, where a stop was made at the recently constructed works of the Pictou Charcoal Iron Co. On entering the large Cast-House of the Company, one was astonished to find it gaily decked with flowers and evergreens, while a long table fairly groaned with the burden of good things thoughtfully provided by way of luncheon by Mrs. Fraser, Mrs. Chambers, Mrs. Sjoztedt and other kind ladies interested in the works.

Among those at the table we noticed: John F. Stairs, M.P. (President New Glasgow Iron, Coal and Railway Co.), Halifax; D. C. Fraser, M.P., New Glasgow; Hon. J. W. Longley, Attorney-General for Nova Scotia, Halifax; Hon. A. C. Bell, New Glasgow; His Worship Mayor Jennison, of New Glasgow; Dr. E. Gilpin, Jr., Deputy Commissioner and Inspector of Mines, Halifax; H. S. Poole (Acadia Coal Co.), Stellarton; John E. Hardman (Oldham Gold Co.), Oldham; T. R. Gue (Acadia Powder Co.), Halifax; James Baird (Canada Coal and Railway Co.), Maccan; R. G. Leckie (Londonderry Iron Co.), Londonderry; C. Fergie (Intercolonial Coal Co.), Westville; J. G. Rutherford, Jr. (Acadia Coal Co.), Stellarton; B. C. Wilson, Waverley; George W. Stuart (Truro Gold Co.), Truro; Duncan McDonald (Truro Foundry and Machine Co.), Truro; Wm. Small (Londonderry Iron Co.), Londonderry; E. A. Sjostedt (Pictou Charcoal Iron Co.), Pictou; G. F. Moncton, Sherbrooke; Simon A. Fraser, New Glasgow; Jas A. Fraser, New Glasgow; J. D. MacGregor, M.P.P., New Glasgow; M. Fitzpatrick, New Glasgow; H. M. Wylde, Halifax, *Secretary*, and B. T. A. Bell (CANADIAN MINING REVIEW), Ottawa.

After ample justice had been done to the excellent collation, and the members had lit up their cigars, Mr. John F. Stairs, M.P. (who presided), gave the usual loyal and patriotic toasts, which were responded to right royally. He then gave the "House of Commons."

MR. D. C. FRASER, M.P., acknowledging the toast, referred to the importance of the development of the iron industries of the province, and to the substantial progress that had recently been made by the companies whose hospitality they were enjoying that day. He dwelt particularly on the good work accomplished by Mr. Graham Fraser, the Managing Director, and his associates of the New Glasgow Iron, Coal and Railway Company.

HON. J. W. LONGLEY, in replying to the toast of the Government of Nova Scotia, said. You have all doubtless heard of Artemus Ward and his skeleton. Artemus was taking a show to Australia, but on the way out on account of the sea air and the excellent provisions, the skeleton got so fattened up that Artemus was compelled to exhibit him as a fat man. His position to-day was somewhat similar. This morning he had started out to visit the Normal School at Truro, but on the way down educational matters had been lost sight of, and in the company of a genial lot of miners he had been fattened up with discourses on mining and the resources of the province. He was glad to have this opportunity of personally inspecting the iron industries of this section of the country. A person making a dismal effort to maintain a conversation with an old maid, after a deathly pause enquired as a starter, "Did you ever see Niagara Falls?" Whereupon she drew herself up primly and replied, "No, I have never seen them, but I have heard them highly spoken of." He had never seen the works at Ferrona and Bridgeville, but he had heard them highly spoken of, and he thought it his duty to be present. The Chairman had placed him in rather an embarrassing position. He had referred to him as an after dinner speaker, and that too when the usual conditions were absent—this being a Scott Act county. (Laughter.) Such an occasion would doubtless call forth the eloquence of his friend Mr. MacGregor, who had been more used to this kind of diet. (Laughter.) The Government of Nova Scotia had rendered some assistance to the iron industry by the construction of the railway over which they had passed to-day. It had done so not in any sense as a favor to the company, but simply because the work of the development of our great iron resources was one which demanded prominent recognition, and in the name of the people and the government of Nova Scotia, he desired to express entire satisfaction with the great progress that had been made. When any work or enterprise of this character is undertaken in any portion of this province the government was free to give to others the same measure of assistance that had been granted to this company. Nova Scotia was a small province, containing between four and five thousand inhabitants, but within its borders were the possibilities of a great industrial and mineral development. With coal and iron and fluxes in abundance side by side, gold in paying quantities, and a large variety of other economic minerals, the possibilities of the future of the province were great. The time had come when the people of the province should realize a sense of the great obligation that is cast upon them to develop these resources. We must dare to be great—to be something more than a province of 500,000 people. Nova Scotia should be made the centre of the greatest mining and manufacturing industries of this continent. He concluded by asking them to drink success to the New Glasgow Iron, Coal and Railway Company.

Mayor Jennison and Mr. Graham Fraser followed.

THE CHAIRMAN, in proposing the Mining Society of Nova Scotia, referred to the beneficial effect the organization had in fostering and developing the mineral wealth of the province. It had, he said, a tendency to encourage investors in mines and capitalists to embark in the various mining enterprises of the province.

MR. H. S. POOLE—The organization which I have the honor to represent is a young one. It is on trial. It has come into the County of Pictou to ask for your suffrages and your consideration. We have been in existence over a year, and have made good progress. I feel assured that the Society is recognized as a possible unit of some weight. He thanked them in the name of the Society for the very hospitable reception that had been tendered them, and for the hearty manner in which the company had responded to the toast.

HON. A. C. BELL referred to the growth of the mining industry in Pictou County. It was pleasing to the citizens of New Glasgow, he said, to see some realization of what had been in their early days dreams exceedingly vague of what the county might some day become. In his early days the people were accustomed to compare New Glasgow on the East River with its namesake on the Clyde. A few years ago where the steel works now stand there was nothing but green trees. The coal trade had grown. The building of iron vessels was now one of the industries of New Glasgow. In conclusion he eulogised his old school fellow Mr. Graham Fraser, who by his courage and ability had done so much to promote the establishment of the iron industry in the county.

The toast of "The Ladies" was responded to by Mr. B. T. A. Bell and the Hon. J. W. Longley.

MR. H. S. POOLE in a few well chosen words referred to the work done by the Pictou Charcoal Iron Company, and proposed a vote of thanks to the company for the use of their buildings on the occasion, and for the invitation to inspect their mines and works.

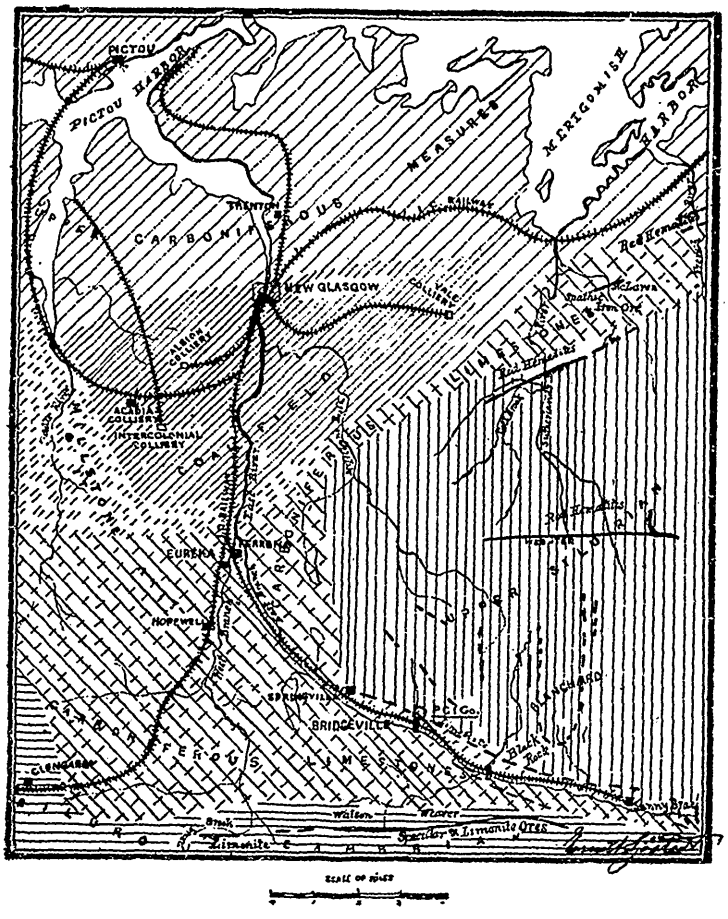
Mr. E. A. Sjostedt briefly acknowledged, and the proceedings terminated.

Visit to the Charcoal Iron Works.

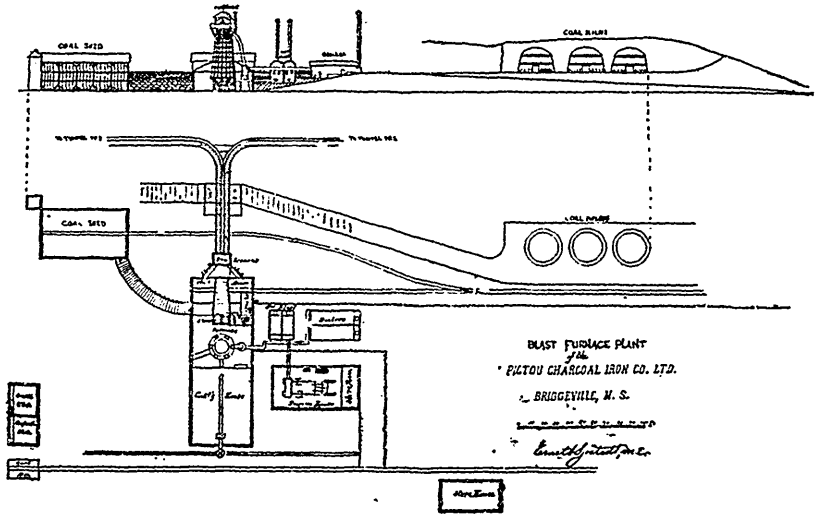
Immediately after the luncheon the members were escorted by Mr. E. A. Sjostedt, the Manager, to the mines, kilns and furnace plant recently erected by the Pictou Charcoal Iron Company. The company was organized in 1891 with an authorized capital of $200,000. Mr. W. B. Moore, of New Glasgow, is President, and his associates in the enterprise are all local men.

The iron ores on the north side of the East River of Pictou have been opened up in several places between Springville and Sunny Brae, and are at present worked by the company in two places on the Grant farm at Bridgeville, and by the New Glasgow Iron, Coal and Railway Company, both at Bridgeville and at Black Rock. They are contact deposits between the carboniferous limestones and the upper Silurian measures, and consist of brown hematites, "residuel precipitated found from the disintegration of the older Silurian rocks above," more or less mixed with pyrolusite in form of nodules and mosses, mostly in the hanging wall, but also as veins or crystals in the deposits themselves. On the south side of the river there are the Weaver and Watson speculor ores, but these have as yet not been worked.

The ore deposits worked by the Pictou Charcoal Iron Company being situated but a few hundred feet from the furnace, on a hillside of an elevation of about 100 feet above the same, the mining and handling of the ore is rendered especially easy. Two tunnels have been driven, one on the east and one on the west side, back of the furnace. The latter, or "A" tunnel, goes through a seam or vein of gravel ore easily mined, ano 10 to 15 feet in width. After being driven in about 500 feet, a slope was driven up through the ore, at an incline of about 45 degrees south-west, to the surface 60 feet above, which showed up a large body of ore, in some places 18 feet wide.



Showing location of New Iron Mines and Works at Ferrona and Bridgeville, Pictou County, N. S. visited by the Members of the Mining Society.



The ore in No. 2 tunnel is of an entirely different character, being fibrous and compact, and requiring blasting. It is besides richer in metallic iron, nearly free from manganese. This ore was first worked by an open cut on the top of the hill, as it displayed a remarkable deposit of solid limonite, yielding 58% metallic iron, and three to four thousand tons were removed. About 60 feet below this cut the company has now driven a tunnel about 200 feet in the same kind of ore, besides an air shaft (at an incline with the dip of the ore of about 60 degrees) and three different levels, all in ore from 10 to 15 feet wide.

The following analyses will serve to give an intelligent idea of the above mentioned ores:—

	Gravel Ore from No. 1 Tunnel.		Gravel Ore from No. 2. Tunnel.	
Insoluble matter....	12·80	6·75	8·58	5·58
Metallic iron.....	45·02	53·41	54·83	56·57
Metallic manganese.	1·56	1·88	0·20	0·20
Comb water..	9·45	11·02	10·00	10·90
Sulphur..	0·05	0·04	0·41	0·09
Phosphorous.....	0·12	0·02	0·03	0·21

The variation in manganese and sulphur is, however, even more marked than the above figures indicate, as crystals of pyrohsite and barite are met with here and there among the ore, without any regularity or warning. The intention of the company is to wash and roast the ore before using it in the furnace; but at present it is simply heap-roasted with wood and charcoal braize at the end of the tunnel track. From here it is afterwards carried on the tramway tracks to the chute above the stack house, and being here dumped on iron rails, placed about two inches apart, and broken sufficiently to pass through these, it falls in a wire netting (10 gauge 3 x 3 mesh) down in the stack house, whereby the dry clay to a large extent is screened through the ore.

The limestone used for flux is quarried at Springville, and is hauled three miles to furnace, costing about 85 cents per gross ton delivered. It contains about 94·0% carbonate of lime, 2·5% carbonate of magnesia, 2·0% insoluble matter.

The buildings consist of offices, stables and store houses, carpenter and blacksmith shops, a coal shed (with a capacity of 40,000 bushels), casting house, stack house and engine house. The shops and furnace buildings are all covered, roof and sides, with currugated iron, painted on both sides with mineral paint. The working plant proper consists of the following structures: The furnace stack is 50 feet high with 11 feet bosh and 7 feet diameter under the hill. The conventional iron shell has been dispensed with and substituted by a cinoline strapping and red brick shell. This, together with the 15 inch fire brick lining is supported by six cast iron columns, and the bosh is surrounded by a boiler plate mantel, and the hearth by a water cooling cast iron jacket. The tuyers, 6 in number, are of bronze and set in water coil breasts. The down-comer has a diameter of 36 inches, and the bustle pipe 15 inches. The top of the furnace is provided with a Weimer patent friction winch and gas seal for facilitating an even distribution of the stock, and to prevent waste of gas. The hot blast is a modified Cooper-Durham cast iron stove, with 30 V pipes, built in two sections and provided with two combustion chambers side by side, and so arranged that the cold inlet and the outlet of the heated blast, as well as the two combustion chambers, are placed in the same end of the stove. This arrangement was successfully adopted by the manager some years ago at Katahdin iron works mine. Besides economizing space and blast and gas connections, it facilitates maintaining the blast at a high temperature with a small amount of fuel gas, the 2,000 feet of heating surface sufficing to keep the 3,000 cubic feet of air per minute (engine measure) up to 750 degrees to 800 degrees Fahr. The boilers are four in number (30 feet x 36 inches), made of best ⅜ Dalzell steel, and built in sets of two with separate draft stacks, and independent steam and water connections, and provided with gas valves and combustion chambers similar to those in the hot blast. besides separate grates for wood or coal, in case of shortage of gas. The blowing engine consists of two horizontal blowing cylinders of 5 feet diameter and 5 feet stroke, and a pair of horizontal steam engines, 18 inches by 36 inches each, capable of performing the work in case of necessity.

The elevator comprises a double Whitney hoisting machine and two Wood & Co's safety cages. These, as well as the limestone breaker (a Forster "crusher and pulverizer") are run by belt from a horizontal steam engine of about 15 h. p. capacity. For the handling and weighing of the stock and the pig iron, Weimer patent steel charging barrows and Richle's furnace charging and pig metal scales are used.

Water supply has been provided for by building a 25 foot dam on the Mill Brook, from which the water is conducted 700 feet through 3 inch wooden pipes to the furnace, besides which a reservoir is built (at an elevation of 75 feet above the foundation level of the furnace) for collecting the spring water from the hills above, as well as the water pumped from the river; in case of lack of water from the above mentioned sources. A Northey duplex steam pump (7½ inches s.c. x 4½ inches w.c. x 10 inches s.t.), is performing this work, and a series of iron pipes are laid to the reservoir, and to different parts of the work, and fitted with valves, hydrants and hose connections in case of fire.

For the carbonization of the wood, 19 brick kilns have been erected at different places. These are of the round (bee-hive) type, each holding 50 cords of wood, and capable of carbonizing 1,200 cords per annum, which will produce 5,000 bushel of coal. Those built in the woods are of the Plattsburg (conical) type, each holding about 30 cords, with an annual capacity of 700 cords of wood, or three thousand bushels of coal. The present coaling capacity is, therefore, about 500,000 bushels per annum, requiring about 1,300 cords of wood. Three more kilns will be built in the spring of 1893, making the total capacity about 600,000 bushels of charcoal, which is the estimated requirement for producing 5,000 tons of pig iron a year.

The wood used for the charcoal making is principally yellow birch, also beach and maple.

Visit to the New Works of the New Glasgow Iron Coal & Railway Company.

After the members had satisfied themselves by a thorough inspection of the works of the Pictou Charcoal Iron Company, the party re-entered the cars and enjoyed a run to the present terminus of the East River railway at Sunnybrae, (a line built by the New Glasgow Iron, Coal & Railway Co.). A brief stop was made at the limestone quarry whence the company derives its fluxes, and then the return trip was made to the new plant at Ferrona. The New Glasgow Iron, Coal & Railway Company was incorporated with an authorised capital of $1,000,000, in 1888 its charter being granted by Act of the Legislature of Nova Scotia. The directors are John F. Stairs, M.P., Halifax, President; Mr. Graham Fraser, New Glasgow; Mr. Frank Ross, Quebec; Mr. John McNab, Halifax; Mr. G. F. McKay, New Glasgow; Mr. J. W. Allison, managing director. It controls in fee simple and under lease a large area of mineral lands on the East River. The ores mined are brown and red hematites and specular iron ore. Last year the furnace, which is situated at the forks of the east and west branches of the East River, (within easy distance of the Pictou coal fields) was completed. It is 65 ft. high; bosh, 25 ft. 6 in.; hearth, 9 ft. 9 in. Its yield when running to full capacity is about a 100 tons a day. The establishment is fitted with all the most modern plant and appliances, including a battery of coke ovens of the Coppee pattern said to be the first of the kind built in America.

We present our readers with a drawing showing exterior view of the works, and in our next issue will devote some space to a more detailed description of the buildings machinery and equipment. Altogether the company employs at present about 400 persons. The output just now is understood to average about 80 tons of high grade iron per day. A considerable quantity of the product is consumed by the Nova Scotia Steel & Forge Co., New Glasgow, (in which members of the company are largely interested) and other provincial foundries. The members of the Society visited in turn the ore washing plant, the cast house, engine and boiler rooms, coal washing equipment, coke ovens, etc., and all expressed themselves as highly pleased with all that they had seen. A little after six o'clock the members took train for New Glasgow where the main body registered at the Vendome.

Reception in New Glasgow.

In the evening the members gathered in Bell's Hall, New Glasgow, where by invitation of the local committee a goodly company of ladies and gentlemen from New Glasgow and neighborhood had assembled to meet them. The platform was tastefully decorated with plants, while the walls were hung with various maps, plans and drawings. Among these were noticed the original plans and profile of the Albion Mines Railway, made by Peter Crerar in 1834, together with his designs for bridges, culverts, etc.; also a large scale map of the Pictou coal field prepared by the Geological Survey of Canada in 1869, together with another made from investigations by Mr. H. S. Poole, M.A., F.G.S., and other members of the staff of the Acadia Coal Company, showing many changes and corrections in geological data presented by the old Survey map. An interesting display of safety lamps, gas testing apparatus and other mining exhibits claimed attention. These were in charge of Mr. J. Geo. Rutherford, Assistant Manager of the Acadia Coal Company and a staff of assistants, and included;—

I. Biram's Anemometer in use 40 years ago.

II. and III. Biram's Anemometer in use at present time, and Davis' Patent Self-timing Anemometer.

IV. Liveing's Patent Gas Indicator for detecting small percentages of fire damp by means of electricity.

V. An old compass used for surveying the mines many years ago.

VI. A ⅞ in. chain which had sustained a weight of 6 tons, 7 cwt. without breaking.

VII. A ½ in. wrought tube rent by an ordinary detonator exploded inside.

VIII. Samples of the various wire ropes, ordinary rope, Lang's lay and Elliot's patent locked coil.

IX. The apparatus for use in deleterions gases, consisted of a smoke absorbent. B. Loeb's patent breathing arrangement, and the Fleuss breathing dress, consisting of a steel cylinder into which oxygen is compressed up to 260 lbs. per sq. in., affording a supply sufficient for four hours. Over the cylinder is a filter divided into four compartments and filled with alternate layers of tow and caustic soda. The exhaled air passes through this filter, the carbonic acid gas is absorbed by the caustic soda (the tow being present simply for dividing the air), and the residue passes into a bag of about 40 cubic inches capacity placed on the chest, and is here replenished with fresh oxygen from the cylinder as occasion may require.

X. An ambulance and basket of appliances in cases of accidents.

XI. The lamps were Davy, Stephenson and Clanny, all invented about 1816-18; all the modern lamps, Mueseler, Bonneted Clanny, Marsant-Ashworth's patent Hepplewhite Gray Deputy's lamp; Pieler lamp, which burns alcohol and detects one-fourth of 1 per cent. of fire damp; Thorneburry lamp, burning a mineral oil of high flashing point, and providing a light equal to from 1 to 1½ candles, whereas the Davy gave a light of one-fifth of a candle, and lastly, portable electric lamps both primary and secondary.

XII. A small portable low-tension exploder for firing shots in the mine.

XIII. A patent multiple wedge for bringing down coal.

XIV. A patent self-lubricator for box wheels.

On motion of Mr. H. S. Poole, the Hon. A. C Bell was moved into the chair.

HON. A. C. BELL said: Ladies and gentlemen, I congratulate myself on being honored in presiding over a meeting of citizens of New Glasgow, whose privilege it is to welcome to our town the Mining Society of Nova Scotia. I congratulate the citizens on the happy occasion of this meeting. They are honored by having as their guests the members of this society, and in receiving men who have gained eminence in all departments of the mining activities of the province.

To-night we welcome those who have taught us how to extract the all powerful yellow metal from that portion of our province which seems to offer least for the benefit of man, and to be of almost no value to the country. Gold is powerful, but more powerful is wealth of iron and coal, and to-night we have the honor of receiving as our guests the men who have achieved success and acquired distinction in the large operations of our collieries and iron works.

Our province owes much of its wealth and much of its position in the Dominion and in the world to the labor of the mining engineer, and we may well congratulate ourselves that we are favored at one of its earliest meetings to receive the members of this, the Mining Society of Nova Scotia, as our guests. Not great agriculturally, Nova Scotia must acquire wealth, population and position through the development of her mines and manufactures and her fisheries, and our progress as a people depends directly on the amount of brains and ability brought to bear on the conversion of our stores of mineral wealth into commodities. In this work most important to us we will owe a great deal to the Mining Society, and to it we wish all success. The progress of this province, although not very rapid, has been steady and satisfactory, and I give a few figures to show that progress. In the last 20 years our output has increased as follows:—

Coal .....from	1,000,000	to	2,000,000 tons.
Iron Ore.. "	3,500	to	57,000 "
Gold ..... "	11,000	to	23,000 oz.
Gypsum .. "	120,000	to	160,000 tons.
Copper Ore	Nil		900 "

In Nova Scotia great progress has been made, and in Pictou County, where we now gather, much more proportionate progress has been made in the province as a whole.

Coal Mining in Pictou County on a systematic method commenced about 1818: Albion Mines, and some years later a small lot of iron ore was smelted. This experiment was not repeated. The iron manufacture in Pictou County was first commenced at the works at Albion Mines for the use of the Mining Association about 1837-39. At these shops a little work was done for the public, but public patronage was not desired.

The first foundry at New Glasgow, that of William Fraser, was opened in 1857. Ten years later Isaac Matheson commenced the foundry and machinist business, which still continues under the name of I. Matheson & Co.

In 1872 the Nova Scotia Forge Co. came into existence on a small scale, and as is well known has grown into the Nova Scotia Steel and Forge Co., with a reputation wider than the Dominion.

At about these and later dates iron working establishments for the manufacture of stoves, bridges and agricultural implements have followed one another, until now the business has assumed large proportions. There are in New Glasgow eight establishments, employing 600 hands, paying $200,000 in wages and producing $750,000 of product each year.

There are now at Ferrona and Bridgeville two plants of most improved character for the production of ordinary and of charcoal pig, thus producing in our midst the raw material for all iron working business, of best quality. There can be no doubt that in future the product of these furnaces will be more and more utilized.

For many years, from about 1825 to about 1885, for a period of 60 years, the great industry of wooden ship building was a mainstay of business in New Glasgow, but for many years no vessel has been built here. Now in this year, 1893, an iron steamer is being built in the long deserted ship yard by I. Matheson & Co., two of the members of the firm being members of the firm of J. W. Carmichael & Co., which for many years did the principal business in wooden ships. Let us hope that the steamer now building is but the first of a fleet which will make the name of New Glasgow familiar and famous in as many seas as did the old time clippers of the days of white wooden ships.

Nova Scotia has, as we are frequently reminded, great wealth of mineral, she has an ingenious, apt and well

endowed race of men, and both in body and mind these are well fitted to compete with all comers.

All she requires is trained and educated management, and capital which will come as soon as it is evident that good investments are offered. In conclusion, I have much pleasure in extending a cordial welcome to our visitors, with best wishes for the success of the Mining Society of Nova Scotia. (Applause.)

H. S. POOLE—As a native of Pictou County, it gives me additional pleasure to acknowledge this most gratifying reception you have given to our Society on its first visit to New Glasgow, and I am sure, from the address of Mr. Bell, all here who are natives of this County, cannot but be flattered with the position in which he puts us. He himself very worthily represents New Glasgow in the interests of mining at this meeting, for he is a namesake and descendant of the first practical miner who came into the county. The name of Adam Carr appears on many of our mining plans in connection with the early workings of 1815 to 1827.

As for the objects and hopes of our Society, Mr. Bell has touched on some of them, and in coming here we hope to gain your interest as well as to enjoy a pleasant outing. "All work and no play makes Jack a dull boy," we recognize, and therefore do not confine our meetings to the reading only of papers, and discussing matters of grave moment. But if we did, we have had in a paper lately read by your fellow townsman, Mr. W. G. Matheson, one of exceptional value and so practical that alone it would justify the formation of such a society as ours.

But in holding our meeting here in New Glasgow we have yet another object in view. Would you be surprised to hear we desire to have it known that we are not engaged in a criminal occupation, that we are not necessarily all criminals because of our occupation, and yet in the matter of legislation we are treated as criminals, we are not consulted in the preparation of legislation that specially affects us. We do not doubt that the alterations in the mining laws are made with the best intentions for the preservation of life and property, but the amendments made are not always practical, their bearing is sometimes wider than was intended, and we ask for your interest to have this grievance removed, that alterations in mining laws should only be made after careful consideration and consultation with those who are most interested in the mining industry.

We have here on the tables and walls maps and articles connected with our early mining history. The large plan and sections were made by Mr. Peter Crear, in 1834-8, for the first railroad built in Nova Scotia, and not only are they worthy of study on account of their age and neatness of execution, *but because they were made by one* who had never seen a railway. When they were sent to England on approval they were accepted without alteration, and Mr. Crear was put in charge of the construction. Then we have a series of safety lamps ranging from the dim Davy to the modern Thornbury, giving seven times the light and with it the strong electric portable lamps with primary and also secondary cells.

Then there is a series of anemometers, one of which is forty years old and still serviceable; and presently we shall show you the Fleuss apparatus that enables a man to enter noxious gases and yet breathe oxygen which he carries with him in a compressed state.

Or, the wall opposite there is a geological map of the Pictou coal field as it was supposed to be twenty years ago, and another map as some of us now think its structure should be shown. I am glad of this opportunity to refer to matters geological, for gentlemen connected with the promising copper industry in Cape Breton have, at this meeting joined our Society, and it is to a discovery made by Mr. H. Fletcher, of the Geological Survey (applause) that we are indebted for this addition to our mining interest.

I would again thank the people of New Glasgow for the exceedingly flattering reception given to the Mining Society of Nova Scotia.

The Hon. J. W. Longley having followed with a few appropriate remarks, the Chairman called upon the Rev. George Patterson, D.D., New Glasgow (the historian of Pictou County), who contributed the following address:—

The Early History of Mining in Pictou County.

REV. DR. PATTERSON—Coal was first discovered in this county in the year 1798, on a brook near *Stellarton, which passed through the rear of the farm* lots of the Rev. James McGregor, D.D., which fronted on the East River at the bridge and northward, and of William McKay, Esquire, which adjoined it to the north. In the same year William Fraser, surveyor, carried a sample to Halifax to the governor, Sir John Wentworth, who sent him with it to Admiral Sawyer, who ordered a small cargo to be sent to Halifax. This was done but it did not prove of good quality. In the following year occurred a contested election for the county of Halifax, then including Colchester and Pictou. The last day's polling was held at the East River, when the doctor entertained the candidates and some strangers to dinner, and as a curiosity he had prepared a fire of the coal dug out of the brook. The event excited quite an interest, partly from its novelty and partly from its bearing upon the future interests of the Province.

Soon after the doctor and some of his neighbors took out *licenses from the Government to dig coal, but he was the* first in the county to use it as fuel. He first opened a pit on what is still known as the McGregor seam; discovered on his own land, and used the coal in his house. This was as early as 1802. From that time he regularly in the autumn got out his winter's supply, and sometimes sold some. Previously the blacksmiths had used charcoal in their work, but now John McKay, of Pictou, commenced sending lighters up the river, and took the coal to town for use in his smithy, and the blacksmiths in other places followed the same course.

I may explain here that in the earliest grants of land in the Province, the mines of gold, silver and coal are reserved to the Crown. At a later date lead and copper were included in the reservations, and still later, in the year 1808, iron, and in fact all other minerals. It will thus be seen that over a large part of the country the iron deposits belong to the proprietors of the soil, but in all cases the coal mines are the property of the government, and are worked under lease from it.

In the year 1807 John McKay, squire's son, but usually known as collier, obtained a license to dig for the inhabitants and at a later date to export. The former licenses, as I understand, only authorized parties to dig for their own use. He and his father commenced working a small three-feet seam on the farm of the latter, but it soon became exhausted. They then searched farther and found what has since been known as the "Big Seam," though they did not know its value. John continued to work at this for some time, selling the coal at the pit's mouth, and sending it down the river in lighters. A demand sprang up for it during the war, to supply the garrison, navy and inhabitants of Halifax, so that in the year 1815 we find 650 chaldrons exported.

After the peace the price fell to half its former rate. Owing to this, and perhaps other causes, Mr. McKay failed, and was imprisoned, while his property was seized by *Hartshorne, of Halifax, who had been furnishing him* with supplies. The workmen being unpaid, the latter

Rev. George Patterson, D.D., New Glasgow, *(the Historian of Pictou County).*

tried to compromise with them, but they persisted in claiming full payment of what was due. Mr. Adam Carr, who was one of them, joined with Edward Mortimer, of Pictou, then one of the most influential men in the Province, and by his influence the government was induced to let the mines to the highest bidder. In that way they obtained the lease of them in the year 1818. They worked together till the death of Mortimer in the following year, when, on the 3rd of November, the lease was transferred to George Smith and William Liddel. Smith and Carr worked for a time in partnership, but afterward separated, when the latter got the whole into his possession, and continued to mine for several years, raising the coal with a gin-wheel by horse power, selling it at the pit mouth and carting it to the river, where it was sent away in lighters. By a report to government it appears that from 1818 to 1827 the amount of coal raised in each year averaged over 2200 chaldrons.

In the year 1825 the British Government leased all the reserved mines of Nova Scotia for sixty years to the late Duke of York, excepting, of course, those which had been already leased to other parties. The Duke's lease was transferred to Messrs. Rundell, Bridge & Rundell, the celebrated London jewellers, in payment of his debts, and from them to the General Mining Association, in which I believe they were large shareholders.

On obtaining their lease, they sent an agent to the Province to explore for minerals, and on his report resolved to commence operations at the East River. They purchased Mr. Carr's lease, and having about the same time secured the rights of the lessees of the Sydney mines, they thus became possessors of all the coal mines of the Province.

Early in the summer of 1827 they sent out Mr. Richard *Smith, intending to commence operations both in coal* and iron mining. In June a vessel arrived in Pictou bringing machinery and implements, with colliers, engineers and mechanics. Without delay he commenced sinking new shafts to the depth of 212 feet and erecting the proper machinery for working the coal mines on a larger scale and in a more scientific manner than hitherto. On the 6th September their first coal was raised, and on the 7th December a steam engine of 20 horse power was in operation, the first ever erected in the Province. A foundry was established in which were cast rails for a tramway, which they constructed from their works to a point a little below New Glasgow. Here chutes were erected, and vessels drawing not more than six feet of water were loaded. To load larger vessels they constructed lighters, in which the coal was conveyed to South Pictou, or the Loading Ground, as it was commonly called, at the mouth of the river. They also employed two steamers, a small one built in Pictou for the river navigation, and a larger one from England for coasting and carrying the coal to market. The first of these, which made her first trip on the 17th July, 1839, was the first steamer that ever plied in our harbor. This plan of loading being slow and tedious, they next resolved on deepening the river. For this purpose they obtained an Act of the Legislature, giving them full authority over the river, so that no vessel drawing over six feet of water was to enter it without their permission, and only on paying toll to them. But in passing the Act, the Assembly, which had resented the conduct of the British Government in transferring our mines and minerals, added a clause to the effect that the bill was not to be construed as admitting the right of the home authorities to dispose of our mines in the way they had done. In consequence of this the Act was disallowed at Downing Street, and at the same time a feeling of opposition having arisen in the country against such a monopoly, the scheme was abandoned.

The company continued therefore to ship their coal in the manner described for several years, but the demand was greater than they could supply, and the long delay of vessels in receiving their cargoes was a great discouragement to the trade. In the meantime the use of locomotives or railroads had been tried successfully in England. Accordingly it was resolved to build a railroad from the East River to the Loading Ground for the carriage of their coal in that manner. The road was laid out in the year 1834 by the late Peter Crerar, and work began upon it in 1836, but it was not opened till the 29th September, 1839. The engines used upon it, of which there were three, named the Sampson, Albion and Hercules, were built by Timothy Hackworth, who competed with Stephenson at the first trial of locomotive engines in England. They were, for their size, powerful though slow, and continued to do duty till lately. One of *them, the Albion, is now on exhibition at the World's* Fair at Chicago. This railroad, which was about six miles long, was extremely well built, but in the year 1886 the use of it was abandoned, it being found more convenient to ship over the government lines.

When the Association commenced operations, they designed to work the iron, as well as the coal deposits, known to exist on the East River. For this purpose, soon after they had completed their arrangements for raising coal, they erected a small blast furnace near the mines. They mined some ore from a bed of red hematite, at Blanchard, and collected a quantity of boulders of limotite in the neighborhood of Bridgeville, principally on the farm of James McDonald, afterward purchased by them. But the vein was not discovered, and on attempting to smelt the ore thus collected, through some defect in their mode of operation, they were unsuccessful. Efforts were made by various explorers to find the vein. The first who claimed to have found it was Dr. Honeyman, about 20 years ago, but his claim was disputed by Mr. Hartley. It was left to Sir Wm. Dawson, two years later, to define the position of the vein, which he found to be at the junction of the Carboniferous and Silurian formations. No further attempt was made to develop the ores till within the last two years, when the works at Bridgeville and Ferrona, which the Society have had to-day the opportunity of examining, were commenced.

The Association spent large sums in developing their coal mines. At that time few of the inhabitants of the Province, except in the city of Halifax or near the coal mines, used coal in their dwellings, and there were few steamers or steam engines, so that the home market was limited. But such was the demand in the United States, that their difficulty was in finding means to raise or transport a quantity sufficient to supply it.

The Association suffered much at different times from fire or explosions. The worst of these took place in the year 1832, and 1839. These involved such destruction of the works that pits which had been equipped at great cost had to be abandoned, thus subjecting the Association to heavy losses.

In the year 1856 the monopoly of the General Mining Association was abolished. This immediately led to great activity in exploring for coal. The result was the tracing of the seams toward the westward, and the commencement of mining at Westville, and at a later date the discovery of workable seams at Thorburn, and the commencement of mining there.

But our subject is the *early* history of mining in this county, and as this change introduced a new era in coal mining, our task may be considered accomplished, and the history of the subsequent development of our mining industry must be left to some future examiner. (Applause.)

On motion, a very hearty vote of thanks was conveyed *to Dr. Patterson for his very valuable contribution.* Thereafter the company enjoyed the evening in social intercourse, in examining the many interesting exhibits, and before finally adjourning in a dance.

Hon. A. C. Bell, New Glasgow.

J. Geo. Rutherford, Stellarton, N. S., Asst. Manager, Acadia Coal Co.

Mr. E. A. Sjostedt, New Glasgow, Manager, Pictou Charcoal Iron Co.

Chas. Fergie, Westville, Manager, Drummond Colliery.

Meeting in the Vendome--The Duty on Mining Machinery.

On the return of members from the Reception, a business meeting was held in the Vendome Hotel, New Glasgow. There were present: John E. Hardman, Oldham; Duncan McDonald, Truro; R. H. Brown, Sydney; C. Fergie, Westville; T. R. Gue, Halifax; Geo. W. Stuart, Truro; B. C. Wilson, Waverley; James A. Fraser, New Glasgow; Dr. E. Gilpin, Halifax; W. G. Matheson, New Glasgow; Wm. Small, Londonderry; John F. Stairs, M.P., Halifax, D. C. Fraser, M.P., New Glasgow; Hon. J. W. Longley, Halifax; B. T. A. Bell, Ottawa; and H. M. Wylde, secretary. In the absence of Mr. Poole, President, Mr. J. E. Hardman, Oldham, was called to the chair.

The minutes of last meeting were read and confirmed.

A proposed amendment to Constitution was, owing to the absence of Mr. Poole, the proposer, held over until next Quarterly General Meeting.

Mr. T. R. Gue, chairman of the sub-committee appointed to consider a statement of the various classes and kinds of mining machinery manufactured in Canada, presented his report, copies of which, before being adopted, had been mailed for revision to Messrs. Matheson Robb and McDonald and other manufacturers of mining machinery.

Mr. B. T. A. BELL having explained what action had been taken in the matter by the General Mining Association of Quebec, the statement was adopted.

Mr. JAMES BAIRD, seconded by Mr. C. Fergie, then moved the following resolution: "That the various members of parliament for Nova Scotia be requested to exert their influence to have the language of the Act relating to the free importation of mining machinery changed to read as follows: "That all tools, machinery and appliances for mining, quarrying, smelting, refining and concentrating and other processes, for the mining, extraction, and treatment of ores and minerals, of a class or kind or pattern not manufactured in Canada, be admitted free of duty, and that a copy of this Resolution be forwarded to the Honorable the Minister of Customs at Ottawa, and to the General Mining Association of the Province of Quebec."

After discussion the motion was put to the meeting and carried unanimously.

The meeting then adjourned until eleven o'clock next morning.

The Introduction of Amendments to Colliery Legislation Discussed.

Meeting was called to order in the Vendome Hotel, Friday, 30th June, Mr. H. S. Poole, President, in the chair.

Mr. B. T. A. BELL moved the consideration of the question concerning the appointment of a committee to interview the premier in reference to the introduction of mining legislation without proper consideration and hearing of proposed amendments.

Mr. G. W. STUART seconded.

Dr. E. GILPIN—I have no hesitation in saying that I do not believe in making legislation until it is first discussed from the three standpoints: 1st. The Government. 2nd. The men. 3rd. By the owners—so you would have all the different interests involved in it. In the recess of the legislature each party could come before the Government and give their views on any proposed legislation.

Mr. H. S. POOLE said—I feel very strongly on this question. We have had amendments made from time to time to the Mining Act, by parties who have had either an axe to grind or who fancied they were born legislators—legislation which it was thought would rectify more or less certain evils. I have had a finger in it myself. The reformers have sometimes seemed to think that when a man was killed in a particular way, that regulations could be provided by legislation which would prevent any accident of that character occurring again. We have had a great deal of legislation, much of which has never been put into operation. I maintain that legislation which is not put in force should be wiped out. An act of parliament should be carried out or dropped.

In 1872 when the original Mines Regulation Chapter was drafted before it came before the legislature, copies were distributed and it was discussed by those interested. That practice should be carried out with respect to amendments to both Acts. Last winter legislation was passed and the Commissioner of Mines had not an opportunity of conferring with those interested in mines; he was not consulted, the legislation was introduced entirely without his knowledge. Dou you think that that was respectful to the position which he occupies? I consider it was not. He might have said to the House, I am the Commissioner of Mines, and no legislation should be admitted into this House without passing through my office; if the Government chooses to ignore me I will not be the Commissioner any longer. It is due to me and to my position that legislation affecting mines should be submitted to me first.

The Mining Society expressed a hope that this would be done, but although that hope was not realized, I am glad for my part to think that the indifference in question was not as some suppose an intentional slight to our society. A little consideration will, I trust, make this clear to all. The snub intentional could not be for the ability to conceive it would carry with it a perception of disrespect to the Honorable Commissioner of Mines in the introduction to the Upper House of legislation touching his Department without consultation first had with him. To snub intentionally and ignore him wilfully would go together. To ignore wilfully would imply the belief in his usefulness, while all who frequent the Mines Office know the broad grasp he has of his Department and the urbanity with which all are received by him.

That he himself did not so regard it is I think evident, so also with the passing over of himself and his Department, it was no indication of the Upper House doubting his usefulness. The offence then, if you can call it one, was one of omission and not of commission. I do not think that there was any premeditated intention of ignoring this Society last winter. I do not think it was seen that to ignore our Society was also to reflect on the Commissioner of Mines, for it was tantamount to saying to the public the Commissioner of Mines is not fit for his office; we no longer trust the Commissioner or the work of his Department, and we allow anybody in the Upper or Lower House to introduce any amendment to the mining laws at the last hours of the session, let it pass and take its chances as to whether it is a fit and proper amendment to meet the cases supposed. I think the matter should be laid before the Executive Council, and that we should ask that legislation affecting one of the established Departments should not be allowed to pass when introduced by a private member after the House is in session, unless it has been previously submitted to the Government during recess and an opportunity given for those interested to consider it.

I would like very much to have the experience of Mr. James A. Fraser, because when he was a member he took a great deal of interest in the mining legislation of this county. This is certainly a matter which should be redressed.

DR. E. GILPIN—What I understand from your views is that the Government should make no alteration in the mining acts without it came from the Mines Department?

Mr. POOLE—Quite so, and that there shall be a general opportunity given for discussion and to hear the views of those affected if it be a question between men and masters, or royalty payers and the Government. Then the legislation should be endorsed by the Department of Mines. The antagonistic parties should have an opportunity of being heard before it is introduced on the floors of the House. It has been disrespectful to the Government, it has been disrespectful also to the Commissioner of Works and Mines, that the work which should specially appertain to his Department has not passed through his hands.

Mr. JAMES A. FRASER—I would suggest that in view of any legislation to be introduced next winter that notice of it should be published in the Royal Gazette or daily newspapers.

Mr POOLE—Provided the Department of Mines approved of it.

Mr. JAMES A. FRASER--You would not get the Government or private members to agree to that. You might get by common consent a ruling that for legislation of that kind due notice should be given. Notice must be given in the Canada Gazette of certain kinds of legislation which goes through the Parliament of Canada. You might get a similar rule in regard to mining legislation.

Mr. POOLE—Should it not be a Government measure? Surely any legislation affecting a matter of which the Government has a Department should be a Government measure.

Mr. JAMES A. FRASER—They would not submit to it. The Government has got to be politic in its movements.

Mr. POOLE—But then it has made some of these amendments thinking they were pleasing to certain voters. I contend the full bearing of some amendments was not seen, nor when it was thought a benefit was being done to one class it was hurting others. For instance, I contend that Mr. Fielding did not see the full bearing of the legislation last winter.

Mr. JAMES A. FRASER—I agree with you with regard to publicity of mining legislation before its introduction into the House. Your object is to get any proposed legislation made public previous to the meeting of the legislature for the purpose of information and discussion and hearing all parties who are interested in connection with it. What we want to get at is that.

Mr. POOLE—A committee might wait upon the Government and urge upon it to make all mining amendments Government measures, and that the same should receive the sanction or consideration of the Department of Mines before being introduced.

Mr. JAMES A. FRASER—Notice of the legislation should be published for at least three months in the Royal Gazette or in a couple of newspapers. It would simply be following out the lines which should be laid down in regard to municipal laws of the towns and counties. Some of this legislation had taken its rise in the Provincial Workingmen's Association, and if we can get the Workingmen's Association to agree with us, and we ask their co-operation they will certainly agree with us. They want publicity as well as we do.

Mr. POOLE—Because when an Act of the Legislature is improperly worded they do not know when it is going to pinch them or pinch us. I have always been perfectly satisfied where a matter was clear and just to leave it to the workingmen.

Mr. JAMES A. FRASER—Go to those men frankly and ask them for their co-operation and explain it to them, and I have no hesitation in saying they will be one with us. When Mr. Drummond was before the Legislature he stated: "I am entirely opposed to the managers from the men's standpoint. I do not come here in a double capacity, I come here in an advocates capacity," but I am satisfied you will find him reasonable in this matter before a delegation.

Mr. R. H. BROWN—I also remember his saying on one occasion in the Commissioner's Office, "I am here as the paid agent of the Provincial Workingmen's Association."

The resolution was then put to the meeting and carried, the President, nominating a deputation to interview the local government.

Mr. B. T. A. BELL then moved a vote of thanks to the various gentlemen composing the local reception committee, who had so thoughtfully provided for the entertainment of the members and the success of the meetings.

Mr. J. E. HARDMAN having seconded, the motion was put and carried unanimously.

Other Excursions.

During the morning parties of members were driven to the top of Grant's Mountain, and greatly enjoyed the magnificent view of the surrounding country. Others visited the well equipped establishment of the Nova Scotia Steel and Forge Co. at New Glasgow, the new steel steamer being built by Messrs. Matheson & Co., and others, at the invitation of Mr. Fergie, the Drummond colliery.

Note on an Occurrence of Manganese and Zinc Ore in Nova Scotia.

By E. Gilpin, Jr., LL.D., F.G.S., F.R.S.C., etc.
Deputy Commissioner and Inspector of Mines, Nova Scotia.

[Paper read before the Mining Society of Nova Scotia.]

These brief notes are intended only to bring to the notice of the members of the Society an occurrence of manganese in a form which is, I think, new in this Province, and of an interesting specimen of zinc ore.

In the case of the former, samples of rock were brought to me from Whitehead, in Guysboro' County, which had excited the curiosity of the discoverer by the readiness with which pieces of it fused in an ordinary fire. This ready fusibility of certain rocks is not generally known, and is usually considered a mark of the presence of some valuable metal. In this case the metal was for some reason unknown to me considered to be zinc. The rock, a sample of which is submitted, is light brown and gray in color, weathering to a light drab. It is hard, brittle and sub-granular in texture. The sample shows a folding in the shape of the letter S, and has crevices, apparently due to the folding, filled with crystalline matter slightly darker than the surrounding rock.

The samples, although resembling in a general way the rocks called felsites, had features of novelty about them, and I sent some to Mr. Leckie, manager of the Londonderry Iron Works, and the analyst of the company, Mr. Smaill, was kind enough to make a partial analysis of it. He reports that it consisted:—

Silica	70·25
Alumina	15·25
Manganese oxide	9·25
Iron oxide	Small quantity
Lime	do
Magnesia	do
Zinc	none

The remainder being probably moisture, with some potash, soda, carbonic acid, etc.

Having disposed of the zinc theory, the presence of manganese became interesting. Presumably the manganese present is in the form of a bi-silicate of manganese, such as rhodonite, and that the greyish red or brown color of part of the sample may be due to the partial penetration of the rock by some carbonate of lime, manganese, etc. Dana, in his mineralogy does not give any analyses of the varieties of the silicates in any way resembling that under consideration. Allowing for the presence of a certain amount of free silica, as is usually the case in rocks of the class under consideration, the analysis given by him of orthoclase, present a parallelism with the exception of the absence of potash and the presence of manganese, the typical composition of this mineral being:—

Silica	64·60
Alumina	18·50
Potash	16·90

It would appear probable that the manganese has replaced nearly all the potash. The addition of moisture and free silica, and the replacement of part of the alumina and potash by the small quantities of iron, lime and magnesia would give a compound almost identical with that before you. All the analyses of orthoclase given on pages 356 to 361, of Dana's Mineralogy, have silica contents of from 64 to 75 percentum, and contain iron, magnesia, lime, soda, etc., in varying amounts up to about four per cent.

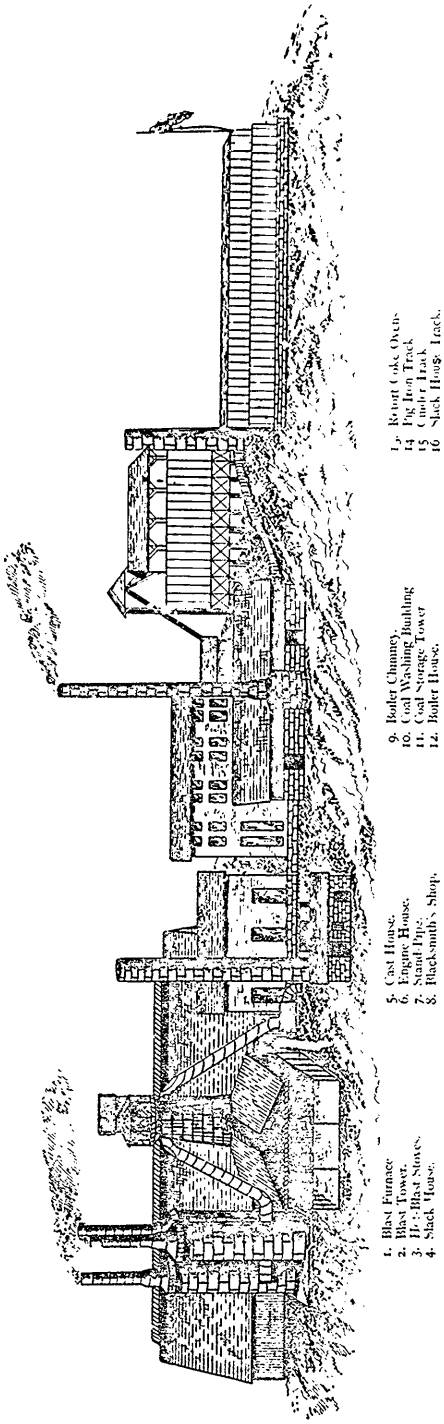
The same may be said of the possibility of the manganese having replaced the soda in an albite, the typical composition of which is:—

Silica	68·6
Alumina	19·6
Soda	11·8

In this case also the other foreign oxides would have replaced part of the soda and alumina.

It appears that feldspars are altered by the action of waters containing carbonic acid, or alkalies, or rendered acid by the decomposition of sulphurets. The completion of a course of decomposition of feldspar by the agency of

PLANT OF THE NEW GLASGOW IRON, COAL & RAILWAY COMPANY, Ltd.
At Ferrona, Pictou County, S. S., Visited by the Mining Society.



1. Blast Furnace
2. Blast Tower.
3. Hot-Blast Stoves.
4. Stack House.
5. Cast House.
6. Engine House.
7. Stand Pipe.
8. Blacksmith's Shop.
9. Boiler Chimney.
10. Coal Washing Building
11. Coal Storage Tower
12. Boiler House.
13. Retort Coke Ovens
14. Pig Iron Track
15. Cinder Track
16. Stack House Track.

Mr. Harvey Graham, New Glasgow, New Glasgow Iron, Coal & Railway Co. Ltd.

Mr. W. B. Moore, Jr., New Glasgow, President, Pictou Charcoal Iron Co.

water containing carbonic acid is the formation of a kaolin, or hydrous silicate of alumina; but there are many intervening steps, modified by circumstances. Thus the presence of lime, iron, etc., leads to changes in composition, forming one or more links in the process. In the case before us it would appear that the mineral most convenient or most applicable has replaced the potash or soda, and marks an important change in the ultimate decomposition of the rock.

The following analysis given by Dana, of minerals resembling most closely in their silica and alumina contents the sample from Whitehead, may be of interest:—

	Silica.	Alumina.	Iron Sesquioxide.	Magnesia.	Lime.	Soda.	Potash.	Water.
1. Albite	71·60	14·75	1·41	trace	1·06	10·06	32	3·5
2. do	70·68	19·80	·11	...	·23	9·06	...	3·0
3. Sanidin	67·42	15·88	2·83	·15	2·77	·43	10·55	...
4. Microlin	66·9	17·8	·5	...	·6	6·5	8·3	...
5. Felsite	71·17	13·6	1·40	·1	·4	....	3·19	3·50
6. Pumice	70·00	16·00	·50	...	2·50	....	6·50	3·0

Professor Lawson has kindly handed me an analysis of "Rhombohedral Feldspar" occurring near Rome, by Jameson. This is apparently a Lepidomelan with most of the iron replaced by manganese and lime.

The following is a comparison of the two minerals:—

	Lepidomelane.	Rhombohedral Spar.
Silica	39·45	40·20
Alumina	9·27	9·00
Iron oxide	37·23	1·10
Manganese oxide	2·54	12·60
Lime	·31	20·80
Magnesia	3·29	...
Potash	5·06	12·00
Water	1·83	...

The analysis given by Dana, p. 238, of Gamsigradite, so named from the locality in Servia where it forms with white feldspar a rock termed tmanite. It is an aluminous iron manganese amphibole, and contains:—

Silica	46·58
Alumina	13·63
Iron	12·29
Manganese oxide	6·00
Magnesia	8·84
Lime	8·83
Soda	3·17
Potash	1·00

I do not know that manganese presented in this form is of commercial value, but its occurrence in connection with the gold-bearing strata is interesting. If the rock under consideration is to be viewed as a volcanic slag, and as having carried up its manganese contents from some unknown sources, there must be large amounts of this element contained in some silicates, and their decomposition may often prove to be the source of the deposits of manganese ores found in later rocks.

Since writing the above, I have noticed a reference showing the practical relationship of rocks containing manganese to deposits of the ores of that metal of economic value. Mr. Halse, in a paper read recently before the North of England Institute, describes some of the Merionethshire (?) manganese deposits, in one of the hills north east of Arenig consisting mainly of Upper Trappean rock, with a mass of feldspathic porphyry. He states, from a careful examination of the veins, that there is no evidence of their being fissure veins, the manganese merely locally filling the joints and certain superficial fissures in the country rock. It appears that the manganese has come from the feldspathic ash itself, and as a result of surface decomposition and erosion has been leached out from it and deposited in the joints and fissures.

It is to be regretted that analyses of the country rock were not given. The mode of occurrence of the ore described by Mr. Halse is that usually affected by manganese, and a good example may be seen near the Salmon River of Truro.

The other sample is a compound containing zincite, red oxide of zinc; Franklinite, an iron black compound, iron, manganese and zinc, and Willemite, a whitish silicious oxide of zinc.

This was found at Forrest Glen, on the line of the survey of the Stewiack and Lansdowne railway, by Mr. T. Ritchie, Civil Engineer. The samples were submitted to Mr. Fletcher of the Geological Survey. He expressed a doubt as to the specimen being from any local deposit on account of its strong resemblance to the New Jersey ore. Mr. Ritchie, however, assured me that he had made full enquiry, and was satisfied that the sample had not been introduced, but was actually discovered. I give the occurrence as of interest on account of the rarity of zinc ore in the Province of Nova Scotia. It is found in small quantities in the gold bearing quartz veins, as traces in manganiferous ores, and occasionally in the carbonate ores of the coal measures.

In New Jerssy, at both Franklin and Sterling, these three ores occur together, and in such quantity as to furnish an important ore of zinc. If, on further examination, the authenticity of the occurrence at Forest Glen is confirmed, and the float traced to its source, an important addition may be made to the list of our mineral resources.

CORRESPONDENCE.

Iron Mining in Ontario.

The Editor:

SIR,—Your timely article on this subject is very much to the point, but I hold that the duty of the Ontario Government goes even further than you indicated. What the iron industry lacks is a capitalist who can afford to risk a little in testing commercial processes. Mowat claims a surplus of over five millions; Hardy claims a partnership in form of royalty in all new developments; the whole province will benefit by substantial progress in its mines; so why should not the miner get the same consideration as all other classes of our population.

To place us on a par with farmers and professionals we ought to have a public smelter at each mining centre owned by government, controlled directly by the Bureau of Mines, and giving returns which would settle the commercial value of the ores submitted in quantity. The recipes for best methods could be obtained more cheaply and correctly through official than private channels; and once obtained, would be available for all the miners in Canada. Were private parties bonused to smelt, they would keep improved methods secret still, and every new enterprise would have to begin as if the Government had done nothing to aid us.

Then again, at a private smelter, there is always a doubt that results would be manipulated to enhance or decrease the value of the ore tested for speculative ends. But under the management of the present efficient Director of the Bureau of Mines, returns would command the confidence of the mining world and afford a far better field for the exercise of his talent and industry, than collecting "Arthur's Pence" from reluctant miners. A public assay for one dollar is another necessity which might easily be supplied. We have quite a number of private assayers at from $3 to $10, whom no one outside of Ontario knows anything, and whose assay is therefore of no commercial value. Similar assays in the United States cost less than half, on an average, and reach a hundredfold as many possible purchasers.

Set a standard, give certificates to all reaching that, with right to assay, charging balance of cost to Government as may be settled by Bureau. Also give discoverer the benefit in a reduction of first cost of land instead of a remission of royalty eight to fifteen years after he has had his pinch to secure the discovery. If prospectors are sometimes unreasonable, they are nearly always badly used in selling; and if they cease to discover where will all the rest of mining interests go?

HOMO SENEX SYLVARUM.

Sudbury, 15th July, 1893.

The Russell Silver Mine, Calumet Island, Que.

The Editor:

SIR,—A few days ago I paid a visit to the J. and C. Russell silver mine on Calumet Island, and with your kind permission I will give your readers a short sketch of the progress made, so far, in its working.

The mine is situated on lots 10 and 11 in the 4th Range of Calumet Island, about three and a-half miles from the Village of Bryson, the *chef lieu* of the County of Pontiac, and about 4 miles in a straight line from the nearest station on the P. & P. J. R.—also about eight miles from Calumet on the C. P. R. Mr. James Russell, of Renfrew, Ont., originally bonded the property five years ago, and finally purchased it for $12,000, two years ago, having meantime prospected it so thoroughly as to leave no doubt about the deposit of ore being very extensive. The mineral is zinc blende—a combination of zinc, lead and silver. Numerous assays have shown from 40 to 54 per cent. of zinc (taking the lowest and highest assays), 10 to 14 per cent. of lead, carrying 12 to 16 ounces of silver to the ton. One main shaft and numerous lesser ones have been sunk at various points on the property, and in every one heavy leads of the mineral have been exposed, varying from a few inches to six feet in width. In the minor shafts or openings, which are quite shallow, the widest lead is about 30 inches. When work was commenced at the main shaft the mineral only showed about 6 inches in width, but now, at a depth of 30 feet it shows fully 6 feet wide and extends from a depth of about 15 feet to the bottom of the shaft. It seems to run in an eastward direction from the shaft, and inclines downward in the same direction. By the leads whose width I have given, I mean that width of pure mineral, bright, sparkling, soft, brittle, heavy, the most beautiful stone I have ever seen. Outside said leads there is a vast quantity of "lean ore"—rock impregnated with the mineral in varying proportion. Several hundred tons of ore have been taken from this main shaft, some of which has been piled in the vicinity, some shipped to different points for practical testing, and several magnificent samples were sent to the World's Fair at Chicago. At the time of my visit only the simplest and most primitive machinery was employed—a large bucket and windlass—but I have no doubt whatever that with the introduction of improved machinery and better facilities for handling the ore that this mine will become of immense value. The ore is there in vast quantity—anybody can see it—and as it can be handled with great profit, all the mine wants is more capital expended for machinery, and Mr. Russell has a bonanza. He richly deserves his good fortune, as he has ventured a large amount and—won.

H. T. HURDMAN, M.D.

Bryson, Que., 15th July, 1893.

The Kaslo District, British Columbia.

The Editor:

SIR,—At the present time—with only a very few exceptions—properties here have been bought (I refer to those that have been sold), by Americans.

I believe that somehow the outside public have got an idea that the Slocan mines are not proving to be as good as was expected. If so, such is probably due to the check in real estate at Kaslo, caused by the boom being pushed too hard and by rumors from the outside world, at a time of the year (the end of March), when all the properties in the camp were deep under snow; and those that were worked looked the better for it instead of worse. Perhaps another cause was the stoppage in shipping ore caused by the breaking up of the sleigh road, which became so bad that until lately even pack animals could not travel it. It has, however, been repaired as far as built last fall (16 miles), and construction advanced four miles further to Bear Lake, at which point the gang are at work with the intention of pushing on to New Denver, on Slocan Lake.

The money for the present work is being supplied by the Provincial Government, amounting to $10,000, whereas that expended last fall, about $20,000, was subscribed by the miners and citizens of Kaslo.

The mines, as you may easily imagine, are placed in an awkward position, owing to silver question and the great financial difficulties of the day. Yet nearly all of them in the Slocan are working. They are for the most part being developed; and where capital can afford it, it is surely the most expedient course, as transportation is extremely high, $35 to $45 a ton delivered at Kaslo. Then, too, the miners are confident of a great reduction in freightage, inasmuch as they feel confident of railroad communication.

Notwithstanding the terrible freight rates, which in the first ran as high as $100 per ton to the smelter, 1,000 tons have been shipped (entirely to the U. S. smelters). The returns show from 130 ozs. to 500 ozs. in silver per ton, and from 50 to 70% lead (ton of 2,000 lbs.) These figures stand for the galenas; the carbonates run high in silver but considerably less in lead. No concentrating works are yet in operation, or even under construction, at the mines, and consequently considerable good ore has to be put on the dump for future date—but it is a noticeable fact that much the greater part of our ore requires no concentration. Large bodies of it running as high as 80% lead. Perhaps one of the causes cited on the outside as the cause of alarm, is the fact that the "Freddie Lee" has stopped producing ore. What miner could condemn a mine which from the very grass roots yielded a ton of ore to every lineal foot of ground broken—dead work included—(and this shows what little dead work was done), for over three months. It was worked for ore only from the outstart. Such is the position of the "Freddie Lee" at the present time. It is now being worked with a view to the future and not the present.

But the "Freddie Lee" is not the only prospect the camp depends upon by any means. The "Washington" is looking better by every foot of ground broken. It did for a considerable time last spring (in spite of the fact that the intention of the owners was toward development), produce 10 to 15 tons per day of shipping ore.

It has been employing as many as 45 men, but at the present time 26.

The "Mountain Chief" is another property that has been pushed all winter and is looking all that could be expected; the ore centre has been constantly widening and the ore is of exceptionally high value even for this camp.

Other properties that have kept open during the winter are the "Dardanelles," the "Northern Belle," the "Lucky Jim," the "Chambers," the "Wellington," the "Blue Bird," and a few others.

These numbers are being added to every day as the snow goes off. One of the new properties, called the "Stanley," took out 100 tons of 130 oz. ore in 15 days after work commenced.

On the "Lucky Jim," or rather on the neighboring claim in the same group as the "Roadley," two new finds have been made which are remarkable in point of size.

It has been unfortunately a bad winter for snow here as elsewhere, and even yet a large number of the prospects are unable to commence development work; the snow laying pretty generally above an altitude of 5,000 feet at the present time.

A sampling works is at present under construction on Kaslo Bay, which shall have a capacity of 100 tons per diem. The road to the site has been finished, as well as one of the buildings and the wharf, and the other buildings are well under way. The machinery is not yet in but expected daily. This undoubtedly will be a great help to the miners, especially those with insufficient capital to carry ore until such time as a carload is obtained. And it will be the meaas of allowing prospectors to work to a greater or less extent their own claims.

There is no time better than the present, for those men who still have faith in silver, to make investments in mining properties here while the depression lasts.

The Ainsworth camp, which for a time this spring looked so promising, has entirely shut down, not one property being worked. The cause is entirely due to the market; everything looked its best up to the last moment.

Yours, &c.,

FRIEBERG.

Kaslo, B.C., 14th July, 1893.

CANADIAN COMPANIES.

The Van Winkle Hydraulic Mining Co.—A correspondent to the Vancouver *World* contributes the following anent the operations of this company. The property is situated two miles from Lytton, on the opposite side of the Fraser River, and just beyond the town of Lytton. The water is brought from Last Chance creek, a distance of two miles, by 1¾ miles of ditching and a quarter of a mile piping, the gore at the penstock being 36 inches in diameter and tapering from 12 feet to 18 inches; the balance of the pipe is 18, 16 and 15½ inches in diameter. The sand tank is 375 feet above the flume, near the river, where the monitor is placed. They were running 1,600 miner's inches of water, which they soon expected to have increased to 2,000 by making some repairs to the ditches. This done, they will then be able to run to better advantage. The present power is 50 lbs. to the square inch, and they were moving about 2 to 2½ cubic yards to the miner's inch of water per day. The nozzles of the monitor are five, six, seven and eight inches in diameter. The eight-inch one was being used. The deflector, which enables a man with one hand to turn the stream in any direction instantly, is Hoskin's patent, but not considered the best. To give some idea of the immense power of this water from the nozzle of the monitor, I may state that they can move with it boulders 500 lbs. in weight. When the water is turned on the gravelly banks, they are run down through the flume very quickly. The cut where they were washing was, as nearly as I could judge, about 80 feet deep, 100 feet wide and back about 300 feet, a smaller cut still further back, about 200 feet, washed out by turning water through it when not using the monitor. They were possibly 30 to 40 feet from bed rock. Eastward about 200 yards, another cut is started, where they have another flume for running waste water. It is the intention to run the pipe to this cut and station another monitor, then they both can be worked at once or alternately, allowing time for the very large boulders to be disposed of. Bed rock can be reached at this cut. The dump at each is good, and the flumes for catching the gold are supplied with all modern improvements. The property has nearly two miles frontage, and extends back about the same distance. Even with big water power all the time, it will last for generations. Over portions of this ground miners have made $10 a day to the man with a rocker, and in all their shafts they have good prospects. The first wash up will likely be made in June some time, although it all depends on circumstances. Miners everywhere will watch with interest the result of this clean up. Vast enterprises of this nature are now under way in Cariboo, and will likely be worked to some extent this year; but the expense up there for working is far greater ere they can get any returns. It is hydraulic mining that will undoubtedly give an impetus to gold mining in British Columbia.

The Hall Mines, Limited, British Columbia.—Advices from England under recent date report the floatation of an English syndicate to acquire and work the celebrated Silver King and associated claims at Nelson, in the West Kootenay district, Province of British Columbia. The capital is £300,000 sterling, divided in 50,000 7 per cent. cumulative shares of £1 each, and 25,000 ordinary shares of £1 each. The board of directors include: Sir Jos. W. Trutch, K.C.M.G., chairman; James Roberts Brown, Esq., London; J. R. Drake, Esq., Sydenham; Rankine Dawson, Esq., M.A., M.D., London; Robert Day, Esq., High Sheriff of Cork; D. H. Gribb, Esq., Isle of Bute; Walter Neilson, Esq., Eisenfield, Ayr; Secretary. F. Ramsay, Esq. The head offices of the new syndicate are at 111 Wool Exchange, London, E.C. Mr. Roepell, the mining engineer who examined the property on behalf of the English investors, in the last paragraph of his report says: "I have to state that I consider the mines of the Kootenay Bonanza Mining Co. a most valuable property, the value of which consists not only in what is already known, but also in its remarkable prospects for the future. I feel confident that if properly taken in hand and managed, it will rank among the greatest and most profitable enterprises of the kind." It is stated on the authority of the manager of the Bank of British Columbia at Victoria, that the owners of the Silver King receive £200,000 in paid up stock and an amount equivalent to the expenditure made by them to date in the development of the property.

The Provincial Manganese Mining Company, Limited, has been organized at Windsor, N.S., to develop property containing some 300 acres of manganese lands near Walton. The capital is $75,000. The officers of the new concern are: D. C. Fraser, M.P., president; George E. Boak, vice-president; W. F. Jennison, Lewis W. Des Barres, and J. P. Burgess, secretary-treasurer.

Byron N. White Company has been incorporated under the Foreign Companies' Act, B.C., with a capital of $500,000, to develop mineral claims in the Slocan and other mining districts of the province. Head office is at Nelson, B.C.

The Thompson River Hydraulic Mining Company, Limited, has been incorporated under the laws of British Columbia to purchase and develop certain placer mining claims on the Thompson River and its tributaries, British Columbia. Authorised capital $100,000 in shares of $10. Head office, New Westminster, B.C. The directors are: John Hendry, J. W. Vaughan and Robert Jardine, all of New Westminster, B.C.

The Fuller Mining Company has been incorporated in Spokane, Wash, with a capital stock of $100,000, with shares at a par value of $1 each. The trustees are T. D. Fuller, of Ruby, Wash.; A. J. Duncan, G. H. Herberling, W. H. Wiscombe, W. H. Downes, G. E. Spoor, S. A. Wells and J. W. Feighan, of Spokane. The company owns the Fuller group of mines in the Okanogan country, B.C. The principal place of business is Spokane, Wash.

General Phosphate Corporation—a Secret Meeting.—In pursuance of the direction of Mr. Justice Vaughan Williams, a meeting of the shareholders of the General Phosphate Corporation, Limited, was held on 16th ulto., at the Cannon street Hotel, "for the purpose of ascertaining their wishes as to whether an order shall be made on a petition to wind up the corporation, presented by George Mander Allender, that the above named corporation shall be wound up compulsorily." Lord Stalbridge presided. At the outset a shareholder rose and asked whether the representatives of the press were present, because, if they were he wished to know whether it was advisable that matters which were likely to be discussed on that occasion should be made public. ("Yes," and "Certainly.") The chairman replied that in his opinion, as they had met to consider what he hoped would prove to be the reconstruction of the company, and what was a purely private matter, and to deal with private documents which were headed "private and confidential," it would be advisable to ask the gentlemen of the press to withdraw. Mr. Barham strongly objected to any such proposition, it was most unusual—in fact, he never heard of such a thing before. This was a public meeting of shareholders, and there should be no privacy of any kind. (Hear, hear.) Mr. Judd also protested against the proposal, which he characterised as monstrous. Mr. Clough said that as a member of the committee he would ask the meeting to so far repose confidence in the judgment and discretion of that body as to accept the suggestion that the representatives of the press should withdraw, as the committee had their own reporter present and a verbatim report of the proceedings would be taken. In view of what the chairman had said and what was in the minds of the committee, he thought it advisable that the reporters should withdraw. (Hear, hear.) He moved a resolution to that effect. Mr. Smallman said he thought that anybody having read the report of the committee could not for a moment imagine that it should be discussed in any other place than a public assembly. There were such grave statements made there against——. The chairman said he must ask Mr. Smallman not to go into the report. Mr. Smallman remarked that what he wished to say was that there were statements made in that report as to the truth or otherwise of which he thought the chairman and his colleagues ought to be first to welcome a public inquiry. The chairman again requested Mr. Smallman to deal only with the point before the meeting. It was not right to go into matters at the present moment which were private and confidential. Mr. Smallman: But I understand we have come here to discuss the report. The question was then put to the meeting, and the chairman declared that the majority was against the reporters remaining; he therefore asked those gentlemen to withdraw. Mr. Smallman demanded a poll, but the solicitor said the question was not one upon which a poll could be taken. The reporters of the press then withdrew.

Referring to the above, which appeared in the London *Financial Times* of 17th June, Mr. George Stewart, of Buckingham, Que. (one of the vendors), now in London, England, writes: "There was a large attendance of shareholders present at the meeting, and they were unanimous that the company should not be wound up. It was agreed to formulate a scheme to raise the necessary capital as indicated in the committee's report, viz., £100,000, and a resolution to this effect was passed and the meeting adjourned for a month. Anything approaching "stormy" was noticeably absent. Everybody seems to think it best under the circumstances to give the business another trial, and your humble servant was heartily in accord with them."

Bridge River Gold Mining Company, Limited, is the name of a new company seeking charter of incorporation under British Columbia statutes. Authorised capital $25,000, in shares of $100. Directors: George E. Bower, John Leatherdale, Wm. G. Allen, Joseph A. Russell and F. R. M. Russels, of Vancouver, B.C. Formed to carry on the business of smelters, refiners, founders, assayers, dealers in bullion, metals and products of smelting of every nature and description, to carry on the business of miners, &c. Head office: Vancouver, B.C.

Tobique Gypsum Company—Is an applicant for charter of incorporation under the New Brunswick Joint Stock Companies Act. The capital stock shall amount to $200,000, consisting of $150,000 of 'A' stock, being ordinary stock of the company divided into 1,500 shares of $100 each, and $50,000 of 'B' stock, divided into 500 shares of $100 each, being preference stock, having preference and priority as respects dividends, at the rate of six percentum per annum thereon, and in the distribution of assets, with the provision that the holders of such preference shares shall have the right to select two directors if the board consist of five directors, and three directors if the board consist of seven directors. The amount of capital stock actually subscribed is $104,000, being $18,000 of preferred and $86,000 of common or ordinary stock. The head office is to be in the Parish of Gordon, County of Victoria, New Brunswick. The directors are: Fred. H. Hall, Woodstock, N.B.; John Connor, St, John; James Stratton, St. John, N.B.

The New Brunswick Coal Company—A meeting of shareholders will be held in the office of Stephens & Mitchell, in St. Stephen, N.B., on 2nd August, for the purpose of establishing by-laws, choosing directors, etc.

New Egerton Gold Mining Company—The New Egerton Gold Mining Co., composed of New Glasgow, N.S. gentlemen, purchased in 1877 a number of mining areas in the Fifteen-mile stream gold mining district. A 10 stamp crushing mill had been erected previous to the purchase. This company operated the mine until December 31, 1889. During that time they mined 4,871 tons of quartz, from which they obtained 2,320 oz. of gold, value $44,086. They then sold out to another company of New Glasgow men, who styled themselves the New Egerton Company. These men put in a new 15 stamp mill, and new hoisting and pumping gear. For the year 1890 they mined and crushed 2,476 tons of 2,000 lbs. quartz, which yielded 2,184 oz. gold; in 1891, 4,263 tons quartz yield 2,446 oz. gold; and for 1892, 2,460 tons quartz, which yielded 1,285 oz. gold. Total for those three years 9,199 tons quartz, gold 5,915 oz, value $112,-373. For the total period worked by the Egerton and New Egerton companies the number of tons quartz raised was 14,070, and the yield of gold 8,235 oz.; value $156,-470. The profits were something in excess of $40,000.

Last winter an amalgamation was completed with the Stanley Gold Company, owning adjoining property, and work was resumed in May, after stopping through the winter, the management being in the hands of the New Egerton Company The mine is now free from water, and mining and crushing has begun on a limited scale. The mine is equipped with two crushing mills—one, the Stanley, being driven by water—good hoisting gear, pumping apparatus, air compressor, and air drills and such other machinery as is necessary for free milling ore. The mines are in the Fifteen-Mile Stream district, Halifax County, Nova Scotia.

Kingston and Pembroke Mining Company—The annual meeting of this company was held in Kingston, May 23rd, when the following directors were elected: H. Seibert, J. D. Flower, J. H. Hollister, New York; W. G. Pollock, Cleveland, Ohio; M. H. Folger, B. W. Folger, F. A. Folger, J. Bawden and C. F. Gildersleeve, Kingston.

Sudbury Nickel Mine Company—At the annual meeting in Berlin, Ont., recently the old board of directors were re-elected as follows: J. G. Reiner, Wellesley, president; Jas. Livingstone, Baden, vice-president; C. H. Ahrens, Berlin, secretary-treasurer; F. Walter, Hamburg; C. Kritzinger, Heidleburg; Dr. W. Morton, Wellesley; F. B. Puddicomb, Haysville; Geo. Fleishaur, Tavistock; J. D. Moore, M.P.P., Galt. A motion was carried authorizing the board of directors to make arrangements to work the mine to the best interests of the stockholders.

The Gold River Gold Mining Company, Ltd.—Is the latest Nova Scotia mineral enterprise seeking incorporation under provincial statutes, with the object of acquiring and working gold areas in the County of Lunenburg or elsewhere in Nova Scotia. Authorised capital, $50,000, in shares of $1. The directors of the new concern are: Milner T. Foster, Halifax; Jas. F. Burgess, Halifax; A. N. Whitman, Halifax; George Musgrave, Halifax; and Ingram B. Shaffner, Halifax. Head office: Halifax, N.S.

MINING NOTES.

[From our own Correspondents.]

Nova Scotia.

A writer in the *Colliery Guardian* of recent date says: "It has always been a matter of surprise to me that the briquette has never penetrated the taste of the Canadian consumer. A very extensive and useful plant was erected some years ago at the Gowrie Mines, Cow Bay, but the effort was abortive: the briquette did not sell. The market of Montreal is scarcely the market for the briquette. This is a fuel for the remoter markets of Canada—that is to say, for the rural districts. Wood is annually falling off as a fuel in these districts, and from patient research I am satisfied that an effort to introduce the briquette would be well repaid. At present the slack coal is sold at a dollar a ton, but in briquette shape very much more could be obtained. Another very important reason of the failure of the briquette in Canada is the excessive percentage of pitch introduced into its composition. The peculiar stoves and chimneys of Canada cannot be adapted to such pitch depositing fuel. The new system, however, noticed in your columns lately—*i. e.*, that of compressed coal, reduced to brick shape under enormous pressure—removes this drawback and opens out a field for effort as yet absolutely unexploited."

Mr. James Baird, Manager of the mines of the Canada Coal and Railway Co., has resigned.

"Messrs. Matheson & Co., of New Glasgow, had on the stocks at our recent visit to New Glasgow, a large steel steamer called the Mulgrave. She is 122 feet long, 34 feet wide and 16 feet deep. Her engines are compound condensing, having cylinders 22 and 42 inch by 30 inches stroke, and indicate about 600 h. p. The launch of the new vessel has since been successfully accomplished. The Nova Scotia Steel and Forge Co. of New Glasgow furnished the material. The new venture it is hoped marks a new era in the industrial progress of Pictou County.

New Brunswick.

Mining in a small way has been resumed on the Grand Lake coal areas in the vicinity of the Newcastle river. At this point there is a vein of coal varying from 20 to 36 in. in thickness and from 20 to 40 ft. below the surface. At several points drifts have been run into the side of the hill and the coal mined without any attempt at scientific working. About 6,000 tons were taken out in this way last year, and it has now been decided to work the vein more systematically. The owners have put in engines with hoisting machinery and pumps, and have commenced to sink a shaft upon the veins.

Quebec.

Ottawa County.

Mr. J. Burley Smith, M.E., Glen Almond, Manager of the British Phosphate Company is to be congratulated on the following high assay returns of a recent shipment from his mines to England. The analyses were made in duplicate and with the greatest care by Mr. J. T. Donald, M.A., the well known phosphate analyst of Montreal, who writes that it is the richest parcel he ever analysed. The following is a copy of the certificate:—

LABORATORY No. 338.

Of a sample of Phosphate marked No. 1, received from British Phosphate Co. Ltd., 8th June, 1893.

*Phosphoric Acid	=	40·23%
Ferric Oxide } Alumina }	=	1·75%

*Equivalent Tribasic Phosphate Lime = 87·83%

Ontario.

A letter from Superintendent Wallace of the Ophir Gold Mining Company, under date of 22nd inst., gives the following particulars of the progress of mining on this well known property:—

"Our friends cannot realize, nor do they believe what they see or hear of the wonderful ore bodies being uncovered. I took the measurements yesterday for the President of the Company, and copy from my report the following statement, which I will try and explain more fully after giving the figures. The pay streak at the following points measures:—

At the lower opening near the incline	4 feet.
At the second opening at the entrance of drift.	10 "
At last or head of drift 70 feet in	22½ "
At open cut above this 100 feet ...	16 "
At the end of tunnel, upper drift	17½ "
Average of 5 drifts and openings, 14 feet.	

"This does not include the incline, which is in rich ore to a depth of 105 feet, and one shaft 95 feet deep also in ore, which I reported in a former letter.

"The depth of lowest point on the incline from upper level is 215 feet, length of vein exposed from incline to last drift on the vein is 475 feet. On the basis of one ton to each nine square feet, which is high enough to cover any fault in the vein, we have 181,555 tons of ore in sight on the pay streak alone; besides this there is 20 feet of quartz that will mill $12 per ton that I did not take into consideration. Our mill returns have netted over $60 per ton to date on the ore from the pay streak, cut this down to $20 and we have in sight $3,631,100. I have 7,000 tons of ore on the dumps that will pay for the mine and all development work, as well as the mill and machinery. These figures I do not give for publication but as facts that you can realize something of this property. The mine is so favorably situated that I can easily cut 40 tons per day with 10 men, and in view of this I am simply doing development work to prove up the property, until the mill is completed and I can make new dumping ground for the ore mined.

"I have from the first had great faith in this mine, but as depth and length is reached, exposing the vein, one's mind is confused by what he sees and undertakes to estimate on substantial facts. It is only nine months since I commenced development here, and at that time very little was known of the property and less believed. Now I have visitors from every part of the globe, and all admit that the mine is a wonder, and to have you fully realize that I am expressing the general and universal belief, I hope you will take time to convince yourself of its truth by coming to see the property.

"The mill is being pushed as fast as possible to completion, the machinery is all at Bruce Station, and delayed there on account of the roads, which the government was to repair in part, and the company (Ophir) has expended large sums in doing. I am now repairing the bridges in order to get over them with heavy machinery. As soon as this is done we shall begin to put the mill together, and by September 1st expect to get started milling ore."

The combined output of the Copper Cliff and Evans mines at Sudbury amounts to nearly 300 tons a day, and both smelters are kept going full blast the whole time. It is said that there is not a pound of matte to be had at any of the mines just now.

An important new find is reported on the Black Jack gold mine, Lake of the Woods district. Two shafts are being sunk on the property, both of which will be equipped at once with hoisting machinery. It is reported that the Crawford mills at the Black Jack are a failure.

A disastrous fire on 1st ultimo destroyed the mill at the El Divir gold mine in the same district.

An American company has acquired the Reduction Works at Rat Portage, and will, it is said, re-equip them with machinery

North-West Territories.

A despatch from Edmonton says that during his recent visit to the North-West, Dr. Selwyn, Director of the Canadian Geological Survey, visited the Egg Lake country at a point about 27 miles north-west of Edmonton to examine a reported petroleum find there. He is fully satisfied that the find is genuine, but is not satisfied as to its extent. The petroleum sand rock found there is identical with that found on the Athabasca, and may be an extension of the beds existing there, or it may be merely a mass detached from the tar sands of the Athabasca and transported to its present location by glacial action ages ago. The he of the country gives no indication in support of either theory, and there are no rock exposure to assist in deciding the point. The only way to decide the matter is by actual boring. Dr. Selwyn is desirous of seeing this commenced as soon as possible. If this deposit should turn out to be an extension of the tar beds of the Athabasca, it could hardly fail to be of the very greatest economic value. The indications here are just such as are found in petroleum producing regions the world over. But even these indications are not infallible proof of the existence of oil in paying quantities. That question can only be settled by actual test.

British Columbia.

Miscellaneous.

The East Wellington Coal Co. having ordered a reduction of 20 in the wages of all their employees earning in excess of $2 per day; the men have gone on strike, and about 150 miners are thrown out of work in consequence.

The annual general meeting of the employees of the New Vancouver Coal Company, to consider the report of the medical committee, was held for 22nd instant. The report will show that there is a balance in hand of $464.15. The total receipts for the year amounted to $15,613.25, the expenses amounted to $15,138.10, the principal items of expenditure being surgeon's salary, $8,210; and special grants to J. Williams, $800; W. J. Pollard, $500; and like amounts to the following: S. Kenyon, J. Spooner, W. Arbuckle, I. A. Macaloney, W. Richardson and S. Wombburn. Relief was granted for 59 accidents, distributed as follows: No 1 Shaft, 29; Protection Island, 4; Southfield, 6; No. 3 Shaft, 4; No. 5 Shaft, 13; outsiders, 3. The top men employed at the colliery have decided to manage their own accident fund, but will maintain the present arrangements as to the employment of the doctor.

Advices under date of 5th inst. report that the North Star (silver lead) mine has changed hands at $40,000. The property is situated in the St. Mary's country, about 14 miles from Fort Steele. The average yield reported is 50 ounces in silver and 45 per cent. lead. Twenty men are employed here.

It is understood that arrangements have been made with the owners of the North Star mine by the Golden Mining and Smelting Company, whereby the latter will acquire five thousand tons of the North Star ore. The ore will be reduced to a matte and then shipped to England for treatment, very favorable rates having been made by the C. P. R. for the shipment.

The East Kootenay Hydraulic Company has its hydraulic plant in operation on Wild Horse creek, and it is the intention to run night and day during the season. The grounds are lighted at night by electricity, and the power is supplied by a Pelton water motor. The company employs twenty white men and no Chinese.

Tom Brown, a fourth year student in McGill University, Montreal, who is taking a course in mining engineering, will not loose a chance for practical study during the long summer vacation. Dressed in corduroys and top boots, he shouldered a pack at Nelson on Friday morning and started for the Hall Creek placer diggings, where he has located a claim, and intends building a shack beside his "Clementine," the name under which he has recorded his claim.

At the Thunder Hill mine great activity prevails. Some 45 men are engaged and 100 tons of ore are being mined daily. It is expected that the shipment of the concentrates will be made in the course of a week or two.

Another despatch says: The concentrator of the Thunder Hill mine, on the shore of Upper Columbia Lake, in East Kootenay, is in operation, and the first shipment of concentrates was expected at Golden this week.

Work has been commenced in earnest on the Poorman, situated about six miles west of Nelson and about a mile from Kootenay River. This property is owned by the Eagle Creek Gold Mining Company, and has not been worked to any extent since the fall of 1890. The ten stamp mill which the company built at the mine was completed early in the spring of the above year, and started to crush ore about June 1st. There are at present ten men at work in the mine taking out ore besides those engaged in operating the mill. Work will be pushed and the mill run day and night in order to take advantage of the high water.

The shaft on the LeRoi is down 190 feet. This will be sunk 20 feet deeper, when a drift will be started both ways at the 200 foot level. The shaft is in solid ore the whole 200 feet.

Gold ore assaying $400 to the ton has been taken from the LeRoi mine, Trail creek, at a depth of 174 feet, and the ore body from which the assay sample was taken appears to be of the same grade. Mr. Pugh, manager of the Pyritic Smelting Co., is bringing in a diamond drill, which, with other machinery for the LeRoi, War Eagle and California, is now awaiting shipment at Spokane until the wagon road is completed from the river to the mines.

Slocan Country

[From the Spokane Mining Review]

The Slocan country is rapidly assuming great activity. Before this month is out the wagon road will be completed and in good condition to Bear Lake, and regular shipments of ore will again be made from the properties where it has been accumulating, as well as from properties that have not yet made any shipments. Notwithstanding the fact that the road has been impassable for teams and hazardous for pack horses for more than two months, the owners of many of the properties have never suspended work, but have taken provisions and powder in as best they could and continued to develop and pile up the ore.

Anyone who has not been in the camp since last fall would be surprised to find the amount of work done since then, and the results have in every case been highly satisfactory. At no time since the discovery of mineral in that camp has everything looked so favorable. The snow is rapidly disappearing and prospectors are pushing into the hills in the hope of making new discoveries. Messrs. Wm. Springer, Thomas McLeod and A. S. Beebe, made a valuable discovery at the lower end of Slocan lake, where they found and made a location on a vein two and a half feet wide, carrying from $900 to $1,000 per ton of silver in milling ore.

Frank Hughes expects to ship a carload of ore from the Mountain Chief, soon, which will exceed anything yet shipped, the owner claiming that it will net him $40,000.

A carload of ore will be shipped from the Big Bertha, on which the owners expect to realize from $10,000 to $20,000.

h Washington never looked better; the recent strike of ore on the third level is the best yet made, and places a greater ore value in sight.

The Reed & Robinson group, bonded by Messrs. Chadbourne & Co., is looking well, with a large body of high grade ore exposed.

The Grady group, on Four-mile creek, is a remarkably fine property and Messrs. Biggs, Latz and Grady hold it at a firm price. The group consists of four properties. At one point there is an ore exposure of seven and a half feet, which crops out solidly and has been stripped for a distance of from twelve to fourteen feet. The vein crops for a distance of 3,000 feet, showing solid ore from two inches to three feet wide at the outcrop. There are 1,000 tons of ore in sight and on the dumps. The owners have done all their own work.

The Idaho, which is under bond by Ed. Gove and others, is in full operation again, and it is the intention to continue uninterruptedly all summer, increasing the force as fast as possible. There are 200 tons of ore on the dumps, which runs from $100 to $1,000 per ton. The character of the ore is steel galena, gray, copper and silver glance. The ore will average more than $150 per ton. The ledge is well defined; is four and a half feet wide, and shows two feet of fine steel galena ore at the end of the upper tunnel, which is now in the hill forty-five feet.

The Cumberland, which is just below the Idaho on a parallel vein, has been operated all winter and has a 130 foot tunnel. At the depth of 100 feet a fine body of steel galena twelve to sixteen inches wide was encountered in the vein, which is four feet wide, and has continued since, being rather larger at the face of the tunnel than at any other point. One hundred and twenty dollars is the lowest assay so far made on the ore. A small force of men are working night and day, and 100 tons of ore are on the dump. The property is located in Idaho basin, on Carpenter creek, and is at an elevation of 5,000 feet above Kootenai lake.

The Almo has a 130 foot shaft on ore all the way down. At the bottom of the shaft there are thirty inches of gray copper and steel galena ore. A large quantity of fine shipping ore is now on the dump, which will be shipped at an early date and other shipments will follow rapidly.

The Lucky Jim is one and a quarter miles from Watsonville, on Bear lake. It was bonded by E. C. Kilbourne, of Seattle, and Mr. Roadly, of Kalso. A body of solid galena ore was struck a few days ago on this property, which is four and a half feet wide. The ledge is eight or nine feet wide. Two carloads of ore will soon be shipped from this property.

Both the routes from this city to Kaslo are open now, and little difficulty is experienced in making the trip.

The activity of both the Kaslo-Slocan and the Canadian Pacific Railroad people is significant of early railway facilities, and although the towns are generally quiet, as they are elsewhere, there is certain to be a marked improvement before the season is over.

[From the Nelson Tribune]

A recent discovery on a branch of the north fork of Carpenter creek, is in rank with the best ever made in Slocan district. The ore is gray copper, and assays gave a return of 1,252 ounces silver, 22 per cent. lead, and 7 per cent copper, to the ton. The discovery is distant about four miles over the range to the north of Watson.

Work has been resumed on the No. 1 and Highland mines, at Ainsworth. A large body of high grade ore being struck in the former. Alex. McLeod has been given a contract for hauling the ore from the mine to the ore warehouse at Ainsworth. He brings down from three to four tons daily with one four-horse team.

During five days of last week 167 sacks of ore were taken from the tunnel in the Idaho mine in Slocan district. Since then work has been suspended, owing to the low price of silver. Work has also been suspended on the Freddy Lee and Young Dominion, for the same reason. The Idaho is the mine that shipped twenty tons of ore to the Tacoma smelter, the net profits on which were $64 a ton. The ore went $119 in silver and $49 in lead—a total of $168. The transportation and smelting charges were $83 a ton, the duty on lead $21 and the cost of mining $10—a total of $104.

—Ore is being shipped to Kaslo from the Wellington, a Slocan mine, the property of an Ottawa company, of which Edward Watts is manager.

Safety Net at the Blanzy Colliery France.*

It happens too frequently that men fall down mine shafts owing to carelessness or a faulty movement of the cage. The accident generally proves fatal; but this is not always the case, and it might be possible to save some lives if it were not for the danger of drowning in the sump. The chance of life, therefore, depends upon the speed of rescue; but, unfortunately, none of the means generally adopted are really practical to permit of rescuing those who have the misfortune to fall down a shaft. A regulation was issued some years ago by the Prefect of Saone-et-Loire enjoining the erection, at all the mines in the Department, of vertical iron ladders, fitted to the side of the shaft and reaching from the lowest landing to the deepest level of water in the sump. These means of safety, however, become illusonary on account of the time occupied and the danger of descending; and the lowest landing may occur at a considerable height above the bottom, owing to exploration works. It is thus that the Blanzy Colliery has in its shafts sumps 120 m. and 150 m. deep, while one of them, that of the Saint-Louis shaft, is even 325 m. (176 fathoms) deep; and, as it was evident that the company could not erect ladders of this depth, their length was officially limited to 25 m. The danger, therefore, remained equally great as before for depths lower than 25 m.

At the request of the Government engineers for the district, the Blanzy Company's engineers devised for the Jules Chagot shaft, the sump of which is 120 m. (65 fathoms) deep, an arrangement for preventing falls, or, at any rate, catching the bodies of those who should be so unfortunate as to fall down the shaft. The essential portion consists of a wire-cord net fixed 2 m. below the stops of the lowest landing, which is 320 m. deep. The net has square meshes of 10 cm. (4 in.) wide, being made of cords composed of galvanized steel wire, with resistance to tensile strain of 150 kilogs per square metre (95¼ tons per square inch). The cords are made up, some of twenty and others of eighteen wires, a difference which has since been found unnecessary. The form of the meshes is preserved, so far as practicable, by a special method of construction. The net is surrounded by a frame composed of wire rope 27 mm. (over 1 in.) in diameter, forming a nearly square figure of 2.6 m. by 2.7 m. (8 ft. 6 in. by 8 ft. 10 in.)

The net is hung by sliding bolts to the timbers of the shaft, placed immediately below the landing frame, by means of loops formed by bending the rope which forms the frame (the loops enclosing iron rings to keep them distended), the total length of the net from centre to centre of these rings being 3.3 m. (20 ft. 10 in.), and its weight only 130 kilogs.; but subsequent nets have been slightly increased in length, and consequently in weight. Each loop is held by its bolt, which passes through a double socket made in a piece of angle iron fitted to the timbers, in such a manner that, on withdrawing the bolts on one side, that side of the net falls.

It is easy to lower and replace the net in case it is necessary to go down the sump, one side being let down by small ropes so as to hang vertically out of the way of the tubs. To replace the net, the side hanging down is drawn up again by the small ropes, and the loops secured by the bolts, the letting down and taking up being the work of two men and ten minutes. The nets cost 500 to 600 fr. (£20 to £24), whilst their fitting up and placing in the shaft amounted to about the same sum.

The net has often proved of great service in accidents to plant. On one occasion, when the cage came down on the stops at 100 great a speed, the shock deranged the mechanism for working them. As a length of slack cable was unrolled, the cage fell a distance of about 2 m. (say a fathom) into the net, which withstood the shock. The damage was slight and easily repaired; and perhaps, without the net, the winding-rope might have broken. On another occasion, a damaged truck was being brought up attached to the bottom of the cage, because it could not be got inside. The rising cage was about 70 m. from the surface, when the truck fell and cut the coupling bars of the descending cage, which also fell the 70 m. into the net. The empty cage and the truck together weighed 3 tons, the impact of which, falling 70 m. (to say nothing of the additional 200 m. that the truck fell) was sustained by the net, which resisted the shock. Although the net itself was damaged, none of the ropes composing it were broken, and only one fastening. It was necessary to replace the net; but the cage could be used again after a few slight repairs, whereas, if it had fallen into the sump, its value would only have been that of old iron. The saving thus effected, added to that of the time which would otherwise have inevitably ensued, largely compensate for the cost of renewing the net. On another occasion a tub full of gob fell from the pit mouth, the fall height of 330 m. (180 fathoms) into the net, which sustained no serious damage, while it also held the tub.

M. Lebreton concludes that these three accidents, in which the net stood violent shocks, prove the efficacy of the measure, while the working of the net has proved no obstacle to winding. It closes the shaft sufficiently without preventing the air-current from reaching the preparatory works below. The success achieved decided the Blanzy Company to apply the net to all their winding shafts with deep sumps.

* From a communication by M. Lebreton to the *Annales des Mines.*

The Choice of Coarse and Fine Crushing Machinery and Progresses of Ore Treatment.

By A. G. Charleton. *

Part I.—Introduction.

The title of this paper has been suggested to the writer by a most interesting contribution on the subject of gold-quartz reduction, read by Mr. A. H. Curtis, at a recent meeting of the Institution of Civil Engineers, which the writer in common with other visitors, had the pleasure of hearing discussed at the two following sessions.

The subject is of such wide scope, that the writer ventures to think some of the points Mr. Curtis dealt with may be enlarged upon, and in fact the subject can be approached from several different points of view (notably from a metallurgical one) without exhausting it, or in any way attempting to trench on matters which Mr. Curtis has more particularly disposed of.

In summing up, Mr. Curtis arrives at certain general conclusions, which are almost entirely in accordance with the writer's own experience, viz:

I.—That the most suitable machine for preliminary coarse-crushing of nearly all ores (depending on individual circumstances, referred to later on) come under one of the two following classes:—

A. Those with a reciprocating-jaw action, either hung at the top on a rocker shaft, so as to swing freely backwards and forwards at the bottom (on the well known Blake and Marsden principles), or pivoted at the lower end, so as to move to the greatest extent at the top (like the Dodge).

B. Those with a gyratory movement (like the Gates or Comet crusher).

II.—That for medium-coarse (below 2½ inches) to fine-crushing, necessary for an ore which has to be amalgamated, concentrated, lixiviated, chlorinated, or treated by any of the various modifications of these processes which have sprung up of late years (each with some special claims of its own), the types in their own particular provinces, of the best classes of machinery to employ, are represented by:—

C. Gravitation stamps.

D. First-motion rolls for medium and fine work; or geared-rolls for coarser ore sizes, and

E. Centrifugal roller-mills (such as the Huntington) which have stood the test of wide use, and time.

If, however, it is intended to reduce to pulp ore already crushed fine, as required in certain branches of amalgamation, one must add to this list:—

F. Edge-roller-mills of the improved Chilian type, Frankfort mills; and what are known in America as

G. Combination-pans, a modified form of the old Wheeler-pan.

Coarse-Crushing.

Although hand-spalling with a sledge still holds its own for breaking gold-quartz in a number of Queensland mills and other places where stereotyped prejudice still holds its position, mechanical means should generally be used for breaking the ore (as it comes from the mine) to a convenient size for its subsequent treatment. The exceptions to this rule are: If the stone contains mineral, which can be picked out at once and shipped to smelting-works to be otherwise dealt with; if manual labour be exceptionally efficient and cheap; if power of any sort be exceptionally dear; if the location of the mine* render the transport and operation of heavy machinery practically out of the question; or if the location of an existing mill of old construction will not allow of the introduction of an ore-breaker with its accompanying bins, grizzleys and automatic-feeders, etc. In point of fact the first is the only case in which spalling can compete with rock-breakers in a modern mill properly located and arranged,† as for instance, where a concentrating ore carries some such combination as argentiferous galena and zinc blende, mixed with carbonate of lead, and copper pyrites or iron pyrites, spathic iron and quartz. The result of crushing ore like this, would be to break up much of the blende, pyrites, etc., into grains, which, with specific gravity ranging only from 3·9 to 5·1, could not be thoroughly seperated from one another by jigging, or any other mechanical dressing process. A mixture of these minerals‡ has no market, and hence crushing without some previous selection would obviously result in loss.

The ore for example at Ems which is divided into (1) rich galena ore; (2) cobbing ore; (3) pyritiferous cobbing ore; and (4) barren rock furnishes an illustration given by Kunhardt.§

In many localities, however, as he remarks, loss or no loss, the value of labour is too high to admit of spalling and cobbing being carried out together (as they have to be in such cases) and at best it is a painfully primitive practice, which, carried out on a large scale, retards, or

* From the paper read before the Federated Institution of Mining Engineers.

* Since the introduction of sectionalized machinery and the application of electricity to long-distance transmission, remoteness from civilization influences this aspect of the question, more than local engineering obstacles.

† Assuming it to have a capacity of 20 tons a day, or anything over that amount.

‡ Above certain proportions small enough to be neglected.

§ *School of Mines Quarterly*, series 2. "The Art of Ore Dressing in Europe.

even prevents, by the sedentary nature of the work, a healthy physical development of the youth of the mining population, though on the other hand, it certainly tends to stimulate their faculties of observation.

In class A, the best known crushers are the Blake and Blake-Marsden stone-breakers.

The Blake-Marsden hand-hammer-action crusher takes, it is claimed, less power to get through a given amount of work than the Blake; nevertheless it does not appear to have come into such general favour for mining purposes. Perhaps this may be accounted for by its greater prime cost, weight, and the large space it occupies, for it seems a simple and well-built machine.

The chief disadvantages, which attach to the use of the above class of ore-breakers are:—

(*a*) That the moving jaw only does effective work during the forward stroke, rendering the action an intermittent one.

(*b*) That thin, flat pieces of rock may at times pass the jaws without being broken, an objection, it may be remarked, which is not of very great consequence to the miner, unless the product of the machine is unusually large, and goes direct to automatic feeders.

(*c*) That the stone leaving the machine is of continually varying sizes.

With regard to the Dodge, its special advantages are:

(*a*) Its light weight.

(*b*) The jaw being fixed at the bottom (1) the size of the product can be more easily regulated; (2) is more uniform in size; and (3) the stones can be crushed down finer than with crushers of the preceding class.

The Dodge is more particularly recommended on these grounds, for fine-crushing in concentration-works, although its capacity is more or less limited as compared with the Blake, owing to the fact that it gives a finer product.

It should also meet a want in small mills, which cannot keep a more powerful breaker fully employed, or as a preparatory machine for finer crushing, in Rolls or a Huntington.

Belonging to class B there are:—

1. *The Gates or Comet Rock and Ore-breaker.*—Owing to the gyratory movement of the breaking-head of this machine on an eccentric, within a circular outer shell, which is protected with toothed liners, and is shaped like an inverted cone, it is claimed:—

(*a*) That flat pieces of rock cannot pass through it uncrushed to the same extent, as in a machine with reciprocating-jaws.

(*b*) That as the area of breaking-surface increases towards the discharge end, the material as it is broken smaller is spread over a larger space, which results in finer crushing than is practicable with a reciprocating jaw-machine.

(*c*) That as the head is loose on the eccentric spindle, there is no grinding action, and there is a line of crushing-surface from top to bottom of the head and liners in constant action.

(*d*) The area of breaking surface is about three times as great as in reciprocating machines of similar power. This seems to admit of the machine doing nearly treble the work in any given time, driven at the same speed, and of tipping into it large quantities of stone (using a hopper); dispensing with much of the attention necessary with machines belonging to class A.

(*e*) That, having a comparatively small crushing-surface acting continuously, dispensing with a fly wheel to store up power (apart of which is wasted), and the rock which is to be broken being supported at its ends only, in the circular crushing-chamber, less power is required, as compared with a jaw machine, to do a given amount of work.

Quoting the report of a committee, on a competitive trial between a 9 inches by 15 inches Blake-Marsden, and a 9 inches by 14 inches Gates, at Meriden, Connecticut, on May 30th, 1883, the makers of the Gates assert that, crushing the same kind of stone to an equal size, the latter machine crushed over three times as much in a given time, and showed a saving of about 35 per cent. of the indicated power consumed in doing the work.

On the other side, it must be said, that a Gates of an equal capacity will not take in a lump of rock of as large sectional dimensions as a Blake or Marsden; and the latter machines have the advantage in respect of weight and prime cost; the price of the large sizes is in fact extremely heavy, and the height of the Gates is also a disadvantage, where fall has to be economized. The injury done to the machine, which might result from a hammer head, or drill falling into it (a not unfrequent occurrence through carelessness, or occasionally other reasons) has also to be considered, and there is no doubt that the Gates requires particular attention, in keeping it properly lubricated with suitable lard, or heavy lubricating oil. The head and liners are made of especially chilled, cast white-iron.

There is one particular case, however, which should be pointed out, in which the Gates seems to possess very special advantages over other crushers and that is, where there is a wide lode yielding large quantites of milling ore, in which the stone breaks "large" in stoping it down, and requires in consequence to be spalled, to get it into the jaws of an ordinary breaker. Under such circumstances, a Gates may obviously serve a very useful purpose indeed, as the larger sizes will take in whole lumps, as big as can be handled, and by this means the tedious and expensive process of breaking in the mine, or "breaker-floor," is avoided.

The measure of economy in using a large sized breaker of the kind will necessarily depend, however, on being able to keep it fully employed, as well as possessing ample storage-bin room and driving power. As an instance of the work it can accomplish under such circumstances, the Caledonia mill in Dakota may be quoted,* where one No. 6 Gates, with receiving-openings 12 inches by 18 inches, attended by one man, crushed 200 tons in 10 hours, and did the work formerly set for three No. 5 Blakes (the largest ordinary pattern in the market), with a receiving-opening 9 inches by 15 inches. These latter took five men 20 hours, it is said, to produce the same result, requiring the same amount of power. It is asserted by the makers of the Gates, that its action entails less stress on the structure it is mounted upon, than is the case with a reciprocating breaker, but one is somewhat inclined to doubt whether this *holds* good in starting it when empty, whatever may be the case whilst it is running full.

Its size, and weight, must evidently be special objections, when it has to be mounted on a lofty structure (like the back floor of a stamp mill); and where the stone is divided, along a long line of bins, the advantage of using one large machine, is more or less offset by the difficulty of distributing the ore between them, unless there is an exceptionally large fall to spare. Under such circumstances the only practical escape from the difficulty, is to set the breaker apart from the mill (if possible close to the shaft); and it is not improbable that this is, as a rule, (where the mine and mill are owned by the same company, and the former keeps the latter entirely occupied), the best disposition to adopt. This does away with much of the dust which plays havoc with the bearings of the other machinery of the mill, permits of lighter framing for foundations and superstructure, less grading (in some cases), † and a smaller annexe to the main building.

2.—*The Lowry Ore-breaker.*—A second form of gyratory crusher has quite recently been introduced by the National Machinery Co., of Tiffin, Ohio.

A description of this crusher appeared in the *New York Mining Journal* of December 5th, 1891.

Its construction is illustrated by a diagram, which shows it in section, with a removable revolving top for fine-crushing, containing two or more holes, to regulate and spread the stone round the breaker-head. The ore is thrown into a hopper, and is discharged as fast as it is broken, avoiding any danger of clogging. The Lowry ore-breaker appears to occupy the same position with regard to the Gates, that the Dodge does to the Blake, as the vertical shaft is fulcrumed below the crusher-head instead of above it; consequently there is less motion, so it is asserted, at the bottom of the jaw, and the product is said to be more even than that of any of the jaw-crushers, in which the jaw is pivoted at the top, a statement which is no doubt correct.

The chilled-iron head or cone appears smaller in the Lowry breaker than in the Gates. The chilled-iron ring or liner, which forms the outer crushing-face is cast in one solid piece, having a solid turned bearing and supporting-backing behind it. The machine is adjusted for crushing to various sizes by screws at the side of the crushing mortar, by which the liner can be raised or lowered. This is done to obviate the necessity of lifting the vertical shaft, carrying the crusher-head, the bottom of which always remains in the oil chamber of the eccentric, at the base of the machine. The vertical shaft is driven by ropes with sufficient laps around the pulleys, and with provision for adjustment in the tension-pulley.

As one of the chief advantages of this machine, the manufacturers claim that the crusher-head strikes downward, and has a tendency to draw in the material to be crushed, which would not be the case if the vertical shaft were fulcrumed at the top.

These breakers are made in nine sizes, having a capacity varying between 5 and 250 tons per hour.

Without having seen both machines at work and knowing more about the Lowry, it is impossible to institute a fair comparison between it and the Gates. But it is probable that, comparing the former with reciprocating-jaw machines, most of the arguments for and against the Gates seem to apply equally to its new competitor.

The purpose for which an ore-breaker is intended, its capacity, saving in space occupied, weight, quickness in setting to work, ease of repair, simplicity of construction, wear per ton of ore, liability to serious or minor accidents, first cost, and consumption of labour in attendance, lubricants, and power required per ton of ore crushed, will all influence the choice of a machine, and no hard-and-fast line can be drawn, between the various coarse-crushers which have been mentioned, each possessing a sphere of usefulness of its own. In fact, as some of the above conditions are o a certain extent conflicting, a careful consid-eration of the particular circumstances of each case is absolutely necessary. In judging of the relative economy of different crushers in regard to consumption of power, it is perfectly correct that the only true test of their efficiency is the actual, indicated, useful effect shown per lb. of fuel burnt in cubing a certain class of stone to a given size. This method of comparison is, not however, so entirely reliable as would at first sight appear, unless the machines under trial be driven with the same engines and boilers, by the same engineman.

The consumption of fuel will, in fact, differ in different works, according to its quality or description, the size and type of engine and boiler employed, and the care bestowed in looking after them.

* "Gold-milling in the Black Hills," by H. O. Hofman. *Trans. Am. Inst. Min. E.*, vol. xvii., page 498

† When rock-breakers and ore-bins are used with automatic-feeders at the back of a stamp-battery, which has tables and concentrators below it, the least practicable fall that ensures the automatic movement of the ore through the various stages of the process is about 33 feet from the rock-breaker to the concentrator floor.

Further than this, it is absolutely necessary to compare the exact time the crushing lasted, deducting all stoppages since an engine which is idle, during the time the boiler fire is alight, may be consuming—in proportion to the useful work done—much more fuel than either the indicated or real horse power (measured while the engine was working) would lead one to suppose. The different sizes, weights, capacities, size to which the stone is cubed, size and speed of driving pulleys, nominal horse power expended, and cost of the Blake, Blake-Marsden, Dodge, Gates and Lowry ore crushers, are given in the subjoined tables, as far as it is possible to ascertain them:

DIMENSIONS, PRICES AND PRODUCT OF THE BLAKE STONE AND ORE BREAKER.*

No.	Size of Receiving Opening.	Approximate Product per Hour in Tons crushed to 2 inch size.	Weight of Heaviest Piece.	Total Weight.	Extreme Dimensions.				Driving Pulley.		Proper Speed. Revs. per Min.	H.P. Required.	Price F.O.B. Chicago.
					Length.	Breadth.	Height.	Diam.	Face.				
	Inches.		Lbs.	Lbs.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.				£ s. d.
..	3 × 1½	Laboratory.	40	100	1 1	0 6	0 10	0 5	0 1	300	..	4	10 8 4
A	10 × 4	4	1,993	4,719	4 6	4 0	3 11	1 8	0 6	..	4	7	62 10 0
2	10 × 7	6½	3,950	7,896	5 4	4 6	4 5	2 0	0 7½	275	7	10	104 3 4
5	15 × 9	10½	7,179	15,749	6 8	5 0	5 3	2 6	0 9	..	10	14	156 5 0
8	20 × 10	13½	7,700	17,000	6 10	5 9	5 11	3 0	1 0	250	14	20	218 15 0

* There are various intermediate sizes not mentioned in this table; the 20 inches by 15 inches, with a product of 20 tons per hour, being the largest.

* Messrs. Fraser and Chalmers' *Catalogue No. 4* (Gold and Silver Mills), and Egleston's *Silver*, page 318.

Size A—Takes pieces 4 inches thick, and crushes to ¼ inch or less. 2—Takes pieces 7 inches thick, and crushes to ¼ inch or less. 3 and 4 are used for road ballast, furnaces and breaking smaller for other crushers. Mr. H. S. Munroe* places the cost of repairs for eight 7 inches by 15 inches lever-pattern crushers (Blakes) with corrugated jaws, estimated to have crushed 224,203 tons of limestone, at Bonne Terre, Missouri, in 12 months, at:—

	£	s.	d.
12 levers, at $25	62	10	0
9 jaw plates, at $15	29	1	3
12 jaw plates, at $12	30	0	0
Toggles, check-plates and sundries	51	12	6
Total cost	£173	3	9

This represents an average of about £20 16s. 8d. for each crusher, breaking 80 tons per dien, to 1¼ inches, but does not include the cost of babbitting bearings, or labour in making repairs.

From these data, the average life of the wearing parts of a jaw-crusher, appears (similarly circumstanced) to be about 8 months.

The lower box of the pitman shaft must be packed with thin wood packing, to prevent the key tightening the box to the shaft. Iron plugs should be kept in the oil holes, and if the fixed jaw requires to be cast up, it should be backed with zinc plate about ½ inch thick.

The amount of product depends on the distance the jaws are set apart, the speed, and also on the nature of the ore.

The product given in the table assumes the jaw set 1½ inches open at the bottom, the machine run at proper speed, and properly fed, but it will vary somewhat with the character of the stone, brittle stone, for instance, going through faster than sandstone.

The No. 2 Blake is made in sections for mountain transport. Total weight, 6,881 lbs.; cost, £145 16s. 8d. No piece of this machine weighs over 332 lbs.

** The new Dressing Works of the St. Joseph Lead Company. *Trans. Am. Inst. Min E.*, vol. xvii., page 650.

DIMENSIONS, PRICES AND PRODUCT OF THE BODGE CRUSHER.†

No.	Size of Receiving Opening.	Approximate Product per Hour to Run Size.	Total Weight.	Driving Pulley Diameter.	Width of Belt used.	Proper Speed. Revolutions per Minute.	H. P. Required.	Price F.O.B. Glasgow, Complete.
	Inches.	Tons.	Lbs.	Inches.	Inches.			£ s. d.
1	4 × 6	½—1	1,200	20	4	275	2— 4	52 1 8
2	7 × 9	1—3	4,300	24	5	235	4— 8	93 15 0
3	8 × 12	2—5	5,600	30	6	220	8—12	114 11 8
4	10 × 16	5—8	12,000	36	8	200	12—18	187 10 0

† Messrs. Fraser and Chalmers' Catalogue No. 1.

The power required per ton will, of course, vary with the size to which the stone is broken, requiring additional power to break it smaller than ordinary macadam.

An elevator and screen are used when it is desired to break everything down to ¾ inch.

If the product is not required smaller than ¾ inch, and some "spalls" are not objectionable, the screen and elevator are not needed.

Prices of Gates' breakers with revolving screen and return elevator fitted complete, on frame, size 0, with 24 inches by 36 inches revolving screen, £156; size 1, with 24 inches by 36 inches revolving screen, £208; size 2, with 24 inches by 36 inches revolving screen, £250; size 3, with 24 inches by 36 inches revolving screen, £354.

Elevators 24 feet between centres, including connections, range in price for the various size breakers (from 1 to 7), from £56 to £127, and weigh from 2,000 to 5,000 lbs. Revolving screens, with dust jackets, cost from £42 to £146 (exclusive of connections) and weigh 2,000 to 8,000 lbs.

Medium Coarse and Fine Crushing.

From the point of view of the mechanical engineer the superiority of one machine of class H. over another, for the reduction of a certain kind of stone say granite), can in a measure, be pretty easily demonstrated, but the question as a miner requires to look at it, becomes one of extreme complexity, as the factors to be dealt with are variable and conflicting, in more ways than one.

Viewed in this light, if the field of selection be limited, merely to the three classes of crushers particularized on page 233, the choice of the best for any special case appears to depend on three equally important considerations, which are altogether outside the primary question of the mechanical merits or demerits of a particular machine, and it is here that the experience of the mining engineer is called into play.

To arrive at a trustworthy solution of the problem, he must take into consideration: 1st, the character of the ore itself and its associated gangue; 2nd, the degree of comminution to which it is desirable to carry reduction in order to get the best results out of any particular system of treatment that may be adopted; whilst in some cases the location of the mine and the nature and position of the mill site, also form a third factor of the question.

To put the matter in a nut shell and go a step farther, it may be laid down as a rule, that setting aside any other machines which have claims to attention, where one of the three classes of crushers (stamps, rolls, and roller mills) now under consideration is found, commercially speaking, to best meet the needs of the mine in any one instance, it is most unlikely that either of the other two types, will be found suited to the requirements of the same case; if indeed, they did not turn out on trial absolute failures, supposing one kind of machine to be substituted for another.

An ideal "reduction plant," would have to establish a claim to extract the largest percentage possible of gold or other metal automatically in the shortest possible time, and in the simplest possible manner, combining capacity for expeditiously reducing the greatest quantity of ore in a given time to any desired point of fineness, with a minimum production of fines or slimes; it should further possess strength and durability without being cumbersome, and have as few working parts and auxiliary appliances connected with it as possible. Now, while this acme of mechanical and metallurgical perfection combined has yet to be invented, the success of one type of crusher as against another in various instances, may be directly traced to the fact that some of those features which are wanting in one class of machine, are found more or less developed in one or other of its competitors. In selecting the most suitable machinery for his own particular object it is therefore incumbent on the miner not to lose sight of the points that have been indicated, as they may relatively affect in a different degree the circumstances he happens to have to deal with.

The comparability of the plant in the foregoing respects, however, is not everything, as the outlay it may involve must after all be justified by the returns it will yield. He has therefore to compare:—

1. The prime cost and weight of each class of machinery, with its indispensable adjuncts for extracting the commercially valuable metals from any particular ore, representing a very variable capital outlay to produce a given result.

2. The simplicity or complexity of the entire plant in each case, not only with regard to cost of repairs, but also the time lost in maintaining it in running order in out-of-the-way places, difficult of communication, and where skilled labour is perhaps not available.

3. The relative time required to erect each different class of machinery; and lastly,

4. The comparative costs (both in regard to quantity and price) of labour, fuel, oil, etc., required to run a given class of plant in a certain locality.

Under these circumstances, with the limited data possessed at present in the shape of independent figures throwing light on many of these questions of relative efficiency and cost, at most only general statements can be made; and any attempt to assert the adaptability or superiority of one machine or class of machines for all cases, must infallibly break down.

Each form of crushing machinery has its champions and detractors who freely express themselves for or against it, according to the measure of success it happens to have achieved merely in their own limited personal experience; and where failure occurs, the machine not unfrequently is blamed, when in some instances it is owing to want of forethought on the part of the purchaser in overlooking natural contingent results, which might have been reasonably foreseen and easily escaped.

The degree of comminution to which it is desirable to carry reduction to get the best results out of any particular system of treatment rests on the general nature of the process employed to extract whatever of value the ore contains; this is dependent to a very large extent on the ore itself and its associated gangue.

The choice of medium and fine-crushing machinery must then be regulated, from a mechanical standpoint, as well as by the class of ore it is required to crush, bearing in mind that ruinous losses may ensue by going to either extreme. That is to say, in selecting a machine, if crushing is carried to an unnecessary degree of fineness, money is wasted in doing unnecessary work, which shows itself in the cost sheet at the end of the year, besides risking various mechanical and metallurgical losses.

Amongst these latter, may be enumerated, slimes and fine mineral in suspension, in concentration, and wet amalgamation; dust in furnace and other dry processes; and various inconveniences in filtering and extraction, in those cases where ore has to be lixiviated; all entailing extra expense, to mitigate a difficulty which has been artificially created.

If, on the other hand, the crushing is not fine enough, a proper percentage of the metals (remaining as they do locked up in their stony envelopes) is not secured. So that whether water be employed to concentrate them, mercury to entrap them, chlorine to attack them, or some chemical solution to extract them, there is a more or less considerable loss, which ought to be carefully studied, for the purpose of finding the vanishing point (so far as it can be learnt) common to all these combined sources of trouble.

One may say then, that there is a certain average degree of fineness, to which it pays best to carry reduction in every process (varying with the ore, and the method of treatment). But before this point can be settled it is

DIMENSIONS, PRICES, AND PRODUCT OF THE BLAKE-MARSDEN (WITH LEVER AND ECCENTRIC MOTION), STONE BREAKERS.*

Size of Receiving Opening.	Approximate Product per Hour to Road Metal Size, 2½ Inches.	Total Weight of Machine.	Extreme Dimensions. Length.	Breadth.	Height.	Driving Pulley. Diam.	Face.	Proper Speed. Revolutions per Minute.	H. P. Required.	Price.
Inches.	Tons. Cwts.	Lbs.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.			£
12 × 8	5 8	10,080	8 1	3 7	4 9½	2 0	0 5	250 to 300 revolutions.	5	113
15 × 8	6 5	12,880	8 9½	4 10	5 3	2 6	0 6		7	135
15 × 10	7 10	15,680	8 9½	4 10	5 3	2 6	0 7		8	150
18 × 9	8 15	17,584	8 11	4 11	5 0½	3 0	0 7		9	165
20 × 10	10 0	22,400	9 11	5 5	5 4½	3 0	0 7		10	180
24 × 13	15 0	30,240	10 6½	5 8½	6 7½	3 0	0 9		12	263
24 × 16	16 0	31,360	10 6½	5 8½	6 7½	3 0	0 9		14	275
24 × 17	16 5	31,920	10 6½	5 8½	6 7½	3 0	0 9		14	282
30 × 18	20 6	33,600	....	....	....	....	....		18	375
34 × 18	23 2	42,560	....	....	....	....	....		20	413

* Makers' catalogue and correspondence.

The makers state that it is advisable to use an engine of 2 horse power more than stated in the table, as it is more economical to run a larger engine, than to run one up to its full power (this remark also applies to the Blake and the Gates crushers). The principal working parts are all crucible steel.

DIMENSIONS, PRICES, AND PRODUCT OF THE GATES OR COMET ORE CRUSHER.

Size.	Dimensions of the Three Receiving Openings combined.	Dimensions of each Receiving Opening, about.	Weight of Breaker.	Capacity per Hour in Tons of 2,000 Lbs. passing 2½ inches Ring according to Character of Ore.	Dimensions of Driving Pulley. Diam.	Face.	Space occupied by Breaker set up. Height from Bottom Frame to Top of Hopper.	Width of Frame.	Length of Frame.	Diameter of Hopper.	Revolutions of Pulley.	H. P. of Engine recommended to drive Breaker, Elevator, and Screen. Lime Stone	Granite.	Net Price f. o. r. London.
	Inches.	Inches.	Lbs.	Laboratory and sampling	In.	In.	In.	In.	In.	In.				£
00	2 × 12	2 × 4	500	S	2½	24	17	26	13	700	½	½	25
0	4 × 30	4 × 10	3,100	2— 4	16	6	48	30	73	28	560	4	4	85
1	5 × 36	5 × 12	5,500	4— 8	20	7	54	31	76	37½	475	8	8	125
2	6 × 42	6 × 14	7,800	6— 12	24	8	60	39	90	39½	450	12	15	165
3	7 × 45	7 × 15	13,500	10— 20	28	10	73	48	103	44½	425	20	30	250
4	8 × 54	8 × 18	20,000	15— 30	32	12	85	54	114	51	400	30	40	400
5	10 × 60	10 × 20	27,000	25— 40	36	14	96	63	123	59	375	40	50	500
6	11 × 72	11 × 24	36,000	30— 60	40	16	109	73	139	66	350	50	60	725
7½	13 × 90	13 × 30	60,000	40— 75	48	18	116	73	144	120	350	60	75	1,040
8	18 × 135	18 × 45	89,000	100—150	48	20	156	90	164	132	350	125	150	1,450

necessary to decide what is the best process for the purpose in view, *i.e.*, in getting the largest commercial return on a given capital outlay.

On these grounds, it is of paramount importance that the chemical and physical peculiarities of the ore and its associated gangue should be first studied, and carefully noted in connexion with the local surroundings of the works, in regard to the character and cost of labour, fuel, supplies, and abundance or absence of water-supply, as well as climate and other considerations, which must influence the choice.

To enter into minute details concerning the peculiarities of various ores, and the processes of treatment they might be subjected to, is far beyond the scope of this paper, but from a general standpoint, as effecting the present question, the materials (ore and country rock and gangue) which the miner, the metallurgist, and mechanic, have alike to deal with, may be divided according to their physical characteristics, in three chief classes :—

(*a*) Brittle and hard ; such as quartz, most pyritic ores, syenite, and coarsely crystalline metamorphic rocks.

(*b*) Tough ; such as native copper, gneiss, and most of the micro and cryto-crystalline metamorphic and intrusive volcanic rocks, which accompany ore-deposits.

(*c*) Soft or clayey ; these latter comprising earthy carbonates, surface ores, or clayey limestones, as well as some classes of stone, comparatively hard and brittle like schist but carrying clay-partings, and sandstone.

When the different physical pecularities which attach to the first elementary mineral substance in the above list are considered, it is seen what wide room there may be for enquiry in this direction alone.

Silica which possesses no doubt a special interest to many engineers when it takes the form of gold-quartz, may possess under certain circumstances, what miners term a kindly appearance, tinged sometimes a light-gray, blue, or brownish-red colour, combined with a dark resinous look ; whilst elsewhere it may have a vitreous, wet, or opaque-white, hungry appearance, probably so-called by "cousin Jack," because it generally leaves him (if he attempts to work it) precisely in that very condition.

Still some of the best specimen-quartz is frequently milky, and white as a hound's tooth, whilst what is known as ribbon-quartz, a laminated variety of stone (separated by thin talc or chlorite-partings, or laminæ of graphitic shale or slate) is not unfrequently when met with, a good weight-carrier of metal. All these physical differences, due to peculiarities of hydration, association, and structure, will influence the way in which the stone breaks, and therefore affect its after treatment.

The materials dealt with by the mining engineer may, therefore, be divided according to their mineralogical characteristics and metallurgical behaviour, into a further number of classes, with different subdivisions :—

(*a*) Ores of the base metals, whether containing gold or silver or not, which have to be smelted or treated by a wet process either with or without a previous (hand or mechanical) coarse or fine concentration, matting, or roasting, depending on circumstances which need not be enumerated.

(*b*) Ores of one or both of the precious metals, properly so-called, comprising :

1. Free-milling gold ores.
2. Free-milling silver ores.
3. Pyritic ores of gold and silver.
4. Combinations of 1, 2 and 3.
5. Exceptional ores.

These different kinds of ore may be subjected to various processes, amongst the most general of which, for dealing with free-milling * low-grade gold ores (belonging to class 1) are :—

1. Stamping the ore wet to fine size, and catching the free gold on copper plates (inside and outside the battery), with wells and mercury traps, used as accessories.

2. Wet stamping the ore coarse, and amalgamating on copper plates, separating the coarse-sands from the finer slimes, by screens or sizing boxes (in some cases, preceding or following this separation by fine concentration) ; and regrinding the coarser sands thus saved, in Huntington or Chilian mills, or pans ; † followed by more copper plates.

For dealing with free-milling comparatively high-grade ores of gold, belonging to class 1, in which there is an excessive loss, if the previously described systems of treatment are followed (owing to the fine state of division of the metal, its alloyage with silver, or some other reason) there may be employed :—

1. Wet stamping, succeeded by direct pan-amalagamation on the ordinary plan (or else what is known as the Ross continuous system); or crushing dry (followed in exceptional cases by roasting) and then amalgamating in Chilian mills or pans. When there is a small percentage of rich sulphides present (especially if dealing with a mixed gold and silver ore) fine *i.e.*, table concentration, may precede or follow the pan-treatment with an appreciable saving.

2. In a few special cases, like the Mount Morgan mine, Queensland, ores of this class may no doubt be treated in bulk with advantage by drying, crushing with rolls, partially roasting, and working by chlorination, in barrels. That the Mount Morgan ore may equally well be classed amongst the exceptional ores (belonging to class 5), becomes evident however, when the facts of the case are closely studied.

(*To be Continued.*)

* A term implying that the greater part of the gold is free.

† Without mercury preparatory to re-amalgamation.

The Silver King—A Sketch of the Discovery of Kootenay's Famous Mine.

In another place our columns contain particulars of the floatation of an English syndicate to acquire and work the Silver King mine.

The history of the discovery of the property now known as the Hall Mines, Limited, is a rather peculiar one. In the summer of 1886 Wm. Hall, Osner Hall, Wm. White, and several others were prospecting for gold placer on the head waters of the Salmon river and some of the smaller tributary streams. The party arrived near the summit, between Salmon river and Cottonwood creek, when a quarrel arose, which divided the outfit into two parties. One of these returned south by way of Beaver creek, and the other, consisting of the Hall brothers and White, kept on to the north. A day or two later some of the pack animals strayed away on the mountain side, and during the search for them the original Silver King lead was discovered.

The next season a location was made and a small amount of work done. This was followed for several seasons with varying success, but as the development progressed it became more and more apparent that the fortunate find would in time prove an unusually valuable property. Several disputes arose between the original owners, and a number of tempting offers for the purchase of the property were refused, owing to the lack of agreement on the part of the owners.

For over a year negotiations have been pending in England for the formation of a company with sufficient capital to handle the mine and its products properly. These have at last proved successful, and the Silver King group will, it is to be hoped, soon take its place as one of the largest and richest producers in the country. The Silver King lies between five and six miles south of Nelson, on the east side of Toad Mountain.

The showing on the surface is fully thirty feet without walls, and at a depth of 150 feet the ore body consists of sixteen feet of solid high grade ore and some twenty feet of a good class of concentrating ore. The expert who examined the property for the present company's incorporators, reported that in the 900 feet of the mine now opened up, there are 55,000 tons of ore practically "in sight," which on careful assays will yield an average of 100 ounces of silver per ton and 17½ per cent. of copper, or a value of $104 per ton. This would give something like $5,000,000 as the gross value of the property from what is now in sight. This ore, he reports, would give, after the erection of a smelter in Nelson, a profit of some thirty per cent. per annum for seven years on the capital stock of the company.

The ore of the Silver King is a combination of variegated copper pyrites and tetrapedrite or gray copper. This latter is very rich in silver. Shipments amounting to 180 tons sent to different smelters have given an average smelting return of 213 ounces of silver and 18·17 per cent. of copper per ton, representing a value of $200 per ton. The ore also carries from $2 to $4 per ton in gold.

Soft Ore Mining.*

Soft ore being a relative term, it is necessary to explain that in this paper reference will be had to the brown hematites and limonities of the Marquette range, locally called "hematites" to the ores occurring east of the Menominee river on the Menominee range, to all the Gogebic and Mesabi ores and the Ely group on the Vermillion range. The ores occuring west of the Menominee river on the Menominee range may be as soft to drill as some of the ores just mentioned, but they are tough and strong and can be mined by methods prevailing in the hard ore regions.

The methods of mining made use of in the Lake Superior soft ore mines are as follows : 1 stripping and open pit work ; 2. rooming and timbering ; 3. filling ; 4. caving.

Stripping and Open Pit Work.—Open pit mining has been used more or less on all the Lake Superior ranges. The stripping has been done by pick and shovel or by scrapers, and the ore has been hoisted by derricks or over skip-roads built on the slope of the banks. As, however, the ore deposits on all the older ranges dip at angles over 45°, almost without exception, the limit of the open pit mining has soon been reached in each case. The discovery of the flat deposits of iron ore near the surface on the Mesabi range has lately revived the interest in this method of mining, and it will undoubtedly be used here on a much larger scale than on the older ranges. Steam shovels and locomotives are already pressed into service for removing the earth from above the ore beds, and though the strippers have suffered a temporary set back, owing to the difficulties of operating the steam shovels in the frozen banks during the last severe winter, they will eventually prove that the "stripping proposition" is both feasible and economical in the end. The question has been raised as to the amount of surface that can be economically removed, and in this respect I would state, as a basis for discussion, that where the volume of ore to be uncovered is equal to the volume of surface to be removed, it will pay to strip.

* Paper read by Superintendent P. Larson, of the Aragon Mine, Norway, Mich., at the meeting of the Lake Superior Mining Institute held at Iron Mountain, Mich., March 22.

Rooming with Timbering.—The system of rooming with timbering has been more extensively used than any other in our soft ore mines. The general plan under this system is to mine out certain blocks of an ore body on a given level in advance of others that are left temporarily for the purpose of supporting the rock walls. The relative size of these rooms and pillars varies greatly, but it is quite common to make the rooms from 20 to 24 feet wide and the pillars somewhat less. The length of rooms and pillars is equal to the width of the ore body. The rooms are worked from bottom to top of each lift, and heavy structures of timber are built up in the rooms as the mining proceeds upwards. In some of the larger mines, where this system has been employed, these huge underground structures have collapsed under the pressure from the surrounding walls, and in such cases the rooming system has either been abandoned or materially modified. Such extensive caves have, of course, temporarily checked the output of ore, and the system itself has sometimes fallen into disrepute. But in cases where the size of the ore deposit is limited, it affords a possibility of a forced output, a fact that commends it to mine owners. The great cost of the heavy timbering that it requires is, of course, one of the greatest objections to it. This cost rarely falls below 25 cents per ton of ore.

The Filling System.—Rock filling is often used in connection with rooming in which lighter timber can be used or entirely dispensed with. Where it is absolutely necessary to keep the surface above a body of soft ore from settling, as for instance in swamp or under a townsite or under a main line railroad, no other system than this combination of rooming and filling will answer the stated purpose as well. But such cases are not very frequent. The instances in ordinary mining practice, where rock filling is most economical and advantageous are those where the filling material can be put into the desired place without the use of shovel or, in other words, where it is not required to put in the filling close up to the back of a stope. Such a case occurs in the Chapin mine, where on the lower levels the ore is of sufficient firmness to hold up without the use of timber in 20 foot rooms carried across the whole width of the ore formation. Here the stopes are taken 9 feet high, and the rock filling is dumped by small cars within 4 feet of the back after the completion of each stope.

Other cases where rock filling is used are those where narrow deposits of ore can be mined longitudinally with stopes reaching from foot to hanging wall. In such cases the rock filling is kept pretty close after the miners, unless the hanging wall is firmer than we usually find it in soft ore mines.

The system of filling introduced 8 years ago into the Chapin mine, whereby the whole ore body in each lift was mined by slicing the ore out floor after floor from bottom up, and by filling each slice close to the back with rock, has been abandoned on accouut of the great expense of shoveling, filling into the stopes and the high cost of the necessary openings.

Caving.—Two distinctly different applications of the caving method are now used on Lake Superior. In the one the miners commence stoping at the top of a lift and are always working under a "gob" roof, while in the other they attack the ore at the bottom of a lift and work under a crumbling block of ore, which keeps sinking down to them. The former method has long been employed in European soft ore mines, especially in the north of England, and it has been in use for a number of years in this region, while the latter is a new method, adopted on a large scale 1½ years ago in the Chapin mine. The former is well adapted to such soft ground, where the ore can be mined chiefly by pick and shovel, while the latter can be used in quite firm ground, which breaks up more or less in settling, before it reaches the miners, the bottom floor alone being in its natural solid state when mined. The north of England system has the advantage that it can be used in irregular bodies without danger of leaving off-shoots from the main ore body. Where it is desired to use the Chapin system in relatively flat or irregular ore bodies, it becomes necessary to make the lifts short. In such cases it may be found advantageous to use a modification of the north of England system, such as is now successfully employed in the Chandler mine, where each lift is mined from top down but each floor is taken 15 feet thick. Other applications of the caving system may be seen in the Norrie and Lake Angeline mines, where on the chamber-and-pillar plan the ore is mined in vertical sections from the hanging to the footwall, and the hanging wall rock or the overlaying "gob" is caused to run into these sections as they proceed towards the foot.

In conclusion it may be said that the conditions that meet the miner in the different mines are so varied, that no two mines can be marked by exactly the same plan. Such of us as have had pet methods are fast giving them up. Those that have advocated filling may occasionally find it to their interest to cave, and those that are professional cavers are sometimes found to be engaged in rooming, and we would perhaps all be only too glad to join our Mesabi friends in adopting their "stripping proposition," if nature had not turned our ore deposits edgewise in the ground. We must, however, adapt ourselves to the conditions that meet us, and, by learning from each other's experience, endeavor to keep ourselves to the front among American miners.

Murday's firedamp detector (Journal of the Iron and Steel Institute, 1892, No. 1, p. 380), as adapted for colliery use, has been brought out recently, and is illustrated in the technical journals (Colliery Guardian, vol. lxiv, p. 789 ; Electrical Review, vol. xx, p. 517.

Steel Trucks in Belgian Collieries.—In the Belgian collieries, trucks made entirely of metal have been in use for several years. Drawings of these trucks, published by P. Vanhassel, show that repairs are cheaply and easily affected. A damaged part has merely to be unrivited and replaced by a fresh one kept in stock. The damaged part is, as a rule, merely bent, and being of steel, can be straightened and used again. A truck of this type can be put together without difficulty by a lad, the separate parts having been purchased. A truck with a weight of 375 lbs. and a capacity of 336 lbs. of coal costs 26s. In many Belgium mines, the wheels of the truck are loose and turn freely on the axle, the advantage they present being the small resistence they offer in passing round curves. The wrought-iron axles are square in section with 1.38 inch side. Four wheels and two axles weigh 132 lbs., and cost 19s. 9d. The entire truck weighs 507 lbs. and cost £3, 5s. 9d. The weight of the truck is, to that of the coal carried, as 1 is to 2·3, and this may be considered a very favorable ratio. A truck of the old type with wooden body weighed 551 lbs., and cost £3, 8s. By the introduction of trucks with steel bodies the output of the Mariemont mine has been increased 40 per cent.

Incline Truck Drop for Calcining Kilns.—A new incline truck drop for use in connection with calcining kilns is described by Mr. C. Wood, in a paper read before the Cleveland Institution of Engineers. This drop was designed for lowering the trucks from the top of the kilns at the Tees iron works, where the space was very limited, and for that reason a drop of the ordinary design was not admissable. After a description of the form of drop usually employed in the district, the details of the latter design are given. Four columns support girders, on which is mounted a shaft with four rope pulleys and a brake-sheave. The counter-balance weights work inside the two main columns. These stand on one side of the centre line of the kilns, from which the truck is run on to the lowering table, its weight being so placed as to keep the guide-wheels in position. The table at the bottom of its travel is tilted automatically, and the stops withdrawn so as to discharge the trucks on the same side as that on which they were received.

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Annual Report, 1888-89,

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