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The Canadian Mining Review

Established 1882

Vol. X.—No. 9. 1891—OTTAWA, SEPTEMBER—1891. Vol. X.—No. 9.

PROVINCE OF NOVA SCOTIA.

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

—AND—

PRECIOUS STONES.

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

GOLD AND SILVER.

Under the provisions of chap. 7, Revised Statutes of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of six months, which can be extended by renewal for another six months. Mines of ld and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. Up to ten areas the cost is 50 cts. per area, for every area in addition in same application 25 cents. Cost of renewal one half the original fees. Leases of any number of areas are granted for a term of 21 years at $2-00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19 an ounce, and in smelted gold valued at $18.00 an ounce.

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

MINES OTHER THAN GOLD AND SILVER.

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

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

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

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

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones; five per cent.; Coal, 7½ cents on every ton sold.

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

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

THE HON. C. E. CHURCH,

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.

Ontario Mining Laws.

The following is a summary of the chief provisions of the amendments to the Mining Laws of Ontario, passed during the Session of 1891:

1. In Algoma, Thunder Bay, Rainy River and that part of Nipissing north of Lake Nipissing and the French and Mattawa Rivers, the price per acre of mining lands sold after the 4th day of May, 1891, is $4.50 in a surveyed township, and $4 in an unsurveyed territory, if within 12 miles of a railway, and if beyond that limit $3.50 in surveyed and $3 in unsurveyed territory. Elsewhere the price is $3 in a surveyed township any part of which lies within 12 miles of a railway, and $2 if at a greater distance.

2. Instead of by grant in fee simple, mining land may be obtained under a ten years' lease at a per acre rental, unless otherwise fixed by regulation, of $1 for the first year and 25 cents yearly thereafter if north of Lake Nipissing and the French and Mattawa Rivers, or of 60 cents for the first year and 15 cents yearly thereafter, if situated elsewhere, with right of renewal at the expiration for an additional ten years at the same rentals, and with a right of renewal thereafter every twenty years, subject to payment of the yearly rent charge in advance and to such conditions as may be provided by regulation. But the lessee may at any time purchase the land so held, in which case the first year's rent shall be treated as part of the purchase money.

3. The owner or lessee of mining land sold or leased by the Crown after the 4th day of May, 1891, is required during the first seven years to expend in actual mining operations $4 per acre if the location exceeds 160 acres, and $5 per acre if it is 160 acres or less.

4. After the 4th day of May, 1891, all ores or minerals of silver, nickel, or nickel and copper, taken from lands sold or leased by the Crown, are subject to a royalty of 3 per cent., and all other ores or minerals to such royalties as shall from time to time be fixed by Order-in-Council, not exceeding in the case of iron 2 per cent., and as to any other ores or minerals not exceeding 3 per cent.; and such royalties shall be calculated upon the value of the ores at the pit's mouth. But royalties shall not be imposed or collected upon any ores until after seven years from date of the patent or lease, except as to mines known to be rich in nickel, and as to these not until after four years.

5. Hereafter in all lands sold under the Public Lands Act, or for agricultural purposes, all minerals and mining rights are reserved to the Crown, unless otherwise provided in the patent or grant.

6. In the case of mining lands for which bona fide application was made in writing to the Department prior to the 24th April, 1891, grants may be made where the application is received within three months from the 4th day of May, 1891, and otherwise at the price and upon the conditions heretofore applicable in accordance with the terms of section 1, sub-section 5, of the Act of 1891.

ARCHIBALD BLUE.
Director.

OFFICE OF THE BUREAU OF MINES,
Toronto, May 21, 1891.

This advertisement will not be paid for if published without authority.

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Outlets for Nova Scotia Coal.

The great drawback to coal mining in Nova Scotia has been the loss of time caused by the closing of navigation in winter. When it is remembered that the costs of pumping, ventilation, etc., remain proportionally nearly the same whether a coal mine is working or standing idle, it will be seen that the matter is of almost more than private interest. In addition, at this season the workmen become scattered, and many leave for other localities where they expect steadier work, or seek occupations promising more continuous employment.

In the County of Cumberland the large and continuous demand for coal by the Intercolonial, Grand Trunk and Canadian Pacific Roads has hitherto allowed of steady winter work. But as the collieries at present working practically meet this demand, the market is not assured enough to encourage the opening of more mines. Pictou County for many years practically ceased exporting coal in winter, and even now the winter land and railway sales serve but partially to keep the collieries running.

In Cape Breton County, however, is found the worst state of affairs. Here the heavy rates of insurance deter the shipments up the Gulf of St. Lawrence when the month of October is reached, although, as a matter of fact, the Gulf of St. Lawrence is safer for steamship traffic in October and part of November than in the summer months, as the autumn gales are less to be dreaded than the fog, and shipments are not under way again till the following April During the winter months there is practically no local sale of coal, as wood is everywhere abundant and the Island railway calls for only a few thousand tons.

An attempt is being made to partially neutralize this inactivity during the winter, by cutting and banking coal during the two months preceding the opening of navigation, and the colliery generally has from 5,000 to 20,000 tons of coal ready. This coal, however, makes slack when exposed, and it is frequently found necessary to ship it in small quantities with the freshly mined coal to prevent complaints from customers. Moreover, as the able-bodied labor of the Island finds its annual farming, fishing and other work confined to the same limited period, it is often difficult for the collieries to secure men for the prompt removal of these coal banks. Under these difficulties it is only by the exercise of great economy and care, and the unrivalled advantages offered by the Cape Breton district for cheap and regular coal mining, that the operators are able to conduct their business so as to secure a reasonable profit.

Enthusiastic supporters of the railway recently built by the Dominion Government from the Strait of Canso to the centre of the Sydney coal field, promised that its construction secured for Cape Breton coal a continuous winter outlet to the markets of Quebec and Montreal. But a railway carriage of 200 miles, in addition to a transfer at the Strait of Canso, would only bring the coal abreast of the Pictou collieries, and 100 miles short of the Cumberland coal field.

It is possible that almost continuous winter shipments could be made from Sea Coal Bay, at the entrance of the Strait of Canso, but this would mean a railway carriage of about 100 miles, or about one dollar a ton in addition to the water freights. As the only markets available at this season would have to be sought in the United States, it is not to be expected that the prospects of securing a market, with the freights increased by a land carriage, would be materially improved over the present state of affairs. A partially successful attempt was made some years ago to demonstrate the adaptability of Louisburg as an all-winter port. It is generally believed that fairly continuous shipments could be sent by this port in winter, and it is understood that the Dominion Government will continue their railway to this harbor, by a line affording facilities to the principal mines. However, it is difficult to see how, in the face of the present tariff and the limited demand for Provincial coal in the United States, that any large shipments can be made from this point. It may be remarked that, if this harbor can be utilised for winter shipments, many of the local coast ports could be supplied in winter, giving the mines greater facilities for the Gulf shipments during the summer season.

The question of utilizing Louisburg so as to provide for an export trade to the United States capable of keeping the mines fairly employed during the winter, turns principally upon the cost of production. The means to this end may be sought for in the employment of mechanical coal cutters, the acceptance of lower prices by both operators and workmen, and the cheapening of transport. The latter involves the acquisition by the companies or by a corporation interested in the mines, of suitable coal-carrying steamers, or possibly of a line of barges for towing to New England ports.

A successful attempt is now being made on a small scale of towing coal from Sydney to Halifax, and the extension of the service to more distant points is only a question of increased power. The Pictou district, if desirous of securing a winter outlet by sea, can turn only to Halifax, which involves a railway carriage equal in length to that already referred to, from Sydney to the mouth of the Strait of Canso, but with the advantage of a shipment assured of no interruption from ice. The port of Parrsboro' offers excellent facilities for winter shipments, as it is readily accessible, and tugs of moderate power could take large tows. In fact from this point it would seem that even with the opposing duty levied in the United States, a fair attempt could be made now to introduce Cumberland coal in that market.

In addition to these possible outlets for coal, much more might be tried by the coal companies to increase the local consumption of coal. Inducements of cheap fuel might induce manufactures to locate near the mines. By this means much slack coal now wasted could be utilised. Collieries having abundance of land could advantageously add the offer of free sites. Arrangements could be made for the manufacture of coke for use in baseburner stoves, for the replacement of hard coal by slack and nut coal in hot water heaters, etc.

EN PASSANT.

We have to acknowledge the receipt from the Arkansas Geological Survey of a very valuable Report on Manganese, compiled by Dr. R. A. F. Penrose, who, it will be remembered, was some years ago connected with one of our phosphate mines in Ontario, and who is now Assistant State Geologist. He has given extraordinary pains to the work, having personally visited every mine in Arkansas, and embodied a description of each in the report. Besides describing the occurrence of ores in Arkansas, the subject of manganese has been taken up as a whole, which led to an investigation of the different kinds of ore and the uses to which they are put. It became necessary, then, to know to what extent the other mines in the country could meet the demand for manganese, entailing a visit to each. But as the funds appropriated were not available for work outside the State, Dr. Penrose himself met these expenses out of his own private funds, and in addition to the field work on manganese in his own state, visited and examined every known manganese region in North America, from Nova Scotia and New Brunswick, and from the Atlantic to the Pacific. The conclusions given in the Report are therefore based upon direct personal observations and are thoroughly trustworthy. The volume has been prepared upon the general plan of discussing: 1—The uses of manganese, together with the history and statistics of the manganese industry; 2—The ores of manganese; 3—The nature of the manganese deposits. The comprehensive nature of the work will thus be seen, and it may be said that the author has in every respect worthily carried out his aims.

The German exploring expedition to Spitzbergen appears to have made a rather noteworthy discovery of coal in that region of "thick ribbed ice." So far as the competition from this coal field at the North Pole is concerned our miners may keep their minds at ease. Not even the promise of an eight-hours day or the hope of a ten per cent. dividend would get that seam opened.

William Crookes, Esq., F.R.S., has joined the board of the General Phosphate Corporation (Limited).

The United Asbestos Co. has for the seventh time secured the contract for the supply of all kinds of asbestos manufactures required for Her Majesty's Navy during the ensuing year.

In a paper read before the recent meeting of the British Association, some figures were given as to the progress of thrift among miners in recent years. This year the miners' societies have 268,971 members, a revenue of £24,658, and £367,293 accumulated funds; while 2,395 widows and 3,842 children are in receipt of allowances. In the course of the year 1890 39,411 cases of disablement were dealt with.

The disastrous effects of strikes to the working-men have been forcibly shown by Mr. E. Trow, one of the labor representatives on the Royal Commission on Labor in England. Not only is the ratio of success to failure very slight, but the loss in wages very heavy; and still more, the loss of the market is often entailed by a stoppage of work, which means that employment cannot be regained. There is a very pointed moral in this, which the working-men, in spite of sad experience, seem slow to discover.

Attention to the utility of our low grade micas for electrical purposes continues to increase and there is a strong demand for quantities of this hitherto unmarketable product. Prices are reported on the rise, but we have heard of sales on the following basis: Size measuring 1½ x 2½, $25 per ton: 1½ x 5½, $100 to $150 per ton; 4 x 6, $200 to $250 per ton: 4 x 8, $300 per ton.

High freights, a depressed market, and the imposition of an iniquitous tax by an ignorant and unscrupulous government, has strangled, for the time, the production of phosphate, once one of the most promising of our industries. The following mines have closed down: North Star, Foxton, Central Lake, McLaurin, Ross Mountain, Canadian Phosphate Co. and Boyd-Smith, while at the Emerald, Anglo-Continental, and other works, a very considerable reduction is noticeable *and the end is not yet.*

English investors, we understand, are not disposed to take hold of Canadian securities at present, on account of the various scandals that have been given perhaps more prominence than their importance deserves. And yet we find these same sapient capitalists sinking their money in a concern such as the Egyptian Minerals Corporation, a company designed to acquire and develop the minerals supposed to exist in the land of the Pharaohs, but which has come to a disastrous, but not unexpected end. If the caution, not to say suspicion, with which Canadian investments are eyed, were transferred to other quarters, and in their place more confidence was displayed, our friends on the other side of the herring pond would find themselves more in pocket.

Commenting upon the present depressed state of the phosphate market in Europe, one of our correspondents writes: "It becomes daily more difficult to sell high grade phosphate, and recently 75% to 80% has been offered at 11d. Canadian. 80% is to-day not worth more than 1s. per unit, and even at such price would find no eager buyers. Contrast this price with the 1s. 4d. and 1s. 4½d per unit of eighteen months ago, and the prospects then ruling of still higher values."

In connection with the projected underground rapid transit system for New York, an electrician has published an undertaking to produce, within a given time, an electric motor capable of drawing a train of six loaded carriages at the rate of 40 miles an hour, or forfeit $50,000. The specific object of the proposed system is not so much to convey passengers underground as to convey them quickly—that is to say, at 40 miles an hour. If Mr. Sprague, the electrician referred to, can accomplish what he has undertaken, the rapid transit system will be commenced forthwith. We do not want any such speed for underground mining work, but any improvement in electric motors must bring some benefit in their application to industrial purposes.

The following statistics of the exports of Florida phosphates for the first six months of the year are interesting:—

January 1st to June 15th, 1891.

		TONS.	
Shipped from Peace River to Europe		10,220	55/60
" " " U. S. ports		6,525	
Railed " " inland points		5,000	
Peace River total		21,745	
Shipped from Fernandina to European ports		16,373	75/85
" Tampa		7,475	
" Brunswick		780	
" Jacksonville		660	
Railed to inland points, estimated		3,000	
Total		50,033	

In the ship building of the last decade there has been no more remarkable development than the construction of enormous iron and steel sailers. The other day the "Drumrock," a vessel constructed to carry about 4,800 tons, was launched at Leith, in Scotland, and it is announced that another firm of Scotch shipbuilders, Messrs. Russell & Co., of Greenock, have contracted to build a steel sailing ship of still greater capacity, which will be the largest steel sailing ship afloat. In long voyages such as the nitrate trade with Chili, the wool trade of Australia, the Calcutta jute trade and the Java sugar trade, no species of shipping pays so well as these vast sailers, which cost little more than $50 a ton to begin with, and repay their owners within ten years. The Province of Nova Scotia, with its immense deposits of iron, coal and limestone, offers peculiarly favorable conditions for the construction of these vessels, and, to quote from a former article, "why should the Gulf coal-carrying trade not be in the hands of those who are also shareholders in the Nova Scotia coal mines, and why could not the provincial ship husband tend with equal success the freights of this class of vessel, suceeding by the inexorable laws of progress to the sailing vessel of his youth."

In another part of this issue will be found a very valuable paper on "The Early History and Progress of Coal Mining in Nova Scotia" by Mr. John Rutherford, M.E., the first Government Inspector of Mines for Nova Scotia, and who, by virtue of his long and intimate connection with the trade, is acknowledged to be the best authority on the subject. The figures and comparisons are especially interesting; and the promise of the title has been literally fulfilled, the coal industry being traced from its crude beginnings to its present position with as full data as can be given.

Mr. Samuel D. Mills, a gentleman well known to many of our readers in the Province of Ontario, and recently Superintendent of the Martel Furnace Co., at St. Ignace, Mich., has been appointed General Superintendent of the New Birmingham Iron and Improvement Co., of New Birmingham, Tex., and in a letter under date of 29th ult. he says: "We are working on an ore resembling somewhat the bog-ore of Lower Canada, but here it is found only on the tops of the hills, covered by from one to nine or ten feet of alluvial deposit of varying nature—sometimes sand, sometimes clay. The ore forms a solid layer or blanket deposit 1½ ft. to 4 ft. in thickness, and carries 44½ to 52% metallic iron. It is mined, or rather rooted out, so to speak, and delivered at the furnace at an average cost of 70 cents per ton, the process of mining consisting of removing the surface dirt by means of ploughs and scrapers, and then prying out and breaking up the ore with levers, bars, sledge hammers and gads. This ore makes a very strong iron, well adapted for car wheels, as well as for general foundry work. We have a 50-ton furnace here, built from the designs of Mr. John Birkinbine, of Philadelphia, and the whole plant is, of course, of the most modern type. There is also in process of construction, by a separate company, a pipe plant which will have a capacity of about 30 tons of cast-iron pipe per day. We hope soon to have a machine shop, and the prospects are that a large rolling mill will follow before long."

The annual report of the Secretary for Mines, Victoria, states that during the past thirty years the whole of Victoria has been more or less searched for auriferous alluvium. Such deposits wherever occurring in considerable amount and at a moderate depth have been very generally searched out and worked. Each year during the continuance of the prospecting grant similar prospecting has been carried on, and the conclusion is come to that in more or less inaccessible localities, or at considerable depths below the surface, the harvest of alluvial gold has been gathered in. Yet the conclusion that the alluvial gold mines of Victoria are being altogether exhausted must not be taken in too sweeping a sense, for there are still very large tracts of virgin country, wherein there is every probability that extensive deep leads will be found containing rich deposits of gold. Such deep leads are, for instance, to be found covered with sheets of basalt along the course of the great

auriferous belt extending from Ballarat northwards, in which some of the richest gold fields have been situated. It is to the diamond drill, working in sites selected by trained geologists, that we must look for information as to where these old leads are to be found, and it is for capital to follow and develop them. As regards quartz mining the report states that although the expenses inseparable from the working of quartz lodes are as great or possibly in some cases greater than those necessary for alluvial mining, yet owing to the continuous improvements being made in milling machinery and other appliances, the greater percentage of gold saved has so far prevented the annual decrease being very pronounced. Nevertheless it must now, it is stated, be fully recognised that as a natural consequence the aggregate quantity of gold obtained from the mines of the colony will be less each succeeding year, but the decrease may be minimised by the success.

The evidence brought forward in an English court recently, implies an extraordinary lack of honesty in the rules of conduct of the London Stock Exchange. The action in question was brought by Messrs. Raffer & Sons, foreign brokers, against the well-known firm of Sebag, Montefiore & Co., to recover £698, the value of a Spanish Exterior Debt bond, sold to them as valid, but the payment of which had been stopped some years ago by a decree of the Spanish courts. The chairman of the Stock Exchange Committee, who was called as a witness, deposed that it was according to their rules for the vendor of a stopped bond knowing it to be such, to sell it to a purchaser who did not know. That such a state of affairs should obtain in such an institution is indeed surprising, and it behooves Canadians who have any dealings with the London Board to be careful that they are not duped in some way permitted by the very lax regulations of the brokers.

Heroes there are in every walk of life, but among one class of men, miners, hundreds of daring acts are done of which the outer world knows nothing. Occasionally some more than usually courageous deed does find its way to the surface, and of such a nature was that performed the other day by a miner named Joseph Walker, at the Postlethwaite Iron Ore Mines at Frizington, in the north of England. He was engaged with his son and two other men in removing some props from the roof in order to put in others, when the timber gave way and a large quantity of metal and other stuff fell down upon his son and the two other men. Making a detour, Walker got to the other side of the fall and found that his son had been killed outright and that his companions were fast in the *debris*. As his own lad was past help the courageous fellow at once commenced the work of rescuing others. The other men in adjoining workings refused to assist, as they feared a further fall, and for an hour, with his dead son lying near, and with pieces of metal repeatedly falling about and upon him, he continued his task, so great being his danger that even one of the imprisoned men begged him to desist, as he could not liberate them, and would probably lose his own life. But the gallant fellow was not to be deterred from doing his best, and he ultimately, single-handed, rescued both men At the inquest subsequently held, the coroner said he could not express his admiration for the gallant conduct of Walker. Under the circumstances most men would have been upset by the death of a son, and left the rescue to others. But he did what others dared not. A greater piece of heroism has seldom been shown.

The question, Does mining pay? has been often asked and it is too often the custom to reply with a decided negative. Statistics, however, which are the only sure method of arriving at exact results, make a very different answer, and show conclusively that mining, conducted on practical and economic principles, not only pays, but gives returns in the aggregate such as no other class of securities can present. An interesting table is given in the volume on "Mines and Mining" recently issued by the United States Census Bureau, in which we find the following: Product of the mines for the year ending June, 1890, $556,988,450; number of industrial mining establishments, 30,000; number of persons employed, 512,114; annual wages in mining, $212,409,809; capital engaged in mining, $1,173,000,000; product in sight on capital invested, 50 per cent. But if we take authentic reports from some of the best known mines, we shall discover still more remarkable profits:—

Name of Mine.	Capital.	Quarterly Dividends.	Total Dividends Paid.
Ontario	$15 000,000	$225,000	$11,975,000
Granite Mountain	10,000,000	600,000	11,000,000
Yankee Girl . ..	1,300,000	150,000	2,000,000
New Guston.....	550,000	110,000	832,500

Mining has been given a bad name in many quarters on account of the unblushing frauds so often perpetrated upon the investing public by bogus companies, but if investors would only exercise a little more judgment and not be so readily taken in by specious promises, these would decrease in proportion as they become no longer profitable.

Some of the great gold quartz veins of Australia are considered by very high authorities, says Dr. Willis E. Everette, in the *Australian Mining Standard*, to have been formed from a deposition of quartz and silica, by condensation from an aqueous solution of an alkaline silicate of gold. The microscopic researches of both Sorby and Howitt, have shown that in the minute cavities of vein silica or in crystals of quartz, an aqueous fluid has been found which, upon analysis, has been shown to consist of water, holding sulphates and chlorides of potash, soda and lime in solution, all of which substances are earth alkalies. Also in this fluid found in the minute cavities of vein quartz, even free sulphuric and chlorhydric acids have been found, thus giving rise to the former possible combination of an aqueous solution of an alkaline silicate of gold, with aqueous solutions of the hyposulphites and chlorides of gold, the free acids being formed as soon as the conversion of the gold in the metallic state took place. Following up this line of reasoning every peculiarity of the genesis and structure of an auriferous or gold-bearing quartz vein can be explained by presuming that the depositions of the quartz came from water which held alkaline silicates, salts and acids in solution, and precipitated them upon condensation of this aqueous solution, which was then followed by crystallisation of the silica into quartz and the silicated gold into metallic gold. The associated minerals found in the veins of quartz with gold may also have been derived from the same sources.

A French mining engineer, says *Iron*, has devised a new system for reducing to a minimum the disastrous results of an explosion from firedamp. He proposes to divide a mine into four parts, and to sink in each quarter two shafts, starting from the surface and terminating in the workings, one shaft to be arranged at the side of the intake of fresh air, and the other at the place of the return of the air. These shafts, not exceeding 40 inches in diameter, are to serve for the entrance and exit of the air, and are to communicate through the galleries, which constitute distinct blocks. Water and air-tight doors, protected from fire by sheet metal, are to isolate each quarter, the aeration of which would be effected by the shafts. According to the inventor, if a firedamp explosion occurs, it would be restricted to the quarter in which it originated, and by the arrangement of the doors, etc., the force of the explosion would be confined to that part of the mine and shafts, which would offer an immediate outlet for the gases. The other portions of the mine would, it is maintained, be unaffected, and the accident would be restricted to a small number of workers, and to a limited portion of the workings.

Those of our readers who are concerned in the outcome of Mr. Mercier's mining legislation, will be interested to know that representatives of the General Mining Association have had a personal interview with the Premier with the object of securing a test case as to the validity of the Act. It is understood that the Quebec Government will agree to this.

Mr. Henry Hall, one of Her Majesty's inspectors of mines, in a recent paper before the Manchester Geological Society, contributes some interesting statistics with reference to falls of soft and hard coal. He finds that in North-east Lancashire and Ireland, during the last seventeen years, there have been 567 persons killed; in West Lancashire and North Wales, 373; in Durham, 740; in Northumberland, 525, and in the United Kingdom, as a whole, 7,790 persons, or 4.5 per cent. of the total deaths about mines. Mr. Hall comments strongly on the weakness of the system of the men doing the timbering. "It simply comes to this," he says, "that the officials go into the working places and see the men at work. Instead of taking an interest in seeing how the place is timbered, they simply say to the man, 'you must take care of yourself,' and

nothing more passes between them. The man has ever to depend on his own skill, and I think naturally, if men are selected to do certain work and are kept at it, they get more skilled at it. Besides, when men are employed solely at timbering there is no monetary consideration with them. They work by the day, and may spend as much time over their work as they like. When the collier, on the other hand, does his own timbering, it is against his interest to spend time upon it. Every minute he gives to it means so much money out of his pocket. The two systems will not bear comparison."

Australia has the leading mine of the world. This is clearly shown by the reports presented at the twelfth half-yearly general meeting of the Broken Hill Proprietary Company held at Melbourne in July last. The chairman stated that one-eighth of the lode in their claim down to the 300 foot level had been extracted, producing 787 tons of silver and 108,000 tons of lead. There is, he added, seven times as much ore remaining as has already been treated, making an allowance for full one-third of the bulk being waste and useless material. Some idea of the immense extent of this company's operations may be gathered from the fact that directly and indirectly the mines give employment to at least 5,000 men; the company's freightage requirements keep actively employed tonnage equal to 22 steamers of 3,000 tons capacity each, while the dividends paid are equal to 50 per cent. or half of those paid by the 20 banks of issue in Australasia. The dividends paid annually have amounted to £1,250,000.

Having regard to the superior excellence of nickel-steel armour plates, which has recently been demonstrated, it may not be amiss to quote the remarks of a recognised French authority, M. Mercadier, bearing on the elastic properties possessed by nickel-steel. This gentleman, who has spent many years in investigating the subject, is of the opinion that steel alloyed with nickel is destined to play a still greater role in the metallurgical world. By means of the acoustic method which he has invented, M. Mercadier finds that steel containing nickel in the proportion of 25 to 100 is perfectly homogeneous and almost completely isotropic. The incorporation of the nickel with the steel in sufficient quantity, he adds, while increasing the homogenity of the material, imparts to it an isotropy similar to that of the belles glaces of Saint Gobain. This result, interesting from a theoretical point of view, is also of importance in consideration of the practical industrial lessons that may be deduced therefrom.

According to the *Iron and Coal Trades Review*, a largely increased trade is now being developed in the waste slag of the basic steel works in Staffordshire, England. The demand for this product from German importers is extending rapidly, and they are buying up all available supplies. In England also the demand is increasing for fertilizing purposes. Slag, which was formerly sold at 2s. 6d. per ton is now realizing 25 . per ton.

The number of accidents in British collieries during the first half of 1891 was unusually small. The total number of persons killed by explosions of fire-damp was only 81, against 276 in the corresponding period in 1890, and 65 in the same time in in 1889.

Mechanical Science in Mining Engineering.

Mr. T. Foster Brown, C.E., in the course of an address before the British Association at Cardiff, said:—

In mining progress has been slow, and it is a remarkable fact that, with the exception of pumping, the machinery in use in connection with mining operations in Great Britain has not, in regard to economy, advanced so rapidly as has been the case in our manufactures and marine. This is probably due, in metalliferous mining, to the uncertain nature of the mineral deposits not affording any adequate security to adventurers that the increased cost of adopting improved appliances will be reimbursed; whilst in coal mining, the cheapness of fuel, the large proportion which manual labor bears to the total cost of producing coal, and the necessity for producing large outputs with the simplest appliances, explain, in some measure, the reluctance with which high-pressure steam compound engines, and other modes embracing the most modern and approved types of economising power, have been adopted. In the raising of coal from our mines and placing it on board ship in our docks there is a vast amount of machinery employed, much of which is now of an obsolete type. Where, however, new winnings have been made, or where in old mines it has been found necessary to replace the old machinery by new, the question of efficiency and, at the same time, economy in machinery has of late years received serious attention. The consideration of the question of economy in the employment of steam in coal mining operations has resulted in boilers of the most modern construction being erected, working to pressures varying from 80 lb. to 150 lb. per square inch, as compared with pressures varying from 40 lb. to 50. lb. per square inch in the old boilers, whilst the various engines are now being constructed on the most modern and improved principle. Compressed air has for many years been used extensively in our coal mines as a motive power. Electricity also has made rapid strides in the same direction; and I have no doubt that, in conjunction with a better type of machinery for the compression and use of air, will eventually become the principal agent in underground mechanical operations. I am, however, of opinion that there is still great room for improvement in electrical plant before it will be adopted in preference to other machinery now in general use, especially in gaseous mines, and these improvements must embrace a certain means of rendering sparking absolutely harmless under all conditions, for it involves not only the question of the increased efficiency of one class of machinery over another, but also the protection of human life. There must also be devised a ready means of reversing the power, so that the system of haulage known as the main-and-tail-rope system can be applied with equal safety and readiness in any part, as compared with absolute safety in the use of compressed air. Compressed air is another motive power largely used in coal mining, it being not only absolutely safe in gaseous atmospheres, but tending to reduce any danger which might exist from sudden outbursts of gas by assisting the ventilation. This may be considered as rather an expensive means of assisting ventilation; but it is very seldom that the air is used direct from the mains for this purpose. It is very doubtful, however, if in any compressed-air installation used in coal mining there is more than 30 per cent. of useful effect obtained; in many instances it is much less, as it is impossible in almost every case to heat the air after it has passed into the mine; and another source of loss is due to leakage, caused in great measure by the occasional upheaval of the ground disturbing the pipes. It is thus obvious that compressed air is more costly than electricity; but up to the present time it is the only absolutely safe power which is capable of being conveyed long distances underground in gaseous mines. In some of our coal fields very hard seams or veins of coal are met with, and various kinds of machinery have been devised to assist the coal hewer in severing the coal from the solid strata, and electrical appliances have in this class of machinery been more or less successful. It appears to me, however, that there is a want of simplicity about the majority of the machines which have come under my notice, which will operate against their general adoption. The cost of the conveyance of coal underground is a very considerable item in South Wales, probably amounting to £600,000 to £700,000 per annum, and consequently has caused great attention to be given to the subject. It has been found that the endless-rope system, where it can be conveniently applied, is the cheapest. This system, however, necessitates the laying and maintaining of either a double line of rails, or frequent passing points or loops, and as the nature of the strata does not always admit of the roads being made and maintained wide enough for this to be done, the main-and-tail system, which requires a single line of rails only, has in that event to be adopted. For endless-rope haulage the speed at which the trams or tubs travel is from 2 to 6 miles per hour, as against from 10 to 20 miles per hour by the main-and-tail system; thus there is much greater wear and tear in the latter than in the former. What is required is an absolutely safe and simple means of light haulage, made as portable as possible, so that it can be readily moved from one position to another, as circumstances may require, and arranged so as to replace the horses. Winding engines have of late years been very materially improved. Mechanical ventilation, by exhausting the air, has almost entirely superseded the furnace ventilation in general use many years ago, and which created a current by heat. Some of our coal mines are very heavily watered, and this involves large and costly pumping machinery, which takes various forms, the most generally used of which is, perhaps, the old-fashioned but economical Cornish vertical condensing steam engine, which, with its heavy rods and pumps, occupies a considerable portion of the room in the shaft. In recent years, however, there has been a tendency to apply the direct-acting forcing engine, fixed at the bottom of the shaft, of which there are various forms; and still more recently, pumps, worked by electrical power, are being brought into use, and in underground workings far away from the shafts this power seems eminently suitable, as the work in pumping required can be so regulated as to be constant, thereby reducing the risk of danger from sparking. Many excellent forms of direct-acting pumping engines have been designed, the most economical being the compound condensing direct-acting ram pump, which takes up little space. Perhaps the worst feature in adopting direct-acting pumps is the fact that steam must be conveyed down the shaft, which means a certain loss by condensation; a loss which can, however, be very materially reduced by having the steam pipes properly protected from exposure by suitable coverings. The steam and water pipes for this type of pump take up much less pit room than those of the Cornish pump, and this is of very great moment where the area of the shafts is limited. At the docks, also, the machinery for placing the coal on board ship has been greatly improved, so as to prevent breakage, one of the most recent improvements being the movable tip, which can be adjusted to suit the varying sizes of ships. Summarising the position of mechanical science, as applied to our coal mining industry in this country, it may be observed that there is a general awakening to the necessity of adopting, in the newer and deeper mines, more economical appliances. It is true that it would be impracticable, and probably unwise, to alter much of the existing machinery, but, by the adoption of the best-known types of electrical plant and air compression in our new and deep mines, the consumption of coal per horse power would be reduced, and the extra expense, due to natural causes, of producing minerals from greater depths would be substantially lessened. The consumption of coal at the collieries in Great Britain alone probably exceeds 10,000,000 tons per annum, and the consumption per horse power is probably not less than 6 lb. of coal, and it is not unreasonable to assume that, by the adoption of more efficient machinery than is at present in general use, at least one-half of the coal consumed could be saved. Much attention in modern times has been given to the relative values of the numerous new explosives which have been introduced for blasting in mines and for other purposes. As applied to mining, various experiments have from time to time been made for the purpose of testing how far it would be safe to employ these explosives in the atmosphere of a coal mine without the risk of causing an explosion of fire-damp. A number of these are mainly composed of compounds of nitro-glycerine with aluminous earth. But, whilst the experiments have indicated that, with rare exceptions, they are practically flameless, it is undoubted that one which would be absolutely so, and which could be used with safety in fiery mines, has yet to be produced. The adoption in our gaseous mines of a flameless explosive, a self-contained electric lamp of moderate weight, which will burn without attention for twelve hours, and the general application of water to moisten the dust, are all more or less questions in which the mechanical engineer is interested, and, when adopted, will probably have the effect of putting an end to the disastrous explosions accompanied by loss of life which occur at intervals in our fiery collieries.

Asbestos Discovered in Australia.

The following further particulars are given of this new and very valuable mineral discovery lately made at Broken Hill, which was announced recently in these columns. At the office of Messrs. Johnson Messent, may be seen a number of splendid samples of asbestos, of a quality superior to anything yet recorded in Australia. The locality of the discovery is Red Hill, about nine miles easterly from Broken Hill, in the Rockwell paddock where for a long time past Mr. R. Hinspeter, had been prospecting on the side of the hill, in which asbestiform rock was known to exist, and lately he struck a large vein of true amianthus, as the true Italian variety of this valuable mineral is called. The specimens on view are of great length, one being as much as 28 ins., and the staple ranges from a striated salmon-tinted variety, known as picrolite, from near the surface, to a beautiful snow-white flossy fibre of a considerable length and good tensile strength, taken from the shallow depth of 20 ft. while the material is now improving rapidly every foot. On the top of the hill, veins of coarse crysotile, the Canadian variety, are found in a ferruginous gangue of what appears to be chromic iron. Lower down a strong vein has been opened, while to the eastward is the deposit of amianthus, which seems of considerable extent. Stains of green carbonate of copper are plentiful, and both silver and gold in small quantities have been found on the property, a not unfrequent occurence in asbestos country. When it is understood that asbestos, for which there is an almost unlimited market in Europe and America, is worth up to £70 per ton, it will be seen that Mr. Hinspeter's discovery is one which will probably lead to the development of a new and profitable mining industry on our border, by which South Australia must benefit. At Gundagai, New South Wales, crysotile is being profitably worked by the Australian Asbestos Manufacturing Company; while at Broken Hill there is a market for picrolite, which is used for covering steam pipes, the asbestos clay being valuable in the making of fire-bricks.—*Exchange.*

The Early History and Progress of Coal Mining in Nova Scotia.

By John Rutherford, M.E., Stellarton N. S

(Written for the Review.)

It is always interesting to note the rise and progress of any industry the development of which is attended with an extension of commerce and a large employment of labor. The profitable investment of capital, the centralization of a large part of the population, and the consequent extension of the means of supply of its requirement, are such important elements in the growth of any country, that a record of the stages by which any branch of industry has advanced must be of general interest.

It is proposed to present in this article a sketch of the progress of one of the most important industries in Nova Scotia, viz: Coal Mining.

The period to be examined will cover a quarter of a century, but as this term is apt to give the impression of longevity, it will, perhaps, be better to call the retrospect one of twenty-five years' limitation. This length of time should surely be sufficient to place on a firm foundation any industry that possesses ordinary vitality. Let us see how the coal trade of Nova Scotia will bear this test. The initial point, however, in this inquiry may be placed a little further back, in order that the position of the coal mining operations, prior to the period embraced in the inquiry, may afford a more striking contrast with their present development.

Judge Haliburton,—Sam Slick—in his history of Nova Scotia, published in 1829, says: "A colliery has recently been opened in the Pictou district by Messrs. Rundell, Bridge & Co., of London, called the Albion colliery;" and the late Mr. Brown, of the Sydney mines, in his excellent work on the Coal Fields and Coal Trade of Cape Breton, states that coal was worked on the north side of Spanish River, the locality of the present Sydney mines, by the Government of Cape Breton in 1784.

These seem to be the earliest dates of any moment in connection with any regular mining operations. The conduction of these appears to have been steadily pursued in the case of the Albion mines, by Messrs. Rundell and Bridge, or rather by the General Mining Association, organized by them in 1825; and a like result followed the possession of the Sydney mines by the same company in 1827.

Coal mining remained in this, as it may be termed, limited form until 1858, when an agitation begun in 1845 against what was considered a monopoly of the mineral rights by the General Mining Association, resulted in an agreement between the Nova Scotia Government and the G. M. A., and, with certain reservations to the latter, the various coal fields in the Province of Nova Scotia and Cape Breton were free for exploration by other parties. Then was aroused the spirit of private enterprise; the explorer, in most cases a practical miner, shouldered his pick and began a search on the range at the outcrops of the seams of coal, or in localities which might be reasonably conjectured to contain the mineral sought for.

A rapid development of extended coal bearing area ensued, and an evidence of this progress is afforded in the report of the Chief Commissioner of Mines for the year 1864. According to that report, coal mining operations were being carried on at the "Albion" and "Fraser" mines in Pictou County, at four localities in Cumberland County, and at 16 mines in Cape Breton.

The production, however, was then of very limited extent in the aggregate. The Sydney, Lingan and Albion mines, the oldest mining establishments in the Province, contributing 314,355 tons of a total production of 429,351 tons in the nine months ending September the 30th, 1864—the then termination of the fiscal year. This is due to the fact of some of the mines being but partially opened, the operations in many cases consisting chiefly of the preliminary arrangements incidental to the laying out of the working places.

It is indicative, however, of the alacrity with which the search for coal was was pursued after the limits of the areas selected by the General Mining Association were defined; and in this connection it may not be out of place to suggest the question whether, as regards the expenditure of capital in starting new mines, the result has been of advantage or prejudicial to the interests of the Province. But apart from this question, there can be no doubt that the stimulus to exploration, under the circumstances referred to, has been of very great service in proving the extension of the various coal fields of the Province, and the existence of seams which, if inferred by geological deduction, were either ignored as unimportant, or, they had no place in the conceived ideas of the contents of the coal fields.

The freedom of search for coal in the unappropriated carboniferous regions was not allowed to remain in abeyance. The practical miner as well as the speculative investor was speedily at work; and it is of interest in this respect to note the indications of this flow of enterprise as shown by the records of the Department of Mines.

The report of the Chief Commissioner of Mines in 1863, is confined entirely to the more attractive metal—gold—and it was only in the following year that a statement is given which enables a comparison to be made in relation to the interest in exploration above referred to. The amount received by the Department during the nine months ending September 30, 1864, for licenses to search for minerals "other than gold," was $2,420, and for licenses to work $300, making a total of $2,720.

It may here be explained that the legislative enactment with respect to mineral explorations was that a license to search for minerals other than gold could be obtained on payment of twenty dollars: this gave a right of search over five square miles, and was in force for one year. The holder of the license was entitled to a license to work one square mile if he applied for it and defined its bounds; but he was not restricted to the one square mile, but could cover the entire ground by consecutive rights on payment of the specified fees. The license to work was of two years' duration, and under certain regulations the areas could then be held under lease.

While on this part of the subject it may be stated that the same arrangement as regards the respective rights of search and to work and obtain a lease is in force at present, with the additional privilege that the holder of a license to work may have the time extended to three years on payment of one half of the amount originally paid for such license.

In this connection it is interesting to note the indications of the spirit of research and the variableness that prevailed in subsequent years. As stated above, the amount paid for licenses to search for and work minerals "other than gold" in the year 1864, was $2,720. The following statement shows the amount received by the Department of Mines for licenses from 1865 to 1886, inclusive:—

	Licenses to search.	Licenses to work.
Twelve months ending Sept. 30, 1865..	$10,400	$1,650
" " " " 1866..	7,520	3,450
" " " " 1867..	2,980	2,450
Three months ending Dec. 31, 1867....	760	300
Twelve months ending Dec. 31, 1868..	2,880	950
" " " " 1869..	3,160	1,200
" " " " 1870..	2,680	650
" " " " 1871..	2,647	852
" " " " 1872..	6,179	2,626
" " " " 1873..	6,840	2,850
" " " " 1874..	4,880	2,825
" " " " 1875..	3,480	2,025
" " " " 1876..	3,280	1,250
" " " " 1877..	1,800	775
" " " " 1878..	1,420	625
" " " " 1879..	1,240	325
" " " " 1880..	3,360	550
" " " " 1881..	4,560	800
" " " " 1882..	5,180	1,925
" " " " 1883..	3,180	1,150
" " " " 1884..	1,940	1,050
" " " " 1885..	1,820	750
" " " " 1886..	2,980	500

These figures exhibit a fairly steady continuance of the energy with which explorations were pursued. Of course the licenses include other minerals than coal, but those for coal constitute very much the larger proportion of the different quests. It will be observed that the largest payments were in the years 1865-6. The discovery of new seams and their partial opening in the different localities, stirred up the desire for the discovery of others, and explorations were actively carried on in these years. In the following years, up to the end of 1871, the stimulus seems to have abated, but in 1872-3—years in which the coal trade generally experienced an extraordinary period of prosperity—a rush is again evident in the ranks of explorers and the licenses approach in the amount of payments to those in the year 1866. Let us now see what was the result of these explorations in the different coal fields.

Beginning with the Pictou coal field—in 1864 the Albion mines was the only mining establishment in that County, and some idea of the extent of the operations may be gathered from the statement that in the year 1863 the shipments were 198,313 tons. In the following year, 1865, other five mining localities are named in the Commissioner's report, at which coal was being mined. The position of these openings in relation to the Albion mines area is indicative of the shrewdness with which the explorations were made. In an east and west direction—the range of the outcrop of the seams from these respective boundaries of the Albion mines area, as well as in the direction of the outcrop to the south thereof—seams of coal were traced and opened on, and the expansion of the coal field was thus developed to an extent which might have been surmised, but had not received the definiteness thus given to it.

A like result attended the search for coal in Cape Breton. In that coal field the outcrops of the seams are in many cases in the cliffs bordering the sea shore, and they were, to a certain extent, a guide of the probable shape of their deposition: yet here, as in other localities, it would seem that the expansion of the coal bearing strata has been on a much larger scale than the geological knowledge of the period we are dealing with appears to have suggested.

In Cumberland County the operations were confined to the Joggins shore on an area held by the General Mining Association, and, as at the Albion and Sydney mines, the locality was one of the earliest worked in the Province, though on a small scale, the sales of coal in 1851 being only 2,400 chaldrons, or 3,600 tons. In 1864 the sales were 6,053 tons, and in 1866, 8,478 tons.

We may now consider what the position of the coal mines was, in a general point of view, at the commencement of the period under review.

The report of the Commissioner of Mines for the year 1865, shows that there were in that year six mines, or openings on seams of coal, in Cumberland County, six in Pictou County, and eighteen in Cape Breton.

The output at some of these openings was on a very small scale; they were in many cases but the exploratory operations, and were not then fitted with the necessary means of production.

The fiscal year at that time terminated on September 30th of each year; but, as the statement gives a year's production it will not affect the comparison with subsequent years.

In the year ending Sept. 30, 1865, then, these thirty mines, so-called, gave a production of 712,574 tons of coal. Taking a decennial period for comparison, there were in the year 1875 the same number of mines in operation in each county as in 1865, but the production was only increased 68,591 tons. In the year 1885, twenty seven places of production are named; nine in Cumberland, five in Pictou and thirteen in Cape Breton, and the total output was 1,352,203 tons; an increase of 571,038 tons, or 73% on the production of 1875. In the next five years the increase at the end of that period, viz., Dec., 1890, is 631,798 tons, the total production being 1,984,000 tons, while the number of mines in Cumberland County is reduced to three, in Pictou to four, and in Cape Breton to ten.

The fluctuation in the number of the mines is due to various causes. In some cases a misapplication of capital in the equipment of the mines under adverse circumstances, or position of the openings; in others the too rapid development of the different seams of coal as regards the requirement of the coal trade; a lack of railway accommodation and convenient and safe shipping places; these led to the abandonment entirely of some of the operations and to a suspension of some others.

It may now be interesting to note the progress and the direction of the expansion of the coal trade over the period under review. A like decennial comparison as in the case of the production will perhaps be sufficient for this purpose.

The classification of the sales of coal is not given in the early reports of the Chief Commissioner of Mines, with the same detail as at present, and the comparison for the ten years, 1865-1875, cannot therefore be given with the same minuteness with respect to the localities as in the subsequent periods.

In the year ending Sept. 30, 1865, the sales are summarized under the heads of "Home Consumption," "Neighbouring Colonies," and "Other Countries," and they are in this rotation as follows: "Home Consumption," 59,536 tons; exported to "Neighbouring Colonies," 52,561 tons; and exported to "Other Countries" 338,756 tons. Generalizing in the same way, the respective sales in 1875 stand, as in the above order, 212,630, 381,711, and 112,454 tons. In the year 1885 the sales are 444,652, 769,643 and 40,215 tons; the comparison standing thus:—

	Home Consumption.	Neighbouring Colonies.	Other Countries.
	Tons.	Tons.	Tons.
1865.....	59,536	52,561	338,756
1875.....	212,630	381,711	112,454
1885.....	444,652	769,643	40,215

These are remarkable figures, and are worthy of comment on their indication of the expansion of the trade. In 1865 the general position was this: Both the local or home consumption and the sales to neighbouring colonies were but of small extent—a little over 112,000 tons. The sales to other countries may be said to have consisted almost entirely of those to the United States—the Reciprocity treaty being then in force. The entire trade may be said to have been done by shipping. The Intercolonial railway, or as it was then termed, the Nova Scotia railway, had its inland terminus at Truro; and had thus no connection with any mining locality. The provinces were not then federated, and Quebec and Montreal drew their principal supply of coal from the United States.

In 1875 all this was changed. The abrogation of the Reciprocity treaty by the United States Government, and the imposition of a prohibitory duty of $1.25 per ton, seriously affected the coal trade with that country. The construction of the Intercolonial railway opened a connection with the growing towns on its route and developed an increasing demand for coal as well as for its own requirements; and a trade by water with the Province of Quebec sprung up and has steadily grown.

It is interesting in this connection to note the direction of the radii of increase, but, for the reason already given, the examination can only be made in the second term of the period, viz: from 1875 to 1885. Their relationship stands thus:—

Sales to	1875.	1885, and in 1890.	
	Tons.	Tons.	Tons.
Nova Scotia.....	212,630	444,652	601,946
Quebec.....	189,754	493,917	751,931
New Brunswick...	85,968	48,634	224,786
Newfoundland.....	62,348	74,322	96,133
Prince Ed. Island.	43,641	52,770	55,843
United States.....	89,746	34,483	50,754
Other countries...	22,708	5,732	4,718

What is to be gathered from these highly interesting figures? The very gratifying fact that the home or local trade, generally the best, has grown largely and is still healthily progressing, as the figures for 1890 satisfactorily show. The expression "a gratifying fact" may be fairly used in consideration of the circumstances whence it has its origination. In the first place it augurs well for the future of coal mining in Nova Scotia that the use of coal is displacing the use of wood for fuel; and that railway communication is being extended throughout the province

in various localities and affording the means of access to comparatively secluded towns and villages. Then, this expansion of the sources of demand necessitates an increased output or production of coal, one of, and indeed the chief, elements affecting the cost of production. A good home trade enables the surplus production to be more advantageously placed in other markets. Having thus briefly sketched the progress of the coal trade of Nova Scotia, as regards the production and sales, a few remarks may not be out of place on the adoption that has become necessary of the improved means of output whereby this extension of the demand has had to be met.

The crude application, for such indeed it may be termed, of machinery in the early stages of Nova Scotia coal mining—not excepting even that of the General Mining Association, for their appliances were somewhat old-fashioned—could not, under the changing circumstances of the trade in the direction above described, long remain unaltered. The adoption of more powerful hoisting engines, a better equipment of the means of preparing the coal for market and the substitution of steam power in the place of horses in the underground haulage, the drainage and ventilation of the mines—all forced themselves on the managerial consideration and have educed a position in these respects that may be favorably compared with the higher stage of mining appliances in older coal producing localities.

A brief description of the appliances at the Albion and Sydney mines of the General Mining Association will best illustrate the condition in this respect prior to the period under review, and the present means of dealing with the requirements of the trade. It is unnecessary to describe those of both because they were, as they still are, alike in most respects.

The hoisting engines were of the class more generally used for driving machinery; beam, fly-wheel, etc., being the characteristic feature, or with overhead drum or rope roll of Crowther's engine, a form of application which possesses considerable merit inasmuch as the lead of the rope is in a higher position and lessens the bend thereof. The drainage or pumping was effected by lifting pumps worked by the same engine by lever or V bob application; and the ventilation was accomplished by the aid of a furnace underground.

On the surface the screens were short and adapted rather to enable any impurity in the coal to be picked out than to abstract the smaller portion of the coal. The steam was raised in the old fashioned egg ended boilers with flash flues, and a considerable number were required with a corresponding large consumption of coal, and the transference of the loaded waggons into which the coal was put at the screens, was effected by the use of locomotives of what may now be not unfairly termed an antique type. The subjoined illustration is from a photo of one of these engines, and it is especially interesting, not only on account of its peculiar construction, but also from the fact of its builder, Timothy Hackworth, having been one of the competitors in the celebrated trial of locomotive power on the Manchester and Liverpool railway in 1829, on which occasion his engine—the Sans Pareil—was admitted to possess features of construction of considerable merit.

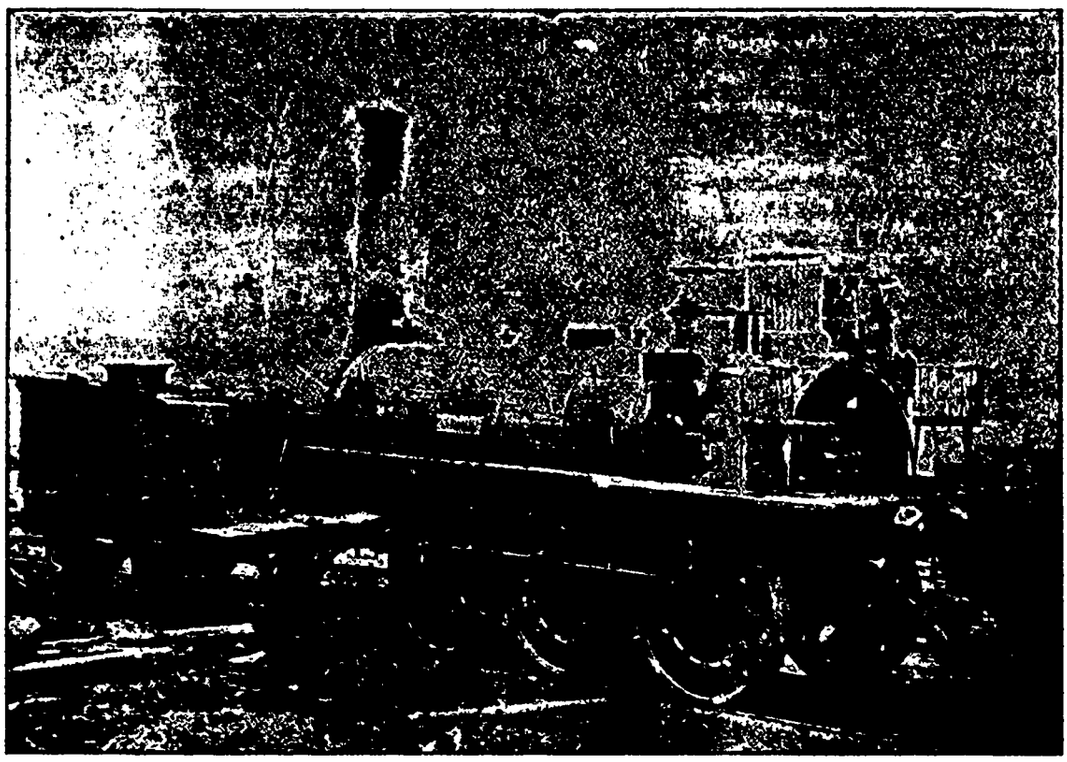
The locomotive of which an illustration is given, was built by Mr. Hackworth in 1838, and has been in use at the Albion mines up to so late a period as the year 1885.

In addition to the interest in this locomotive arising from the preceding statement, is the fact of its being the oldest, but one, in America. It was exhibited at the Chicago exhibition and was then awarded this position as regards seniority. One of its peculiarities deserves special mention. The wheels are of cast iron and composed of two parts, a centre or axle piece and an outer portion to which the tyre is attached; the connection between the two pieces of the wheel being made and held tight by wooden pins, driven into the circular sides formed by the junction of the inner and outer pieces.

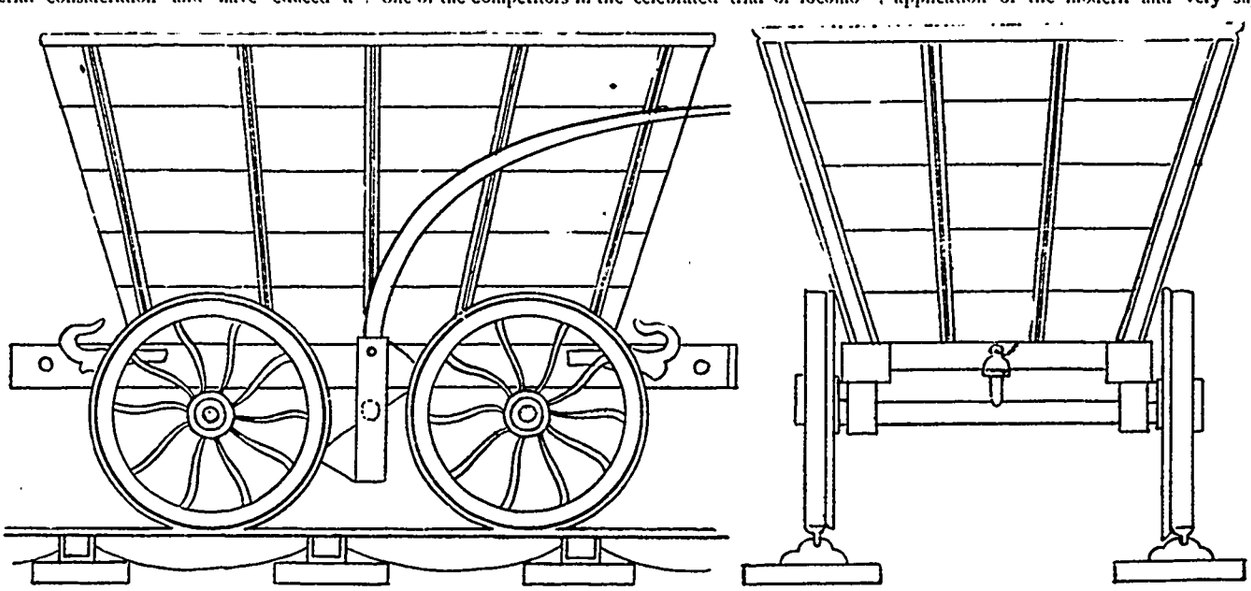
Another old fashioned adoption in use at these mines, is the vehicle of transportation of the coal from the mine to the shipping wharf; this is the Newcastle chaldron waggon, a sketch of which is given.

Its capacity was ordinarily reckoned 53 cwt., but by the addition of a narrow board on the top of the sides and ends, it will hold three tons. The shape is assumed to give freedom of discharge, but the mechanical structure cannot be considered of the best form. It, however, as well as the fish bellied rail of cast iron, the stone blocks on which the metal chairs were placed, and the wooden keys to hold the rail in place, all have had their day; and as in the case of the hoisting, pumping and traction engines, a new type has displaced them, and, as regards the mines to which the preceding description refers, an application of the modern and very superior form of engine power for each of these purposes has been adopted.

One of the usual results of the extension of the workings in the mine has had development in these localities in which a large output of coal has become necessary, that is the application of steam power for underground haulage. The writer is not aware of any special peculiarity in Nova Scotian mines in this respect, but it is an evidence of the growth of mining appliances and of the importance of mining officials of all grades watching



THE OLD HACKWORTH LOCOMOTIVE AT THE ALBION COLLIERY.



THE NEWCASTLE CHALDRON WAGGON.

keenly the scientific adaptations of older mining localities. The keen competition in the trade demands a managerial watchfulness of every appliance of whatever object it may be in connection with mining.

Having thus sketched the productive progress, let us now note that which is of especial importance in connection with the mining operations.

A comparatively small space of workings and a freedom from the coal miner's *bete noir*, explosive gas, is apt in the first operations to induce an indifference with respect to the provision of a ventilation or supply of fresh air necessary for the miner's health, irrespective of that required when gas is exuded in a quantity sufficient to render the working place unsafe.

A consideration of the circumstances in which many of the mines, opened on the outcrop of the seams, were situated in the first openings, is to some extent, an excuse for this indifference. The absence of gas of any importance—in some cases the entire freedom from it—and the natural tendency of the air to pass into the workings where the temperature was higher than that outside, together with, in some cases, the means of exit in a favorable position, seemed to beget the idea that little more was required than to allow the air to take its own course through the mine and leave when it liked. An illustration of this idea may be mentioned, which was by no means a single instance of this belief in natural ventilation, so called. The writer on one occasion put some questions to the person who superintended the underground operations relative to the ventilation, and sought to ascertain whether any idea existed with respect to an organized arrangement of the conduction of the air through the working places. After passing through these, and when scarcely a movement of the air was perceptible, the question was put: "Which way does it go now?" "Oh! it goes out," was the reply. "Where?" was asked, "let us follow it." This was done so far as the assumed route was followed, but not the slightest bend of the flame of the light carried could be observed. "Why there is none here; what has become of it?" was asked. "No, it has gone out," was the inferred reply from the confused statement of opinion on this all-important point.

It will not be a matter of surprise, in view of the preceding, that in many cases the opening of a coal mine was undertaken by persons who had little knowledge of mining beyond the cutting of the coal and such general ideas as an observing and reflective disposition might suggest with respect to the means of ventilation.

As the operations extended and the workings began to approach a gas yielding position the adoption of artificial means of ventilation became necessary, and the liability to trouble from its neglect became evident. The position of the Inspector of Mines at the period now referred to was not that of the official of the present day. He was not armed with any power to compel the adoption of what he might consider necessary in order to a safe carrying on of the operations; nor indeed could it be considered an absolute necessity in the early stages of the opening of the mines. Under the circumstances, with respect to freedom from gas and the very limited extent of the operations, it was not considered necessary to impose what might be thought to be a restrictive measure at that time; the Inspector suggested and recommended improvements, and in most cases they were received in a satisfactory manner. The time came, however, when an enforced system was necessary, and it is to the credit of Mr. Poole, the then inspector, that he was instrumental in inducing the Government to pass a Mines Regulation Act, the terms of which are based on those of the English Act for a like purpose.

The system of mining, which has been generally adopted is that known as the bord and pillar. Take as an illustration the starting point of the commencement of a slope driven from the crop. It is driven in the direction of the fall dip of the seam far enough to allow a goodly strip of solid coal between the levels—to be driven on that course from the slope—and the crop. At regular distances in the level, places are worked to the rise out of which bords are turned and driven, in the level direction, at such distances apart from each other as circumstances may render it expedient to adopt. Communication is made between the bords for ventilation and other purposes, and thus detached blocks of coal are formed which are termed pillars—their object in the first working, as it is called, being indicated by the name.

They are after a time removed and the roof or superincumbent strata falls into the excavated space and forms the roof. Of course this description applies to seams whose deposition is comparatively flat as well as to those at various angles of dip. Sundry attempts at long-wall working have been made, and it is not improbable that this system will come into greater use than has hitherto prevailed. There are so many circumstances that have to be taken into account before it can be beneficially adopted, that those who have had practical experience of the system are best able to decide on the fitness of its application.

A brief sketch has now been given of the progress and development of the Nova Scotia mines in both a commercial and mining point of view. A few particulars in connection with the general operations are added which may be of interest. The statements given in the Annual Reports of the Department of Mines furnish the data on which the following comparisons are made.

With respect to the number of persons employed, the classification of underground and above ground is taken in its general sense without regard to this division of labour.

In the year ending September 30, 1865, the persons employed at all the mines numbered 3,043; in the year ending Dec. 31, 1890, the number is 5,324.

The average quantity of coal used on the mines by engines and workmen is, in Cumberland County, 7% of the quantity raised, equal to 160 lbs. per ton of coal raised, and of this quantity 76% was used by engines and 24% by workmen. In Pictou County the figures are over 9%, or 224 lbs. per ton of coal raised, of which engines used 78% and workmen 22%; and in Cape Breton the average is a little over 9%, being 215 pounds per ton of coal raised, of which engines used 64% and workmen 36%. The average number of tons of coal cut per day by the cutters is, in Cumberland County, 2·6 tons; in Pictou, 3·3 tons; and in Cape Breton, 3·9 tons.

Having taken this brief retrospect of the coal trade of Nova Scotia, embracing the mode of conducting the operations, and the extension of the trade in a general point of view, it may not be out of place to glance prospectively at its future. Not possessing the dangerous gift of prophecy the writer is sensible that he is approaching a delicate part of his subject, and holding in respect as he does the old saying that "discretion is the better part of valor," he will not venture further than to express a firm belief in the future as regards the mineral wealth of this wonderfully enriched province in this respect.

The schemes of speculators may subserve their immediate interest, although lacking the essentials of success, but even they tend to develop resources which might otherwise remain dormant.

It may be more within his ken to strongly urge the adoption of assured improvements in mining machinery and economical and safe appliances; the extension of the scientific knowledge that must be the foundation of that grade aimed at by those workmen who possess the praiseworthy ambition to fill a higher position and to contribute by the application of practical skill conjointly with that knowledge, to the healthy and wealthy advancement of one of the most important branches of industry.

Notes on Mining Explosives.*

By Mr. Charles Cockson.

At the January meeting of this Society, during a discussion on a paper read by Mr. James Grundy, one of Her Majesty's Inspectors of Mines, the writer promised to prepare some notes on the electrical firing of mining explosives. On further consideration it occurred to him that a more general paper on the question of explosives used in mining would be of more interest to the members than would be one dealing only with the minor but at the same time most important matter of the best means of firing such explosives. He felt that this extension of the subject was allowable, because at the time at which this paper was promised considerable difficulty was being experienced by some users of electrical detonators in the Wigan and other districts by occasional miss-fires, and the writer was confident that such difficulties were due to some temporary defect in the manufacture of some portion of the detonator or the connecting wires, and he thought that in the investigation that was then being made as to the cause of these difficulties some points of interest would transpire that might with advantage form a portion of this paper. This has not, however, proved to be the case; the only result of the investigation having been that the manufacturers of the electrical detonators referred to have ascertained the exact cause of the occasional miss-fires which for some couple of weeks or so had tried the patience of the users, and, as far as the writer's experience goes, there is now no cause of complaint, the proportion of miss-shots at the collieries with which he is connected having been only 1·17 per thousand during the last six months, with the exception of the two weeks at the beginning of January. This figure, which includes miss-fires from causes other than defects of manufacture, compares most favourably with the system of firing by ordinary fuse, and convinces him that there are no real disadvantages, and he thinks no very great difficulties in the adoption of electrical firing, the advantages of the latter system being so great as to make the small additional cost or trouble matters hardly worth considering. Before describing what, in the writer's opinion, should be the essential qualities of a safe explosive for the use in coal mines, it would be well to give a *resume* of the conclusions and recommendations of the various Government Commissions that have investigated the question, and also to note the various official recommendations and reports that have been made subsequent to the passing of the Mines Act of 1887. We shall be then better able to discuss the merits and faults of some typical explosives of the various classes now being manufactured and used in this country. The question of rendering safe the use of explosives in fiery mines has been investigated by Government Commissions in England, France, Austria, Prussia and Saxony. In this country the Accidents in Mines Commission was appointed in 1876, and issued their final report in 1886, and their conclusions were as follows (p. 48); "1. The occurrence of a blown-out shot in working places where very highly inflammable coal dust exists in great abundance, may even in the total absence of fire-damp possibly give rise to violent explosions, or may at any rate be followed by the propagation of flame through very considerable areas, and even by the communication of flame to distant parts of the workings where explosive gas mixtures or dust deposits in association with non-explosive gas mixtures exist. 2. The occurrence of a blown-out shot in localities where only a small proportion of fire-damp exists in the air, in the presence of even comparatively slightly-inflammable or actually non-inflammable, but very fine, dry, and porous dusts, may give rise to explosions, etc." They consequently recommended as the only possible means of guarding against the occurrence of explosions from shot-firing—1. The removal of dust as completely as possible from the working places. 2. The provision and thoroughly efficient adoption of simple and effectual measures for rendering dust innocuous in the presence of a blown-out shot. 3. The discovery of means for preventing the possible occurrence of blown-out shots. 4. The adoption of particular explosive agents or particular methods of using such agents which deprive blown-out shots of their danger by ensuring the total absence of flame, or of highly heated solid matter when the shot is fired. 5. The substitution for explosive agents of similarly efficient methods of bringing down coal and stone, which are quite free from the special dangers attending the use of those agents. The committee also recommended that the use of powder should be prohibited in fiery and dusty mines, unless the dust be removed as completely as practicable from the vicinity of the place where the shot is to be fired, such removal to be followed by a copious watering of the face and the place. They also recommended the substitution for powder in dry and dusty mines of one of the then known high explosives, in conjunction with the water cartridge and electrical firing. Taking their recommendations seratim, subsequent experience has, in the writer's opinion, proved the following: 1. The thorough removal of dust is impossible as a practical safeguard. 2. The rendering dust innocuous by watering or chemical agents is expensive and impracticable, and inadvisable in many mines. 3. No means have yet been discovered to prevent blown-out shots. 4. The use of compressed air and lime cartridges have both proved failures, and no mechanical appliance has yet been devised that can do the work of explosives either as safely or as economically. 5. The only recommendation of the Commissioners left is the use of such an explosive, or such a method of firing an explosive as deprives a blown-out shot of its danger. In the writer's opinion this recommendation is now perfectly practical and feasible, and should be enforced by the Government in all coal mines in which fire-damp is given off, or which are dry and dusty. It was not until after the report of the English Commissioners had been presented, that anything had been done in this country, beyond laboratory experiments, in the direction of finding an explosive whose composition would in itself be such as to deprive blown-out shots of their danger, hence no mention is made of any of the so-called safety explosives which are now in considerable use in British and foreign mines. The French Commission on the use of explosives in mines presented a most voluminous report, in July, 1888, and in consequence of their recommendation, on August 1st, 1890, the French Minister of Works issued a decree applying to all fiery mines, or mines in which the dust is inflammable. 1. Prohibiting the use of blasting powder. 2. Prohibiting the use of explosives whose products of detonation contain any combustible matter, such as solid carbon, or hydrogen and carbon-mon-oxide gas. 3. Prohibiting a less length of stemming than 20 inches, such stemming to be of plastic matter. The reports of the Austrian and Prussian Commissions, speaking generally, condemn the use of gunpowder and ordinary fuse-firing. In this country, the Mines Act of 1887 contains much more stringent regulations than did the Act of 1872, doubtless they are so well known to all of you that their repetition here would be a waste of time. Since the passing of the Mines Act of 1884, circulars have been sent out by Her Majesty's Inspector of Mines in this district, in January, 1889, calling attention to special rule 73, by which the use of gunpowder is prohibited in any ventilating district of a mine in which inflammable gas has been found during any of the last four previous recorded inspections by the fireman; and in September, 1890, disallowing the use of roburite as a non-inflammable explosive if fired by ordinary fuse, and recommending electrical firing; in December, 1890, the Home Secretary issued an important minute on the question of coal dust, accompanied by a detailed report of Mr. Hall's on the experiments in this district, which he had carried out on a large scale to test to what extent colliery explosions may be caused by blasting with gunpowder in colliery workings which are dry and dusty, and in the entire absence of fire-damp. In these experiments, for which the thanks of the mining community are due both to the Home Secretary and Mr. Hall, it was established that a violent explosion could be caused by a blow out shot in the presence of coal dust and the entire absence of fire-damp, Mr. Hall stating that at experiments at the Big Lady Pit "such flame travelled more than 200 yards, and only ceased when it reached the mouth of the pit, and there was an undoubted increase of violence as it travelled on its course." The Home Secretary, in his minute, urges the prevention of the accumulation of dry coal dust; the abolition of the use of gunpowder, except when all the workmen have been withdrawn from the seam, and the adoption of the best means at present known for preventing, or at least mitigating such disasters as have recently occurred. Her Majesty's Government subsequently appointed a Royal Commission to investigate the question, and their detailed report will doubtless be of much interest, and in my opinion will certainly confirm the conclusions arrived at by Mr. Hall. Taking as our standard of perfection such an explosive as cannot cause in actual use in the mine an explosion of either fire-damp or coal dust, we may reasonably divide the explosive agents now in use in coal mines into three classes. 1. The non-safety class. 2. The water-cartridge class, or safety tamping class. 3. The Safety, or so-called "Flameless" explosives. 1. *The Non-Safety Class*—In this class we must place gunpowder,

* Read before the Manchester Geological Society.

both ordinary and compressed, dynamite, gelignite, and tonite, unless they are used with the water or other safety tamping. Of these gunpowder is the most dangerous, because it cannot be made safe in the presence of fire-damp or coal dust even by water tamping or any such analagous device. (Mines Commission final report, p. 53). Also the flame of a powder shot, although not from a blow-out shot, is sufficient to produce an explosion. The result of numerous experiments with mixture of inflammable gas and coal dust alone, witnessed by the writer, proves that a blown-out powder-shot will almost invariably produce an explosion. It can only be a question of a year or two before the use of powder must be abolished in all fiery or dusty mines. 2. *The Water-Cartridge or Safety Tamping Class*—In this class the writer includes a high explosive used with either (1) Dr. McNab's water tamping, (2) Galloway's moss and water tamping, (3) Settle's water cartridge, (4) Heath and Frost's gelatinous cartridge, (5) tonite used with Trench's fire-extinguishing compound, (6) coal securite used with the Securite Company's flameless cartridge case. To Dr. McNab should be given the credit of first using water tamping with the object of lessening the loss of time caused by powder smoke in mining work, and also with the idea of quenching the flame. This system was never largely adopted, the gun in which the explosive and water tamping was placed being an unnecessarily cumbersome arrangement. Mr. Galloway suggested the use of a high explosive tamped with moss, saturated with water. Mr. Miles Settle's water cartridge is an adaptation of Sir Frederick Abel's idea of water tamping, which appears to be the best arrangement of effective water tamping. Heath and Frost's gelatinous cartridge is intended to have the same effect as the water cartridge, but with a lesser risk of the tamping becoming inoperative by leakage of water through breaks in the water cartridge or coal. The Galloway, Settle, or Heath and Frost's systems of firing shots in mines if carefully carried out with suitable high explosives and electrical firing and the protecting tamping in each case properly proportioned to the charge of explosives used, may be said to be practically free from risk of causing an explosion with a normal charge of explosive. The objection to all these systems are mainly: 1. The increased guage and cost of bore-hole required for each shot. 2. The tamping detracts from the power and useful work that can be done by the explosive. 3. There is a constant risk of workmen, through forgetfulness or other reasons, neglecting to use the protective tamping properly, in which case the fancied security of the system may lead to disastrous results—as shown at the Apedale Colliery explosion last month, when ten lives were lost. *Trench's Compound with Tonite*—This system is open to all the objections above named, and the writer has experimentally caused gas explosions with the blown-out shots of six ounces of tonite tamped with six inches of Trench's compound—the tonite, however, not being surrounded with the compound. *Securite*—The writer has not tried this explosive with the Securite Company's flameless cartridge case, which consists of a flannel bag prepared with chemicals, which requires to be immersed in water shortly before use. Without this protection he has repeatedly seen gas and dust explosions experimentally produced by a blown-out coal securite shot. 2. *The Safety or So-called Flameless Explosives*—In this country the explosive of this class, which is best known and has established its name as being a thoroughly safe explosive, is roburite. Of other explosives now being manufactured abroad with the same object in view, the writer has not yet been able to make sufficient experiments to allow of his classifying them; but so far as he has gone he has found as yet no explosive which is equal to roburite from the point of view of either safety or economy. This explosive was brought before the notice of this Society in a paper read by Mr. James Hilton some two years ago. The result of another two years' experience has been to confirm all that Mr. Hilton said in favour of the explosive, which is now being sent away of regular quality, free from any defects, at the rate of considerably over a ton a day. Mr. Hilton described the method of using the explosive and the precautions required for electric firing, so that it is needless for me to do more than deal with a few matters that have transpired since his paper. Referring to the question of fumes from the explosion of roburite, the committee of experts appointed by the owners and workmen at Park Lane Colliery thoroughly investigated the matter, and their report was most satisfactory to users of roburite, their decision being that "if proper care is exercised the use of roburite will not add to the harmful conditions under which the miner works," as summarised by the Home Secretary, in reply to a question in the House of Commons, when he also said "it is a useful explosive and practically safe for use in fiery mines." In September, 1889, a joint committee of the Durham Owners' and Miners' Associations was appointed to enquire into the question of both roburite and tonite fumes, and although their report is not yet printed, the writer understands it refers most favourably to roburite. In August, 1889, the members of the Lancashire Branch of the National Association of Colliery Managers visited the Roburite Company's works, near Wigan, and, themselves made a series of tests with blown-out shots, when they were unable to fire an explosive mixture of gas, although gunpowder and tonite fired it under the same conditions. It should also be noted that Mr. Hall, in his recent coal dust experiments, found that roburite did not fire a mixture of coal dust and air, and in his report says: "Some experiments were tried with roburite shots, and these failed to explode the dust; but although I think the experience of the experiments went to show that a large flame, such as is given off by a blown-out gunpowder shot or a local explosion of fire-damp, is required to ignite dust, yet further tests of the high explosives, such as roburite, seem desirable before they can be pronounced actually free from danger in the presence of coal dust." Within the last week or two the writer has witnessed a series of experiments where blown-out shots have been fired into a mixture of coal dust and air, in the absence of inflammable gas, the results of which were as follows, using four ounces of explosive in each case: Roburite did not fire the dust when tamped with four inches of coal dust. Under the same conditions both coal securite, tonite, and gelignite caused an explosion of the dust, which burnt fiercely for some seconds after its ignition. These experiments were made on two different days, and on the second day were witnessed by Mr. Hall, on which day tonite did not fire the dust during a trial of three tamped shots, although it had done so two days previously on a very wet day, when one would think the dust mixture would have been less liable to ignition. In the writer's opinion the essential qualities of a safe explosive for use in coal mines are: 1st. It should be incapable of exploding accidentally by concussion, pressure, friction, fire, or lightning. 2nd. A blown-out shot should not fire an explosive mixture of either coal dust or fire-damp, and the explosive should have this property under all conditions that may be met with in ordinary use, and without the addition of anything but the ordinary tamping, which is necessary to develop the useful effect of the explosive. 3rd. It should not, when detonated, produce any combustible or inflammable gases. 4th. It should be of such a composition that it will not affect the health of workmen if used with due care. 5th. It should be unaffected by frost or variations of temperature. In conclusion, the writer would submit that these qualities are all possessed by roburite; in addition it is for coal work almost as cheap as gunpowder, and in nearly all mines is as effective as powder in getting the coal down in good condition, while for roof-blowing and metal work the writer is convinced that it is quite as cheap, if not cheaper, than powder.

Asbestos Mines to Close Down—Mercier's Mining Act Begins to Bear Fruit.

An important meeting of the mine owners and representatives of the companies operating asbestos mines in the Thetford and Black Lake districts, was held in the Club House, Black Lake, on Thursday evening, 24th Sept. Among others present were: Hon. George Irvine, Q.C., (president Johnson's Co.); Col. Lucke, (Beaver Co.); E. Wertheim (American Co.); James King, (King Bros.); John Johnson, S. J. Johnson, Alfred Ward, Robert Ward, Peter Ward, Tom Sheridan, (Bell's Asbestos Co.); Matthew Penhale, (Glasgow and Montreal Co.); A. S. Johnson, M.P.P., A. H. Murphy, (Thetford Mining Co.); G. M. Melville, (White's Co.); L. A. Klein, John J. Penhale, (United Co.); A. M. Evans, B. T. A. Bell. Hon. George Irvine, Q.C., was elected chairman, and Mr. B. T. A. Bell, secretary. The proceedings were private. It is understood, however, that the subject mainly under discussion was the relation of the crude asbestos trade to the Mercier Mining Tax. The outcome of a long session was the following resolution adopted unanimously:

"In view of the circular letter of Mr. Antoine Taschereau, Inspector of the St. Francois district, announcing the intention of the provincial Government to enforce the provisions of the new mining act "*with the utmost rigor of the law*," we, the asbestos owners and operators of Thetford and Black Lake, do hereby resolve to close down our mines from 1st November until further notice." The resolution was signed by all the companies represented at the meeting.

Steel Car Wheel Test.—A very practical test recently made in Boston of the strength and serviceable qualities of steel car wheels would seem to leave no room for doubt as to their superior value. A 33 inch car wheel of this description was placed on two solid iron blocks, with the rim resting on each block. Under this arrangement a weight of 525 pounds, falling from a height of 17 feet, struck the hub 25 times, without any effect other than battering the metal. It was then dropped 10 times on the rim without a fracture. Next, a weight of 1400 pounds was tried, falling from a height of 17 feet, and striking the wheel 11 times, but failing to break it, thus showing it to be practically indestructible under even extraordinary circumstances. At another series of experiments, in order to determine the expansion and contraction of the metal, a wheel was buried in sand and a charcoal fire built around the tread until it was brought to red heat; then it was taken out and exposed to the atmosphere, which had no effect on it whatever, thus demonstrating the safety of such wheels.

Electric Miners' Lamp.—M. de Gerson has laid before the Paris Academy a new electric mining lamp which has been tested by the Ecole des Mines, and which is to be experimentally used in one of the most dangerous of the Anzin Mines. The weight of the lamp is 1600 grammes, and the light given is of about a normal candle power. The lamp gives light for a period of 12 hours before having to be recharged.

The amount of phosphorus consumed per annum is about 2,000 tons, and is chiefly used in match making. Hitherto chemicals were used in its manufacture, but by a recent improvement the raw material and coke are placed in a specially-prepared furnace, and electric heat is applied. The vapor arising is condensed, and marketable phosphorus is produced.

Successful Re-opening of the Asbestos Club Rooms at Black Lake, Que.—A Thoroughly Interesting and Enjoyable Gathering.

The Rooms of the Asbestos Club at Black Lake, Que., recently destroyed by fire, were re-opened with great *eclat* on Thursday evening, the 24th instant. The club room was crowded, among others present being Hon. George Irvine, Judge Dugas, Mr. James King, Mr. E. D. Ingall, Mr. E. Wertheim, L. A. Klein, Col. Lucke, John J. Penhale, John Johnson, Mr. Douglas, Glasgow, Scotland; Mr. Alfred Ward, Mr. T. Sheridan, H. J. Williams, A. H. Murphy, Peter Ward, A. M. Evans, G. M. Melville, S. J. Johnson, B. T. A. Bell, and many others prominently identified with the mining industries of the Eastern Townships.

A pleasing feature too was the presence of the following ladies: Mrs. Richard Penhale, Mrs. L. A. Klein, Mrs. Crabtree, Mrs. Proteau, Mrs. Matthew Penhale, Miss Penhale, Miss Maltby.

Mr. Matthew Penhale, vice-president of the club, occupied the chair, and in a few graceful words introduced Mr. E. D. Ingall, M.E., to the Geological Survey of Canada, to read his paper on the subject of:

The Functions of the State Investigator in Relationship to the Mining Industry.

When your worthy Secretary wrote to me the kind invitation to be present at the opening of your new Club Rooms and suggested that I should read a paper on the occasion, I must say the former proposition struck me more favorably than the latter, as reading papers is not much in my line. The temptation, however, to be with you on the occasion and exchange ideas with my brother professionals of the asbestos region was too strong, and I decided that my inherent aversion to that kind of dissipation must be overcome.

I have thought that the subject as outlined in the title to my paper might be appropriately considered on such an occasion as this, and I feel sure that if a review of our relative positions in regard to the whole work and necessities of the profession and industry should lead to any fuller measure of co-operation of all for the common good, the introduction of the subject to your notice will have been justified and my own effort fully repaid by your sympathy with our work.

When we think that the ultimate object of the mining industry, is to extract from the earth's crust various mineral substances as required by mankind, and to bring them to such a condition that they become available as raw material for the manufacturer, it is not at first very evident where the function of the Government investigator comes in, seeing that so far the State leaves all such questions of the supply of the necessities of its existence to private enterprise. The community at large, however, *is* interested in having the most made of the resources of its country and in having the supply of the material it requires produced as cheaply as possible—that is, with the minimum of expenditure of time, material and energy. This requires that those having the direction of the operations for winning these mineral substances should be armed with the fullest possible information and should come to their task with a thorough knowledge of the nature, modes of formation and habits of the deposits to be worked, and the bearing of the geological surroundings on the probable extent and nature of the same.

So far many of those engaged in the industry have, I know, regarded this theoretical knowledge as of secondary importance to the exercise of the mechanical and technical side of the profession with its more immediately evident connection with the object to be obtained, but I think we may say that with the progress of time a better understanding is being arrived at with regard to the very practical nature of true theoretic knowledge, and that when properly understood there's decidedly "money in it."

In fact one may say that to a great extent the mining art has been regarded from the point of view of "taking it out," but on the principle of "first catching your hare before cooking it,' it is evident that precedence must be given to the consideration of all that pertains to the finding of the required article whether by underground development or surface exploration, whether in hunting for the deposit or in its subsequent opening up.

In this connection then the need for geological knowledge is evident, else our search and subsequent operations will be directed by the very wasteful process of hap-hazard. If one could only state in dollars and cents the actual amount of waste due to this cause for any given time and area, I think the figures would astonish many, but one can only form an idea by so constantly seeing examples of the results.

It is a great mistake to suppose that theory is ever divorced from practice as everyone engaged in developing a mineral deposit will be found to have some sort of theory, some ideas as to its nature, whereby he guides his actions. It may not be the true theory based on the widest experience of humanity, but if not, it will be one which, springing from the narrow limits of an individual's experience, and often largely tainted with gratuitous imaginings, is therefore very apt to be mistaken. If looked for, instances of this will be found at every turn, with their resulting waste of money, material and energy. In one district I was in, I found a belief prevalent that "true fissures always run dead straight," and as a consequence in one instance a picket line, starting from the outcrop of a vein had been run through the bush out on to the clay lands of the valley and a lot of money spent sinking shafts through a thickness of cover, evidently very considerable, to find the vein which, being firmly believed to maintain an absolutely straight course, must be there-

fore surely attainable by this method. Needless to say no useful result was attained. As another instance might be mentioned the belief largely held some years ago about the Canadian phosphate deposits, viz., that they did not "go down," which lead in so many instances to the premature abandoning of effort on encountering the first "dead ground," and the consequent retardation of the development of the district.

The question then being admitted of the necessity of such general or theoretical information being at the disposal of those who are to apply it to the solving of the problems of an individual mine or district, whence shall it be obtained? The theory being but the summarising and generalized form of the knowledge gained by practice, a certain amount of this generalization has always been existent, and before the times of modern science, mining districts of centuries standing, such as those of Germany, England and elsewhere, had their theory and their code of generalizations taught from mouth to mouth and handed down by tradition. Such theory, however, was only local in application, and whilst often marvellously correct within these limits was still considerably diluted with error, due to the imaginatory contributions of ill trained minds, and always had the disadvantage that in its crude mode of statement it was inapplicable to new districts with different conditions.

Thus we see that in the more primitive ages, practice and theory existed side by side — the lion lying down with the lamb—but in these post-millenial times, this happy partnership has, to a certain extent, been dissolved, and the practical miner finding an ever-growing necessity to occupy himself with the commercial necessities of his position, has to, largely or altogether, cease to be an investigator, so that one might almost classify the fraternity under the two heads of "investigators" and "applicators."

Thus has arisen a necessity that the progress in further study of the nature of mineral deposits and all that pertains to the subject should be undertaken by hands other than those already so busy with other branches of mining, an inevitable result of the application to human affairs of the principle of the division of labor.

In mining, as in all other branches of human industry, every year sees a greater demand for skilful and economical handling, and any increase in the theoretical knowledge must contribute to this end, true practice being but the application to individual problems of true theoretical knowledge. If our knowledge, however, is to advance beyond the point at present reached, such result must come from extensive study, costing much both in time and money. The latest methods of research must be at command and freely used, and it cannot be expected that the mining engineer engaged in practical work can spare either much time or money for the task.

A great deal has been done by voluntary contribution as it were, by men of means and leisure devoting themselves to scientific research, but yet there remains an enormous field of operations. Luckily the undertaking of this has been recognized the world over as an important function of the State as evidenced by the existence of the Government Geological surveys which are found in every civilized country. On these corps of "State investigators" (as I have called them for want of a better term), devolve the duties of making the studies before alluded to, enabling them to supply to the miner the information which is demanded by him for the attainment of the best results of practice.

Such an organization has to deal with the very diverse requirements of a very mixed public, for not only must their work meet the wants of the local mining fraternity, but the reports must also supply the information called for by the scientific and non-scientific public, the legislator dealing with the resources of the country, the investor, both native and foreign, and many others, nearly every one being more or less benefitted by the results obtained.

Thus we find that a Geological Survey must undertake very various work, which may be considered under the following headings:

The Natural History Division, whose work, whilst otherwise widely useful, has a less direct and tangible interest to the mining fraternity, but whose utility to us is easily recognized when we remember the very important part played by fossil evidence in the working out of the geological structure of a district.

The Chemical Division, the necessity for whose existence is evident with its analyses of minerals and ores and the demonstration of their fitness for use, etc.

The Mineralogical Division, contributing to our knowledge of the nature and associations of our mineral species and the indications they yield—through the changes found to have occurred in them—of the nature of the forces at work in the formation of our mineral deposits.

The Field Staff, whose work might be further classified under the heads of Preliminary Explorations, Systematic Geological Mapping, and Mining Geology. In a new country like ours there are always large tracts of unknown territory, of whose resources it is necessary to know with a view to their development. Into these districts then will go the pioneer parties, working by methods which, whilst not so accurate as those possible in the more developed sections, are yet sufficiently so for preliminary work, and allow of the necessary rapidity of transit in order to cover a reasonably large tract of country in the season. Thus their methods will consist in the traversing of the watercourses and lakes, track surveying the routes passed over, and noting all phenomena encountered, so that the report of the work will comprise information on everything pertaining to the natural resources of the section visited.

The systematic geological mapping of the country is of course a process familiar to all. Being a work of considerable detail, it is evidently only possible in sections where facilities for travel and for getting at the rocks is considerable, and hence follows the settlement of the country. To be of lasting benefit it must be carefully done, and is hence slow of attainment, and in its nature must be carried out on a systematic plan. For this purpose the map of the country is usually divided into sheets; as soon as one is finished an adjacent one is begun. Each of these represents an immense amount of painstaking work, both in investigating the nature and relationship of the different formations or groups of rocks, and in mapping their distribution. It has been customary with many to regard this work as "purely scientific," and as of no use, as so much of it relates to areas yielding little or no economic minerals. One might as well assert, however, that because one did not live in the cellar, a foundation to a house was of no good, whereas in reality this work is the basis on which all the more immediateiy useful work must be built up. For instance a man would be ill fitted to investigate a mining district who understood nothing of geology, and yet how could it be taught at our universities, or anywhere else, if one were to refuse to collect that information which constitutes geological science. It may seem to some that an attempt is being made to prove a self evident fact, but it is unfortunately the case that there is a large section of the public who take the view combatted. One might dilate upon the multitudinous benefits of such work, but it would be unnecessary and tedious in a scientific audience such as this.

Having now dealt with the main body of the army—as one might say—and with its steady advance we come to another branch of the forces which constitute what one might call a flying column, to be sent out in any direction in which special necessity arises without disturbing the systematic advance of the main body.

I refer to the work of the mining geological division, with which it has been my pleasure to be connected since forming the staff.

As new discoveries of mineral are made in various parts of the country, constant need is arising for special investigations apart from the systematic progress of the Survey. The necessities of this kind of work require that it should be differently treated to the rest. Whilst a comparatively small area is undertaken, much more detailed work is required. The systematic mapping of the country deals with groups of rocks, but in the immediate vicinity of mines we must read closer, and deal further with individual rock units, and with all the minutæ of the structure, To attempt to work in such detail for the general geological maps of the country would be manifestly inimical to the interest of that work, and indefinitely postpone its completion. Of the work now under consideration, we have examples in the various reports of our own Survey on the mining districts of the Dominion, and also in the splendid monographs issued by our southern neighbours.

When we study these we see some of the relationships of the Government Investigator to the mining industries clearly illustrated. In them is to be found all the evidence as to the nature and habits of the deposits worked, analysed, summarized and supplemented by the personal investigations of the geologist, and put in such form that future effort can be directed by the light of past experience. The nature of the rocks existent in connection with the deposits has been demonstrated not by mere eye examinations, but further by the aid of chemical and microscopical investigations. A vast flood of new light has been thus thrown on the subject, not only illustrating the present composition of the rocks, but also upon the alterations they have undergone and the causes producing these changes and acting in the formation of the deposits of ore.

Of the great utility of such knowledge in practical work one might draw endless illustrations, did time allow and were it necessary before an audience such as this, so familiar with all that pertains to our art. I shall not, however, now occupy your time with this view of the matter, but pass on to the consideration of the question of how we can best collect and render generally useful more of such information. An excellent beginning has been made and much useful work has been done in the last fifty years or so since geological investigations have been brought to a systematic basis. When, however, we look into the state of our knowledge in this respect, it is evident that the work has been but begun and that an enormous field of research yet lies open to us, and a harvest of the most useful results awaits the reapers hand.

We have reviewed then the necessity for theoretical information of the nature of mineral deposits, their geological associations in the application of the art of mining to their development with the need of continuous extension of our knowledge of these matters. We have seen that it is a work of great complexity, that problems have to be faced calling for the application of the fullest methods of study for their solution, as generalization of value cannot be obtained by the examination of a single mine, and that it must, therefore, be undertaken by those who being in the employ of the State can make it their life work, but this will not be enough if we are to add to our knowledge at a satisfactory rate, and secure for ourselves and the future all the experience gained from mining operations the world over.

For this we require the fullest measure of systematic co-operation by all interested, and it is here that we may look for improvement in the closer and more understanding relationship of the State investigator with his practically engaged brother. Let us not then look askance at each other; our functions are different but all have their part in the economy of the whole science. The practical miner has great opportunity for accumulating material in his day by day observation of his deposit as it is developed under his eye. Every mine opened up is an experiment and an object lesson, yielding raw material which, when compiled, correlated and, as it were, manufactured into theory, shall yield principles and knowledge by which all future procedure shall be improved in an ever-increasing degree. On the miner engaged in the practice of his profession necessarily devolves much of the duty of collecting these data, but unfortunately this has never been clearly recognized, and untold amounts of most useful knowledge have already been lost and are being lost every day. When a mine has closed, all its records and plans, if even they existed, have been lost, and when all those conversant with its history have wandered away to other parts, an irrecoverable injury has been suffered by our fraternity in the loss of knowledge and experience, costing thousands of dollars in its acquirement.

In regard to these investigations and studies, the functions of the State officer must be evidently confined to that part of the whole work which, being nobody's business, would else remain undone. Had he a thousand eyes he might collect all the data for himself, but if he could trust more to his practical brethern for much of his material and confine himself to his proper functions of elaborating this and presenting it in a useful form, his field work could be concentrated on such studies as were necessary to complete the record and of such a general nature as to be outside the scope of the efforts of the practical miner.

He also performs another useful function in that he provides an outside and disinterested person to whom information so often of a confidential nature, may be entrusted to be stored up until the lapse of time having removed the necessity for secrecy, it can be used for the good of all. The confidential nature of this relationship has become recognized of late years so that we find it specifically defined in our own Geological Survey Act passed last session, and in that of the United States and others that their officers shall in no way become pecuniarily interested in mines or mineral lands.

How then shall we begin to carry into effect this much to be desired understanding and fuller measure of co-operation between the different members of the mining fraternity, and between them and their brethren in the employ of the state.

Firstly, let each one make it his business to bring about, amongst others, a better and wider understanding of this relationship, and of the desirable results arising from its practical recognition. Let them explain that the state investigator, the Government geologist, is not an outsider with whom they have nothing to do, an amiable crank, who at best should be left alone as harmless, or a Government agent sent in to spy out the land on the behalf of some mysterious outside interests, but that primarily he is a member of the mining fraternity, entrusted with special duties, acting in its interests, and a necessary part of the economy of the whole, and that all branches of his work are useful either directly or indirectly, either immediately or in the future.

Secondly, let all pay more attention to the study and recording of the natural phenomena, which come under notice in the development of the mineral deposits, and the prosecution of the work under their direction.

Thirdly, let such record be systematically and fully kept and put in shape for future reference, and here I may enter a plea for the wider prevalence of the practice of keeping plans of mines—posted up to date—with full notes of the rocks encountered, phenomena presented by the deposit, and all such information recorded on them.

Fourthly, let us strive after a more complete organization of our efforts, a more understanding system of co-operation for the attainment of the object in view, viz., the extension of mining science and the widening of the basis of knowledge upon which our art is founded. Let each mining district have its club or associatton, such as your Asbestos Club here, and let them be assisted by the state, and recognized as necessary parts in the whole economy of mining, they in their turn acting as agencies for the central state investigation bureau. Let them see that no item of useful information is lost, but that whether it be illustrative collections of specimens or records of mining developments, that all shall be carefully collected, and either kept on the spot, or perhaps better, transmitted to the great central storehouse of such records for safe keeping.

Of course, as to the other functions of such organizations as yours, it would be out of place to dilate in this connection, although it is a subject whose consideration would lead to much useful discussion, nor shall I attempt to further follow the subject in hand and tire you, but shall content myself with a few final words to beg a continuance of your assistance in the work it specially rests with myself to carry out as being in charge of the Division of Mining Statistics and Mines of the Geological Survey.

It has been recognized both here and elsewhere that a legitimate and important branch of the work of such a survey consists in presenting to the public an annual review of the economic condition of the mining industry, and it is one which more than any other calls for the hearty and prompt co-operation of the mining community for its successful fulfillment. The information solicited is asked for in no inquisitorial or impertinently curious spirit and is always accepted as confidential, whilst in the recording of it in the office and in its publication, precautions are taken to guard fully against any injury to private interests. I cannot do better than close my appeal on this point in the words of Mr. F. S. Emmons of the United States Geological Survey, in a paper read before the American Institute of Mining Engineers, where,

speaking of the collection of such information, he says: "The influence of the individual members of the Institute can be of the greatest use to us if they will take the trouble to explain to these mining men with whom they come in contact the practical value of the work and persuade them to answer our questions promptly and in a friendly spirit. It is often more labour to get information from one or two reluctant individuals than from a whole district or State;" and I may add that the absence of one or two items often delays the issue of the whole report.

I have thus far attempted to pass in review the functions of the State investigator in relationship to the mining industry, the mode of application of the principles found to underlie this connection and the benefits that may be expected to accrue therefrom, but in judging of the results —so far accomplished—I would beg your attention to a few considerations:—

Firstly, we know only too well ourselves that our attainments fall far short of what they should be, but the work is young yet and the difficulties both outside and inherent in the work itself both hard and tedious to be overcome.

Secondly, we must judge of all such work from a wide standpoint not merely from that of our own individual interests or those of our own district and remember that the reports are written in view of a distribution amongst a very wide public with very diverse wants and that what may be no news to ourselves may illustrate our district or industry to others.

In fact I can only quote to you in this relation the notice stuck up at the door of the church in Leadville when that prosperous city was yet young, on which might be read the plaintive appeal, "Please do not shoot at the organist, he is doing his best."

I would not of course deprecate proper criticism for it is a useful spur to continued improvement, but to be useful it must be both friendly and just, without which it does but little good and militates against that consolidation of effort so much to be desired.

In conclusion then, as we would wish the history of mining to be a record of continued and rapid progress let us all, the practical miner, the technical press, the scientific investigator, in fact the whole mining fraternity, keeping that object steadily in view, work harmoniously together for its attainment, for the realization of the principle of the *profit each in the benefit of all*, and let us take for our watchwords Fraternal Sympathy and Systematic Co-operation.

Mr. Ed. Wertheim, Managing Director of the American Asbestos Co., next read the following paper on the subject of:

The Uses of Asbestos.

It is not long ago since our mutual friend, Mr. Evans, in his capacity as secretary of the Asbestos Club, surprised me by the request to read a paper before this club and its visitors on the occasion of the opening of the new club room. I call it a surprise, because I did not expect such a privilege. The fact of the matter is that I do not consider myself sufficiently trained, and more than that, I do not consider myself master enough to speak before an audience, especially an English audience, as I know hardly enough of that language to get through an every day conversation without making some funny blunders. Well, gentlemen, if you find that I am correct in saying that I am not fit to read before such a prominent party as has gathered around us to-night, don't blame me, but blame those who made me do it, especially our worshipful secretary.

Before I come to the real objects about which I intend to speak, I might say a few words not directly connected with them, but which I consider opportune enough to be expressed in this place and at this time. I refer to the opening of this club room.

Gentlemen, the Asbestos Club has had a hard time, and a constant struggle ever since it first breathed the air of the asbestos region. All kinds of obstructions have had to be got over, as those know who took an active part in the management of the club, but they managed to keep it going until on a certain gloomy Sunday in June a disastrous fire swept away the mortal remains of the Asbestos Club. Strange to say that an asbestos club should have suffered a death of fire after hardly a year's life. Asbestos, the great fire-resister, should have lent its name to a club that would die of combustion. No; it would have been considered no recommendation to the fire-resisting powers of asbestos if the Asbestos Club would have been satisfied to perish under the ashes of a wooden building. No, gentlemen; like the Phœnix who rises from the fire with new life, spirit and power, so the Asbestos Club has arisen with new strength and glory, brighter than ever before, and proud of having the opportunity to prove that a powerful element such as fire is by no means powerful enough to injure the life of anything made of asbestos.

Here we are to-day assembled to celebrate the opening of this new home of the Asbestos Club, to celebrate its resurrection from a death of fire. Gentlemen, it would be hard to find a more appropriate opportunity for a celebration in that part of the world where the production of asbestos is the sole object and the only work which its inhabitants pursue. Let this opportunity not pass without remembering all the good purposes for which this Club has been established, and let us recognize the efforts and the lot of work which the officers of the Club have taken upon themselves to enable us to hold our meeting in such a comfortable and suitable place as we have at our disposal to-night. I think the best way in which we can express our gratitude is to make up our minds to encourage them and to encourage the further development of the Club by regular attendance at the meetings and by frequent visits to this hall. If we form such decisions, and do our best to carry them out, I am sure we can show the world that the Asbestos Club is not only *incombustible* but *everlasting*.

And now, Mr. Chairman and gentlemen, let me come to my subject, "The Uses of Asbestos."

There is no necessity for me to explain to you what asbestos is—you all have had some dealings with this remarkable mineral—and I can confine myself to describe some of the many uses to which this mineral has been and is now being put.

Asbestos has been used, one might say, ever since mankind had the ability of making a thread out of a fibre. Even without giving full credit to the numerous reports of the old Egyptians having known and used asbestos 3,000 or 4,000 years ago to manufacture an incombustible canvas to envelop the bodies of the dead to be cremated on the funeral pile, and thus to retain separate the ashes destined to be deposited in the family urn, I say, even allowing these stories to be somewhat mysterious and liable to be argued upon, there seems to be no doubt that asbestos was known long before the records of history were retained in such a way as to leave us no doubt about their credibility.

Not only was the mineral known, but also its wonderful quality of being able to resist fire.

The word itself, asbestos, or as our friends at Ottawa persistently call it, "asbestus," is a plain proof that the people who gave this name to the mineral—or, as they may then have believed it to be, a plant—were aware of its fire-resisting power, for "asbestos," a word derived from the Greek, means nothing else but imperishable, incombustible, unchanged by fire.

The word is found mentioned in many old books and scriptures as also is the word "amianthus," which means pure, incorruptible.

The question is, however, left open, whether by the names of "asbestos" and "amianthus," our forefathers meant the same mineral which we now know in the trade as such. Some will not admit it, and they think that the name of the mineral which is produced in this district is neither amianthus nor asbestos, but "chrysotile." However, let others fight that out, it is sufficient for us to know that the mineral which we produce is known all over the world as "asbestos," and goods manufactured therefrom as "asbestos goods."

The manufacturing of asbestos goods forms at the present date a very important industry both in America and Europe, and it may be said that it owes its importance principally to the discovery of the asbestos in Canada. Until then, say 1878, the uses of asbestos were very limited indeed, owing to the difficulty of spinning the only kind then known to be of commercial value, namely the Italian. I will not enter into the question of which is the superior kind; it will be sufficient to say that until 1878 the yearly consumption of asbestos did not amount to more than 500 tons, while since the discovery of Canadian asbestos the uses increased so much that in 1890, more than 8,000 tons were probably used.

I have mentioned that the spinning of asbestos caused difficulties owing to various circumstances. First of all the fibre has not sufficient strength to withstand all the operations to which other fibres, be they of vegetable origin, such as cotton, flax, etc., or of animal origin, such as wool, silk, etc., have to be submitted, and another difficulty is found in getting various asbestos fibres to adhere to each other. While fibres such as I have mentioned, wool, flax, etc., have a rough surface, the surface of a single asbestos fibre seems to be perfectly smooth, something like spun glass, so that in trying to twist a number of single fibres together they slip past each other and thereby add to the difficulties mentioned. Science, however, as well as continuous study of the nature of asbestos fibre, has, to a certain extent overcome the difficulties, and manufacturers have succeeded in turning out a single asbestos thread which, although not weighing more than an ounce to 100 yards, has a pretty fair strength.

You will see by some samples which I have before me and which I shall presently pass around for inspection, to what a degree the spinning of asbestos has been accomplished.

The short notice I had of my lecture to-night did not permit me to procure representative samples of the best that has been done.

The manufacturing of asbestos in other ways than spinning it, has not the same amount of difficulty, as, for instance, the manufacturing of paper, cardboard, etc.

It is difficult to say in which manner asbestos finds its largest consumption. The market seems to vary in various countries. While in the United States and Canada large quantities of short fibre are used to manufacture pipe-coverings of all descriptions, the European market calls principally for long fibre to be used for spinning, braiding and weaving.

As a pipe and boiler covering Asbestos is claimed to be superior to most other non-conducting materials, because of its heat-resistance and because it adheres, being fibrous, better to smooth surfaces than powdery substances. The variety of pipe and boiler coverings in the market is very great, and the number of companies which make the manufacturing of it a specialty shows what an important position this article has gained in the United States.

Asbestos is used in various ways for the purpose of preventing the radiation of heat from pipes, boilers, tanks, etc. One way is to mix loose asbestos fibre, after freeing it fairly well from stone admixtures, with other materials which either serve to increase the non-conducting qualities of asbestos or to make the composition adhere better to the surface of the pipes, not to speak of the admixtures which sometimes have for their only object the cheapening of the article and the substitution of a cheaper material for the costly asbestos fibre. To apply a composition manufactured in that way to a pipe, consists of mixing it with water and putting it on in thin layers with a trowel, allowing one to get dry before the next layer is put on. To finish off, canvas or oil-cloth is used, which prevents the covering from falling off, should it in the course of time become cracked.

Another mode of using asbestos for covering pipes is effected by forming it into sectional pieces which are placed on the pipes and connected by means of wire or canvas. This mode of applying asbestos has the principal advantage that it can very easily be put on and taken off the pipes, and that the same covering may be used for a great length of time. Special sectional pieces of such covering are made to fit elbows, tee's, crosses and other fittings. As sectional covering asbestos is often used in connection with hair-felt, fossil meal, magnesia, cork, etc. It is claimed that by a good asbestos covering as much as 25%, 33⅓% and even 50% of the fuel can be saved, and when once a selling agent praising his goods, ventured to promise even more than that, his customer wanted to know how much asbestos covering he would have to use in order to dispense with the fuel altogether.

A composition of asbestos is also manufactured to be used as a cement for the backing of fire grates and furnaces, or as a fire-proof putty to be used between rough or uneven joints; as a paint, fibrized or powdered asbestos, mixed with other ingredients, serves as an effective preventative of fire by applying it to wooden structures. By a special preparation such paint can also be made waterproof and then can be used outside as well as inside. Fibrized asbestos also serves as a filtering medium in chemical works, and for packing steam cocks and chemical pumps. In warfare asbestos fibre has been adopted for numerous purposes, for closing the breeches of big guns in connection with torpedoes, and even as a lint in hospitals and on battle fields. Some very interesting experiments were made some time ago by the British Admiralty with respect to using asbestos fibre as a coating for men of war. The idea was that if asbestos fibre is pressed firmly together, it would prevent the inflow of water after the penetration of a ship's side below the water line. I cannot however, say, whether the experiments led to a final application of asbestos for such purpose.

Asbestos fibre is to some extent used, especially in England, in connection with gas fires; the gas is made to rise through asbestos and then lit. The asbestos fibre glows while the gas is burning, and thus not only serves to spread the heat, but also gives a pleasant appearance to the open fire-place. I may also add that asbestos fibre is used in water filters, and is claimed to be very effective as such.

Manufactured into paper and millboard (I pass samples around of same), asbestos finds a variety of uses. The millboard serves as a joint packing for steam pipes, cylinder covers, steam chest covers, etc., and is greatly appreciated for its durability, economy and cleanliness. It will adapt itself to uneven surfaces, and forms a perfectly tight joint, which with very little care can be removed and replaced without injury. For special purposes, especially where there is any lodgment of water in the steam pipes, asbestos millboard can, by special treatment, be made perfectly waterproof, and I pass a sample around of such waterproof board, which is known in the trade as asbestonite. Asbestos millboard is also used for other purposes, such as the construction of fire proof deed boxes, etc.

Asbestos paper is very largely used, the manufacturing of it in the United States alone being estimated at 1,500 tons per year. Its principal use is for building purposes. Placed between two layers of boards, in ceilings as well as walls and partitions, it necessarily tends to reduce greatly the danger of fire in as far as it checks a fire which starts in any part of a building thus protected. When the flame gets to the asbestos paper, there can be no doubt that it has to stop there for a time until the paper gets so much heated that wood or other combustible materials on the other side of it can ignite, and such a delay very often may save a building. In fact, insurance companies have agreed to allow specially low premiums to houses which are thus protected. Asbestos paper placed underneath the roof also acts as a non-conductor of heat and cold, and contributes to hold a building warm in the winter and cool in the summer. Asbestos paper is also printed and colored same as ordinary paper, and then serves as a wall paper (sample), filling both purposes of decorating and protecting the walls. For electrical purposes asbestos paper is also extensively used in Europe, and likewise as a filter in chemical works. Asbestos paper can also be specially prepared to be used as a non-combustible writing paper, and as such is invaluable for deeds, contracts, and other valuable documents. In theatres it is largely in use in connection with side scenes, possessing the advantage, besides being fire-proof, of showing the colors much brighter than ordinary paper, owing to the bright white color of the paper itself.

Asbestos in its spun state is very largely used as a steam packing, be it in the shape of yarn, or as it is often called, wick, for packing small glands, valves and cocks, or in the shape of piston packing, for piston rods, valve-stems, throttle-valves, etc. In the application for these purposes the heat-resisting quality of asbestos has been found to make it specially suitable for superheated steam, as is used in the large triple and quadruple expansion engines used on the fast ocean

steamers. Asbestos-packing has stood the test where all other packings, such as soapstone, hemp, flax, cotton and even metallic packings have failed. It is durable, reliable, and economical. Durable, in that it is not affected by the heat or moisture, and less than other packings by friction and pressure. Reliable, because as it does not require to be frequently renewed, the regularity of motion in the piston is preserved and as a consequence all the machinery connected with it runs more smoothly. Economical, for the reason that being to some extent a self-lubricant, it saves in oil and friction, and from its elasticity, caused by its fibrous nature, keeps the joint perfectly tight a longer time than other packings. The most common asbestos packing is made by either twisting or braiding asbestos wick or yarn together into a rope, but a great many other kinds of asbestos packings are in the market. Sometimes wire is used to increase the durability and strength of the packing, sometimes an India rubber core is inserted to increase the elasticity. Asbestos packing is manufactured with a filling of powdered soapstone or graphite, in order to increase the lubricating power, and so on. A very superior kind of asbestos packing is made by first producing an asbestos cloth and then rolling this up into any desired thickness, placing rubber solution on between the layers. In a similar way, by uniting layers of asbestos cloth, a flat packing, generally called asbestos and rubber sheeting, is made, which can be cut into rings of any shape and form and thus used as a superior flat-joint packing, instead of mill-boards. Tape made in a similar way can be bent into the form of a ring and used for the same purpose as the sheeting, having the advantage of leaving no waste to the consumer. Such asbestos and rubber combined packings are very much in use, owing to the advantage they have over the ordinary asbestos packing of being more resistant to moisture, and also of withstanding a still higher pressure, owing to the peculiar way in which they are made. A so-called asbestos block packing is made by uniting a number of layers of asbestos cloth by means of India rubber, then placing a flat rubber back cross-ways at the edge of the layers and covering three sides by a cotton cloth, leaving one side to face the piston rod. The rubber back gives it a great amount of elasticity, while the friction acts against the edges of a number of asbestos cloth layers. This packing has an enormous power to withstand steam pressure. I pass around a variety of steam packings made wholly or partially of asbestos. The next important use of spun asbestos is in the shape of asbestos cloth. This being a fire-proof and flexible cloth has found use for a great many purposes. As theatre drop-curtains it is in use in a great many theatres both in Europe and America. Asbestos curtains have the advantage of being much easier handled than iron or steel curtains in case of necessity, which is a matter of no small importance when a fire breaks out during the performance. Garments made of this asbestos cloth are used both as a protection against fire and also as a protection against injuries from acids. Gloves, gaiters, aprons, caps, masks, blankets, bags, etc., are made of asbestos cloth and constantly used. Fire brigades, as well as firemen and furnace men in iron and steel works, use them as a protection against heat and fire.

There are a number of other uses to which asbestos has been and is now being put, and they are too numerous to be detailed in a short space of time such as is at my disposal to-night. I might mention that belting is manufactured of asbestos, to take the place of leather, cotton and rubber belts in places exposed to heat or acids. Soldering blocks are made of asbestos for the use of jewellers, dentists and all those who use the blow-pipe; cords and ropes are being made by twisting asbestos threads together, and serve as fire escapes and rope ladders. Asbestos wicks are also used in lighthouses, where the saving of frequent trimming is a great advantage; for covering electric wire the use of asbestos is fast increasing; as a roofing, asbestos, in connection with wire netting, and rendered water-proof, also finds considerable use; fire bricks are made of asbestos; asbestos has been introduced in the shape of cigarette paper, dispensing with the inconvenient and unhealthy smell of burning paper; in short, the uses of the mineral are of such a variety as hardly those of any other material. A flexible fibre, which is practically fire-proof, acid-proof, self-lubricant, a non-conductor of heat and electricity, is bound to be found useful as industry progresses, and the chances are that new uses, now unthought of, will be discovered, and will increase the consumption in a degree which will surpass the most sanguine expectations. Unless new discoveries are made of suitable qualities of the crude material in other parts of the world, which then might share in the supply of the world's demand, the district in which we find ourselves at the present moment is bound to flourish for a long time to come by the production of that wonderful and remarkable mineral, asbestos.

With this hope, Mr. Chairman and gentlemen, let me finish this little paper, asking you to excuse me if I have too much imposed on your good nature and patience. I thank you all for the attention you have given me to-night.

A vote of thanks having been conveyed to these gentlemen for their papers, and to the ladies for gracing the meeting with their presence, the meeting adjourned downstairs to the supper room.

The Supper.

Here one found a spacious room decked out with evergreens and flags and many emblematical designs of the miner's calling tastefully adorning the walls. Mr. James King presided, and Mr. Matthew Penhale occupied the vice-chair. After ample justice had been done to an excellent bill of fare, the following toast list was gone through: "The Queen;" "The President of the United States," replied to by Col. Lucke, Sherbrooke; "The Asbestos Industry and its Club," proposed by Mr. Ingall and replied to by Mr. James King; "Our Guests," by Mr. E. Wertheim, and replied to by W. M. Douglass and Mr. Martin Longee; "The Mining Industries of Canada," by Judge Dugas, replied to by Mr. B. T. A. Bell, of the CANADIAN MINING REVIEW; "The Geological and Natural History Survey of Canada," by Mr. A. M. Evans, replied to by Mr. E. D. Ingall, M.E.; "The Ladies," by Mr. John Penhale, reply from Mr. J. C. Noel, B.C.L. At midnight the party adjourned to the Club Room, where songs, recitations and dancing brought to a close a thoroughly enjoyable gathering.

The Phosphate Market.

The following translation from *L'Engrais* of the phosphate situation in Europe will be of interest. We therefore quote in full:

The ruling prices are about the same, with a weak market, the French and Belgian products being entirely neglected.

We perceive, however, that the limits favorable to the purchaser are attained, and they now open negotiations for 1892 and 1893 deliveries. Buyers, nevertheless, hold pessimistic opinions concerning this article, and even some sellers are not too optimistic. The true situation is to be found in an equitable medium of a reasonable quotation, neither too low nor too high, and it beholds us to ring the true key under the present circumstances.

To believe in the return to old prices as do some producers, is to be dreaming while awake. The low prices are not the result of a cabal of ephemeral influences, but the consequence of the European production, and especially of the discovery of the Florida deposits.

We need not scare ourselves too much over Florida phosphates, neither should we avoid looking the danger in the face by putting our head under our wing as the ostrich, to avoid seeing what is going on at our neighbors!

Looking at the Somme deposits, and more particularly the richer qualities, we recognize that our own efforts are completely thrown in the shade by those of Florida, and it is by this latter market that we must be governed, or lose our export demands by forcing an exaggerated output from the Florida fields.

It is our duty to expose this fact, and not to conceal the truth.

Now, Florida Phosphate of 75% is offered at 11*d* and 1/2 per unit in English or German ports, which is about 1 franc 20 centimes per unit for 1015 kilograms accepted in bulk on delivery, and although not in a ground state, it is of a nature easy to be ground. Admitting 6 to 7 centimes per unit for grinding, we obtain 1 franc 26 centimes to 1 franc 27 centimes for 75/80 % delivered; it is this price that must guide us; then deducting freight and the small profit of the exporter, we obtain the value of our phosphate on board in our seaports. We are essentially dependent upon our exportation, our domestic consumption being far from absorbing our own production. By the above figures it is seen that we must not dream of fancy prices, but resolve to sell at reasonable figures.

Can we possibly expect a lower market in the richer qualities? We do not think that this eventuality is to be feared; the consumption of fertilizers is on the increase, and the richer qualities, notwithstanding long transportation, will always be in demand at all European markets; moreover, the comparatively lower prices of richer qualities will tell against the inferior grades. Buyers are wrong in reckoning upon a continuation of a falling market; the time is favorable to negotiate business on long terms at reasonable prices; one need not fear buying, there is nothing to risk.

One cannot but expect a change in the prices for the lower grades of Somme phosphate; they are now so low that it is evident they will recover themselves shortly. There are a quantity of small supplies furnished by individual proprietors in the Somme which cannot longer satisfy the superphosphate manufacturers, who are outfitted to buy unground phosphate. The low grades already extracted and put into stock, keep down the prices, because the holders wish to realise regardless of working cost, but when such are absorbed, who will recommence extracting and manufacturing at a dead loss.

We are of the opinion therefore that the low grades of some phosphate are at their lowest quotations, and that they will recover within a few months' time; we believe also that the higher qualities will maintain reasonable prices, if the producers do not force the sales, but we are persuaded that we must not figure to ourselves high prices which no combine can bring about.

Combines are necessary to sustain the article, and to limit the production to the demands of consumption but not for bringing about in an artificial manner high prices which are out of season.

It is upon this common sense basis that the syndicates of the Somme and of Liege should be founded.

The basin of Liege will always find a market for her excellent phosphate, but on the condition that she moderates the production; this is a question of life or death for this region.

Present quotations are not firmly established; certain deals at low figures in order to secure a sale are cited, but on the whole the quotations have changed but little.

In the Somme the 70/75 % is sold at 1 fr. .05 to 1 fr. .08 on cars at Doullens or elsewhere; and certain forward sales are mentioned at slightly lower prices for phosphate on board in our ports, or C. A. F. in English ports.

The 65/70 % without guarantee for iron alumina is a little neglected at 0 fr. .88. The same grade "washed" is more in request.

The 60/65 % not washed, is so to say unsaleable. Ridiculous prices are offered for it, but the producers will not sell at such extraordinary limits and prefer waiting. 66 centimes per unit are nominally quoted in the Somme.

The other qualities are altogether abandoned, otherwise they are little produced.

At Mons, phosphatic chalk of 40/45% remains about 43 centimes the unit.

At Liege, we await the formation of the syndicate. Some impatient sellers have done business, at any prices, it is said at 78 centimes for 55/60% with 3½% iron and alumina, and at 68 centimes for 50/55%. The inferior qualities are, figuratively, given away. It is high time that some combination should put a little order and discipline in these transactions which promised so well at the beginning of the Liége industry.

At the moment of going to press, we have received a letter from an English correspondent who appears to count on an improvement in prices; we should like to see this rise for the producers' sake, and would only wish for them that present prices remain firm; that would be already a good result. We shall publish in a following number some interesting statistics on phosphates.

Here are some quotations from this correspondence:—

"It is to be seen by the statistics that the United Kingdom has still to receive large quantities of phosphate, roughly, about 180,000 tons, during the second half year in order to attain an equal quantity to the importations of 1889, and some 220,000 tons to reach the total of last year. We believe, however, that the importations of 1890 were in excess of the consumption; but seeing that the English buyers, or at least the greater part of them, have not yet made provision for all their requirements of the approaching season, the returns show that they will still need large quantities, and that they cannot avoid soon coming to buy upon the market."

It is the same case in Germany.

We shall, therefore, shortly see a greater activity in this business, and if the sellers remain firm to their prices instead of lowering them, it is highly probable that there will be a stiffer market.

English Market.—The market is very quiet with prices tending to favor the buyers. Florida phosphate 78/80%; is quoted at 11½d, but one could buy perhaps a little below this price.

The 60% is not in request, and is not worth more than 10d. Bull River rock, kiln dried, is quoted at 10d, but is certainly obtainable at a lower figure.

The richer qualities of Somme phosphate are rarely offered, and maintain comparatively good prices. These quotations are: 11½d. for 80/75%, 9½d. for 60/65%, 8¼d. for 55/60% C. A. F. English ports.

Belgian phosphate 40%, is at 7d. per unit.

Canadian 70% is not worth more than 9½d., and the 60% is offered at 8d. without finding buyers.

Phosphate Shipments from Montreal.

The following are the official returns of the quantities of Canadian phosphates shipped to Europe from the port of Montreal from August 12 to date:

DATE	NAME OF VESSEL.	DESTINATION.	SHIPPERS.	TONS.
Aug 12	SS. Monarch.	London.	Lomer Rohr & Co.	200
18	" Main.	Hamburg.	Squaw Hill Phos. Co	150
26	" Congo.	Glasgow.	Lomer Rohr & Co.	248
29	" Canopus.	Liverpool.	Wilson & Green.	555
Sept. 7	" Norse King.	London.	Squaw Hill Phos. Co	107
7	" "	"	Lomer Rohr & Co.	150
9	" Colina.	Glasgow.	"	45
9	" "	"	Millar & Co.	60
14	Ship John M. Blakie	Liverpool.	Wilson & Green.	268
14	" "	"	Lomer Rohr & Co.	175
14	" "	"	Millar & Co.	100
				2057

SHIPPERS' RECAPITULATION.

	Tons.
Wilson & Green	823
Lomer Rohr & Co.	817
Squaw Hill Phosphate Co.	257
Millar & Co.	160
Total shipments to date	2057

RECAPITULATION OF EXPORTS.

	Tons.
Liverpool	1098
London	457
Glasgow	352
Hamburg	150
Total tons exported	2057

Herr T. Lange, in his new process for obtaining, by electrical decomposition, metallic zinc from solution of sulphite of zinc, uses zinc sulphite instead of zinc sulphate as electrolyte, as the difficulty of keeping the bath neutral is thereby obviated, and the metal obtained of better quality. Less power is required for the decomposition of zinc sulphite than for that of zinc sulphate, to the extent, it is stated, of 30 per cent.

CORRESPONDENCE.

Mining in the Kootenai District, British Columbia.

The district of Illecillewaet, the centre of the mineral belt of British Columbia, situated in the Selkirk Ranges, and with the Canadian Pacific Railway running right through the centre of it, is, after a period of quiescence, again showing signs of a strong vitality, and bids fair to make a stir in the mining world in the near future. This is not a matter of surprise to any who know anything about the capabilities of this surprisingly wealthy mineral district. The fact of its not being prominently to the front, is not because there are no valuable mineral lands here; but simply because the population has been so limited in number, and also that the resident population have not had sufficient means to provide the crushing and concentrating machinery requisite to reduce the ores to a marketable condition. The want of good trails to the various mines has been a drawback, but that is being overcome. There is a great opening here for the judicious investment of capital, to work and develop the mines of this district; and in no place or part of British Columbia would a higher return be given for the outlay. The galena here is of an extremely high grade, the average being from 100 ounces silver and 72% of lead and upwards. The ledges are large and well defined, and most of them true fissure veins, extending for miles and of a permanent character. The walls well defined, of gray schistic slates and black graphitic slate. There are a few claims where some extent of work has been done, and the ore has been packed down on horses and mules, and shipped either to San Francisco or Denver, U.S., where the returns have been over 100 ounces to the ton of silver. The Selkirk Mining and Smelting Company has been working for more than two years on their claim, the Lanark, on which they have expended some $30,000 in development work, by tunnelling, drifting, etc. They have a face of mineral twenty-six feet in width, and will soon commence to reap the handsome reward for their energy and perseverance. They intend to construct an aerial or cable tramway from the mine to the Canadian Pacific Railway track, and will be able to deliver their ore on the track at a cost of about 40 cents per ton. Formerly the price of packing down the mountain was $15 per ton. That will be the rule here for all the principal claims—aerial tramways—to get the ore down from the mountain. There are inexhaustible supplies of timber for mining purposes, and an unlimited supply of water for driving machinery everywhere about. No heavy sinking of shafts, hoisting and pumping gear required, as the chief part of the work can be done by tunnelling, and consequently the mine will drain itself. The capitalists of Canada seem to be unaware or indifferent to the mineral wealth of British Columbia, and to English capitalists it is nearly unknown; not so the American capitalists, who are snapping up everything that they can lay their hands on, and whose money even now controls most of the big mines now working in this province. They know a good thing when they see it, are always on the lookout for good mining property, and are not afraid to invest their money in development work. England spends millions every year in wild-cat ventures, of which not one cent is returned to the shareholders, and here are valuable mines laying idle for the want of some of that same capital that is so recklessly squandered on worthless ventures. If anyone visits the mines here they are simply astonished at the enormous wealth lying idle awaiting development, and a visit to the mines leaves an unfading impression on the visitor. There has been a new find in this district at Fish Creek, where an extensive mineral lode has been discovered, running nearly parallel with the Creek. It has been traced for nearly five miles, and there are now eighteen claims located on it. There is a surprising show of rich galena on the outcrop, blocks of galena from 100 lbs. to 250 lbs. in weight, showing freely. Assays of galena from this lead have shown 130 ounces silver, 70% lead. There is great excitement about it, and experienced miners all declare that it is the greatest show in the Province yet discovered. Fish Creek is about 17 miles from Illecillewaet, via Hat Creek; Canadian Pacific Railway runs past mouth of Hat Creek, which is five miles from Illecillewaet station, Canadian Pacific Railway. There is a great future before Fish Creek, but the natural outlet is down the Creek to arm of North Arrow Lake, thence to Revelstoke, but there is no trail that way yet. A trail is at present being made from Hat Creek to the lead, and a bridge is being built across Fish Creek, which is a turbulent, rapid and wide stream, running like a mill race, fed from the enormous glaciers at the head of the Creek. The smelter at Revelstoke is finished and now running low grade ores from Field in the Rockies. The smelter seems to work well, and the ore runs freely, but the work is not finished at Revelstoke, for though the ores are smelted, they are not separated, and the bricks run are composed of silver and lead, and they will have to be sent to England or Wales for treatment to separate the ores. But there is not the least doubt that very shortly all the work necessary to be done to make the district an assured success will shortly be done. Enquiries are being made from all parts and there is some strong indications that some of the best properties will soon change hands.

The town of Golden has given forth to the mining world in particular, and the rest of it in general, the first issue of a very creditably got up four page paper, to issue weekly. The matter is interesting and readable, paper good in quality, type clear and distinct. We wish the venture every success.

Mr. Kelly, M.P.P., lately visited us and stayed for some days. He is member for West Kootenay, and a thorough practical miner, and he is thoroughly well posted on the wants, capabilities, and requirements of the East and West Kootenay districts. He is of opinion, after a long, patient, and impartial research, into the various camps and mining ventures of the East and West Kootenay districts, that the prospects of the Illecillewaet district, for permanency, extent, high grades of galena and general capabilities for producing great wealth at moderate expense is, with one exception, that of Toad Mountain, the best in British Columbia.

We have had a visit from Mr. Ami, of the Geological Survey of Ottawa. He went to Fish Creek, ascended Granite Creek, and there found the contact of the granite with the gneissic rocks, trap rocks and basaltic, proving that a great eruptive upheaval has taken place here. It was believed to be so, but no geologist had succeeded in verifying this matter before. A great deal of harm was done this district by a report spread that the upheavals were not eruptive, and that there was consequently no permanency in any deposits of mineral; many left their claims and the district in consequence. But now this important matter will be set at rest and due confidence will be restored. Mr. Ami deserves great credit for the energy and indomnitable perseverence he has shown in overcoming the most serious obstacles, in determining this matter, and he risked both life and limb in his efforts over a country without trail or path, in which he had literally to fight his way through the thick scrub. There was also the pleasant possibilty of meeting a grizzly or cinnamon bear at any moment. Unarmed, except with geological hammer, and tired from exertion, fortunately, he had not that experience, though they are numerous and their tracks are quite recent. Mr. W. Scott, of Illecillewaet, was his guide; an energetic prospector and well qualified to assist him.

The weather has been beautiful for some time, only varied with a few thunderstorms.

In conclusion, I can only reiterate what I have said in a previous part of this article, that there is no district in British Columbia that will better repay any judicious outlay of capital, and the extent, richness and permanent character of the lodes of mineral ore offer one of the safest and best investments now before the investing public. It is fully time that Canadians awoke to the fact that the wealth of one of the richest provinces of the noble Dominion of Canada, is going to enrich foreign countries.

EDMUND A. WATSON.

ILLECILLEWAET, B.C., Sept. 15th, 1891.

LEGAL.

Stewart v. Wright.

This case was heard in the Assize Court, Ottawa, on the 17th inst., before Mr. Justice Street and a jury. Mr. G. S. Kidd appeared for plaintiff, and Mr. F. H. Chrysler represented the defence. The suit was of particular interest to mining men, inasmuch as it hinged upon the point as to whether a mining engineer had the right to dispose of a report to parties other than those it was made for, at the same price as would have been originally demanded.

The action was brought by Mr. John Stewart, of Ottawa, against E. V. Wright, also of Ottawa, to recover $288, the balance of $300, which value he placed on a report of the Lake Temiscamingue galena mine then owned by Wright. The defendant submitted that the sum already paid, $22, was ample remuneration, as the reports were not original, but copies.

MR. J. STEWART was the first witness called. Being sworn, he deposed that in December, 1889, he went to the mine at the request of Mr. R. G. Leckie, to report on his own and the adjoining lot owned by Wright, on which he had a 30 day option, in which time he was to pay $50,000 down and the balance later. The time being so short, Mr. Leckie did not purchase the property. It was understood, however, that Mr. Leckie was not bound to take the report—in event of his not buying the mine—in which case witness was to be at liberty to dispose of it elsewhere as best he could. In the following January Wright came to him and said he wanted a report—not the same, but with all reference to Leckie's property left out. This witness supplied from the data in his possession. He was given $10 to pay for the cost of material, and promised more when the mine should be sold. In February he furnished further copies, for which he received $7, and during last autumn he made a sketch of the property, when he received $6. It had taken him three weeks to make the examination and to write the reports, make plans, etc. He considered the work worth $500, including as it did, underground and aboveground surveys and examinations, estimates, etc. Wright had told him that a Mr. Treadwell, an English engineer asked 200 guineas to report on the property. $300 was a moderate charge and he had a perfect right to sell the report.

The mine was sold in March of this year to Mr. B. W. Chapin, president of the Ingersoll Rock Drill Co., of New York, who employed Mr. J. Williams, M.E., to examine it. Mr. Wright had never had another report made on it, and he, witness, was told by Mr. Williams that if it had not been for his report the mine would not have been sold as the snow was on the ground, and William's took Stewart's report and in great measure embodied it in his own; thus gaining at least six months' time, —and, moreover, witness' plans have been used at the mine ever since.

Cross-examined by Mr. Chrysler.

He went on Leckie's account solely. He did not mention his first agreement to Wright. There was a good deal of difference between the two reports, and moreover, he did not charge for changing the plans, but for an expert report. He had also conducted correspondence for Wright with Leckie, informing the latter that a further extension of time would be given or an option of $125,000. The report given to Wright estimated a yearly income of $97,500 from the mine, but witness afterwards wrote to him explaining how the operations could be conducted much more cheaply, so as to give $187,500 a year. He had been for twenty-three years engaged in various branches of mining work.

MR. J. LAINSON-WILLS, F.C.S., was then called and gave evidence that he considered the plans perfectly intelligent. Taking the distance into account, the work was worth $500. The value of a report depended very largely on the reputation and status of the engineer, and Stewart bore a very good name. Fees are for reports solely; out-of-pocket expenses are a separate item and Stewart's should be discharged by Mr. Leckie. Making copies of reports was clerical work, but if the engineer's signature was attached they at once ranked as reports and had the same value.

MR. B. T. A. BELL, editor of the CANADIAN MINING REVIEW, stated that from his acquaintance with expert work, he should judge the reports and plans to be an intelligent and fairly valuable description of the property. He had read the report carefully and it seemed to bear out the general reputation of the Temiscamingue mine. The draughting work was excellent. There was no fixed scale for professional work of this kind, but from $500 to $1,000, was no uncommon figure. Everything depended upon the status and practice of the expert. He had known Stewart for six years and thought he possessed a practical acquaintance with mining work. He would not class the reports as mere copies or clerical work. They had a value and were well worth the amount claimed if used by the vendor in disposing of the mine.

MR. GEORGE GOODWIN, next called, said he had been interested in the mine jointly with Wright. It had been sold to Mr. Chapin of New York. He did not know the exact sum.

MRS. J. STEWART deposed to have heard Mr. Wright tell her husband that he had asked the English engineer, Mr. Treadwell, to examine the property, but that the latter had asked 200 guineas.

E. WRIGHT, the defendant, was then called and, being sworn, deposed that he had employed Stewart in 1890. He asked him for a copy of Leckie's report, plans and tracings, prompted in great part by curiosity to see why Leckie did not take them. Stewart said he could pay him what he (witness) liked, so when he received the report, having a $10 bill in his pocket, he gave it to Stewart, who professed himself satisfied and went off. He afterwards got another copy of the plans, only half as big. He paid about $7 for the second, but though Stewart did not seem satisfied, he asked no special sum. It being thus left to witness, he paid him what he thought was sufficient. The last time he employed witness was last fall when he gave him $5 for a sketch plan of the property to effect some insurance. Then Stewart asked what about the other money? Which was the first mention made of it. The mine was not sold through Stewart's report—the purchaser had an expert who viewed the property. The second report was very little different from the first. He told Stewart he could do nothing with the report, and the latter said that some of the figures might be altered somewhat, (as was done by letter of March 6, before mentioned).

Cross-examined by Mr. Kidd. The property comprised about 500 acres. He had never had a mining engineer to report upon it. He had tried to sell it before but failed. He sold it (as mentioned) for $127,500. He had expected to give Stewart something, but did not tell him that if he had had his reports before he would have sold the mine sooner. He had never applied to Mr. Treadwell for a report.

G. REIFFENSTEIN, sworn, said he had seen Stewart in October, 1889, and was told by him of the report he had prepared for Leckie. Witness therefore suggested to Wright that he should get a copy of the report. Copies might be worth 25c. a folio. Witness had little or no knowledge of mining matters, and based this valuation on his own work.

Counsel for the defence then addressed the jury and in an able speech endeavored to prove that the reports received by Wright were mere copies and as such should be paid for at copy rates and not at such a preposterous price.

Mr. Kidd, for the plaintiff, following, urged that the work was original and as such it must command its full professional valuation, under the agreement with Leckie.

His Lordship summed up very impartially, though it inclined somewhat to the side of the plaintiff, and the jury left the box.

Verdict was rendered to the plaintiff for the full amount claimed, $288 with costs.

Anglo-Continental Guano Works Co. v. The Emerald Phosphate Company.

This appeal was heard by the Court of Queen's Bench at Montreal on Tuesday the 22nd inst., before Chief Justice Lacoste and Justices Baby, Bossé and Wurtele. Messrs. R. Laflamme, Q.C., and A. E. Cross, Montreal, appeared for the appellant, and T. P. Foran, Aylmer, for the respondent.

The appeal is from a judgment which maintained an injunction, and ordered the appellant to cease from work on certain lots in the Township of Buckingham, County

of Ottawa, Quebec, and to desist from the removal of phosphate until the bounds of the respective properties should have been legally defined.

The respondent complained that the appellant was encroaching on its property and removing valuable phosphate of lime.

By its first plea, which is in the nature of an exception to the form, appellant alleged:—That respondent was wrongly described in the writ as having its place of business at Buckingham, as in fact its place of business was in the State of New York; that respondent's demand was not of a nature to entitle it to the summary procedure applicable to injunctions, and the delay of less than ten days between service and return was therefore insufficient; that the return day was not fixed by order of the judge, and that the affidavit and petition were vague and did not disclose a case for injunction or even allege exposure of respondent to irreparable or serious damage if the writ were not granted.

By its second plea, appellant denied any trespass or work upon lot 19, alleging that its operations were confined to mining upon its own property, lot 18, the mining rights in which it had purchased, and in the development of which it had spent at least $10,000.00 to respondent's knowledge; and it further pleaded, that neither respondent nor its predecessors had ever taken the necessary steps to have the boundary between the two lots settled, though protested and called upon to do so; that said boundary still remained unsettled though appellant reserves its right, upon due proceedings being had to fix the boundary, to maintain as the true boundary a line drawn by Edward J. Rainboth, surveyor, in the year 1890; that respondent having neglected to have the boundary fixed by proper boundary suit was without right to take the exceptional and rigorous remedy of an injunction; that the matters complained of were not properly the subject for remedy by injunction, and that the petition or demand did not allege exposure to irreparable damage or show that injunction was the proper remedy and that the petition was premature.

Appellant also pleaded a general denial.

Respondent answered the first plea or plea to the form, in law by alleging that it was waived because appellant filed pleas to the merits at the same time.

To the second plea respondent answered that in the year 1887 or 1888 the surveyor, Edward J. Rainboth, had surveyed the boundary in question at the request of McIntyre, appellant's predecessor in title, and drawn the line opposite the point where the alleged trespass was committed less than twenty feet further west (that is towards respondent's side) than where George C. Rainboth had drawn the line, and that appellant had trespassed even beyond this line also.

That this line drawn by Edward J. Rainboth was not drawn with legal formalities; that a change in the survey law cannot alter ownership acquired under former laws; that respondent had always occupied up to the line drawn by George C. Rainboth, and that appellant assumed the functions of a Court in operating beyond the lines.

Judgment was reserved.

MINING NOTES.

[From Our Own Correspondents.]

Nova Scotia.

Cumberland County.

Work at the different collieries is about as usual at this season.

At Springhill about 1,400 persons are employed, and the daily output averages from 1,500 to 1,700 tons. Since the time of the explosion in February, safety lamps have been introduced and the "Marsaut" is now used exclusively in all the pits. No powder is used in No. 1 slope where the explosion occurred, and in consequence the cost of mining has greatly increased. The miners complain because of the prohibition of the use of powder in certain cases, and a committee has been appointed by the local government to prepare a report on the best flameless explosive for use in gaseous mines. The explosion, however, did not affect the output at the collieries, except for a brief period. Indeed it is doubtful if the output would be so large to-day if the large output of 2,200 tons daily had been kept up, for the reason that the pillars were pretty well exhausted, and sufficient pit room had not been opened up. The levels, however, are now being extended and considerable prospecting is being done. Levels are being driven northerly to test what is known as the Aberdeen seam, and it is said to be the intention of the company to sink another large slope, or a shaft, as soon as the exploratory work is far enough advanced. It is improbable, however, that a start will be made this season.

Since stoppings have been built in all the tunnels it is necessary to find some means of draining No. 3 slope. Hitherto the water from this slope was conveyed in pipes through a tunnel into No. 2 slope, and thence pumped to the surface by two powerful plunger pumps, built by Allison, of Port Carbon, Pa. Another pump will shortly be put in No. 3 slope, which will then be entirely independent of the others. The column pipes are nine-inch diameter. They are fitted with wooden lining to resist the destructive corrosive qualities of the pit water. The pump and pipes are imported from Janesville, Pa.

At No. 2 slope a new bankhead is being built. It has an elevation of thirty feet, and will be of wood, with a corrugated iron roof. The present building is so low that the coal cannot be screened, and it is to remedy this that the new building has been erected. The trestle supporting the building is constructed of heavy timber.

A difficulty with the workmen's union recently had a threatening look, but a strike was averted by submitting the question in dispute to three arbitrators. They heard both sides and at once decided that the company had no case.

The Joggins colliery—the oldest in Nova Scotia proper—is now working steadily, and the outlook is exceedingly bright. The output averages 300 tons daily, and is steadily increasing. About 250 men and boys are employed. This colliery is now operated by the Canada Coal Co., with considerable success. The system of mining has been changed from the bord and pillar to "longwall." This gives larger coal and is more economical. To the deep the quality of the coal is improving, and the quantity of the coal now being shipped is large, clean and bright. It is growing in public favor, and consequently there is an increased demand. The company now operating the mine is about to erect a number of cottages for the accommodation of their workmen.

Another mine on the line of the Joggins railway, a short distance from Maccan—known as the Lawson pit—which was worked in a small way to supply the local demand, is now closed down temporarily. All the buildings, including the engine house, were recently destroyed by fire. The engine was considerably damaged, and the loss is $6,000. Mr. J. T. Smith, of Amherst, was the owner.

The Chignecto colliery, near Maccan station, owned by the Londonderry Iron Company, has been abandoned. The colliery has been idle for some time, owing to the coal having been exhausted, and all the pillars have since been drawn.

A diamond drill is boring on areas near Maccan station, and it is expected that a workable seam of coal will be found to the deep. It is believed that the Joggins seams extend in that direction.

Copper has been found near Minudie, about three miles rom the Joggins. A company has been organized, and the district will be thoroughly explored. The owners assert that the ore can be extracted in paying quantities.

Asbestos has been found at Five Islands, just on the boundary between Cumberland and Colchester counties. The discovery was accidentally made by Mr. G. Gilling. Several Americans are negotiating for the purchase of the property.

Cape Breton.

The output of coal from the Island this year will be greater than in any previous year, all the mines being taxed to their utmost capacity. An estimate places the quantity in the vicinity of 1,000,000, as against 800,000 tons last year.

The Electric Company of Amherst, N.S., have shipped to the Gardner Mining Company, Sydney, a thirty horse power dynamo and apparatus to run an electric coal cutting machine. This is the second system of the kind in the Dominion, the other being the Jeffrey machine, now used in British Columbia.

Pictou County.

The Drummond colliery is at present being worked steadily. The management has curtailed boy and horse labor very much, by a system of endless rope haulage underground which gives great satisfaction. These run on the levels with 22 boxes and on the slope with 11 boxes.

The annual meeting of the New Glasgow Coal, Iron and Railway company was held during the month. Quite a number of shareholders were present. Messrs. Stein and Schwartz, the company's engineers, reported the work of furnace construction well under way, the foundations being nearly all in, the greater part of the materials on the ground, and everything looking favorable for the furnace being in full blast early in the spring of 1892. Mr. Chambers reported the railway construction well in hand, seven miles being ready for the rails, and the remainder will be ready by October 1st. The mines being worked are showing very large quantities of ore, and are constantly, as the working development goes forward, increasing in value, and proving more conclusive than ever that the company possesses abundance of ore for all their purposes. The capital stock of the company has nearly all been taken up and the first two calls paid thereon.

Quebec.

Miscellaneous.

Messrs. Walsh and Mulvena, of Sherbrooke, show samples of very good fibre from their asbestos property near East Broughton. Development is reported satisfactory.

Apatite has been discovered on the property of the Radnor Forge company at St. Maurice. Mr. Obalski, the Government engineer reports the quality quite equal to that raised in the Ottawa valley.

Some promising deposits of Muscovite mica of excellent quality have been recently uncovered in the Township of Bergeron, Escoumains and Tadousac, in the County of Saugenay.

Ottawa Valley.

The High Rock mines continue to lead in the production of phosphate, their agents reporting shipments averaging from 1,300 to 1,500 tons per month. One hundred and fifty men are employed at mines.

There is little or nothing to report from the other mines, the most of which, in view of continued depression in the market, high freights and the imposition of a burdensome tax, will very shortly be closed down for the winter.

Rumors are current that the North Star, the Shirley grinding mill at Buckingham, with the super-phosphate works at Capelton, will shortly pass into the hands of an English syndicate. We hope to give fuller particulars later.

Mr. P. Würzburger, M.E., Antwerp, consulting engineer for the Anglo-Continental Guano Works Co., is at present making an examination of the Squaw Hill and Etna mines owned by the company. Mr. Würzburger will also visit the Florida mines in the interest of a Hamburg company.

Black Lake District.

Mr. A. H. Murphy is opening several new pits on lot 32, range B. Three new derricks have been erected and the drift and clay is being removed.

Mr. Douglas, representing Glasgow capitalists, has been making an examination of the property owned by the Thetford Mining Co., with a view to purchase.

The Anglo-Canadian Asbestos company are working a number of pits on their property and a larger output than last year is reported. This company are also erecting a larger cobbing house.

The Glasgow and Montreal Asbestos company, formerly the Scottish-Canadian, is working a large force of men; output to date reported excellent. The finest asbestos this property has yet yielded, has been taken from a pit recently opened at the bottom of their property near the Ireland and Coleraine line. A steam hoist and derrick is the latest acquisition to a well arranged plant.

The property of the United Asbestos company, under the energetic direction of Mr. John Penhale, is developing nicely with usual complement of men.

New hoisting mechinery has been installed on the hill, by the American Asbestos Co. The works on the property reflect the highest credit on Mr. E. Wertheim, and his able and genial engineer, Mr. L. A. Klein. The stock of crude, fibrized material on hand, attests to the productiveness of their various pits.

The Laurier Mining company has lately resumed working on their property.

A derrick and horse power has been put in by the Central Co.

The finishings of the new Asbestos Club's rooms, although not yet quite complete, are in excellent taste and reflect credit on the executive. The secretary, Mr. Evans, desires to convey the obligations of the club to the ladies and gentlemen who so materially assisted them by their efforts at the recent concert, particularly the Misses Penhale, Crabtree, Barbour and Beauchesne. It gives us great pleasure to announce that a handsome sum was realized.

A full report of the proceedings at the opening meeting and its successful and thoroughly enjoyable supper will be found in another place. The occasion will live long in the memory of those who had the privilege of being present—particularly at the dancing and its subsequent "pow-wow."

As announced elsewhere all the mines in this district will close down on 1st November until further notice.

Thetford Mines.

The Beaver Asbestos company have added a fine new 80 h. p. boiler to their plant. A new cable derrick has also been put in at pit.

The Jenckes Machine company have lately furnished the Bell's company with a pair of 80 h.p. boilers.

Danville.

The mine operated by Mr. W. H. Jeffrey in this district, continues to maintain its reputation as one of the best of our asbestos producers. The mine has been equipped with a new and improved plant.

Ontario.

Belmont Township.

The Belmont Bessemer Ore Co. of New York, have been working steadily for the last six months on their magnetic iron mine in Belmont Township, with a force of about 20 men. So far they have been doing preliminary and development work only. A shaft has been sunk to the depth of about 50 feet, mostly through good ore, and several cross-cuts have been made, showing ore of excellent quality.

The company have decided to construct a branch railway from their mine to the C.P.R., about six miles, and have commenced the necessary work. Mr. G. L. Woodworth, M.E., late of the Iron River mine in Michigan, is the manager.

Perth District.

The Anglo-Canadian Phosphate company will close down next month for the winter.

Kingston.

The Foxton Mining company has closed down *pro tem.*

Manitoba and North-West Territories.

General Superintendent White, of the Canadian Pacific Railway, has returned to Winnipeg, after inspecting the lines under his supervision west of Winnipeg. He first went over the Souris branch to Melita, and drove thence to the coal fields, for the purqose of making personal observations of the country through which the Souris line is being constructed. He afterwards went to Donald, the end of his division, and made calls at Canmore and Anthracite, where he visited the coal mines. Mr. White says that the Souris railway will be completed with due despatch to the coal fields, and it is expected that the promised cheap coal will be in the market by February 1st, at the latest. The mines will be located some distance west of Alameda, the drilling tests made at that place having proven unsuccessful. Experienced miners will be brought from Pennsylvania to develop the mines. Mr. White states that there is great activity at Anthracite, work having been resumed in the mines there under new and energetic management. One hundred and thirty men are employed in the mines, and preparations are being made to ship coal to Winnipeg and the coast. Shipments will also be made to Spokane Falls, in Washington, by way of the Columbia river. The coal that is now being mined at Anthracite is said to be fully equal in quality to the Pennsylvania coal. Compared to the Pennsylvania coal, analytical tests show that it contains as much fixed carbon and more volatile matter, and consequently leaves less ashes after burning.

The discovery of new deposits of anthracite coal in the Province of Alberta, comprising a portion of what was formerly known as the North-West Territory of the Dominion of Canada, will prove, if reports are correct, highly important, not only to Manitoba and British Columbia, but also to the Pacific Coast States of this country, there being no import duty on anthracite coal. It is said that large seams of this coal have been found along the Red Deer River, forty miles north of Banff. Hitherto it has been supposed that the only anthracite coal in Canada was at Anthracite, near Banff, from which place the present supply for the western part of the Dominion is taken.

British Columbia.

Kootenai District.

The Revelstoke smelter, after making a short run, has been closed down until such times as a supply of ore can be obtained. The ore from the Monarch mine, at Field, was found to be too refractory to work to advantage, the furnace "freezing" twice in running through a few tons. Afterwards 81 tons of good ore were treated successfully. President and Mrs. Boyle left Nelson, on Thursday, expecting to sail from New York on September 1st for their home in London. They will return to Kootenai in the spring.

Vancouver Island.

It is reported, upon what is believed to be good authority, that Hon. C. E. Pooley, Q.C., secretary of the Esquimalt and Nanaimo Railway company, British Columbia, and Mr. D. R. Harris, will leave for England in the course of a few days, to complete the sale of the Wellington collieries, the property of R. Dunsmuir & Sons, to an English syndicate. The price named is two and a half millions, and, for this amount of money, it is understood that all the valuable coal area at Wellington, the collieries, docks at Departure Bay, shipping owned by the Dunsmuirs, and employed for coal carrying, etc., will be conveyed to the purchaser. The E. and N. railway and the vast tract of timber, mineral and agricultural land known as the Island railway grant, and estimated to contain over 1,500,000 acres, will not, of course, be included in the sale at the figures mentioned. The total value of the railway and the lands referred to would aggregate not less than $10,000,000. The proposed sale of the collieries has been mooted for several months past, and it is more than likely that the deal, which will, perhaps, be the biggest sale of private property ever accomplished in Canada, will be completed upon the visit of Messrs. Pooley and Harris to England.

CANADIAN COMPANIES.

The Scottish-Canadian Asbestos Company.—A meeting of the creditors and shareholders of this company will be held in the office of Hanson Bros., Temple Building, St. James street, Montreal, at 2 p.m., on October 7, for the purpose of receiving and considering the cash statement and first dividend sheet, etc.

The Northey Manufacturing Company, (Ltd.)—This company will apply for incorporation under Federal laws, for the purpose of manufacturing and dealing in pumps, engines, boilers, machinery, etc. Head office, Toronto. Capital stock, $100,000 in 1,000 shares of $100 each. Applicants, J. P. Northey, J. Leys, A. Brindley Lee, A. Burdette Lee, and H. S. Pell, all of Toronto; all of whom are to be the first directors.

The Lunenburg Iron Company, (Ltd.)—Will apply for incorporation under Nova Scotia laws, for the purpose of casting and manufacturing iron and other metals, stoves, etc. Head office, Lunenburg, N.S. Capital stock, $10,000 in 200 shares of $50 each. Applicants, W. T. Lindsay, C. E. Patterson, P. T. B. Harris, W. Saunders, and S. A. Chesley, Lunenburg; of whom the first three are to be the first directors.

The Robb Engineering Company, (Ltd.)—This company is applying for incorporation under the Nova Scotia Act, for the purpose of carrying on the business of iron and brass founding and general engineering and the manufacture of all kinds of machinery, engines, boilers and pumps. Head office, Amherst, N.S. Capital stock, $249,900, in 2,499 shares of $100 each. Applicants, D. W. Robb, F. B. Robb, W. R. Robb, A. G. Robb and Dame Margaret A. McGregor, all of Amherst; all of whom are to be the first directors.

The Steveston Natural Gas and Development Company, (Ltd.)—Application will be made by this company for incorporation under the British Columbia Act, with power to dig, bore and mine in and about the town site of Steveston and elsewhere in British Columbia, for natural gas, petroleum, coal, mineral water, or any other natural commodity, or to acquire such properties by purchase or otherwise. Head office, Vancouver, B.C. Capital stock, $50,000 in 500 shares of $100 each. Applicants, W. H. Steves, A. M. Beattie, H. F. Keefer, J. W. Vaughan, D. McGillivray, Vancouver, all of whom are to be the first directors.

The North Vancouver Land and Improvement Company, (Ltd.)—This company will apply for incorporation under the British Columbia Act for the purpose of acquiring by purchase or otherwise, coal lands and coal mines, mineral claims and mines of every description, and to work, lease or dispose of same, with other powers in respect of real estate, the building of railroads, etc. Head office, Vancouver, B.C. Capital stock, $500,000, in 5,000 shares of $100 each. Applicants, H. A. Jones, Johann Wulffsohn, and E. Mahon, Vancouver; all of whom are to be the first directors.

The Canada Coal Company, (Ltd.)—Will apply for incorporation under the Nova Scotia Act, in order to mine, quarry, work and win by any process, coal, iron, stone, or other minerals or mineral substances, and generally to carry on the business of coal owners, ore and metal dealers, etc., with other powers. Head office, Joggins, Cumberland Co., N.S. Capital stock, $50,000, in 5,000 shares of $10 each. Applicants, R. Cruikshank, Hon. J. Boyd, St. John, N.B.; R. G. Leckie, C.E., Londonderry, N.S., D. McPherson, and S. M. Brookfield, Halifax, N.S.; all of whom are to be the first directors.

The Electric Mining Company, (Ltd.)—Application will be made for incorporation under Dominion regulations, by the above company, for the purpose of carrying on phosphate and other mining works in the provinces of Ontario and Quebec, and to buy and sell and deal in mines and minerals; to erect works for the manufacture of sulphuric and other acid, and for testing phosphate and manufacturing superphosphate of lime; to prospect for and work or deal in any mines or mineral lands, with other powers. Head office, Ottawa. Capital stock, $125,000, in 1,250 shares of $100 each. Applicants, Hector McRae, J. W. McRae, A. Stewart, J. Nicholson and F. H. Chrysler, all of Ottawa; of whom H. McRae, J. W. McRae and A. Stewart, are to be the first directors.

The Coleraine Mining Company, (Ltd.)—Application will be made by the above company for incorporation under Federal laws, for the purpose of buying, selling, dealing in, and working mines and minerals, the reducing and smelting of ores and the manufacture of articles and products from minerals; with power to erect plants, etc. Head office, Montreal. Capital stock, $120,000, in 1,200 shares of $100 each. Applicants, Hon. J. A. Chapleau, Ottawa; A. Desjardins, A. L. DeMartigny, Hon. A. Lacoste and Dame D. J. Dansereau, all of Montreal; of whom the first four are to be the first directors.

The Sault Ste. Marie Nickel Mining and Contract Company, (Ltd.)—This company will apply for incorporation under Ontario laws, to carry on the business of exploring, developing, mining and treating nickel and other ores and mineral substances, to deal in, buy, sell or lease, mineral properties and establish agencies in the United States and Great Britain for the sale of mineral, timber, agricultural and other lands; operations are to be carried on in the Township of Drury and elsewhere. Head office, Sault Ste. Marie, Ont. Capital stock, $45,000 in 9,000 shares of $5 each. Applicants, J. McKay, J. Dawson and D. M. Brodie, Sault Ste. Marie, Ont.; E. S. B. Sutton, L. F. Bedford, Saulte Ste. Marie, Mich.

Glasgow and Montreal Asbestos Company, (Ltd.)—Registered in Scotland, with a capital of £70,000, divided into 35,000 preferred and 36,000 deferred shares of £1 each. The offices are at 68, St. Vincent street, Glasgow. Object, to adopt and carry out an agreement with Robert Gaston Aitken, chartered accountant and stockbroker, in Glasgow, providing for the purchase by the company of the properties, mining rights, and others, including the Martin Mines, in the township of Coleraine, and county of Megantic, and the Fraser Mines, in the township of Broughton and county of Beauce, both in the Province of Quebec, with all the mining machinery, plant, tools, and other personal property, and the whole other rights, members, and appurtenances; to carry on the business of asbestos producers, manufacturers, and merchants, of a mineral or mining company in all its branches.

Montreal Nut-Lock and Manufacturing Company, (Ltd.)—Application for incorporation under the Quebec Act, will be made by the above company, to make nut-locks, bolts, rivets and other articles. Head office, Montreal. Capital stock, $110,000, in 10,000 shares of $10. Applicants, J. R. Wilson, L. H. Young, A. H. Holden, G. C. Arnoldi, J. Abbott, F. A. Draper, D. A. McCasgill, Montreal, and H. W. Leslie, New Glasgow.

The Moir Granite Company.—This company will apply for incorporation under Quebec laws, for the purpose of quarrying and dealing in granite and other stone. Head office, Stanstead, P.Q. Capital stock, $100,000, in 4,000 shares of $25 each. Applicants, W. D. Moir, Stanstead; E. G. Miller, Beebe Plain; G. H. House, Beebe Plain; S. Stevens, Stanstead Plain; D. W. Davis, Derby Line, Vt.; J. H. Lang, Boston; and D. S. House, Beebe Plain; of whom the first five are to be the first directors.

The Superior Natural Gas Company of Ontario, (Ltd.)—This company will make application for incorporation under Ontario laws, to bore for and obtain natural gas, oil, salt, or any other natural commodity; to construct and operate pipe lines, and erect plant, refineries, etc, for treating the same, with other customary powers. Head office, Sherkston, Welland Co. Capital stock, $100,000, in 5,000 shares of $20 each. Applicants, S. Carroll, Sherkston; W. E. Carroll, G. Bork, G. Lang, J. Binz, A. W. Hickman, E. G. S. Miller, Buffalo, N.Y.; and H. Cronmiller, Port Colborne, Ont., of whom S. Carroll, J. Binz, and H. Cronmiller are to be the first directors.

The International Mining and Milling Company of British Columbia, (Ltd.)—This company will apply for incorporation under the British Columbia Act, in order to acquire certain mines and mining properties situate at the North Fork of the Kettle River, B.C., known as the "Ophir," the "Lynden," the "Dominion," the "Union," and the "Volcanic Mountain" claims, and to otherwise deal in other lands and claims; to carry on the business of miners, smelters, etc., with other customary powers. Head office, Company's mines at North Fork of Kettle River, Osoyoos Division of Yale District, B.C. Capital stock, $500,000 in 500,000 shares of $1 each. Applicants John L. Broe, W. C. Kincaid, J. L. Wilson, R. A. Brown, B. M. Spinning, J. C. Kincaid, Victoria, B.C.; of whom R. A. Brown, J. L. Broe and J. L. Wilson shall be the first directors.

Montreal and Kootenay Mining Company, (Ltd).—A company under this title will shortly apply for charter of incorporation under Dominion laws, respecting Joint Stock Companies. Capital stock, $20,000. Directors: E. B. Greenshields, R. T. Hopper, W. H. Irwin, R. A. Peterson, F. Fairman, J. W. Smith, all of the city of Montreal. The property to be operated is the Tam O'Shanter argentiferous-galena claim located near Ainsworth in the Kootenai district, Province of British Columbia. Assays from the workings are reported high in silver. A small force is at present working on this claim.

Thetford Mining Company.—The asbestos lands owned by this company in the Black Lake district, Province of Quebec, are reported to have been sold to Glasgow capitalists.

The Mycenian Marble Company of Canada, (Ltd.)—Notice of application for a charter of incorporation under Dominion laws, is made on behalf of this company by Messrs. Pearson and McDonald, Toronto. Authorized capital stock, $100,000, composed of 1,000 shares of $100. Head office, Toronto, Ont. Directors, J. Yorke, builder; J. C. Mellechamp, manufacturer; Walter Gaynor, broker; Henry Meade, gentleman; John L. Davison, physician; R. B. Hamilton, F. F. Manly, J. E. Elliott, J. G. Gibson and James Pearson, all of Toronto. Formed to purchase patent No. 35,696, of the Dominion of Canada, being a new and improved method of manufacturing marble called "Mycenian marble," obtained by Richard Guelton, the inventor, and to manufacture all kinds of artificial marble, capable of being manufactured under said patent or under any other process.

Alberta Railway and Coal Company.—The annual meeting of shareholders will be held on Wednesday, 23rd October, at the offices of the company, 37 Old Jewry, London.

Bertie Natural Gas Company. — Supplementary letters patent have been granted under date of 2nd Sept., whereby the capital stock of this company has been increased from $2,000 to $50,000.

The Oil and Gas Company of Comber, Ont. — Charter of incorporation under date of 9th September has been granted to J. A. Buchanan, A. Ludlam, Moses Creighton, James Sellers, William Harmer, John T. Jordan, R. O. F. Ainslie, Wm. Mann, James Kerr, C. N. Anderson, R. H. Abbott, T. F. Johnson and S. T. Anderson, all of Comber, in the County of Essex, Province of Ontario, under title of company as above. Authorized capital $3,000, divided into 150 shares of $20.

The Chicago-Algoma Nickel Company, (Ltd.)—This company gives notice of application for charter under Ontario laws. Capital stock $1,000,000, divided into 10,000 shares of $100. $300,000 of said stock to be first preference, on which a dividend or dividends aggregating $90,000 on such stock shall first be paid out of profits, but ever thereafter, the holders of said stock shall not be entitled to any further or greater dividends than those allowed on ordinary stock. Applicants: R. P. Travers and Henry R. Durkey, Chicago; A. F. Mason, Boston; T. L. Nelson, Boston; F. A. Whitney, Leominster, U.S.A.; H. R. Valpey, Boston; T. Travers, Township of Drury, Ont. Formed to acquire and operate mining lands in the Township of Drury, district of Algoma, Ont.

The Westminster Slate Co. (Ltd.)—This Company has applied to the Chief Commissioner of Lands and Works to purchase certain lands containing 160 acres at Deserted Bay, Jerves Inlet, B.C.

The Carbonate Mountain Mining Co. (Ltd.)—This Company gives notice of application for charter under Companies Act of B.C. Head office, Vancouver, B.C.; capital stock, $100,000, divided into 100,000 shares of one dollar. The Trustees are: Charles Wetham, E. E. Rand and C. D. Rand, all of Vancouver, B.C.

The Lanark Consolidated Miuing and Smelting Co. (Ltd.)—This Company gives notice of application for a charter of incorporation under the Companies Act of B.C. Object: to acquire the rights and interests of his Selkirk Mining and Smelting Co., (Ltd.) in and to the Lanark mine, the Red Fox, the Isabella mine, the Dorothy mine, the Sutton mine and the Sprague mine, and all and every the other real and personal property of the said Selkirk Mining and Smelting Co., lying at or near the Town of Illecillewaet, West Kootenai District, for the sum of $120,000, to be paid for in fully paid up shares of the Lanark Consolidated Mining and Smelting Co. (Ltd.); Capital Stock, $200,000 in 8,000 shares of $25 each; Directors: Thos. Earle, W. J. Goepel, F. S. Barnard, A. J. Beaulands and N. P. Snowdon; Head Office, Victoria, B.C.

The Vancouver Stone-Quarrying, Mining and Transportation Co. (Ltd.)—This Company has applied for charter under laws of British Columbia, with the object of searching for and mining stone, coal and other minerals. Capital Stock, $25,000 in 2,500 shares of $10 each; Head Office, Cardova Street, Vancouver, B.C.; Directors: J. W. Vaughan, J. Wulffson, J. T. Carrol and J. A. Green,

Canadian Manganese.

In that very comprehensive report on the subject of Manganese: its uses, ores and deposits, prepared by Dr. R. A. F. Penrose, Jr., and just published under the auspices of the Geological Survey of Arkansas, much information of great value is given on the subject of Canadian deposits. Dr. Penrose says:—

"The uses of the manganese ores of New Brunswick and Nova Scotia differ from the uses of the larger part of the manganese ores of the United States, in that the former are devoted mostly to chemical purposes, while the latter are largely consumed in the manufacture of spiegeleisen and ferro-manganese.

The manganese ore used for chemical purposes has a much greater value than that used for spiegeleisen and ferro-manganese. It sells for from 2 to 5 cents per pound, or from $40 to $100 per ton, according to quality, while that used for the latter purposes rarely brings over $15 per ton. The applicability of an ore for either use depends on its composition; its value for chemical purposes is based largely on its oxidizing power, that is, on the amount of oxygen known as 'available oxygen' that can be obtained from it in the ordinary processes of manufacture. The available oxygen, as explained in previous chapters, depends on the amount of manganese peroxide in it, and, therefore, the market price of an ore for chemical purposes is determined by the percentage of this constituent. Pyrolusite contains a larger percentage of peroxide than any of the other manganese ores, in fact, being, when pure, composed entirely of it, and therefore, the value of the Canadian ores is due mostly to the large proportion of this mineral found in them. Pyrolusite is never found in a perfectly pure state in nature, however, and the very best picked ore rarely contains more than from 70 to 95 per cent. of peroxide, equal to about 13 to 17 per cent. of available oxygen.

Psilomelane also contains a considerable proportion of peroxide, but on account of its hardness and other peculiarities, as already explained on page 42, it is not so desirable as pyrolusite for most chemical purposes. Manganite, on the other hand, has only a small percentage of peroxide;* while wad, though it frequently contains a considerable amount, is too impure to be desirable for chemical purposes.

In the manufacture of spiegeleisen and ferro-manganese, the amount of available oxygen is not an item in the valuation of the ore. For these purposes, the three main requisites are a high percentage of manganese and a low percentage of silica and of phorphorus. Hence the manganese ores of the United States, which usually contain a smaller proportion of pyrolusite than the New Brunswick and Nova Scotia ores, but often fill all the requirements for spiegeleisen and ferro-manganese, are used for the manufacture of these materials. Small quantities, however, are sorted out and sold for chemical purposes.

At present most of the Canadian ore is used as a reagent in glass making, in electric batteries, in the manufacture of chlorine and disinfectants, as a dryer in varnishes, and for other chemical purposes. The use as a reagent in the manufacture of chlorine is one of the largest chemical sources of consumption of manganese, but the best grades of Canadian ores are too high priced to be employed for this purpose, their greatest value being in glass making. For this purpose the freedom of the ore from iron is a necessary quality, and the purity of much of the Canadian manganese renders it especially well adapted for this use.

It is the adaptibility of the Canadian ores for the above mentioned purposes, and consequently their high price, that permits them to be worked, as they do not occur in quantities sufficient to be profitably mined as a source of spiegeleisen and ferro-manganese alone. The poorer grades of ores, however, which are mined in connection with the better ones, are shipped under the name of 'furnace ore,' and are sold at the regular price of ores for spiegeleisen and ferro-manganese.

Tempering Steel Tools for Mining Purposes.

Chisels, drills and picks require careful treatment in sharpening and tempering. The student ought first to know that steel is a compound of iron and carbon; indeed it partakes more of the character of an alloy than of a compound. So much is this the case that when some varieties of pig iron are examined the graphite or carbon may be seen as a distinctly separate crystallisation. Cast iron contains from 2 to 5 per cent. of carbon, and steel contains from 3 to 1·8 per cent. Carbon is removed from cast iron by oxidation, cast iron being melted in the puddling furnace bottom and rabbled by the puddler in such a way that the surface of the metal is constantly exposed to the oxidising influence of the atmosphere when the carbon is burnt out, leaving malleable iron in the furnace bottom. Indeed it may be said of iron that it is easily carbonised and easily decarbonized. This being the case, the smith has to exercise very great care in heating steel for sharpening purposes. If the temperature be too high the steel is decarbonised and rendered worthless. Tools ought not to be heated to more than blood-red, and quickly hammered into the required shape. During the process of tempering steel, if the skin of the tool be cleaned, certain colors are seen which denote the molecular change going on at different temperatures. To understand this clearly, take a bar of steel with a clean skin, which has previously been made very hard by plunging it into the water when red-hot, and slowly heat it, when a wave of straw color will pass over the surface; next, on a further increase of temperature the straw will change into purple, and still further heating, the purple will change into a blue color. Now each of these colors is an index of the different degrees of hardness, the straw being hard, the purple less so, and the blue moderate hardness; that is supposing the bar of steel to be immediately cooled at the moment the particular color is seen. In cooling off a tool, care must be taken not to fracture. This may be illustrated with a common glass bottle. Set a bottle into a dish and carefully pour boiling water into the dish until the bottle is immersed to a depth of 2 inches; if the bottle be now taken out of the dish and be slightly tapped, the bottom will fall off, because a line of fracture has been produced; the expansion of the heated molecules of the glass have torn themselves asunder from the cold or unexpanded molecules; precisely the same thing occurs with steel if heated or cooled carelessly. On tempering a drill or chisel if the chisel be held steady with a certain line coinciding with the surface of the water, the chisel will break at that line when it is put to use, but a thoughtful temperer gives the tools an upward and downward motion in the water when cooling off, so as not to produce a line of fracture. Mining tools of all kinds ought to be tempered in coal tar and not in water, the tar being a bad conductor of heat is less apt than water to produce a line of fracture, besides the chemical action is such that the tar restores the carbon lost by heating in the fire.

*Manganite is a hydrous sesquioxide of manganese and, accurately speaking, contains no manganese peroxide; but what is meant here is simply the amount of available oxygen expressed in a commercial sense in terms of "peroxide." Manganite when perfectly pure, contains about 9 per cent. of available oxygen, equal to about 49 per cent. of peroxide, but it is never found in large quantities in this degree of purity.

Tool Sharpening Machine.

We notice the introduction of a compact little machine, which promises to supersede the use of the oil stone for sharpenig plane-irons, chisels, and other carpenters' tools. The apparatus, which can be fixed to a corner of the work bench or shop board, consists of a small cylinder on rollers, supported by two standards in a horizontal position, and provided with a handle, by which it is made to revolve. The surface of the cylinder is first covered with oil, and a little powdered emery or knife polish is then sprinkled over the rollers. The plane-iron or chisel is held vertically against the rest or back of the machine, with its edge downwards, and gently pressed against the roller by the left hand of the operator, who simultaneously causes the cylinder to revolve by turning the handle with the right hand. The back or rest against which the tool is held, being worked in slots, can be adjusted to any bevel required. The appliance is so easy and simple that a boy can sharpen a plane-iron, and make sure of having a straight and true edge, in less time than an experienced workman could do it on a stone.

Patent Valve or Draw-off Tap.

This novelty is designed with a view to provide an efficient cock, easy to repair, without involving the necessity of shutting off the water from either main, boiler or cistern. The action of a half-turn of the lever handle, from right to left, opens the valve fullway, by reason of the quick thread on the inner plug, or *vice versa*; and in case of repair, by unscrewing the cap, and screwing down the plug, on the upper setting, the water way is closed, enabling the inner plug and jumper to be removed and fitted with a new washer, thereby rendering the valve as sound and good as new, and at an infinitesimal cost for material and labour. The solid plug which shuts off the water in case of repair also acts as a regulator in case of excessive pressure.

What a Pound of Coal Represents.—A curious and interesting calculation has been made by Professor Rogers, of Washington, on the dynamic power of coal. According to the professor a single pound of good steam coal has within it dynamic power equivalent to the work of one man for one day. Three tons of the same coal represents a man's labour for the period of twenty years, and one square mile of a seam of coal, having a depth of four feet only, represents as much work as one million men can perform in twenty years. Such calculations as the above serve to remind us how very wasteful our methods of burning fuel are, in spite of the efforts of inventors in the direction of economy.—*Iron.*

New Centering Machine.—The chief improvement noticeable in this new appliance consists in the machine being provided with two sensitive balanced spindles for drilling and countersinking at one setting of the work, which can be driven at different speeds by a single belt. It has positive stops, which are so arranged as to secure perfect uniformity in the depth of the work, and actually prevent countersinking too deep. A feeding lever successively advances the spindles to their respective cuts. This lever, which is always in the same position, has the same direction of feeding motion for both spindles. The latter, which cannot be advanced except at the central point, are moved into position by the ball handle. The vice is a well made scroll chuck with hardened jaws, this form of chuck being considered easier to keep true and in alignment with the spindles than other forms. A support is provided for the front end of the bar while it is being inserted in the chuck, as well as a V-shaped rest for the rear end. The advantage of this is that the chuck is made self-centring, and the machine does not have to support the weight of the work while guiding it between the jaws.

Patent Fire Kindler.—This novel and effective appliance for utilising petroleum in lighting fires, is, we believe, of Colonial origin, and known as Chapman's patent. The "lighter" consists of a bulb of some substance very like asbestos, to which is attached a handle of twisted wire. The cylinder serves as a receptacle for petroleum and for the immersion of the bulb, the porous nature of which allows it to absorb sufficient oil to kindle a coal fire without the use of wood, or to boil a small quantity of water in a few seconds, the flame usually burning fiercely for some five or six minutes. In case it should be necessary to light several fires in succession, the bulb may be instantly recharged by plunging it smoking hot into the petroleum without risk of igniting or exploding the oil.

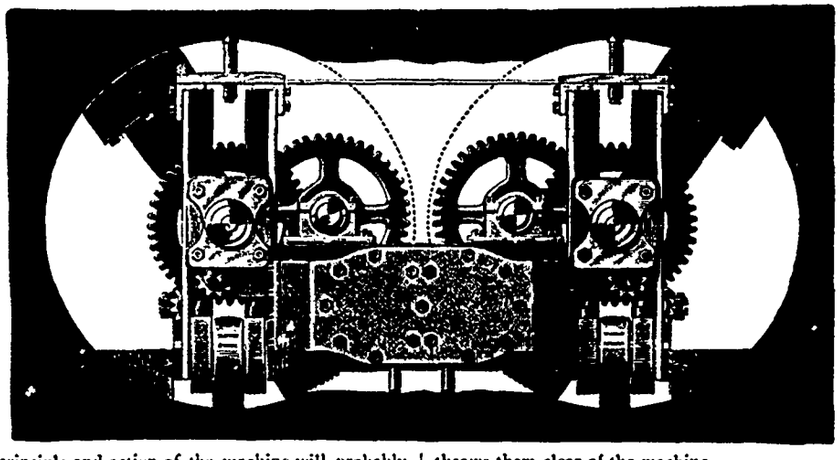
MACHINERY MECHANICS & INVENTIONS

Stanley's Patent Coal Heading Machines.

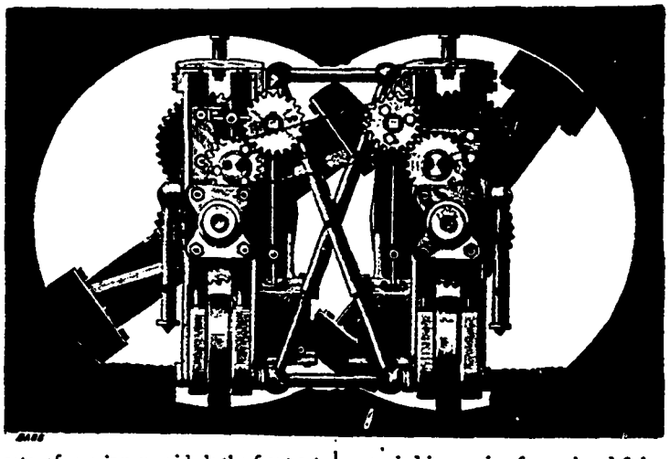
These machines are the invention of Mr. Reginald Stanley, of Nuneaton, England, who has had the advantage of being identified with collieries and engineering works, and accordingly possesses practical mining and mechanical experience.

They have for some years been working under most varied circumstances and have successfully stood the most severe tests to which they have been subjected, proving themselves to be perfectly adapted for the purpose for which designed.

The patentee has been awarded the only medal granted in Great Britain for coal tunnelling, and to-day, they are the only tunnelling machines known to be working successfully in coal seams anywhere. At the present time they are being extensively used at a number of collieries in Great Britain and the Colonies, in the United States, and in several continental countries.



The principle and action of the machine will probably be gathered with sufficient clearness from accompanying figures, together with this description. The machine travels on two broad central tandem wheels running on the floor of the heading, being steadied by a side wheel, visible just above the cylinders. When the bottom of the heading is soft, iron plates of the shape of the heading, which slide forward with the machine, are substituted for the wheels. The machine consists mainly of a central shaft carrying radial and horizontal arms, to which are attached the cutters. These cutters cut an annular groove round the face of the heading, leaving a core which either falls away or is got off as the work proceeds. To get rid of this coal there is no necessity to run the machine back, the heading affording room for men to travel and handle lumps of coal quite as large as can be loaded into tubs.



There are two sets of gearing provided; the front set causing the shaft and the arms to revolve, and the back set serving to advance the frame of the machine, which is built of angle iron, and with engine and gearing attached, weighs from 35 cwt. upwards. The back gearing consists of a cog-wheel with threaded gun-metal bush, fitted into its bosh, which works on the threaded part of the central shaft. It is held to the frame and driven by a sliding cog wheel on the crank shaft, the cutting gear being thrown out. When it is set in motion, the frame is caused to advance on the shaft, or if the machine has been run forward, the back gearing is thrown out, and the front or driving gearing thrown in, and the central shaft and arms then advance in the front and do the cutting. The advantage of the frame advancing on the shaft while the arms and cutters are fixed in the drift, will be at once apparent, the direction of the heading being kept and everything being ready for another cutting as soon as the frame has been fixed.

On either side of the machine are two telescopic screw pins which hold the frame while the annular groove is being cut. The machine being up at the face of the drift and fixed ready for work, the cuttings are brought back by the scrapers, and a man at the back of the machine easily takes them towards him while the arms are revolving.

When the arms have advanced sufficiently to allow of his doing so, the man moves to the front of the machine and, changing his raker for a shovel, throws the cuttings to the back where a second man loads them into tubs, or throws them clear of the machine.

Small lumps that fall from the face while the cutting is proceeding, are dealt with in the same manner without stopping the arms, but for large lumps, or when the core breaks down, the air is shut off while the coal is disposed of. In most seams the core breaks down every foot or so, and with proper diligence on the part of the workman it is soon got rid of, but of course the capacity of the machine—by which we mean its power of driving—depends largely upon the manual energy displayed at this point; as regards the actual operation of cutting, that is very soon accomplished. When the arms have worked out to their full extent—namely, between 3 and 4 feet, the engines are stopped, and by means of the back or the propelling gear, already referred to, the frame is advanced and fixed, ready for another cutting. The time occupied in running forward and fixing varies from 5 to 10 minutes.

The machine is easily moved; being put together with bolts, can (when travelling roads are low, or for other reasons), be taken to pieces, transferred to where it is required, and firmly put together again in a very short time.

The machine will cut through the hardest coal with ease, and such material as shale and fire-clay without difficulty; a machine of greater power and slower travel of cutters is made for working in seams containing strong or sandy-bind, gritty chunch, or thin bands of stone.

A double machine (see fig. 2), is also constructed for use where the roads are required unusually wide, or in thin seams of coal, the extra width affording greater convenience for getting at and removing the coal from the face, and allows of a double train being lain where requisite.

This machine, which is largely adopted in the principal collieries of Great Britain, cuts the road 70% to 100% wider than the height, and travels forward as fast, and in some cases faster, than the single machine. It can be made to cut a head any size, from a metre in height to two metres in width.

For the same purpose two single machines, coupled together (see fig. 3), can be supplied. The advantage of this system being that they can at any time be uncoupled and used separately.

The speed at which the heading can be driven in pure coal, averages about four times that of hand labour, and the cost is very much less. In seams of average hardness two-thirds of the material produced is round coal, this being a great advantage as compared with hand labour, and going far towards paying the expense of heading.

The heading ensures great safety in working fiery seams by rendering the use of explosives unnecessary, and when compressed air is used, produces a supply of fresh and cool air to the back of the heading, and in many cases obviating the necessity for counter-heads and thirls for ventilating purposes. The headings remain arched and unshaken, requiring little or no timber in their maintenance; and instances can be given of headings with under roofs, that otherwise would have been closely timbered, remaining intact as when first driven, without the help of timber. The smoothness of the heading and its freedom from timber and other obstructions also facilitate the ventilation.

In the almost innumerable trials that have taken place at the Nuneaton colliery of the patentees, the machine has never failed in any one case, to do the yard lineal, within the hour, and that often in coal which was very hard and dead, owing to the machine having been underworked. Numerous testimonials in the patentees book prove this fact.

A number of testimonials have been received by the patentees, proving that the machine possesses all the advantages claimed for it herein. Copies of same will be furnished on application, and also prices and full particulars of machines.

Wolfram Mining in New Zealand.

Wolfram, or tungsten, belongs to a group of rare metals, and until a comparatively recent time was known only to the chemist, and its value was known only in the laboratory. With the invention of 100-ton guns the demand for tungsten soon made the previously obscure metal well known throughout the mining world. It was soon found that the steel tube lining the bore of these enormous guns could not resist the shock entailed by discharging many shots without becoming fractured. Experiment proved that the addition of a small quantity of tungsten to the fine steel employed in gun-making rendered the latter metal wonderfully elastic, so that the steel tube will expand under the tension of firing and contract again to its normal size a great many times before the quality of the metal is in any way impaired. The German gun factories absorb most of the tungsten found in the world, and from being a mere curiosity seen only in the laboratory of the chemist) this rare metal has acquired considerable value. Wolfram generally occurs in combination with iron in Europe, but it is also found in Scheelite, or tungstate of lime. It is in the latter form that it occurs in Otago. The metal itself is of a white colour, extremely brittle, and heavy, the specific gravity being 19·1, that of gold being 19·3. It will thus be seen that tungsten is a very heavy metal, being only very slightly lighter than gold.

The total number of persons engaged in the gold and silver mines of the United States in 1889, above and below ground, was 57,650, which makes the average output per person employed, $1,722. The average earnings of the persons engaged were $749, which would give to the mining proprietors a return of $973 for each person employed, or a total of $65,823,450. The total value of the mines and works (mining plant, mills and reduction works) was $486,378,711.

NORTH-WEST MOUNTED POLICE

RECRUITS.

APPLICANTS must be between the ages of Twenty-two and Forty, active, able-bodied men of thoroughly sound constitution, and must produce certificates of exemplary character and sobriety.

They must understand the care and management of horses, and be able to ride well.

The minimum height is five feet eight inches, the minimum chest measurement 35 inches, and the maximum weight 175 pounds.

The term of engagement is five years.

The rates of pay are as follows:—

Staff-Sergeants.....$1.00 to $1.50 per day.
Other Non-Com. Officers.. 85c. to 1.00 do

	Service pay.	Good conduct pay.	Total.	
1st year's service..	50c.	—	50c.	per day.
2nd do ..	50c.	5c.	55c.	do
3rd do ..	50c.	10c.	60c.	do
4th do ..	50c.	15c.	65c.	do
5th do ..	50c.	20c.	70c.	do

Extra pay is allowed to a limited number of Blacksmiths, carpenters and other artizans.

Members of the force are supplied with free rations, a free kit on joining, and periodical issues during the term of service.

Applicants may be engaged at the Immigration office, Winnipeg, Manitoba; or at the Headquarters of the Force Regina N. W. T.

Money Orders.

MONEY ORDERS may be obtained at any Money Order Office in Canada, payable in the Dominion and Newfoundland; also in the United States, the United Kingdom, France, Germany, Austria, Hungary, Italy, Belgium, Switzerland, Portugal, Sweden, Norway, Denmark, the Netherlands, India, Japan, the Australian Colonies, and other Countries and British Colonies generally.

On Money Orders payable within Canada, the commission is as follows:

If not exceeding $4 .....2c.
Over $4, not exceeding $10.....5c.
" 10, " " 20.....10c.
" 20, " " 40.....20c.
" 40, " " 60.....30c.
" 60, " " 80.....40c.
" 80, " " 100.....50c.

On Money Orders payable abroad the commission is:

If not exceeding $10..... 10c.
Over $10 not exceeding $20.....20c.
" 20 " " 30.....30c.
" 30 " " 40..... 40c.
" 40 " " 50..... 50c.

For further information see OFFICIAL POSTAL GUIDE.

Post Office Department, Ottawa.
1st November 1889.

FOR SALE.

The following first-class Phosphate lands in Templeton, P.Q:

West ½ of Lot	8,	10th Con.,	100	acres.
South ½ "	16,	10th "	100	"
"	11,	12th "	215	"
"	12,	12th "	190	"
South pt. "	13,	12th "	50	"
North " "	21,	12th "	147	"
"	11,	13th "	161	"
"	12,	13th "	132	"
"	17,	13th "	47	"
			1142	acres.

These lands are held in absolute fee simple under Crown Patents. In addition to phosphate they contain many other minerals, among which may be mentioned ASBESTOS, MICA and BARYTES. As will be observed, most of the lots are in fairly close proximity, and they adjoin, or are actually traversed by a good county road, affording easy transit to the East Templeton Railway Station and Wharves on the Ottawa River. After personal examination Sir William Dawson, LL.D., F.R.S., F.G.S., the eminent Geologist, reported regarding this property: "In my opinion it has been very judiciously selected both with reference to probable yield of phosphate and facility of transport."

Application may be made to

Mr. L. Marcellais,
Perkins' P.O.,
East Templeton, P.Q.

Or to **Mr. L. T. Paterson,**
Box 2002, Montreal

TORONTO MINING

ASSOCIATION,

[LIMITED].

This Association is established to form a centre of information on all matters pertaining to Mining, and a suitable place where specimens may be received and examined.

It is intended to collect in the rooms of the Association specimens of all merchantable Canadian Minerals, with particulars as to place of deposit, and other information which may be useful both from a scientific and merchantable point of view. With this object the Association has decided to open rooms in Toronto within the next few weeks, where information can be sent and obtained, of Mining Properties for sale, and the undersigned has been appointed Managing Director.

The Stock Books of the Association are now open, and mining men and parties having mining properties to dispose of in all parts of the Province are invited to become members of the Association and to send information regarding their properties.

A person can become a member by subscribing for one share of $10 and by paying an annual membership fee of $4.

Further particulars can be obtained by applying to the undersigned,

A. S. THOMPSON,
Managing Director,
Cor. Victoria & Lombard Sts., Toronto.

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.

MINING REGULATIONS
TO GOVERN THE DISPOSAL OF DOMINION LANDS CONTAINING MINERALS, OTHER THAN COAL, 1890.

THESE REGULATIONS shall be applicable to all Dominion Lands containing gold, silver cinnabar, lead, tin, copper, petroleum, iron or other mineral deposits of economic value, with the exception of coal.

Any person may explore vacant Dominion Lands not appropriated or reserved by Government for other purposes, and may search therein either by surface or subterranean prospecting for mineral deposits, with a view to obtaining under the Regulations a mining location for the same but no mining location or mining claim shall be granted until the discovery of the vein, lode or deposit of mineral or metal within the limits of the location or claim.

QUARTZ MINING.

A location for mining, except for iron or petroleum, on veins, lodes or ledges of quartz or other rock in place, shall not exceed 1,500 ft. in length and 500 ft. in breadth. Its surface boundary shall be four straight lines, the opposite sides of which shall be parallel, except where prior locations would prevent, in which case it may be of such a shape as may be approved of by the Superintendent of Mining.

Any person having discovered a mineral deposit may obtain a mining location therefor, in the manner set forth in the Regulations which provides for the character of the survey and the marks necessary to designate the location on the ground.

When the location has been marked conformably to the requirements of the Regulations, the claimant shall within sixty days thereafter, file with the local agent in the Dominion Land Office for the district in which the location is situated, a declaration or oath setting forth the circumstances of his discovery, and describing, as nearly as may be, the locality and dimensions of the claim marked out by him as aforesaid; and shall, along with such declaration, pay to the said agent an entry fee of FIVE DOLLARS. The agent's receipt for such fee will be the the claimant's authority to enter into possession of the location applied for.

At any time before the expiration of FIVE years from the date of his obtaining the agent's receipt it shall be open to the claimant to purchase the location on filing with the local agent proof that he has expended not less than FIVE HUNDRED DOLLARS in actual mining operations on the same; but the claimant is required, before the expiration of each of the five years, to prove that he has performed not less than ONE HUNDRED DOLLARS' worth of labour during the year in the actual development of his claim, and at the same time obtain a renewal of his location receipt, for which he is required to pay a fee of FIVE DOLLARS.

The price to be paid for a mining location shall be at the rate of FIVE DOLLARS PER ACRE, cash, the sum of FIFTY DOLLARS extra for the survey of the same.

No more than one mining location shall be granted to any individual claimant upon the same lode or vein.

IRON AND PETROLEUM.

The Minister of the Interior may grant a location for the mining of iron or petroleum, not exceeding 160 acres in area which shall be bounded by north and south and east and west lines astronomically, and its breadth shall equal it in length. Provided that should any person making an application purporting to be for the purpose of mining iron or petroleum thus obtain, whether in good faith or fraudulently, possession of a valuable mineral deposit other than iron or petroleum, his right in such deposit shall be restricted to the area prescribed by the Regulations for other minerals, and the rest of the location shall revert to the Crown for such disposition as the Minister may direct.

The regulations also provide for the manner in which stone quarries may be acquired.

PLACER MINING.

The Regulations laid down in respect to quartz mining shall be applicable to placer mining as far as they relate to entries, entry fees, assignments, marking of localities, agents' receipts, and generally where they can be applied.

The nature and size of placer mining claims are provided for in the Regulations, including bar, dry, bench, creek or hill diggings, and the RIGHTS AND DUTIES OF MINERS are fully set forth.

The Regulations apply also to

BED-ROCK FLUMES, DRAINAGE OF MINES AND DITCHES.

The GENERAL PROVISIONS of the Regulations include the interpretation of expressions used therein; how disputes shall be heard and adjudicated upon; under what circumstances miners shall be entitled to absent themselves from their locations or diggings, etc., etc.

THE SCHEDULE OF MINING REGULATIONS

Contains the *forms* to be observed in the drawing up of all documents such as:—"Application and affidavit of discoverer of quartz mine." "Receipt for fee paid by applicant for mining location." "Receipt for fee on extension of time for purchase of a mining location." "Patent of a mining location." "Certificate of the assignment of a mining location." "Application for grant for placer mining and affidavit of applicant." "Grant for placer mining." "Certificate of the assignment of a placer mining claim." "Grant to a bed-rock flume company." "Grant for drainage." "Grant of right to divert water and construct ditches."

Since the publication, in 1884, of the Mining Regulations to govern the disposal of Dominion Mineral Lands the same have been carefully and thoroughly revised with a view to ensure ample protection to the public interests, and at the same time to encourage the prospector and miner in order that the mineral resources may be made valuable by development.

COPIES OF THE REGULATIONS MAY BE OBTAINED UPON APPLICATION TO THE DEPARTMENT OF THE INTERIOR.

A. M. BURGESS,
Deputy Minister of the Interior.