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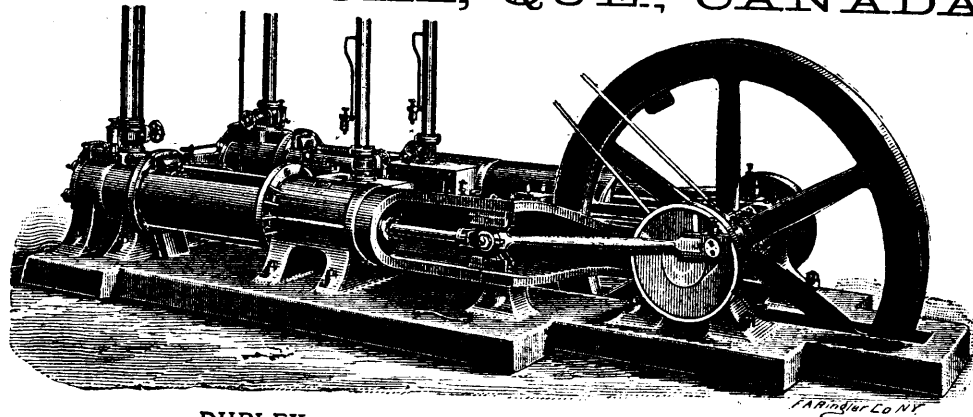
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1892—OTTAWA, JULY—1892.

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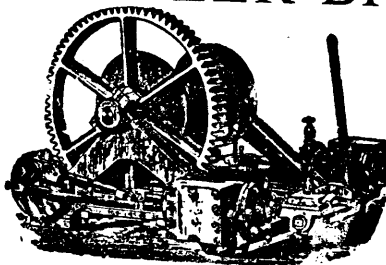
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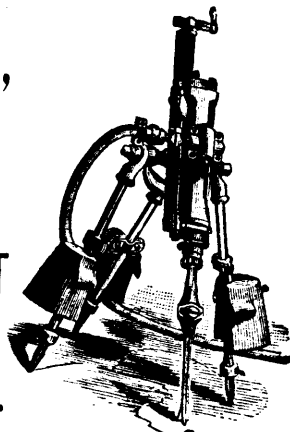


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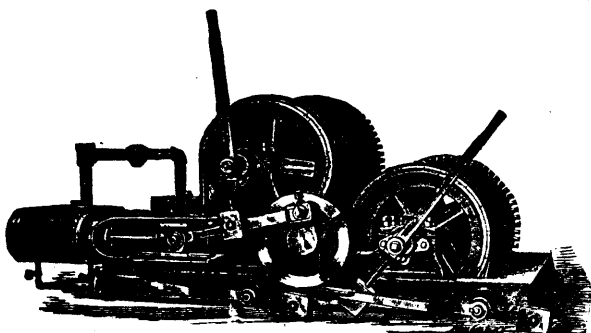
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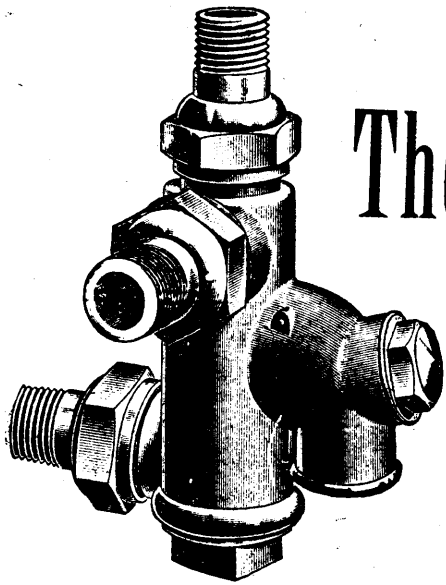
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JENCKES MACHINE CO.,

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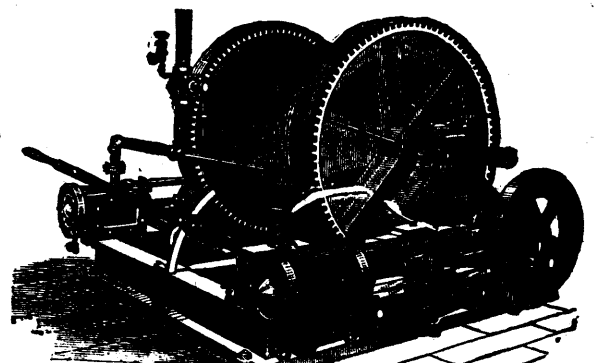
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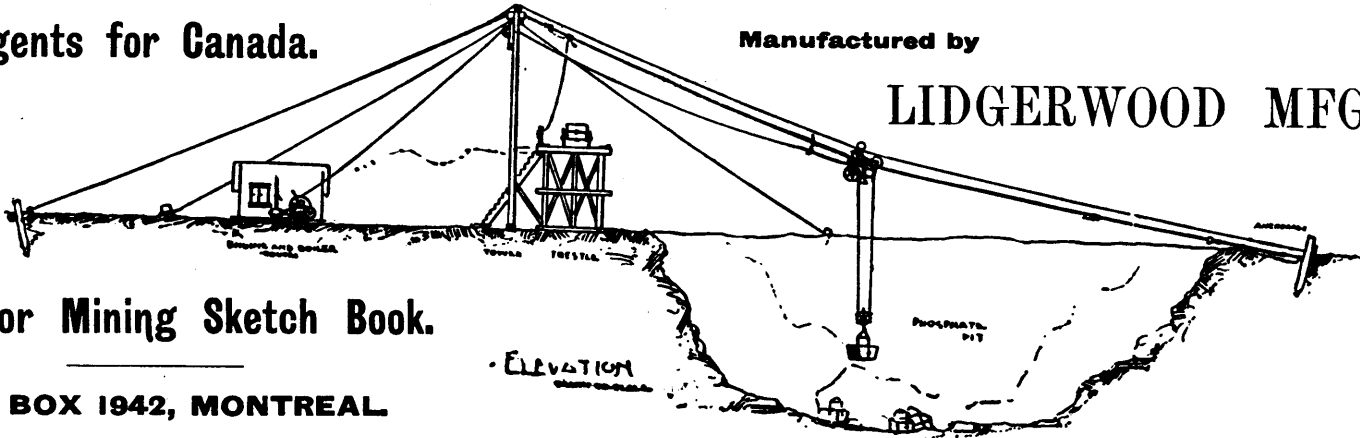
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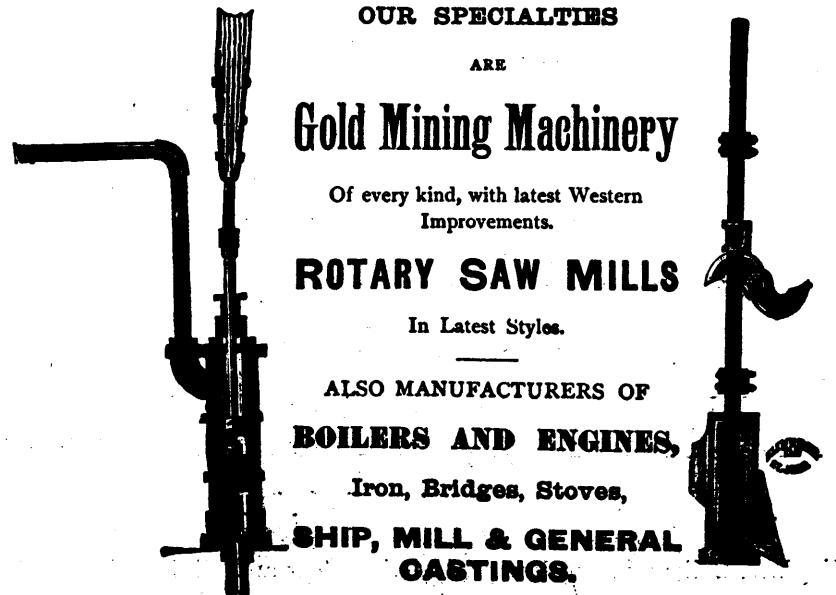
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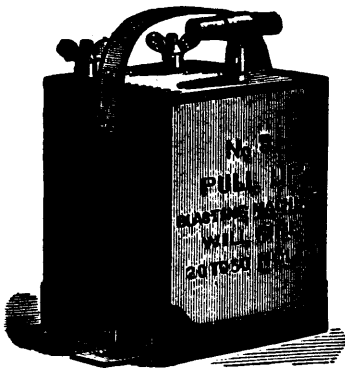
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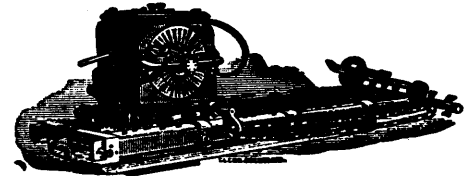
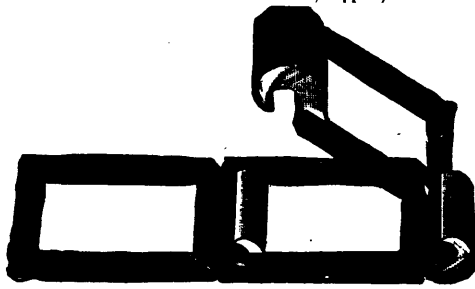
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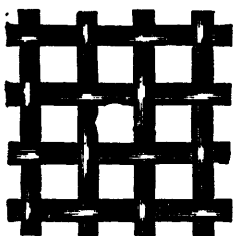
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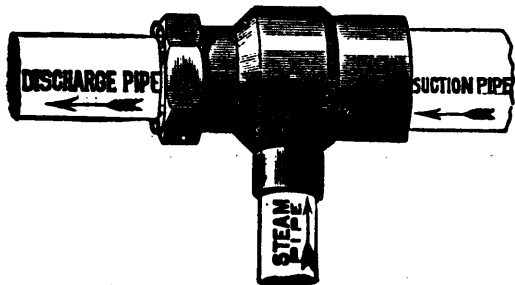
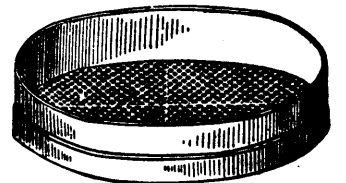
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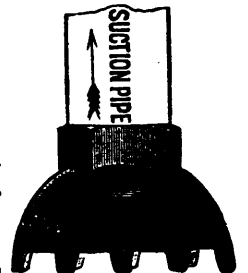
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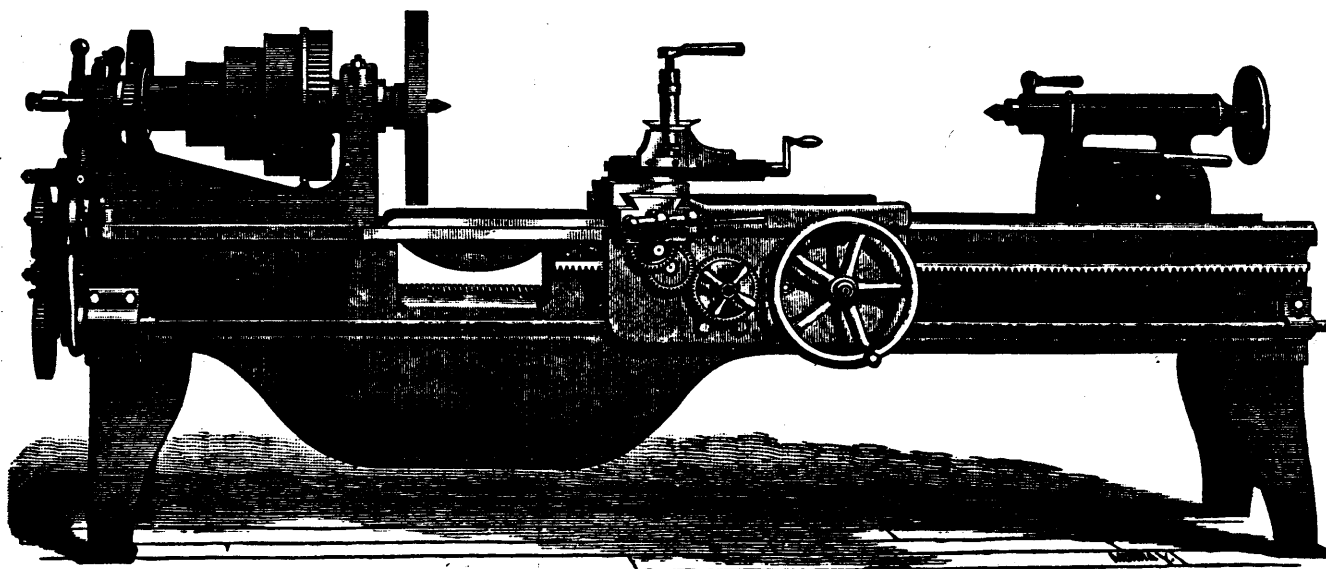
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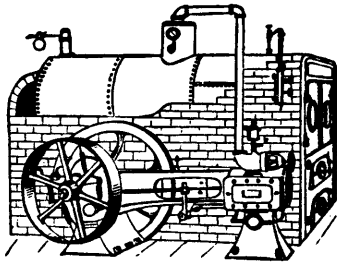
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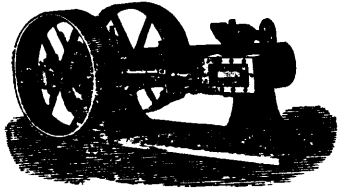
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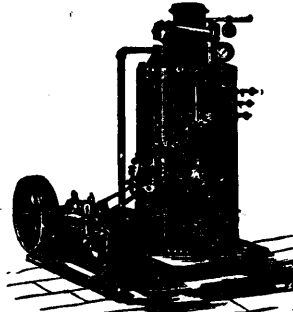
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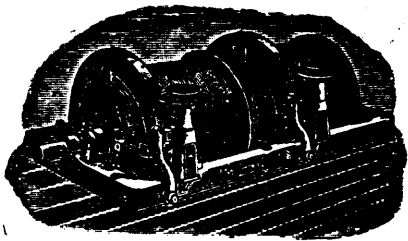
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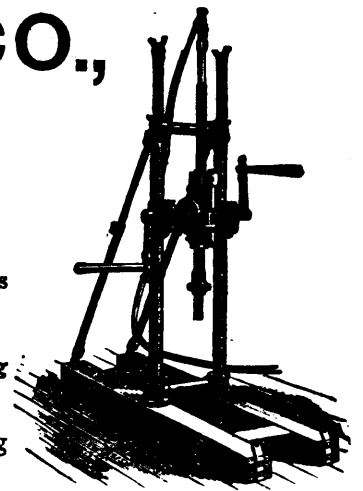
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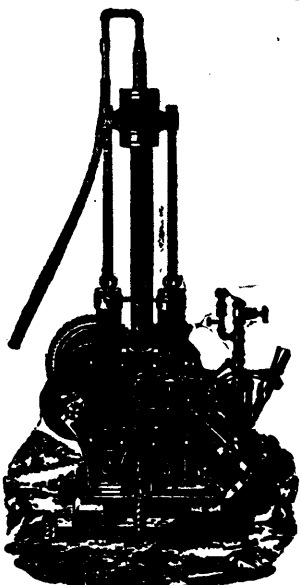
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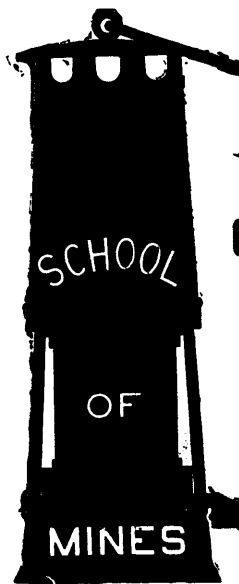
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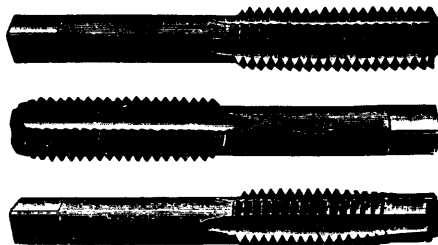
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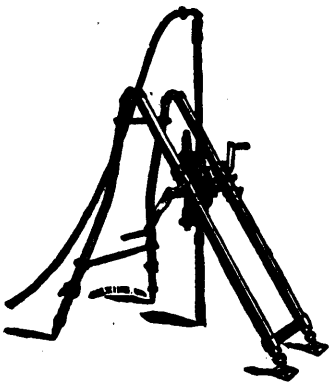
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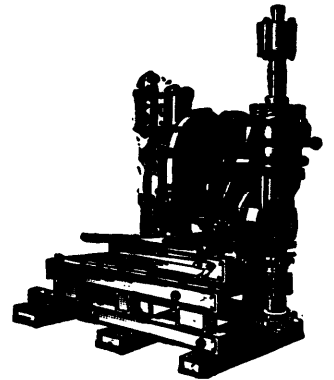
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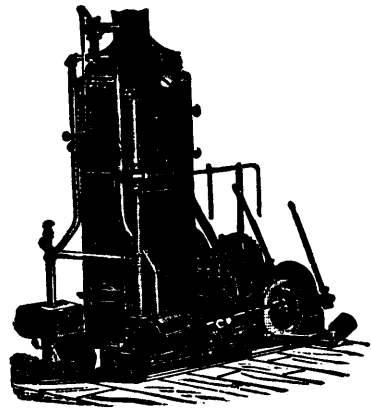
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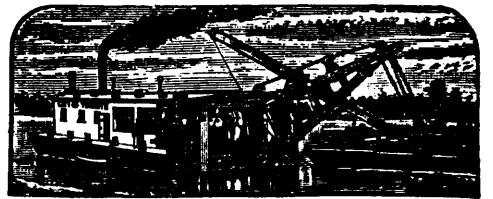
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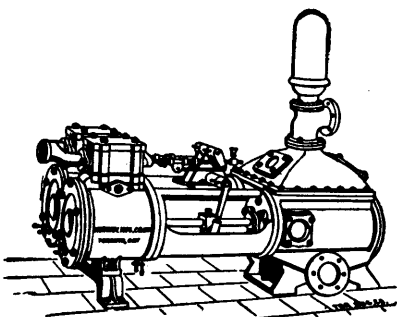
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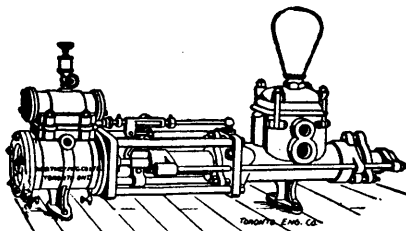
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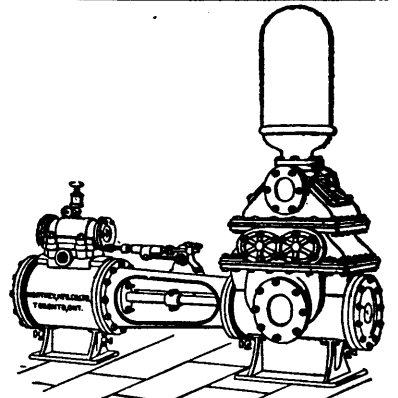
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## THE OFFICIAL ORGAN

THE GOLD MINER'S ASSOCIATION OF NOVA SCOTIA,  
THE UNITED MINING SOCIETY OF NOVA SCOTIA,  
THE ASBESTOS CLUB, QUEBEC,  
THE GENERAL MINING ASSOCIATION OF QUEBEC.

THE following Resolutions of Council indicate beyond a peradventure the status of THE REVIEW as the exponent of the Canadian Mineral Industries:—  
The Gold Miners' Association of Nova Scotia.

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

The United Mining Society of Nova Scotia.

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

The Asbestos Club, (Quebec.)

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

The General Mining Association of the Province of Quebec.

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

## OFFICES:

Victoria Chambers, 140 Wellington Street,  
OTTAWA.

Vol. XI. JULY, 1892. No. 7.

## Direct Taxation in Quebec.

New brooms, we are told, sweep clean. The new broom at Quebec is no exception to the rule. Mr. DeBoucherville's Government has signalled its first year of power by inaugurating a policy of economy which, under ordinary circumstances, ought to restore the equilibrium between revenue and expenditure. But the circumstances of Quebec are not ordinary; they are, fortunately for the credit of Canada, without a parallel outside of the Province in any part of the Dominion. A more liberal application of the pruning knife is needed before any appreciable check can be put on the growth of the public debt. The maladministration, the reckless extravagance, the boodling and stealing of the past, have brought Quebec to the verge of bankruptcy. It is not enough to check extravagance, to discharge useless employés, to put an end to pilfering in public offices and compel the thieves to disgorge a portion of their plunder; more revenue must be had to meet the obligations of the Province and save Quebec from the disgraceful alternative of bankruptcy or repudiation. The Government has, as a last resort, introduced the thin edge of direct taxation. All other sources of revenue have been exhausted or are utilized to their fullest extent.

That was the natural result of Mercier's policy "to spoil the Egyptian"—to take all he could from the pockets of the English speaking minority. Through their enterprise and intelligence, the English population practically control the capital and commerce of the Province. In their hands the mining resources of Quebec have been developed and made productive; through their energy and sagacity, industries giving employment to thousands of workmen have been established throughout the Province. Mercier's policy was to cripple these industries by excessive taxation, thus, at one blow, inflicting serious injury on a class whose support he could never hope to gain, and providing money to reward his greedy followers. When Mercier was driven from office, the taxation of the English-speaking minority had reached its highest productive limit. In many cases it had passed the limit, closing up mines and mills and driving commercial companies from the country; there remained nothing more but to impose a general tax which would fall evenly upon the entire population of the Province. This obviously just policy has been commenced by the DeBoucherville Government, and, we may fairly assume, will be enforced while they remain in power. It speaks well for the honesty and courage of the Government that they have adopted a policy which cannot fail to be unpopular amongst the *habitants*. Hitherto the ignorant rural population of the Province has never realized the burden of indirect taxation that it has borne. It has never occurred to the mind of the simple *habitant* that the money poured so liberally into the treasury of the Province and so lavishly expended, had to come, in the end, from his pocket. No argument could convince him that he had any personal interest in seeing that the public revenue was judiciously and honestly expended. Now, however, when the tax-gatherer raps at the door he will begin to realize what it means to admit thieves and demagogues to the public treasury. The *habitant* has found it hard enough to pay the tithes exacted by the church and meet the demands of the fabrique; these exactions have kept him and his children in poverty and ignorance. How will he meet this new demand from the state? It will place him on a level with the Russian peasantry; but it will prove an undisguised blessing if it awakens him to a sense of his duty as a citizen of a free country. It will be a well spent tuition fee if it teaches him some of the rudimentary principles of political economy. The general election of last year showed what capacity for self-government our French Canadian citizens possess if they choose to cultivate it and exercise the duties, while enjoying the privileges of citizenship in a free country. If the Government can accomplish the abolition of the unnecessary Legislative Council, and retrench in other directions where savings can obviously be effected, the direct tax may, after a few years, be repealed, but in the meantime it will have the effect of opening the eyes of the people to the dangerous position to which demagogues have brought the Province, and may be the means of placing Quebec on a sounder financial basis than she has occupied since confederation.

## The Coal Royalty Legislation.

In 1873 the Legislature of Nova Scotia enacted that the holders of coal leases issued subsequent to 1858 should be entitled to renewals upon the same terms, conditions and covenants as contained in the original lease. The royalty in the original leases issued up to 1866 was fixed at ten cents Nova Scotia currency per ton of screened coal; slack paid no royalty. The royalty was payable yearly. Those leases expired in 1866. In that year renewals were issued, fixing the royalty at 7½ cents per ton on both round and slack, payable quarterly. Some of these renewals, the Glace Bay Mining Company's among others, contained a clause that the Legislature might increase, diminish, or otherwise change the royalty. The question is: What was the intention of that clause? If its intention was that the Legislature might increase the rate of royalty beyond that fixed in the original leases, then it was a breach of legislative faith, seeing that in 1873 it had been enacted that the renewals were to be issued upon the same terms, hence at the same rate of royalty as in the original lease. But if the intention was that if the 7½ cents on run of mine proved to be less than the rate fixed in the original leases, the Legislature, might increase it; or if found to be more than the original rate, the Legislature might diminish it, then it was no breach of legislative faith to enact said clause, and its insertion in the renewals issued in 1866 was lawful and right.

From 1885 until 1892 no change in the coal royalty was even suggested in the Legislature, and it is unquestionable that the new rate of 7½ cents had been found to be fully equal to the original rate. But previous to the last session of the legislature, the Government notified coal lessees that the rate of royalty would be raised, and when the house met it was raised 33½ per cent., that is, from 7½ to 10 cents per ton. Naturally enough, lessees objected, but were told to look at that clause in their renewals that the Legislature might increase the royalty as they might see fit. Well, on the face of it, and apart from the legislation of 1873 ensuring lessees renewals upon the same terms as in the original leases, it looked as if that clause left the unfortunate renewal holders at the mercy of a needy Government and of a legislative majority bound to carry out its behests.

After the Legislature adjourned, however, the official report of the debates in 1885 on the coal royalties was examined, and it was discovered that the intention of that clause was not that the Legislature might increase the rate of royalty so that it would be more than the original rate, but only that it would be equivalent to it.

To substantiate this statement I have made a number of extracts from the speeches of members of the Government and others when the coal royalty bill of 1885, changing the royalty to 7½ cents, was being discussed, which, perhaps, you may find room for in your paper, the organ of the new Nova Scotia Mining Society.

It will be noticed that the Hon. Commissioner of Mines stated that "the object of the Govern-

ment has been to get as nearly as possible an equivalent rate to the present rate of 6 and 7-10 cents per ton, a uniform rate that will yield an equivalent revenue to the present rate."

The Provincial Secretary also stated: "The real difficulty that he saw suggested was that the Government might be making a mistake, and that they had not the necessary information. He was going to suggest that the bill (which fixed the royalty at 7½ cents) might be passed with the provision that all leases issued should contain a stipulation that the royalties might be increased or diminished, which would leave the House free to make a change next year." "Free to make a change!" To what extent or for what intent? Clearly, according to what was said in the debates, only with the intent of obtaining a royalty equivalent to the old rate fixed in the original leases. For to increase the original rate would be a breach of faith. No wonder, then, that the Hon. Provincial Secretary's proposed clause passed unanimously, no one probably dreaming that it would ever be used as a pretext for any real increase of the royalty. Yet in 1892 it was held up as a clause agreed to in 1885 by both sides of the House which justified an increase of 33½ per cent, and a bill was passed imposing 10 cents per ton on all coal sold subsequent to 23rd February, 1892; and holders of leases running to 1906, wherein the royalty is fixed at 7½ cents per ton, are expected to pay the new rate. Should they be compelled to pay it? Is an interesting question.

J. R. LITIGOW,

Sec. Treas. Glace Bay Mining Co.

HALIFAX.

*Extracts from the Official Report of the Speeches of the Hon. Mr. Church and others, on a Bill to amend in Chap. 7 of the Revised Statutes, Fifth Series, "Mines and Minerals," April 17, 1885.*

HON. COMMISSIONER OF MINES.—"As I understand the matter, Mr. Speaker, in the year 1826 His Majesty King George the Fourth granted to the Duke of York and Albany, the mines and minerals of this province for the term of sixty years. This had the effect of preventing all other parties from leasing and working the mines of Nova Scotia. In 1857 the late Judge Johnston and Hon. A. G. Archibald, representing both political parties of the day, were sent to England to make arrangements with regard to this matter that might be more beneficial to the interests of the province. Their mission was successful, and as a result of their efforts, chapter 1 of the Acts of 1858 was passed, entitled, 'An Act for giving effect to the surrender to Her Majesty by the legal personal representatives of the late Duke of York and Albany, and by the General Mining Association and their trustees, of the mines in Nova Scotia, and to the lease of part of such mines to the said Association.' The effect of this legislation was that certain mining property in the Counties of Pictou and Cumberland, and on the Island of Cape Breton, were reserved to the representatives above mentioned, now known as the 'General Mining Association,' and the remainder of the mines of the province were thrown open to general public competition. The General Mining Association received a lease which expires on the 25th August, 1886, and other parties, among in received leases, all of which expire on the 25th August, 1886. The royalty on coal in this chapter was fixed at the rate of sixpence or ten cents old Nova Scotia currency, per ton, on what is known as round coal, that is, coal passed over a screen the bars of which are three-quarters of an inch apart. No royalty was charged on what is known as slack coal. As I understand at that time, slack coal was not of much value in this province, and hence the greater bulk of the sales on round coal. The leases given to other parties were of the same character, and given to the General Mining Association, with a few exceptions, the royalty being payable on the same quality of coal and at the same rate; but the General Mining Association had the privilege of paying its royalties yearly in the month of March, whereas the others were liable to pay theirs quarterly. Now the difficulties in the way of fixing upon a rate arises from various causes.

During the last few years a great deal of slack coal has been sold, principally during the last few years. This increase in the sale of slack coal has arisen from various causes. One is that a great deal appears to be used in the province for various industries, and a good deal is put into the manufacture of coke. Hence it has become an article of value. Also within the past few years, the system has grown up in some mines, notably the Springhill mine in Cumberland, of selling what is known as 'run of mine coal,' that is, the coal as it arrives at the mouth of the pit without screening it at all. Of course, in selling coal in this way it is very difficult to get a proper return under the present system, which obliges the mine owners to pay royalty of 9½ cents a ton, equal to 10 cents old currency on screened coal. As the owners of the Springhill mine sell so much run of mine coal they do not nearly to pay the same royalty that they might by law be obliged to pay, that is 9½ cents per ton on their total sales.

"A difficulty in fixing the royalty also arises from the fact that the relative amounts of slack and round coal differ in Nova Scotia and Cape Breton. The percentage of slack coal is much greater in Nova Scotia proper than it is in the Island of Cape Breton. From careful statements made by officials of the province for a period of five years back, we find that the sales of round coal liable to pay royalty were, for Nova Scotia proper, 2,250,940 tons, and the sales of slack coal during the same period, 914,017 tons. In Cape Breton, during the same period the sale of round coal amounted to 2,317,704 tons, which shows nearly a hundred thousand tons more than Nova Scotia proper during the five years, while Cape Breton only sold during the five years, 372,541 tons of slack coal, or nearly 600,000 tons less of slack than Nova Scotia proper sold. Now it will be very clearly seen that, on the coal sold during those five years, Cape Breton has paid more royalty than Nova Scotia proper, because she sold a much larger proportion of round coal, which alone paid royalty, than Nova Scotia proper. From 1880 to the end of 1884, Cape Breton sold of round and slack a total of 2,634,755 tons, and paid a total royalty during the five years of \$224,827.27. I have made a calculation which I vouch for as being correct, that this would give an average of 8½ cents per ton royalty on the coal sold from the total output of Cape Breton during the five years of Nova Scotia sold during the same period 3,164,958 tons of round and slack coal, on which she paid a total of \$272,341.27, or 8½ cents and a fraction, say 7 cents per ton, while Cape Breton paid 8½ cents per ton as I have stated.

"Now, sir, the object of the Government has been to get as nearly as possible an equivalent rate to the present rate of 9½ cents per ton—a uniform rate that will yield an equivalent revenue to the present rate.

"Our rate was 10 cents a ton in former years, but by the Canada Currency Act, passed in 1868 or 1869, Nova Scotia currency was depreciated; so that 9½ cents present currency became the equivalent of 10 cents old currency. Hence in the fourth series of the Revised Statutes, instead of having the rate of royalty named at 10 cents as in the previous series, it was put down at 9½ cents. It might be argued that the province has been losing ½ of a cent on every ton sold since that time, and the Government might have based their calculation on a royalty of 10 cents instead of 9½. But this matter was very fully considered and we thought that as this rate of 9½ per ton has obtained since the first time of its introduction, and that now a somewhat depressed condition of the coal trade exists, and as the outlook is not very promising at the present time, while the Government might fairly have adjusted the royalty on the basis of 10 cents, yet it would be said that we were placing burdens on the trade, tending to cripple its success, and therefore we based our calculations on the rate of 9½ cents per ton.

"The third sub-section says—

"Nothing in this Act shall compel lessees of coal mines in this Province to pay royalties other than on the terms prescribed in the leases now outstanding until said leases expire, but any such lessee may take advantage of the provisions of this Act from the date of its passage, if so disposed."

"As I stated a few moments ago, the present outstanding leases lapse on the 25th of August, 1886. We provide by this section that the lessees of mines holding under leases now outstanding can take advantage of this Act, as soon as it becomes law, if they see fit; if they do not they will continue to pay royalty under the existing law until their leases expire; then, of course they will come under the provisions of this Act. There might have been no necessity for introducing this Act in this session, were it not for the fact that there may be some new leases applied for between this date and next session, because, when the Revised Statutes, fifth series, became law, as they soon will, parties may come in for new leases. Another reason why it was deemed necessary to deal with the subject this session was, that under the provisions of the law, parties who wish to renew these outstanding leases are entitled to give six months' notice to the department of their intention. That would give the department ample time to have all these leases renewed after next April, were it not for this fact, that there may be questions of forfeiture raised, questions involving the title to these areas and there may be long and tedious investigations taking weeks to settle. Consequently it was not deemed wise to defer this legislation till the next session, but it was thought better to lay it down this year. I may say, Mr. Speaker, that I hope in regard to any disputes that may arise, that

the present holders may be able to renew their leases, and to carry on their works, but of course the Government will be obliged to carry out the law.

HON. MR. FIELDING.—"I have not had much to do with the preparation of this Bill, which belongs to the department of my hon. colleague (Hon. Mr. Church), who has had the principal share in its preparation. I believe that if it is not the wisest solution, it is a solution of the question singularly happy to the mine managers. I received a note, and the hon. Attorney-General and a member of the other branches as well, from a mine manager of Cape Breton, stating that 7 cents on the ton of coal sold would be a fair rate. When we put on 7½ cents I do not think it is objectionable. I am sure the mine managers of Cape Breton do not think this Bill unfair. I am informed that the manager of the Cumberland mines has telegraphed that it is satisfactory to him. The Government say 7 cents would suit these gentlemen, but it would not give us so much royalty as we now get; we say we will put on 7½ cents, which will give us the same revenue as before. Now when we have put on only half a cent more than the miners name, I think it must be satisfactory. There are three interests to consider: First, the Province, we get the same revenue; second, the interest of the mainland colliers, and the hon. Attorney-General says they are satisfied; at least the Cumberland colliers; from conversations I have had with Mr. Leckie, I am warranted in saying that; third, the Cape Breton colliers; the Associations say 7 cents, but the agent has said that 7½ cents is not objectionable to them. It seems to me, therefore, that the Bill protects the interests of all concerned; the Province gets the same revenue as we now receive."

HON. MR. CHURCH.—"I wish to correct the hon. member for Inverness on one point. Seven and a half cents per ton, I said, would give us a little more royalty than we received last year on the same output. I consider it fair to judge on the basis of an average of 25 per cent of stock. Now there is no other convenient figure than 7½ cents unless you go on to 7 cents. A million tons would give, say, 750,000 tons of round and 250,000 tons of slack. Multiply 750,000 by 9½ and you have \$72,750 as the royalty that we would get from a million tons under the present system. Then take a million tons at 7½ cents and you have a product of \$75,000, the gain being simply \$2,250 on a million tons. That is very little. Now the object the department had was simply to get a uniform rate that would give the same revenue we are now receiving."

HON. MR. LONGLEY.—"All were united in the opinion that there should be no tax on coal, but in our present financial circumstances it was not a policy which this Government could adopt to make any substantial reduction."

HON. MR. FIELDING said, "That if the effect of this amendment was going to reduce the revenue to the hon. friend should move not only to reduce the tax on culm coal, but to raise it on other coal half a cent or a cent a ton. The hon. Commissioner of Works and Mines, in moving the second reading of the Bill, had stated that it would give about the same revenue as the old rate. If there was any doubt, he presumed the hon. Commissioner had put himself to the test of the doubt. It would strongly urge that no amendment be made which would reduce the amount the Province would receive. He thought it was generally admitted in the House that, however much we would like to see the royalty done away with, we could not now do it."

HON. MR. CHURCH.—"He (Commissioner of Works and Mines) thought this Bill must either be passed in its present form, or else withdrawn and not introduced next year. The outstanding leases did not expire until 25th August, 1886; but there might be applications to know leases before that date, and the Government wanted to know what rate to put in new leases."

HON. MR. FIELDING said: "He did not think it reasonable to ask that slack coal should be exempted after the Government had based a figure on all coal. The Bill in the main was satisfactory to him, but he had the real difficulty that he saw suggested was that the Government might be making a mistake and that they had not the necessary information. He was going to suggest that the Bill might be passed with the provision that all leases issued should contain a stipulation that the royalties might be increased or diminished, which would leave the House free to make a change next year, and the same provision was made parties taking leases might complain."

MR. BELL said that with the consent of the hon. member for Cumberland and on the understanding that such a clause would be added to the Bill, he would withdraw his amendment.

HON. MR. CHURCH said that all the information that the Government or the department had was included in the returns. The Government had no power to enforce any of the returns as regards the cutting of the coal, and he believed that it was no part of the duty of the inspector to pry into the accuracy of such returns. That was the difficulty in regard to an *ad valorem* tax. The only object the department had was to fix a rate that would be fair all around, and would give an equal amount of revenue to that now received from this source.

The photogravure illustrations of the recent excursion meeting of the General Mining Association of Quebec, published in this number, are from the kodak of Mr. J. Lanson Wills, F.C.S.

\* Not correct. Ours were payable yearly. J. R. L.

## EN PASSANT.

The Dominion Government has acceded to the universal desire of the mining community of Nova Scotia, as advocated in these columns, and has instructed the engravers to prepare the new geological map of that Province on the scale of one mile to the inch, instead of four, as originally proposed. The engravers report that good progress is being made with the work.

During the recent fighting on the Kashmir frontier, when the British troops defeated the rebellious Hunzas, the natives used bullets of garnets encased with lead. Tommy Atkins could doubtless throw some light upon a rather novel and painful form of mining for these curiosities.

No mining country has a monopoly of capital mis-spent in mining ventures. A recent issue of the Australian Government *Gazette* notifies no less than 255 gold mining and crushing companies that if they are not reported as operative within three months they will be swept into oblivion. "Most of them," the *Week* says, "are gold mining companies, and some with high-sounding and encouraging names; but even their fine names couldn't keep them going. The 'Gilded Rose' appears to be just what it says, with the gilt all gone. The 'Heart's Content' may now be read, 'The Heart is Content'—'as had enough of it.'

A Swedish officer named Ekeland has invented a coking oven which is continuous in its operations, and in which not only coal, but wood, and more especially peat, may be reduced to a good quality of charcoal or coke. Up to this time there has been no successful method for utilizing peat to any great extent, but it is believed that much will be accomplished by this new oven. The inventor claims that a ton of coke or charcoal produced from peat will yield as much heat as a ton of ordinary coke, notwithstanding that in the former there must be a large proportion of ash. In the matter of cost it is stated that the new material need not cost more than 10 francs a ton in Sweden, while the English coal imported costs 25 francs in Sweden. A company has been formed at Stockholm with a capital of \$750,000 to push the invention, which has been patented in the United States, Great Britain and Germany.

Some official statistics have recently been published with regard to the production of gold in French, British and Dutch Guiana. Though the discovery of gold in French Guiana took place in 1856, yet it only began to be seriously worked in 1864. Since the latter date 35,817 kilogrammes have been exported. The production in 1891 was 1,502½ kilogrammes, and was less than the average of the last sixteen years. The tax on entering the city of Cayenne is 10 francs per kilogramme, and a duty of 8 per cent is paid on exportation. The number of men employed on the placer mines of French Guiana is 1,800. Of the nine quartz mining conces-

sions granted up to date two are being worked, but great difficulties stand in their way. In 1891 101,297 ounces of gold were produced, compared with 62,676 ounces in 1890; 28,282 ounces in 1889; 74,570 ounces in 1888; 11,906 ounces in 1887, and 6,518 ounces in 1886. The production in Dutch Guiana was 81.4 in 1890, an increase on 1889, but not so great as in 1887.

*Apropos of the Nova Scotia coal royalty.* The question having been raised as to whether, in order to test the legality of the Government's action, it would be advisable to refuse payment, a consultation was held lately at which Messrs. Henry, Drysdale and Borden, eminent Halifax lawyers, reported upon the position the coal companies would thus assume under recent statutes. The consensus of opinion was that the Government could adopt one of three courses: *First*—They could sue for the royalties in our Supreme Court. *Secondly*—They could issue a warrant of distress under section 146 of the "Mines and Minerals Act, 1892," under which the sheriff could levy upon and sell such portion of the personal property of the company as would be sufficient to pay such royalties. *Thirdly*—They could take proceedings, under the provisions of the lease, to forfeit the lease for breach of the conditions therein contained. The second course is the one that would probably be adopted. Any company refusing to pay would, however, run the risk that the third course might be adopted, the result of which might be that the lease would be forfeited. In this view it seems inadvisable for the companies to take the extreme step of refusing payment of the royalties. If it is desired to test the question whether the statutes mentioned apply to existing leases, the Government would probably enter into a special case to be argued before the Supreme Court. A memorial to the Governor-General-in-Council is now being prepared on behalf of the companies, asking for the disallowance of this legislation.

The Quebec Government having repealed the Mercier Act of 1890, has just passed in its place an Act which will, we think, give general satisfaction to the mining community of the Province. It respects vested rights. The price of Crown lands containing minerals has been increased to a reasonable figure, which, while increasing this source of revenue to the Government, should not in any way retard the investment of capital. If the lands on which it is proposed to operate mines are situated within twelve miles of a railway the price of sale, in future, is to be \$10 an acre for superior minerals (including gold, silver, copper, iron, nickel, graphite, phosphates and mica), and \$4 an acre for inferior minerals, and if more than twelve miles from a railway, \$5 for superior and \$2 for inferior, or minerals other than those enumerated. An important clause, from the public point of view, gives the Commissioner of Crown Lands the right to offer at auction any mining location of special value. Care is also taken to prevent the locking up of valuable areas in

speculators' hands by authorising the cancellation of sales when bona fide attempts are not made to work the deposits. Provision is also made for mining under lease where such method is preferred. The Hon. Mr. Flynn may be congratulated on a measure whose provisions are in the main equitable alike to the Government, the operator, and the investor.

*Some pertinent remarks on the subject of the redemption of capital invested in collieries* were made by Mr. H. D. Hoskold at the last meeting of the Federated Institute of Mining Engineers. He claimed that a company had no moral or equitable right when profit accrued to absorb it all as dividend profits, and provide no redemption fund. The plan sometimes adopted by accountants and financial agents of merely writing off a capricious sum per year for depreciation in place of redemption, was certainly a fictitious mode of dealing with the question, because, instead of being made an accumulation fund in reserve, as it should be, the sum so written off actually passed into the pockets of the partners or shareholders of a colliery company as part and parcel of the common dividend. A company engaging in the exploitation of a colliery with lease extending over an agreed term, is, or should be, placed in exactly the same position as any private party investing a certain fixed sum of money to buy a fixed income at a given rate per cent. upon the capital for a definite period. This question of redemption was of the greatest importance, and was undoubtedly as onerous upon the lessee of a colliery as it was upon the lessor, because, in the former case the surface estate was rendered more valuable during the period an annual income was derived from the exploitation of coal mines below it.

Readers will remember that in our March issue there was reviewed at some length the advance sheets of a very commendable work on the phosphates of Florida and Canada, from the pen of Mr. C. C. Hoyer-Millar. The book, nicely printed and creditably gotten up, is now out, and readers who may not have received a copy should address the Scientific Publishing Company of New York, who are the selling agents on this side.

Since the publication of our exposé of C. M. Dobson, we have received a number of letters from readers in Chicago, Western Ontario, and the Maritime Provinces, adducing evidence of further shady dealings by this notoriously unscrupulous person. Our warning, while it prematurely shut off Dobson's would be connections in Nova Scotia and New Brunswick, did not, it seems, prevent him walking away with cash and specimens to the value of \$500, the property of unsuspecting gold miners, who had been misled by the *Critic's* pernicious eulogy of the imposter. By the way, it is now some four months since the *Critic*, smarting under rebuke, blusteringly promised its readers a full and complete defence of its protégé. Surely the *Critic* has not been caught bluffing?



In a paper read recently before the Federated Institution of Engineers some interesting facts relating to the progress of gold mining in New Zealand were brought out. The writer, Mr. George J. Binns, said the first results in Auckland were disappointing; instead of the nice alluvial deposits which had characterised the South Island, but little ground of this nature was found. This peculiarity still remained, the deposits yielding generally 54 to 75 per cent. of gold, and 46 to 25 per cent. of silver. In spite of these early drawbacks the reefs had turned out abundantly rich, in some cases yielding at the rate of 600 ounces to the ton. The yield of gold for 1890 was £125,760; the total quantity of gold entered for export to the 31st December, 1890, was 1,639,357 ounces: value, £6,122,173. Taking 33 mines in the west coast gold fields, which had crushed stone, £96,575 had been paid as dividends and £310,692 worth of gold had been produced. In the North Island alluvial mining was not carried on to any appreciable extent. Estimating the average earnings of miners was an exceedingly difficult matter, but taking the period ending 31st March, 1890, the figures came out as £51 2s. 7d. per man per annum, as against £59 16s. 6d. for the previous year.

Mr. W. S. Gresley, in a recent paper before the Western Pennsylvania Mining Institute, claims the following circumstances as being suited to longwall working in preference to any pillar-and-room method:—

- a. Where all the coal is sought to be mined out.
- b. Where the highest selling price is on lump coal.
- c. Generally where the seam is under 6 feet thick.
- d. Where dirt lands or much refuse is contained in or has to be mined with the coal.
- e. Where economy in timber is a desideratum.
- f. Where concentration of work is desirable.
- g. In gassy seams where the fresh air current should sweep the working faces.
- h. Where a shot or shot-firing are a nuisance.
- i. Where dead-lamp and bad air are troublesome.
- j. Where division of labor is desirable.
- k. Where the best work is desired to be gotten from under-cutting machines.
- l. Where the top and side weights are most felt.
- m. In thin seams or heavy pitches.
- n. Where a fairly steady sale obtains.
- o. Where it is desirable to let down the surface as regularly and as evenly as possible.
- p. For very thin flat seams.
- q. Where plenty of skilled diggers can be had.
- r. Where rapid opening up of workings for a large out-pit is a point.

Upon good, systematic under-cutting, run in as far under as the seam is high, and a continuous length of it completed before any of the coal is thrown down or allowed to fall down, greatly depends the success or failure of longwall. Some walls require to be under-cut some hours before they are ready to come down; others will hardly stand being under-cut the full distance; others again need no under-cutting to speak of. Stated generally, the deeper the under-cut the better the product. The proper management of the roof or "top-weight" in working successful longwalls is one of the chief features of the system, the great point being to so regulate or control the pressure on the face that it shall be neither more nor less than enough to bring down or greatly assist the miners in bringing down the "web" when it is ready to fall, and be loaded p.

Mr. Wm. Duncan, fifth bituminous mine inspector, contributes a paper before the same Institute, in which he gives interesting facts in favor of the advantages of slopes over shafts. Among these he enumerates: Smaller cost of opening; less height to lift the coal and water; but one pair of engines required instead of two, while the liability to wreckage is less; coal may be gotten out much sooner, thus enabling one to realize on his investment much more promptly; material may be more readily taken into the mine, and finally by allowing water to fill the portions of the mine where the work is completed, there is just so much less water to pump out, and less space to drain and ventilate. In the shaft system no water can be allowed to accumulate until every ton of coal is mined. To prove these points, Mr. Duncan takes a supposititious coal field, 5000' square, having a slope of 5' to the hundred, making a total of 250' slope. This is about the average in the coke region. A railroad is located at the outcrop, and another immediately over the dip boundary line. To work this by shaft would require two 250' feet shafts, a hoisting shaft costing \$100 per foot, or \$25,000, and an air shaft costing \$70 per foot, or \$17,500. The yield of this supposititious coal field is estimated at 5,740,000 tons, which in the shaft method would needs be lifted 250', together with about three times this weight of water, while in the slope method the total lift would not exceed 150', and some of the water, which is left in the worked out portions, need not be elevated at all. As to capital invested, Mr. Duncan estimates the cost of slope openings at not more than \$1,000, as compared with \$42,500, the estimated cost of the shafts, while two sets of engines are required in the shaft method to one set with the slope method, the point being made that as much power is required to control the descending load in the shaft system as the ascending load in the slope, while there is less liability to wreckage in the latter case, and rails, etc., can be more conveniently carried than when they have to be placed vertically on the car in the shaft. Another very important advantage which the slope system possesses is the rapidity with which the field may be opened. Coal may be had in a month's time, and by the end of six months coal for 200 ovens may be obtained, while by the shaft method six months would be required before any coal at all could be secured.

In describing a new safety cage at the meeting of the Federated Institute Mr. Whitelaw stated that from 1857 to 1868 the average annual loss of life from over-winding alone was about 24. During that period 300,000 men on an average had to descend and ascend pits daily in the performance of their duties. In 1890 the number employed underground increased to nearly 500,000, and at that rate of increase the number of men now employed underground in Great Britain will be about 600,000. Assuming these have to be lowered and raised at the pits say 250 times a year, it would be equal to 300,000,000 separate times, and that from pits ranging in depth from

40 to 800 yards. Considering the risks attendant upon descending and ascending pit shafts, Mr. Whitelaw attributes the comparatively small number of accidents that have occurred to the application of suitable machinery and to skillful attendance. The safety cage under consideration is another contribution to the efforts to still further reduce that number. The safety appliance consists of an arrangement of levers, springs and grippers, and of rods instead of chains; but more particularly of the teeth of the grippers on the ends of the levers. The grippers or catches are brought into play, if the rope breaks or the cage becomes disengaged by the detaching apparatus, in cases of overwinding, by the strong blade springs fixed to a centre bar. The provision made for the adjustment of this spring consists of a piece of leather or India rubber inserted under it and acting as a cushion. When thus adjusted it is not liable to derangement. Mr. Whitelaw added that two cages of this construction were in daily use for eight years at a colliery under his charge.

The phosphate produced by the General Phosphate Corporation has been seized at the instance of local creditors—among others the Ottawa Powder Co., I. Bernardin and J. Lainson Wills. This looks like the beginning of the end.

Among the archives of the Mining Society of Nova Scotia, we came across, the other day, the following satirical reference to some methods of company promoting not unknown to some of our readers:—

### PROSPECTUS.

Frog Lake Mining, Birch Broom Making, and Blueberry Crushing Company.

Capital, \$1,000,000.

The property contains 1,000 acres. There are one hundred loads of gold from  $\frac{1}{4}$  to an inch in thickness, all of which are gold-bearing, more or less.

To give an idea of the large dividends which may be expected, the proprietors refer to the high prices which blueberries and birch brooms command in the market. Since the purchase of this property there have been raised the material for eight birch brooms, and sufficient blueberries to manufacture a quart of port wine.

The present proprietors have no hesitation in recommending this property to the public as a profitable investment, believing it will prove the BEST MINING and blueberry and broom brush growing property in the province.

### Present Proprietors.

Samson Carter, Esq.	Adam Phool, Esq.
Gabriel Hall, Esq.	Jos. Southdown, Esq.
George Lambert, Esq.	Zachary Crawley, Esq.
Shadrach P. Ross, Esq.	Zachariah Goose, Esq.
Samuel Lees, Esq.	Richard Blake, Esq.
Richard Blue, Esq.	A. Lamb, Esq.

The capital, to be subscribed and paid up, 1,000,000 shares at 5¢ cent a share, \$5,000. To be applied as follows:

For the purchase of property.....	\$4,000
Erection of wine press, birch broom factory, and mining machinery.....	750
Working Capital.....	250
	\$5,000

The Stock Lists will be found at the office of Adam Goodman, and at the residence of Fisher Lambrock, in Mouse Street, also at the "Stag" Hotel, Preston.

The present proprietors having taken a large amount of the stock, a limited number of the shares only will be placed on the market.

We clip the following gem from the Australian Mining Standard:

He was a simple countryman, but as persistent as he was unsophisticated, and when he once formed an idea or a resolution it stuck to him like wax. He got an impression, how it does not matter, that some dark rubbishy stuff on his selection was coal, and with all sorts of visions of wealth before his eyes, he sailed down to a friend in the

Mines Department and worried him for days and days to get an expert opinion upon his chunks of rock. The official thought to put him off and wear him down by temporising, but the bucolic was not to be put off, and at last the Mines man got the stuff reported on. The verdict was unfavorable, and so exasperated was the Government official at the trouble he had been put to for nothing that his annoyance smothered the sympathy he should have naturally felt for the country friend whose fond hopes were blasted. He readied himself up for a final visit from the owner of the samples, and in announcing the result of the tests to which they had been subjected delivered himself somewhat as follows: "You believe that at the last day the world will be consumed with fire?" "Yes," answered the amazed and expectant countryman. "Well, then," continued the official, "you just go home and tell your friends that you can make yourself all right against the last day, for the stuff on your property will be about the last thing on God's earth to burn."

### The Coal Fields of Cape Breton Island.

By ROBERT ROBERTSON, JUN.\*

The coal field of Sydney, occupying an area of about two hundred square miles, is the most extensive, and has been asserted to be the most valuable in the Province of Nova Scotia. It extends from Mira Bay on the east to Cape Dauphin on the west, a distance of 31 miles, and is bounded inland by the Millstone Grit formation, and dipping towards the N.E. under the sea, in the direction of Newfoundland, thus forming one extremity of a great coal region, the main body of which lies under the Atlantic Ocean. The total thickness of measures is stated as being not under 7,000 feet, and a fine natural section can be seen on the north side of Sydney Harbour, three miles long, and measuring 1,860 feet in thickness. This section contains no less than 34 seams of coal, of which, however, only a few are workable.

The Sydney mines district of the Sydney coal fields occupies an area of about ten square miles, the principal seam in the district being known as the Six-foot, or Sydney Main seam.

The first operations in this Main seam were commenced in 1785 by Governor Lieut.-Col. Desbarres, on Government account, when the Island was erected into a separate Government. From 1785 to 1826 the mines were leased to six individuals or companies, and were three times in the hands of the Government, and on the 1st of January, 1827, the mines came into the possession of the present owners.

The General Mining Association was organised in 1825 by Messrs. Rundell, Bridge & Rundell, the late well known firm of jewellers and goldsmiths, who obtained a transfer of the lease of all the mines and minerals in Nova Scotia which had been granted by George IV. to his brother, the Duke of York. The lease of the Sydney mines, which were not included in the Duke's lease, expiring on the 31st December, the mines were offered to the G.M.A. for one year on the terms then in force, pending other arrangements to obtain a long lease on more favorable terms. The amount of royalty at that time was 4s 3d per ton.

In 1828 an agreement was made with the Provincial Government by which the G.M.A. obtained a lease, terminable in 1886, of the Sydney Mines, the terms of which were that the G.M.A. upon payment of a fixed rent of £3,000 sterling a year should be allowed to sell 20,000 chaldrons (Newcastle measure) in Nova Scotia and Cape Breton, at 7d sterling per Newcastle chaldron, upon all coal sold over that quantity.

These rents and royalties were paid up to the year 1845, when the British Government consented to allow the Association to sell 26,000 instead of 20,000 chaldrons at the same fixed rent. This last agreement continued in force until December 31st, 1857, when the G.M.A. surrendered their claim to all the mines and minerals, except within certain well defined limits, reserving an area equal to 34 square miles in Cape Breton, and 12 square miles in Nova Scotia proper.

The agreement made with the Government of Nova Scotia in 1858 fixed the amount of royalty at 4½ pence per ton on all large coal up to 250,000 tons per annum, and 3½ pence per ton on all coal sold over 250,000 tons.

The first steps taken to open out the works were inaugurated in 1830, when a shaft 200 feet deep was sunk, which continued to supply the trade until 1834, when another shaft, 320 feet, was sunk, 400 yards further to the dip. This shaft continued in operation until 1854, when it was lost by a heavy influx of water, which overpowered the pumping engine. In the meantime, a new shaft had been sunk and equipped in anticipation of such a disaster, and was brought into operation. This shaft is 400 feet in depth, and now forms the upcast shaft for the present workings. This shaft is known as the Queen Pit.

In 1865 a lease five square miles in extent, of submarine area, was obtained, and for the purpose of working this area the sinking of the present shafts was commenced in 1868. These shafts are situated near the shore, at the north-west entrance to Sydney Harbour. They are placed 22 yards apart, one is 13 and the other 11 feet diameter, and are 670 feet deep, and known by the name of Princess Pit. In the course of sinking, heavy feelers of water were met with at a depth of 300 feet, which were successfully tubbed off with cast-iron tubbing, both shafts being lined to a depth of 300 feet. The larger

shaft is used for winding, and the smaller one contains the pumps, and is used for lowering and raising the men. The winding engine is of 160 H.P. nominal, and has two high pressure horizontal cylinders, 36 inches diameter, with five foot stroke, crank shaft 15 inches diameter, carrying a round rope drum 20 feet in diameter. These engines are capable of raising 1,000 tons of coal per day of ten hours.

The engine raises two tubs at a time, standing end to end in the cage. Each tub carries 14 cwt. of coal. Four slides are fitted for each cage, but the cages run on the wall slides only with shoes, the inside of the cages being fitted with bevelled irons, which run on the slides. The winding ropes are of steel, 4¼ inches in circumference. A very simple and effective means is employed to break the fall of the cage on the bottom, which consists of a bed of spruce boughs, and forms an excellent cushion, on which the cage alights, and so effectually breaks the fall of the cage, that after having been renewed, the cage rests without the slightest shock.

Two hauling engines are placed near the bottom of the shaft, the steam being taken from the surface in 10 inch pipes.

The North engine has two 18 inch cylinders, 3 foot stroke, geared 1 to 3, with 4 foot drums for main and tail rope. These engines haul out of two deeps, one branching off the level 100 yards from the shaft, and is one mile long, with a branch 1,500 yards. The other deep branches off the level at 750 yards from the shaft, and is 1,500 yards to the bottom of deep. The empty trips descend by gravity, the tail ropes being used only on the level. The dip varies from 1 in 10 to 1 in 14, and trips of 26 to 30 tubs are hauled at a time.

The South engine has two 16 inch cylinders, 2 feet 9 inch stroke, geared 1 to 3, with 4 foot and 5 foot drums for main and tail rope respectively. These engines also haul out of two deeps, one branching off the level at 160 yards from shaft, and is 1,200 yards in length, with a branch in course of formation. The empty trips descend this deep by gravity, the dip varying from 1 in 22 towards the top to 1 in 12 towards the bottom. Trips of 32 to 38 tubs are hauled. The inside deep branches off at 560 yards from the bottom, and is one mile long to the landing. The dip in this deep is undulating and variable, being from 1 in 14 to 1 in 52. The tail rope is used to take the empty trips inbye, and 40 to 45 tubs are hauled on each trip.

The main ropes are 2¾ inches in circumference, and the tail rope 2½ inches, of best plough steel, imported from England.

The hauling of the coal from the faces to the engine roads is done by horses, from 45 to 50 being usually employed. The stables are large and well ventilated, and afford accommodation for 60 horses.

The system adopted is a modification of the stoop-and-room method, but none of the pillars are being taken out, the workings being all under the Atlantic Ocean. The main levels and deeps are driven in pairs, 8 feet wide and 10 yards apart. The rooms are 16½ feet wide, and are carried parallel to the levels. At intervals of 70 to 80 yards single deeps and headways are set off as they advance, and are again broken off as the deeps and headways win them. Midway between these deeps and headways, cross-cuts are driven between the rooms, almost invariably downhill from the higher to the lower room. These single deeps, headways, and cross-cuts are driven 9 feet wide, and the pillars are 12 yards thick on the square. The rooms are broken off 12 feet wide and put through at the same width.

The ventilation of the workings is effected by means of a Guibal fan placed at the top of the Queen Pit. The fan is 30 feet diameter by 10 feet wide, and at 40 revolutions per minute circulates 30,000 cubic feet of air, with a water gauge of 1½ inches.

For the purpose of unwatering the mines, a large Cornish engine is in operation. The cylinder is 62 inches diameter with a stroke of 9 feet, and the water is raised by two bucket lifts, each 20 inches diameter. Eight hours' pumping is usually sufficient to keep down the water. There is also a large pumping engine at the bottom of the Queen Pit, which forces the water to the surface in one column. This engine is direct acting, with large flywheels, cylinder 24 inches diameter and 4 foot stroke, plungers 10 inches diameter.

An engine of the same type with 36 inch cylinder is being erected at the bottom of the Princess Pit to force the water to the surface in one lift to supersede the Cornish engine.

The pit bank, screens, and engine houses are lighted by electricity, and electric signals are in operation under ground on the engine planes.

Steam is supplied at Princess Pit by six egg-end boilers 35 feet by 5½ feet, and 3 multitubular boilers; and 4 egg-end boilers, same size, are at Queen Pit.

The colliery is also fully equipped with large workshops, including waggon and tub-shops, smithies, steam hammer, pattern, and carpenters' shops, foundry, saw-mill, fitting shops, with large turning lathe, planing, drilling, screwing machine, and screw cutting lathe; also boiler and locomotive shops and sheds.

The coal is shipped at North Sydney, four miles distant from the pit, and three locomotives are required to carry the coal during the shipping season. The greater part of the coal raised is sent up the St. Lawrence to Montreal, Quebec, and several other places; and while the navigation is open everything is pushed as much as possible to execute contracts and get away the greatest amount of coal in the shortest possible time, in order to overtake the great rush of trade, which usually extends from May to November. Large quantities of coal are landed during

the winter months. It is nothing unusual to have 40,000 to 50,000 tons landed in this way.

The severity of the winters and the drift ice in spring are great hindrances to the coal trade in Cape Breton. If the winter sets in early, the harbour may be frozen over in December, and remain so until April. Then, if it breaks up and gets cleared out, it opens the way for the drift ice to come in, which often blocks the harbour in May, and even in June.

The miners, as a rule, are civil and respectful, and well to do, some of them owning horses and waggons, cattle, houses and land, boats and fishing gear, and can take their stand alongside the best of our British miners.

#### DISCUSSION.

The PRESIDENT said this was an interesting practical paper. There were some particulars as to working coal under the sea which might be of use to some of the members. Before long there would be a great deal wrought under the sea in Fife and the Lothians, and he believed in Ayrshire too.

MR. DURIE asked why they were superseding the Cornish engine at the pit-head.

The PRESIDENT asked if the author would be good enough to say: first, the thickness of the seam worked under the sea; secondly, the percentage of coal taken out; and thirdly, the depth of the coal from the bottom of the sea.

MR. JOHNSTON said it might be interesting to know the character of the strata there.

The discussion was adjourned.

### Nova Scotia Coal Royalty—An Interesting Correspondence Between Premier Fielding and Mr. J. R. Lithgow, Sec-Treas. Glace Bay Mining Company.

HALIFAX, 6th May, 1892.

Hon. W. S. Fielding,  
Provincial Secretary.

DEAR SIR,—It occurs to me to make one more appeal to you, and through you to the Government of Nova Scotia, to do the Glace Bay Mining Co., Ltd., an act of justice.

If your legal adviser will show that we are not justly and legally entitled to what I am about to ask of you, then we must be content. Our case is briefly as follows:

1. Prior to 1866 we held, and still hold, three coal leases which expired in 1886, but by the legislation of 1873 were renewable for three periods of twenty years each, up to 1946, upon the terms, conditions and covenants of the original leases.

2. There was nothing in our original leases touching a change in the royalty. It was fixed at 6d. per ton with slack free.

3. In 1873 and up to at least 1883, we were entitled to renewals up to 1946, with the royalty fixed at the rate named.

4. The foregoing being admitted to be correct, without a breach of provincial faith we were entitled to such renewals in 1886.

Allow me to illustrate my contention. Suppose I owned a large wheat farm and gave you a lease of it in 1865 for 21 years, to terminate in August, 1886, at a rental of 7½ cents per bushel of wheat raised and sold by you. Then, suppose that in 1873, I assured you by a written document that you, by giving me six months' notice prior to August, 1886, would become entitled to renewals of your lease for twenty, forty or sixty years from 1886, on the terms of your original lease. What would you think of me if, two or three years prior to 1886, I wrote you that you could have renewals, but they must contain a provision that the rental may be raised as I may see fit? Would you regard me as an honest man? Would you not call my second proposal, repudiation, or something like that?

But again, suppose, as you could not help yourself you accept a renewal with that provision inserted, thinking probably that the rent would never be raised, the owner being a just man, and in 1892 you were suddenly notified by me that the rent up to 1906 would be ten cents per bushel instead of 7½ cents; and up to 1926 it would be not over 12½ cents; and after 1926, well, I would not say what it might be: how would you feel towards me?

For a dozen years at least, you believed you were sure of renewals up to 1946 at 7½ cents per bushel, and in 1892 you find you cannot get them from me for the periods I had promised even at 33¼ per cent. advance on the original rental: could you regard me as an honourable man? Before you could do so you would say, "Mr. Lithgow, give me the renewals you assured me in 1873 I would be entitled to in 1886."

Now I beg to say to you, with all due respect, give us the renewals we were assured by the legislation of 1873 we were entitled to on giving six months' notice prior to August, 1886, on the terms, conditions and covenants of our original leases; else, I must appeal to the people to do us justice.

To enable you to settle with us in accordance with existing legislation, we will accept leases running until 1946 at ten cents royalty on all coal sold, save the 60,000 tons we sold in January last.

Holders of leases issued since 1866 are not in the position we are to claim renewals at the old rate of royalty, for the leases since '66 had the "revise and alter" clause in them.

Hoping to hear from you,

I remain yours respectfully,

J. R. LITHGOW,  
Treas. Glace Bay Mining Co., Ltd.

\* Transactions Mining Institute of Scotland.

HALIFAX, May 18th, 1892.

DEAR SIR,—I beg to acknowledge receipt of your letter of 6th inst., which reached me on my return to town after a few days' absence.

I regret that I am unable to agree with you in your views respecting the coal royalties.

Pressing engagements would render it impossible for me to discuss the subject at any length with you at present. A brief statement, however, will be a sufficient answer to your letter.

1. It is true, as you state, that your original leases referred to contain "nothing touching a change in the royalty."

2. But it is also true, although you do not state it, that those original leases contained nothing touching a renewal of the leases; consequently, so far as any contract between your company and the Government was concerned, your rights ceased and expired in 1886, and if you had then received no leases at all you would have had no cause of complaint.

3. The mining laws had, however, been amended from time to time, not as a matter of special contract with your company, but in the general interests of the Province. You seem to think that you have a right to pick out of twenty years of legislation such parts as you like and claim the benefit of them, while ignoring all the rest. It should not be necessary for me to argue against such a view. If, having no rights whatever under your leases after 1886, you desired to claim rights under the general law, you had to deal, not with selected parts of the statutes, but with the whole law. You were not bound to continue to work your mines. You were at liberty to withdraw from the business on the termination of your contract. But you preferred to apply for renewed leases under the law as it then stood, including a provision respecting the right of the Government to increase the royalty. You did so apply, the leases were granted, and you went on your way rejoicing in privileges which the Legislature had generously given you, but which it might have withheld altogether without affording you a shadow of cause for complaint or breach of contract. That you should have applied for these privileges, accepted them and enjoyed the advantages of them for nearly six years and now assail the Legislature which gave them to you seems to me to be most unfair.

If in any "appeal to the people" which you desire to make you will include this statement of the case I shall be content to await their judgment. I have the fullest confidence that the course pursued by the Government in this matter has been in the public interests and that ample justice has been done to every private interest affected by the legislation.

Yours faithfully,

J. R. LITHGOW, ESQ., W. S. FIELDING.  
Treasurer Glace Bay Mining Co., Ltd.

HALIFAX, 19th May, 1892.

Hon. W. S. Fielding.

DEAR SIR,—I beg to acknowledge your valued favor of the 18th and to reply thereto.

1. It is true that our leases, in common with all other leases issued between 1858 and 1866, contain nothing touching renewals, but you are certainly wrong when you say "consequently, as far as any contract between your company and the Government is concerned your rights ceased and expired in 1886, and if you had then received no leases at all you would have had no cause of complaint." You know that by the legislation of 1866 we became entitled to renewals in 1886, and again by the legislation of 1873 we were entitled to renewals in 1886 "upon the terms, conditions and covenants of our original leases," upon giving six months' notice prior to August, 1886, of our intention to renew our original leases. That notice we gave. How then can you affirm that had we received no leases (renewals you mean) in 1886 we would have had no cause of complaint? Do you undertake to say the Government could legally have refused to give us renewals? Do you hold that it was optional with the Government to renew or to refuse to renew our original leases? You know that the Government was bound by the law of Nova Scotia to issue the renewals we applied for in accordance with the law. "No cause of complaint had we not got any renewals in 1886"! You surely cannot hold to that opinion. The contract embodied in our original leases issued by the Government between 1858 and 1866 was legally renewable for three periods of twenty years each, from August, 1886, upon the terms, conditions and covenants of the original leases, and we had by law the right to demand such renewals up to six months prior to the expiration of the original leases in August, 1886.

2. I have never claimed that the mining laws were amended as a matter of special contract with our company, nor have I claimed the right to pick out of twenty years of legislation such parts as I like and claim the benefit of them, while ignoring all the rest. Thence it was not necessary for you to argue against that view. We had legal rights in renewals of our original leases, and in December, 1885, applied for renewals as we had a legal right to do, and as all holders of leases issued since 1858 had the same right to do, and the Government was bound by law to give them on the same terms, etc., of the original lease and as prescribed by any Act of the Legislature up to the time of issuing the renewals.

3. The revision and alteration of the royalty made in 1885 was no infringement of the rights guaranteed to the holders of leases by previous legislation, inasmuch as it did not increase the royalty. Even the clause that the royalty "might be increased or diminished as the Legisla-

ture might see fit," you must remember, or if you do not can ascertain by reference to the debates in the House on the change in royalty, was suggested by yourself, not with a view to increasing the provincial income from the coal royalty, but in order that if  $7\frac{1}{2}$  cents on all coal were found to yield more revenue than the original 9.7 cents on screened, with slack free, it might be diminished, and if found to yield less it might be increased by, say,  $\frac{1}{2}$  cent per ton. It was distinctly stated by the Hon. Commissioner of Mines in those debates (in 1885) that all the Government wished was a royalty equivalent to the old rate. The intention of that clause, which was to be inserted in all leases (not in renewals) issued after the passing of the Act authorizing it, was clearly stated by yourself, the Attorney-General and the Commissioner of Mines, and you will admit was not to justify any increase beyond the old rate, which in bulk will not be increased without a legislative breach of faith, seeing that for many years previously holders of leases were assured that they could obtain their renewals on the terms of their original leases—hence not exceeding the original rate of royalty—up to August 1946.

Yes, we applied for renewals, accepted them and enjoyed the advantages of them since 1886, and I respectfully submit that without the glaring breach of legislative faith recently enacted we should have continued to enjoy them up to August, 1946.

In any appeal to the people I may make your sentiments shall be published as you desire.

Yours very respectfully,

J. R. LITHGOW.

Treasurer.

HALIFAX, May 19th, 1892.

J. R. Lithgow, Esq.,

Treasurer Glace Bay Mining Co.

DEAR SIR,—I beg to acknowledge receipt of your letter of this date in relation to coal royalties.

I think there is danger of some confusion of the words "Government" and "Legislature" in dealing with this question. The Government had no power except such as the Legislature conferred upon it. The Government is merely the instrument for carrying out the directions of the Legislature. It is with the Legislature, rather than with the government, that you have to deal.

In my letter of 18th inst. I pointed out that your original leases contained nothing touching a renewal, and I added, "Consequently, so far as any contract between your company and the Government was concerned, your rights ceased and expired in 1886, and if you had then received no leases at all you would have had no cause of complaint." You dispute this and you ask if I will undertake to say the Government could legally have refused to give the renewals. Let us assume that, in view of the legislation that had in the meantime been passed, the Government were bound to give you renewals. But I must point out most distinctly that *the Legislature was under no obligation whatever to you to pass such Acts*. If it had not passed them, and if you had been left to stand upon your lease, you would have had no just cause of complaint. You would have received all that the Government had contracted to give you. Whatever privileges you have received since 1886 you have received, not because you had any contract right to them, but because the Legislature in its wisdom and generosity was pleased to give you such privileges. But if it had given you nothing there would have been no breach of faith.

You say: "We had legal rights to renewals of our lease and, in December 1885 applied for renewals, as we had a legal right to do, and as all holders of leases issued since 1858 had the same right to do, and the Government was bound by law to give them on the terms of the original lease and as prescribed by any Act of the Legislature up to the time of issuing renewals." Well, in this passage you admit the whole case. You had no rights whatever except such as were prescribed by the law as it existed at "the time of issuing the renewals." A part of that law read as follows:—

"All leases of coal mines issued after the passing of this Act shall contain a provision that the royalties may be increased, diminished, or otherwise changed by the Legislature."

It was under that law that you applied for leases. The leases were granted to you in 1886 in conformity with that law and accepted by you without any question. The leases show on their face the right of the Government to increase the royalty. Is it not preposterous then for you to come forward and deny the Government's right which is so clearly set forth on the very document which you hold?

You say that clause was inserted in the Act of 1885 at my own suggestion. That is perfectly true. Every outstanding lease which contained any right of renewal contained also a specific declaration of the right of the Government to revise and alter the royalty in and after 1886. Nobody was rash enough to question that right. It was desirable that every lease to be issued in or after 1886 should contain on its face an emphatic recognition of the right; hence the insertion of the clause which was unanimously approved by the House. You say that at the time it was not intended to increase the royalty. That is quite true. I stated, and every other member of the Government who discussed the question stated, that we did not desire at that time to obtain a larger royalty than the rate then existing, namely, nine and seven-tenths of a cent per ton on round.

The language of the Act of 1885 is too plain to admit of a moment's doubt. It must be clear to everybody that although the Legislature did not at the moment wish to

increase the rate of royalty it did wish to declare most emphatically the right to increase it at any future time. The Government's views in this respect met with the unanimous approval of the House of Assembly, and I am quite satisfied that they have the approval of the public at large.

If there has been any breach of faith in this matter it has not been on the part of the Legislature or Government. They have kept faith. The only attempted breach is on the part of those who, after obtaining through the favor of the Legislature privileges to which they had no contract right, now appear to wish to repudiate their own agreements and assail the Legislature which dealt so liberally with them.

Yours faithfully,

W. S. FIELDING

HALIFAX, 20th May, 1892.

Hon. W. S. Fielding.

DEAR SIR,—Your kind favor of the 19th was read on the following evening, and as only good can come out of mutual desire to know the truth of the subject we are discussing, I beg again to trouble you. You say after reading my letter of the 19th that the Government were bound by legal enactment to renew the leases we held. That the Legislature of 1866 and 1873 were under no obligation to pass the Act entitling lessees to renewals, any more than to authorize the issue of original leases, no one has ever disputed. The Government could only give what the Legislature authorized, and hence if the Legislature in 1873 had not enacted that the holders of coal leases issued since 1858 and expiring in 1886 were entitled on giving six months' notice prior to August, 1886, to obtain three renewals of twenty years each up to August, 1946, we could not have claimed them. And again, if the Legislature had not in the same session enacted that the said renewals were to be issued upon the terms, conditions and covenants of the original leases, we could not claim that the insertion of a clause in the renewals that the royalty might be increased was a breach of Legislative faith. Nor could we claim that the increase of one-third, that is from  $7\frac{1}{2}$  to 10 cents per ton, is a most flagrant breach of the legislation of 1873, under which we were entitled to leases to terminate in August, 1946, at the old rate of royalty, namely, 9.7 cents per ton on coal except slack, a rate revised and altered in the Legislature of 1885, but not raised.

You do not seem to appreciate the fact that a Legislature cannot without repudiation, or a breach of faith, enact in 1892 that leases of coal areas must pay one-third more rent than the same Legislature had in 1873 enacted the lessees should pay up to 1946. A Legislature may by enactment put lessees in a better position than they previously were, but they cannot subsequently, without a breach of faith, make their position worse during the periods of the leases issued to them. A lessor of a property has the right to lease it for a certain number of years at a certain rental, say from 1862 to 1886 at \$7,500 a year. He has also the right to assure the lessee, in say 1873 that he can have renewals of his lease at the same rental, for three periods of 20 years each from 1886 on giving six months' notice, but he cannot without a breach of faith, subsequently either refuse his promised renewals, or give them with a clause inserted that the rent may be increased. Above all, he cannot during the first renewal period give notice to the lessee that the rent shall be at once increased from \$7,500 to \$10,000 a year until 1906: after which and until 1926 it will not exceed \$12,500 a year. I say, he cannot; well, I mean he cannot honorably, whatever he may be able to do legally. You will have no difficulty in seeing from this illustration what a gross breach of faith the Legislature at their last session committed, in raising our rental from  $7\frac{1}{2}$  to 10 cents per ton, seeing they had in 1873 guaranteed us that until 1946 it should not exceed  $7\frac{1}{2}$  cents, which you will admit is the full equivalent of the original rate. The fact that the Legislature in 1885 authorized the insertion of a clause in leases issued thereafter, to the effect that the royalty might be raised, I fully admit, but I contend that said clause could not be inserted in the renewals referred to in the legislation of 1873 without a breach of faith. It could be inserted in new leases, but not in renewals which were to be issued upon the terms, conditions and covenants of the original leases, hence, with no increase of royalty.

Again, no one knows better than you do that the said clause was passed by the Legislature simply because it was uncertain whether or not the altered rate of royalty— $7\frac{1}{2}$  cents on all coal, round and slack—would be the equivalent of 9.7 cents on round with free slack. Any increase over the old rate, the debates clearly show, especially the statement of yourself and the Hon. C. E. Church, was distinctly repudiated. That clause was enacted so that if  $7\frac{1}{2}$  cents yielded more revenue than the old rate, it might be diminished by a quarter of a cent; and if it yielded less than the 9.7 cents, it might be increased sufficiently to make it the equivalent of the original royalty. It was not designed to legalize any increase of the original rate per ton, either then or at any future time. You cannot show from the debates which led to the enactment of the clause in question, that the Legislature did wish to declare most emphatically the right to increase it at any future time. The Government, or such members of it as spoke during the debates, never hinted that the object of the clause was to declare the right to increase the  $7\frac{1}{2}$  cents beyond what would make it equivalent to the old rate. Admitting that every outstanding lease which contained any right of renewal, contained also a specific declaration of the right of the Government to raise and alter the royalty in and after

# ❖ SUPPLEMENT TO THE CANADIAN MINING REVIEW. ❖

JULY 1892.

The June Excursion Meeting of the General Mining Association of the Province of Quebec, at Black Lake and Thetford Mines, Que.



ARRIVAL AT THETFORD MINES.



AT KING BELL'S MINES.



IN THE BEAVER HILL.



GROUP AT THE JOHNSON'S MINE.



CAPT. ADAMS. J. BURLEY SMITH. A. W. SILFVERSSON.



GROUP AT THE BELL MINE.

1886, you should bear in mind that there were in 1873 outstanding leases, subsequently renewed, which contained no right of renewal and no declaration of the right of the Government to revise or alter the royalty in and after 1886, and that the holders of such leases—the Glace Bay Mining Co. among others—became by the Act of 1873 entitled to renewals on the terms, etc., of the original lease, hence, at the old original rate of royalty, could amend in 1886, and without any assent as to revising, altering, diminishing or increasing the royalty, and that hence the holders of such leases did not receive in 1886 such renewals as they were legally entitled to, seeing they contained a clause under which the Government have claimed the right to exact until 1906 one third more than the lessees were formerly entitled to pay. Again, the leases which were the same originally as the Glace Bay Mining Co.'s issued prior to 1886, which were renewed in 1886, and whose renewals contain the provision that the royalty might be revised or altered in and after 1886, were, I hold, equally with leases not then renewed, entitled under the legislation of 1873 to renewals until 1946, on the terms, conditions and covenants contained in the original leases; hence, with the same clause in 1886, but with the royalty increased or diminished. That the royalty might be diminished, or changed, or altered, as long as it was not increased, I freely admit; just as a landlord may freely lower a tenant's rent, or make it payable quarterly instead of monthly, without any breach of faith; but he cannot increase it during the term of his lease. No more may the Legislature increase the royalty on those who in 1873 held leases renewable till 1946, at the rate of royalty named in their original leases.

It is true that the Glace Bay Mining Co. and other lessees who applied for renewals at least six months prior to August, 1886, obtained them with the royalty specified at 7 1/2 cents per ton, and did not object at the time to the clause in the legislative enactments upon which it was diminished, supposing it was legally inserted, and that anyhow the royalty would not be increased; but, surely, the real binding contract is not a document issued from the mines office, but the Acts of the Legislature, construed in accordance with consistency and good faith; for the written lease can only be viewed as binding so far as it has the same effect as the legislative enactments upon which its validity depends.

You speak of privileges we have received since 1886; perhaps you will kindly specify them. I know of no privileges we have received since 1886, from either the Government or Legislature. Our original leases were obtained nearly thirty years ago. The legislation entitling us to renewals up to 1946, at the old rate of royalty payable, was passed in 1873. All that we have to thank the Government and Legislature of 1892, or since 1886, for, is a breach of public faith heretofore unheard of in Nova Scotia, and most injuriously affecting the value of our coal properties.

When the time comes for the Commissioner of Mines to collect in cents per ton royalty on run of mine coal at the rate of 7 1/2 cents per ton, it may be tested whether or not the recent Mines' Act can be enforced. If it can, then another legislature may cancel our leases, or make the royalty 50 cents per ton, notwithstanding the legislation of 1873.

Yours respectfully,

J. R. LITTLEWOOD,  
Treasurer.

HALIFAX, May 25th, 1892.

J. R. Littlewood, Esq.,

Treasurer Glace Bay Mining Co.

DEAR SIR,—I have neither time nor inclination for continuing a discussion with you which can only amount to a repetition on both sides of what has already been said. Every material point in your letter of 23rd inst. has been dealt with in my letters already addressed to you. As you did not receive or seek any leases under the law of 1873, nearly every word you say concerning that law—and that means the greater part of your letters—is beside the question. You applied for and obtained leases under the law as it stood in 1886, which law distinctly recognized the right of the Legislature to increase the royalty.

If the closing paragraph of your letter is meant to indicate that your company intend to attempt to repudiate its contract and set the law at defiance, I need say nothing more than that the Government are not unaware of the power with which the Legislature has clothed them in regard to such a case.

Yours faithfully,  
W. S. FIELDING.

**The Nova Scotia Coal Royalty—An Eminent Legal Opinion on the Issue.**

Previously to 1866 the General Mining Association held certain leases from Her Majesty of coal areas in Nova Scotia.

By the Statute of Victoria (Nova Scotia), Chapter 9, Section 1, it was enacted as follows:

"Lessees of coal mines in this Province, their executors, administrators and assigns, holding leases from the Crown, or from the Chief Commissioner of Mines, made since the first day of January, A.D. 1853, or hereafter to be made, shall, upon giving notice in writing to the Chief Commissioner of Mines at least 12 months previous to the expiration of such leases respectively of their intention to renew such leases respectively for a further period of

twenty years from the expiration thereof, be entitled to a renewal thereof for such extended term upon the same terms, conditions and covenants, as contained in the original lease, and in like manner upon giving a like notice before the expiration of such renewed term to a second renewal and extension of term of twenty years from and after the expiration of such renewal term; and in like manner upon giving like notice before the expiration of such second renewed term to a third renewal and extension of twenty years, from and after the expiration of such second renewed term, provided that at the time of giving such notice, and the expiration of such terms respectively, the said lessees, their executors, administrators and assigns, are and shall continue to be bona fide working the areas comprised within their respective leases and complying with the terms, covenants and stipulations in their respective leases, and until after the expiration and meaning of Section 104 of the Act hereby amended, and provided that in no case shall such renewal or renewals extend, or be construed to extend, to a period beyond sixty years from the 25th day of August, A.D. 1886, and provided also that the Legislature shall be at liberty to revise and alter the royalty imposed under such leases, and to alter the rate of the same."

In the fourth revision of the Statutes of Nova Scotia (R.S. 4th Series, Cap. 9, Sec. 102), which came into effect in the year 1873, and in the fifth revision (R.S. 5th Series, Cap. 7, Sec. 105), which came into effect in the year 1885, the provision as to increasing the royalties was altogether omitted from this Section.

In 1885 the Statute 48 Victoria (Nova Scotia) Chap. 4, was passed, the effect of which is as follows:

"All leases of coal mines issued after the passing of this Act shall contain a provision that the royalties may be increased, diminished, or otherwise changed by the Legislature."

In 1886 the leases granted to the Association expired, and all necessary conditions having been performed, renewals were granted.

My opinion is asked:

1. As to whether the word "leases" in the Statute 48 Victoria, Cap. 4, Sec. 4, includes these renewals.

2. As to the meaning and effect of the following clause in the form of renewal above mentioned: "Provided that the Legislature shall be at liberty to increase, diminish, or otherwise change the royalty imposed by these presents, or renewals thereof, as they may think fit."

I am of opinion that the word "leases" does not include these renewals, but only includes original leases granted after the passing of the Act. The provision is expressly made applicable only to leases issued after its passage. If the Legislature had intended to include leases issued before the passing of the Act, it would undoubtedly have expressed that meaning more plainly, e.g. by using the words "a renewed" after the word "issued" in this Section.

2. I am of opinion that the words of this clause or proviso have, strictly speaking, no legal effect whatever. The Legislature has power to increase, diminish, or otherwise change the royalty, and this provision cannot in any way affect that power.

If the lease is to be construed as if the word "lessor" or the words "Commissioner of Public Works and Mines" were substituted for the word "Legislature," then a serious question does arise.

That question is this: Can the royalty be increased without the consent of the lessee at any time during the continuance of the term granted by the renewal, or can the power be exercised only on the occasion of a further renewal of the lease? In other words, is it intended to give the lessor power to increase, diminish or otherwise change the royalty on every day in the year during the six years, or only at the expiration of each period of twenty years, and upon the renewal of the lease.

I am of opinion that this provision must be read in connection with the provisions for renewal, and that if the words "Lessor" or "Commissioner" were substituted for "Legislature" the Commissioner could only increase the royalty on the occasion of a renewal.

This construction gives a reasonable effect and meaning to the Act. It gives the lessee the term of twenty years at a certain rent, and the option of refusing to renew if the royalty be increased oppressively. It gives effect to every word of the proviso. It gives effect to the words "These presents" because the royalty thereby granted may require to be increased when the next renewal is granted. The word "renewals" is also required in order that the royalty imposed by any subsequent renewal may also be increased upon the occasion of a subsequent renewal.

Any other construction would bind the lessee to a contract of the most unreasonable and uncertain nature, and would place in the hands of the lessor extraordinary and unreasonable powers of oppression. A lease of that character would be absolutely useless and valueless as an inducement to invest or continue capital in mining enterprises. Such a construction will not be placed upon the provision unless the words absolutely require it. And I think they do not so require.

HALIFAX. (Signed), R. L. JORDEN.

**The Cost of Mining Labour in the United States.**

A recent Foreign Office report gives some interesting details regarding the conditions and cost of mining labour in America. We make the following extracts—

*Illinois*.—Coalminers proper are always piece-workers, and control in greater or less degree their own time. Being paid for the number of tons they mine and delivered for the hours they work—the amount of coal sent up

is the measure of their earnings, and the proprietor keeps record, and is interested in his rather than in the hours of labour. Fortunately, in the character of the mineral, his own skill, or other circumstances, the miner may do more than a nominal day's work in less than a day's time and quit work, or, if unfortunate, he may work overtime, or he may work when the mine is not running and get coal ready to hoist. Therefore, the days when a man is credited with coal are the days he supports the cost of labour. Fortunately, but he cannot be recognised as a perfectly correct record. In the same manner the monthly earnings are not necessarily the amounts earned by a full month's labour, but such as the man is credited with on the pay-roll for a given calendar month; sometimes, too, the labour and earnings of a father and son, or two or even more men, are represented in a single account with only one of the actual workers. With regard to other employees in and about mines, they are paid by the week or month, and their time record is accurate.

A comprehensive investigation was made at a number of the principal mines in the State of Illinois, and statistics compiled, embodying the records of many thousand men, and showing just what each man had done of labour and output, and the earnings thereon. It shows that the average running time at the mines during twelve months was 213 days, the full time 281, and the possible time 306 days. The number of days' work done per month was 15.9 out of a possible time of 25.5 days per month, or a total for the twelve months of 190.8 days out of a possible time of 306 days; thus the miner found it took an average of 1.56 days to produce one ton of coal. The average daily earnings of the miner were 9s. 24.4d.; but the average monthly earnings amounted only to £7 6s. 64d., or £87 18s. 3d. per year, which gives a more definite conception of the actual revenues derived from labour performed. The average number of tons of 2,000 lbs. mined per man was 78.9 per month, or 4.8 per day. The average coal miner receives less than 20c. a day; 30 per cent. receive less than 45 c. a day; only 5 per cent. receive more than 8s. 9d. a day. From enquiries among the men it appears the average income per family is £105 11s. 3d. a year; the average number of persons working per family was 1.4, making the average income of each person working £74 11s. 8d. The average amount expended for the year for food per family was £43 12s., of which £16 2s. 7d. was for meat. Rent averaged £12 1s., and clothing £17 5s. 9d. per family, or £3 9s. 5d. per individual, the average number in each family being 4.98 persons. The average total yearly expenses of each family was £97, of which individual £19 9s. 3d., and of each adult £32 7s. 9d.

*Iowa*.—With regard to miners the conclusions arrived at in Iowa are admirably applicable to other occupations, as the books of a mining company are ambiguous, and the men, who always work on check numbers, are paid by the lump call they produce at a stated price per ton; as before observed in the part relating to miners in Illinois, these pay rolls show the number of days a miner puts out coals, not the number he worked, and the number of days he worked. In Iowa, too, a miner may be assisted, perhaps, by his son, but only one person receives the pay on the check number. According to the Census report issued March 1891, the average yearly earnings for Iowa coal employes are £87 9s. 11d., or 5s. 84d. a day, allowing 308 working days in the year; but as these conclusions are arrived at from averages of men, it is not surprising to find it unsafe to say that after deducting expense of powder, oil, and smelting, the earnings of coal miners will not average above 4s. a day in that State. In some States the real earnings of miners are still less, while in Kansas, Wyoming and Colorado they are more. The average loss of working days in the year in coal mines is about two-fifths, and it is reasonable to call on a similar basis of working time in Iowa.

*Colorado*.—At the mines ten hours constitute a day's labour in ordinary work, and in some mines ten hour shifts only are employed; engineers and foremen usually work twelve hours. In heavy labour in some portions of the work, and in one or two mines, eight hours is a day's work. Miners are mostly paid by the month and their daily wages ranged in 1885 as follows:—

Occupation.	Highest.		Lowest.		
	£	s. d.	£	s. d.	
Miners.....	0	16	6	0	10
Foremen.....	1	4	6	0	16
Timbermen, blacksmiths..	1	0	7	0	14
Carpenters.....	0	16	6	0	12
Engineers, pumpmen.....	1	0	7	0	16
Blacksmiths.....	0	12	0	7	3
Ore sorters.....	0	12	0	7	2
Labourers.....	0	10	4	0	6

*Minnesota*.—With regard to miners, who are stated to work twelve months in the year, the average annual earnings, as mentioned above, are collected at 310 working days; but it is presumable that few, if any, work that number of days in the year, therefore in their case, and possibly in some other occupations, the sum stated to be the average annual earnings would appear to be rather the possible than the actual earnings, and the months to represent the time during which it was possible to work, not the actual number of days worked.

### First Quarterly General Meeting of the Mining Society of Nova Scotia—A Successful Gathering of the United Mining Interests of the Province.

The first regular Quarterly General Meeting of the Mining Society of Nova Scotia was held in the rooms of the Society at Halifax, on Friday, 17th inst.

#### Morning Session.

Among others present were: H. S. Poole, A.R.S.M., Acadia Coal Co.; S. B. Hart, John E. Hardman, S. B. M. E., Oldham Gold Co., Oldham, N.S.; Capt. G. MacDuff, Palgrave Gold Mining Co., Waverley; J. M. Reid, Oxford Gold Mines, Musquodou Harbor; C. E. Willis, Halifax; J. S. McLennan, International Colliery, Bridgeport; G. J. Partington, Whiteburn Gold Mining Co., Whiteburn; E. D. Davison, Bridgewater, N.S.; T. R. C. C. Halifax; J. R. Lithgow, Glace Bay Mining Co., Halifax; H. A. Budden, International Coal Co., Montreal; B. G. Gray, Halifax; Duncan McDonald, Truro; H. Austen, Halifax; George W. Stuart, Truro; Dr. E. Gilpin, Jr., Inspector of Mines, Halifax; Charles Archibald, Gormic Coal Co., Cow Bay; Lucius J. Boyd, Waverley; Dean S. Turnbull, Empress Gold Mine, Beaver Dam; Howard Clarke, Halifax; W. G. Mathes, N. S. New Glasgow; G. E. Franchly, General Mining Association, Halifax; J. M. Wythe, Secretary, Halifax; B. T. A. Bell, Editor CANADIAN MINING REVIEW, Ottawa. Mr. H. S. Poole, President, in the chair.

The Secretary read the minutes of previous meeting and presented the report of business transmitted by Council since last meeting, which were confirmed.

Mr. JOHN E. HARDMAN, moved, seconded by Mr. J. S. McLennan: That whereas by resolution passed on the 24th of May last, the Gold Miners' Association of Nova Scotia does hereby express its willingness to amalgamate with the Mining Society of Nova Scotia, under that name and title, to transfer to that society the assets, debts, and lists of the Association, therefore be it resolved that the Mining Society of Nova Scotia does hereby accept the membership of the said Gold Miners' Association of Nova Scotia, with its assets, debts, property and list of members.

Mr. H. M. WYLDE, in answer to an enquiry, stated that there was a sum of \$63 in the treasury of the Gold Miner's Association with no liabilities worth speaking about. The resolution was carried unanimously.

#### The Coal Royalty.

THE CHAIRMAN—An important question coming up to-day for further consideration was that in respect to the recent levy of an increase in the royalty on coal. Possibly it may appear that this was a question affecting the coal members of the society only, and perhaps it might be better left in the hands of a sub-committee of the present meeting to discuss what steps should be taken regarding further action. Perhaps it would be necessary to approach the Governor-General in Council with a memorial praying for its disallowance. It was a question which had not been decided by Council.

Mr. G. J. PARTINGTON—The question, sir, is one which affects the whole mining community—the gold and iron and gypsum—as well as the coal operators. If the right of the government was admitted in this instance, it might be extended and increased on the output of gold also. A discussion on the question might allude some new points.

Mr. C. ARCHIBALD—I quite agree with Mr. Partington that the matter affected the gold mining interests as well as the coal. A general discussion would enlighten the meeting and the matter could then be committed to a sub-committee to report later in the day.

Mr. J. S. McLENNAN—It would expedite matters if the sub-committee dealt with the matter first and then make some recommendation or report which could then be discussed by the society. He would move that the chairman name such a sub-committee to consider the question and report at the afternoon session. The motion was carried.

THE CHAIRMAN named Messrs. McLennan, Budden, Archibald, Franchly and Lithgow, as a sub-committee.

#### A United Mining Convention at Montreal.

THE CHAIRMAN—Mr. Bell has, I understand, some suggestion to submit from the General Mining Association of Quebec?

Mr. B. T. A. BELL—At a recent meeting of Council of the General Mining Association of Quebec, a suggestion was made to hold a united mining convention at Montreal next year. With this view, negotiations had been entered into with the American Institute of Mining Engineers and other bodies, and replies favorable to holding such a convention had been received. The idea was to invite all the Canadian Associations to unite with the leading mining men of the United States in discussing such questions as mining legislation and mining practice. Papers on the mineral resources of the various provinces and their development would be submitted, and would doubtless do much to attract the attention of capitalists to Canada as a good field for investment. The order-in-council respecting the free admission of mining machinery not manufactured in the country would expire next year, and he thought that if a well directed move was made, this beneficial legislation might be renewed for another period. The Government would be pleased to have the Mining Society of Nova Scotia in conjunction with the other Canadian Associations, unite and co-operate in carrying out a programme for such a convention.

Mr. JOHN E. HARDMAN Speaking personally, I

am heartily in favor of Mr. Bell's proposition. The question as to whether we should go as a representative body or as individuals might, however, be left in the hands of the Council.

Mr. B. C. WILSON—It might be well to appoint delegates.

Mr. B. T. A. BELL—The idea was not only to have a representative attendance, but also to have the Province of Nova Scotia represented by papers on its resources, mineral development, mining legislation, and such subjects of peculiar interest to itself.

Mr. JOHN E. HARDMAN moved, seconded by Mr. Archibald: That this Society express itself as favorable to the idea of a united convention, to be held in Montreal on or about the 23rd of February, and the matter be referred to the Council to report at the next Quarterly Meeting.

The motion was carried unanimously.

#### New Members.

On the motion of Mr. C. E. Willis, Dr. Haley, President of the Newport Gypsum Mining and Manufacturing Co., Windsor, was elected a member, and Mr. Hugh Med. Henry, Q.C., was elected an associate member of the Society.

#### Revision of Constitution.

After some informal discussion on the classification of the roll of membership, it was resolved, on the motion of Mr. Hardman, and seconded by Mr. McLennan, "That the Constitution and By-Laws of this Society be submitted to a special committee, composed of the following members: H. S. Poole, J. E. Hardman, R. G. Leekie, B. T. A. Bell, G. W. Stuart, J. S. McLennan and the secretary, for revision, and report thereon at the next Quarterly meeting."

#### The Society's Rooms

Mr. BELL said that it was very gratifying for the members to be able to meet to-day in the very comfortable and commodious quarters which their genial friend Mr. Gue has so thoughtfully provided and so generously furnished for their use, and he moved, with great pleasure, that the hearty thanks of the Society be conveyed to Mr. Gue. Mr. Stuart seconded.

THE CHAIRMAN expressed gratification that the Society was housed at present in such excellent quarters, and upon such excellent terms—freely and unostentatiously given. He had much pleasure in tendering to their kind host the unanimous and hearty vote of thanks of the members of the Society.

The meeting then adjourned until 2.30 p.m.

#### The Coal Royalty.

Messrs. Budden, (chairman), Franchly, McLennan, Archibald and Lithgow, the sub-committee on the coal royalty increase, met immediately afterwards and held a private session. Mr. Lithgow read extracts from a correspondence he had had with the Hon. W. S. Fielding, Provincial Secretary, (published in full elsewhere). Letters were read also by the chairman. It was understood that the committee recommended that a memorial to the Governor-General-in-Council be prepared and presented to the Hon. the Minister of Justice at Ottawa, praying for the disallowance of the recent legislative enactments of the Nova Scotia Government in respect to the increased royalty.

#### Afternoon Session.

Members met at three o'clock, the President in the Chair. The sub-committee on coal royalty reported in favour of a memorial to the Governor-General-in-Council.

Mr. C. ARCHIBALD said that the members of the Cape Breton Coal Miner's Association were willing to bear their proportion of the expenses incurred in thoroughly testing the increased royalty law in case the same should be taken to the courts, or in the event of any memorial being submitted.

Mr. J. S. McLENNAN moved that the report of the sub-committee be adopted.

Mr. JOHN HARDMAN seconded the motion. Carried unanimously.

#### Exhibits for the World's Fair.

Dr. E. GILPIN, Inspector of Mines, said that the Government had appointed an advisory board in connection with the Chicago Exhibition. The Government wanted to make an exhibit of the mineral resources of Nova Scotia as complete and representative as possible, and Dr. Saunders had informed him that they could have as much space as they required. It was also intended to be represented by the local fisheries, forests and fruit resources. He mentioned the latter in case any of the gentlemen present might have an opportunity of picking up exhibits. With regard to valuable gold specimens he was afraid they could hardly expect specimens to be presented gratuitously for the purposes of the exhibition, but he thought some suitable arrangement might be made with the Government for the use of the same. He would be glad to have suggestions from the members, and hoped that the miners would all co-operate and do what they could to assist in making an exhibit that would reflect credit on the Province.

Mr. J. M. REID—I have a few suggests that are at the Government's service, provided it will guarantee their safe return.

THE CHAIRMAN—They will be insured by the Government.

Mr. T. R. GUE presumed that proper precautions would be taken to ensure their safety and safe return.

#### Mining Engineers to be Qualified.

Dr. GILPIN, continuing, said there was a movement on foot by the Canadian Society of Civil Engineers to have a statute enacted whereby only qualified engineers should be admitted to practice. The matter was of great importance to the mining engineer and the mining community generally, and he suggested that the Society take some steps to help this matter along. In conclusion, he directed the attention of the Society to the remarks made by Mr. Hugh Fletcher, B.A., in his report for the members of the Geological Survey of Canada to the Civil Service Commission, having particular reference to a wider distribution of the survey reports and maps.

#### The First Crushing Mill in Nova Scotia.

Mr. C. E. WILLIS pointed out that at Chizetcook was to be found the first gold crusher used in Nova Scotia. The first method practiced of extracting the gold from the quartz in this Province was at Mooseland where they made a hole in the ledge rock and used a pestle. The first mechanical mill was built at Mooseland. It was afterwards taken to Tangier and is now at Chizetcook, the property of Mr. Graves of Boston. The mill should be secured and preserved as a relic to enable the methods of working in vogue in the Province thirty years ago. It could be got at small expense. I have received permission from the officials of the Public Gardens at Halifax to place it there for safe keeping, if it can be obtained without any expense to the city. Mr. Partington, the agent of Mr. Graves, assures me that he can obtain the mill. The expense of placing it in the Gardens would amount to about \$25 outside. I would suggest that this Society assist in placing this mill in the Gardens as a permanent exhibit of the old methods of gold mining in Nova Scotia.

Mr. G. J. PARTINGTON—I have great pleasure in seconding Mr. Willis' motion.

The motion was put to the meeting and carried unanimously.

Mr. CHAIRMAN called upon Dr. Gilpin to read his paper.

#### Notes on Nova Scotia Iron Ores.

Dr. GILPIN—I do not pretend to claim any degree of originality for these notes, as I treated the subject in some detail in a paper recently read before the Canadian Institute of Civil Engineers. It occurred to me that as you had a paper on explosives, one on gold, and the names of two men prominently connected with coal mining were down on your list, I might complete the cycle by taking up the subject of iron ores.

Historically speaking, the history of iron ore mining and smelting in Nova Scotia, as well as in the Dominion, is a disheartening record of ill-advised starts and subsequent failures. A few exceptions stand out prominently. Bartlett, in an interesting paper published a few years ago, gives a succinct account of the progress of iron working in Canada, and many valuable statistics showing the amount of our imports of iron in its varied forms.

I may perhaps give a glance at the relative positions of the chief geological horizons recognised in the Province, in some one of which each of you is more specially interested. The differences of the more profound geologists as to the exact equivalents and ages of some of these rock masses need not be dwelt upon in this connection, especially as you will find that the geographical and geological relations of the iron ores are somewhat in unison. We have, therefore:—

- The modern or surface soil.
- Trassic sandstone and trap.
- Carboniferous, including permo carboniferous, upper coal measures, true coal measures, marine limestone, lower or local carboniferous.
- Devonian, Oriskany sandstone, etc.
- Upper Silurian—Clinton, lower Helderberg.
- Lower Silurian.
- Central-Silurian.
- Lower Cambrian—Longmynd.
- Laurentian.

All the above horizons carry iron ore, some in large amounts, others in quantities not yet recognised as of value, except the lower Cambrian, the slates and quartzites of our gold fields. I have never been able to hear of any deposit of iron ore of any amount promising to be of importance. The only occurrence of iron ore I have seen was a bed or seam about three inches wide a few miles west of Goldenville. It was a soft limonite, and may have been the result of oxidation of iron pyrites. Some of you who are more intimately acquainted with our granite and the gold-bearing strata may know of deposits of iron ore in them. The subject is interesting, for its rate to meet so large a series of rocks amounting in many places in beds containing a good deal of ferruginous matter, and traversed by faults and foldings, not holding more or less segregated bodies of iron ore. Near Grand Lake there are some exposures of red hematite which were reported as belonging to the gold measures. Those that I saw were contact deposits between carboniferous conglomerates and grits and black slates belonging to the upper part of the gold-bearing rocks. In this connection I do not, of course, allude to the beds of bog iron ore which are not uncommon in the gold districts. The value of a good bed of iron ore on the Atlantic coast, within easy reach of shipping, would be considerable and might be greater than of some gold mines. It may be remarked that, as the auriferous rocks of the Province show little trace of fossils, the iron ore beds, if found, might be compared comparatively free from phosphorus.

The bog iron ores which occur at numerous points in Nova Scotia in connection with the sites of swamps will

prove of interest to our furnace men in the future. They are worked to the extent in Quebec for local furnaces. They are too low in iron and too high in phosphorus to be available for export, or to be in demand for other than foundry purposes. Their method of formation is interesting as illustrating the aggregation of the sedimentary ores of iron in almost every age. Waters containing carbonic acid, dissolving iron from the strata they percolate by means of certain complicated combinations, deposit it again when the water is thin and water highly charged with vegetable matter. In some cases the result is only a sand charged with ferruginous matter which will harden into a rock containing a few per cent. of iron. In other cases the resulting bed as now presented will contain a preponderance of iron, with percentages of silica varying from a minimum up to one rendering it valueless to the furnace man. An instance of this is met in Pictou County, where the bed is composed of fine grains of sand, each grain coated with iron oxide. At one point the coating of ore is so thick that analysis shows it to contain some 50 per cent. of metallic iron; gradually, from the richest portion of the bed, the coatings grow thinner, as it is followed right and left, until it becomes a ferruginous sandstone, and finally a coarse sandstone. These ores as met in Pictou County are highly charged with iron, come under my notice, by some process in the alchemy of nature are usually free from phosphorus. When, however, the deposition of iron oxide took place upon a layer of sand or marl abounding in the "fossil" forms of the particular horizon, which may have been either an ancient lake or even a salt water bay, etc., not only are the casts of the fossils retained but the ore is generally phosphoric. I allude here more particularly to the beds of the Clinton, etc., in Pictou county. At one time these beds may have been higher in grade over wider spaces than they are now, and it is easily credible that in the long periods that have elapsed since they were laid down they may in turn have been themselves subjected to the action of waters capable of leaching out some of their iron in the presence of small crystals and veins of quartz in them would be some proof of a process of replacement.

Passing for the present to the carboniferous measures, we notice that "clay ironstone" ores occur in all parts of it. I am not yet aware that they have been met in quantities to excite the cupidity of the miner. It is in the carboniferous marine formation, best known to the general public as the Geynes and Hamilton, and in the Silurian lands, and in the underlying or basal conglomerates or shales, that we meet our most interesting deposits of iron ore. In addition to the nodular layers of carbonate of iron there are, at two or three points, beds of the purer variety known as spathic ore.

As, for the purpose of this paper, the carboniferous may be considered the latest formed rock series of the Province, as well as one of the most extensive, it is evident that as it ranges through the country it must rest now upon one, now upon another: the earlier formed rocks. It thus occurs resting upon granite, Devonian, Silurian, Cambrian, Laurentian, etc., always of course, unconformably. These junctions are always of interest to the student of field geology. You are probably all acquainted with the celebrated Gays River junction, where the limestone rests on the gold measure with a layer of fine detritus between. At other points sandstones and shales rest on the older rock, like layers of plank and boards butting against a brick wall, or have the point of junction cemented with silicious, calcareous, or feldspathic matter, and often fragments of the older rock abound in the newer along the plane of contact. When limestone forms the later rock the passage from the pure limestone to the slates is often gradual.

It will be readily understood that these lines of junction form natural highways for the passage of underground waters. These waters, governed by no law we are cognizant of, frequently exert their powers to give us junction deposits of iron ore. A glance at the contact deposits of Pictou county will serve as an example of the limonite deposits. Here the marine limestones come, at many points for considerable distances, in contact with Silurian slates. Evidently denudation has swept away many feet of measures, a process hastened by the access afforded to water by the planes of contact, and by the lines of faulting which frequently characterize newer rocks at their junction with older strata. As this went on the particles of iron ore gathered in the older slates, as well as from the carboniferous strata, were accumulated at the junction. As the limestone was moved it was either replaced by the iron oxide or the channels of the water currents were filled with it. In the Whitehaven district in England there are many interesting examples of the replacement of masses of carboniferous limestone by iron ore, and of the filling of channels and crevices in it by the same means.

To complete and, if I may use the word, "so carefully conducted" has been the replacement of each particle of limestone by one of iron ore, that the lines of bedding and the fossil remains have been preserved. This melting down of great masses of limestone, and accumulation of masses of limonite, is well illustrated in Pennsylvania, in some of the Silurian limestone districts.

In the case of the contact deposits between the basal carboniferous conglomerates and the older rocks, the process has presumably been somewhat similar. These ore bodies are often irregular and thicken or thin out rapidly. The thicker bodies represent perhaps the line of most decided action, and the points where the boulders of felsite, granite, slate, whin, etc., were removed and their place filled with iron ore. As the attention of the miner is turned to the lower beds of iron ore he finds that while perhaps a thin seam follows the line of junction,

the power acting on the conglomerate has become weaker. The ore when broken shows inclusions of rock; gradually the percentage of more or less formed rock increases, until only the surface of the boulders has been transformed into ore; finally the only indication left is the replacement of the original silicious or calcareous bond of the pebbles by one of iron oxide. Often the process has not advanced beyond a thin film of ore at the point of junction, or a coating of the boulders. I think I am correct in saying that the limestone contact rock grows greater, often varying in their water contents, and sometimes manganeseous, while the contact deposits making the basal carboniferous rocks are hematites. This presumably is merely due to greater age and slight metamorphic action.

Descending once more in the geological scale, the next notable deposits are the bedded hematites, sometimes magnetic, of the Laurentian limestones, as met at Whyloghmal and East Bay. There are always conflicting theories with regard to the modes of formation of every mineral deposit in this wonderful horizon, and I will not detain you beyond remarking that to the miner these deposits appear in their ore contents, relation to surrounding rocks, etc., to resemble closely those of Pictou and Annapolis counties, always called "beds," and to suggest their having been formed in a somewhat similar manner.

The vein deposits of limonite at Londonderry and of specular iron ore at the East river, Pictou county, appear to have accumulated in a fracture running with the general course of the strata, and to have been accompanied by replacements of country rock by carbonates of iron, lime and magnesia, and more or less secondary segregations of iron ore.

This brief and imperfect glance over the classes of iron ore presented in Nova Scotia may prove interesting to the miner as well as to the geologist and the student of mineralogy. The miner, whose interest it is to extract the best ore at the cheapest rate, need not concern himself with the disputes of geologists, but he must thank them for the classification of the facts gathered by many generations of his predecessors. His outlays on junction deposits must be more carefully made than in bedded deposits; his preliminary work more particularly directed to proving ore in advance; his attention directed to the variations in quality due to the modifying effects on his ore of the different strata it was influenced by during the process of formation. When mining the bedded deposits he must be guided by the motto, "All that glitters is not gold," for the grade of his ore and its sulphur and phosphorus contents continually vary. Still he has the advantage of a longer stretch of reasonably assured regular workings. If he is to win ore from a vein, the skill of his foreman and their unremitting study of the working faces have to be invoked to assist him in laying down the best rules for following leaders, slips, and for meeting the host of curious changes every vein shows as it is followed.

As I feel that this rambling paper, which was designed to provoke discussion, has reached its limits, I will close, with the hope that all members of the Association will give it the benefit of the curious or anomalous phenomena they meet in their mines, for brief notes on such points are very valuable from the discussion following them.

#### Discussion.

Mr. JOHN HARDMAN wished to know whether the deposit of iron ore at Grand Lake was red or brown?

Dr. GILPIN—It is apparently a red hematite.

Mr. HARDMAN—Is it silicious?

Dr. GILPIN—Yes.

Mr. WILLIS said that about four years ago he was down at Lockport, and on the beach, and for a mile along the shore he found masses of brown hematite ore. It is a granitic formation, and evidently there was a large deposit of brown hematite in that vicinity.

Dr. GILPIN—I was going to say that boulders of brown hematite are not uncommon about Bedford and Sackville.

THE CHAIRMAN suggested that they might have drifted from Lake Rossignol.

Dr. GILPIN. It would not be further than from Londonderry or from Truro.

#### On the Introduction of New Explosives for Coal Getting in Nova Scotia.

By H. S. POOL, A.R.S.M., F.G.S., STELLARTON.

The selection of the writer to present to this Society a paper on the introduction of new explosives in our coal mines has been solely made because in the pits under his charge there has been a large consumption of the so-called flameless explosives than elsewhere in Canada.

He has nothing new beyond the practice in question to speak of, and the following notes have been put together with that understanding.

The quantity of inflammable gas met with in several of the pits of Pictou County, early pointed to the extra danger there attending the use of ordinary blasting powder, and led to the drafting of strict rules governing the firing of shots in coal long before mining legislation made similar precautions compulsory. Until lately, when from the free evolution of fire-damp in any workings, the risk accompanying shot firing seemed excessive, the only alternative open to the miner was to abandon powder altogether and fall back on "mud and wedge."

But in Europe the possibility of preparing explosives making less flame than powder, engaged the attention of

chemists for many years, and met with marked success. Recent legislation has forced this foreign enterprise on the notice of all our coal operators, in consequence of the undoubtedly additional risk that has been proved to attend the use of common powder in pits of a certain character. It is not proposed to follow step by step the enquiries made by royal commissions in Prussia, Austria, France and England, nor to refer to the various compounds which seemingly can be used as substitutes for powder in the notice of the several reports, or summaries of them which have been given in colliery periodicals.

Some four years ago no explosives of this new class being then available in this country, shot firing stopped in the Acadia pit at Westville and shortly after powder was also given up in the adjoining Drummond mine on the same seam. As yet in the former no other explosive has been introduced, the coal working freely under the pressure entailed by the depth of cover, now about 1,500 feet, vertical over the levels of the eighth lift. At the time the use of powder was abandoned in these pits attention was drawn to the advantages and decreased risk accompanying the firing of shots in Germany with such compounds as carbonite, though the difficulties of importation then barred its adoption in this Province.

Trials, however, were made with blasting gelatine and water cartridges, which, though flameless, did not seem to promise satisfaction in pits where the character of the coal required a large number of shots to be fired each day, say three in each working place each shift. It was found, so slow was the process of tying each charge in its bag of water, that in such a pit as described an army of shot-firers would be necessitated; besides, it was felt in the desire to reduce the preparation of the comparatively large percentage of shots would undoubtedly lose the water envelope and hence might show flame; besides the size of hole the water cartridge required was another objection. Previously, it should be added, an attempt was made at Sydley mines to bring down coal with lime, but it was not proceeded with.

Later on the Acadia Powder Co., with works at Waverley, took up the question of flameless explosives and prepared several samples. These were practically tested in the Vale pit in April, 1890. When fired under confinement they all proved flameless, even when the stemming was blown out under conditions that with powder would have produced an abundance of flame. The work done by these samples was, however, irregular, and the details of the tests are not given, but generally which defects further experimenting was necessitated. In the meantime a local company started at Halifax the manufacture of roborite, the best known preparation of its class in use in England. But before relating in detail the experiences connected with the practical application of these two compounds supplied by the Koburite Company and the Acadia Powder Company, a few remarks of a general character on the subject of explosives may interest men, who, like the writer, had not previously given the matter attention.

At the same time it is proposed to mention in a very summary way the theoretical grounds for believing black powder should be excluded from certain coal mines.

All engaged in coal mining are aware that the workmen with their choice contented with some inferior material to compare with powder for bringing down coal; nor is this preference confined to colliers. Mining engineers of repute are also to be found who insist that for certain strata no other explosive can touch powder. This view has been put down to prejudice, especially by the champions of new compounds, who may be as positive as their blasting experience is limited, and it may be worth while to consider whether there is any real basis for any theoretical ground in favor of their contention.

To those familiar with explosives, much that is here given will necessarily appear very rudimentary, but possibly to others the points that were found of interest to the writer may also prove so to them, now especially when legislation brings into disrepute gunpowder without offering to explain why it is considered more dangerous than some other materials of similar nature.

The Cape Breton miner who knows that in his County some 19,000,000 tons of coal have been won by the probable consumption of some 1,500 tons of powder without the occurrence of an accident involving the lives of as many even as three men, cannot see wherein lies the danger that is in excess of other sources of accident to which he knows he is exposed. The additional risk which long immunity has shown to be fractional, he is willing to take, especially as efficiency, cheapness and convenience, a change from powder, so far as he knows, is not for the better. He knows that dynamite and its allies are too quick in action, shatter the coal too much and make a larger percentage of small coal than powder, which brings down more coal shot for shot, and tends away from the whole to the larger mass by the action of the explosive. The special danger attending the use of powder has not as yet, fortunately, shaken his nerves, so to find the necessary experience we have to look at the mines of Cumberland and Pictou Counties. In these counties inflammable gas is often freely evolved and the roadways and walls of the working places covered with a fine dust noticeably worse than in cold or warm weather, and where these conditions exist a blow-out or "ground shot," emitting a stream of flame and sparks a distance, it may be, of six or eight yards, has a very ugly look and suggests the worst of possibilities.

Prior to Nobel giving to the world his investigations with nitro-glycerine, which revolutionized the manufacture of explosives, the mixtures generally employed were of one class, combustible as gunpowder, and a considerable of substances that have so strong a chemical affinity that

they combine and generate gases with rapidity on the application of heat. Under confinement, this sudden evolution of gas causes explosion, but unconfined there is rapid combustion only.

In the manufacture of powder for different purposes, changes have been made in the relative proportion of the ingredients, in the purity of the materials, in the size of grain, and in the substitution of substances chemically equivalent—the latter often to cheapen the production, as in the substitution of nitrate of soda instead of nitre. The remarkable influence on the quality of the charcoal used was early noted, certain woods furnishing superior charcoal to others, but the greatest stride in this direction was in the adoption of some straw fibre, and that imperfectly carbonized. At least it is reported that cocoa powder largely owes its exceptional efficiency to this innovation, although of course rival manufacturers who sought to discover its composition had no difficulty in at once noting that it contained an unusually small percentage of charcoal, 3 per cent. only, while the ordinary mixture in gunpowder ranges near to sulphur with 15 of charcoal and 75 of nitre. Whatever may be the composition of cocoa powder, the change made has given it a progressive quality at the moment of explosion not attained by any previous mixture.

The better to understand the theoretical source of danger attending the use of powder, it may be well to consider the explosive action in the study of the relation of powder to gun for military purposes and see wherein it applies to the question before us. To begin with, it is necessary to distinguish between the ignition and the total combustion of powder; to note the rapidity with which the heat resulting from the burning of one grain spreads the conflagration to adjoining grains, and the entire consumption of each grain. Thus it is found the larger the grain the quicker the ignition, but the slower the combustion. This property is taken into consideration in the preparation of powder for different purposes, and explains why small-grained and mealed powder are used in fireworks and large grains in cannon proportionate to the length of the piece. In the former the communication of burning from grain to grain is purposely made slow, although the total decomposition of each grain, being small, is rapid.

For military purposes to obtain a continuously increasing propulsive force that will develop a low trajectory, the rapidity of combustion of powder has been regulated by the composition, the relative percentages of the ingredients in the mixture, as well as the size and shape of the grain. For guns of different sizes special powders are prepared, the size of the grain varying with the object of producing initial pressures at the breech of the gun as low as possible, at the same time maintaining a progressive action behind the projectile as far as the muzzle without the explosion of unconsumed powder. The most modern form of large grain is understood to be a pierced hexagonal prism. Although powder has been so long known, a great improvement has been effected in its efficiency within the last twenty years. Instead of imparting to the projectile an initial velocity of 1,500 ft. per second as a maximum, a flight at the rate of 2,000 ft. per second has been attained so late; at the same time the internal pressure exerted by the explosion of the charge in the gun has been diminished from 20 to 13 tons per square inch.

For mining purposes, where a progressive action is desirable, as in rendering down coal, the size of the grain of powder has something also to do with success; and the quantity of powder used should be proportioned to the depth of the hole to be drilled. But the object the miner desires to attain differs somewhat from that of the artilleryman; the one looks to explode the stemming without fracturing his piece, the former to cause the tight tamping of the stemming to rupture the breech of his gun, and this disruption necessitating a new bore-hole, for each shot declares him from experimentally proportioning his charge so as to avoid the explosion of some unconsumed but ignited grains of powder into the atmosphere. It is the emission of ignited but unconsumed grains that is so dangerous in the case of dry and fiery mines. There is also in the explosion of powder a large amount of heat evolved which further expands the gaseous product of combustion and also projects into the atmosphere the solid residue at a high temperature. An additional objection to the use of powder in a dry hole occurs when the oxygen is left in aid adds to the inflammable material. The presence of the excess of carbon is imperfect and produces the deadly carbonic oxide which when heated burns in contact with the oxygen of the air and generates more heat. For a time in England a compressed form of powder has been found convenient, but for the reasons stated above it is considered somewhat more dangerous than the ordinary form.

Having shown some of the sources of danger attending the use of gunpowder, it is very plain we have now to consider in what direction safer explosives have been sought. More or less success was found to attend the mining or enveloping of high explosives with salts, such as alum, that contain a large percentage of water of crystallization. The earlier Prussian and Austrian commissions recommended the admixture of carbonate of soda. Soda-water-dynamite contains 40% carbonate of soda and 66% of dynamite; its explosive force is low and it freezes at 95° Fahr. and what is worse, at a temperature of 95° Fahr. it loses water of crystallization, which causes the nitroglycerine to exude.

Partial success was attained with wet moss as stemming. Then it was shown by experiment that dynamite and other high explosives did not give a flame if the stemming exceeded 16 inches, but that with less they gave a flame that ignited gas; so again, when dynamite is burnt it will

ignite fine coal dust, but when exploded no combustion takes place. Other experiments showed dynamite and wet moss will not fire a 5% mixture of gas and air, but would fire one of 8%. One great objection to carbonate of soda is that this salt is inert, so that when ammonia nitrate was substituted a great step in advance was taken, for it is explosive besides possessing other advantageous qualities, its temperature of detonation is comparatively very low, 1832° Fahr., and not only is its combustion perfect, but it generates free oxygen.

$2\text{N}_2\text{H}_4\text{O}_2 = \text{N}_2 + (\text{H}_2\text{O})_4 + \text{O}_2$

The value of the free oxygen lies in ensuring a perfect combustion of the other ingredients of the explosive mixture, which, in those preferably employed, are nitro compounds; that explosion leaves their components completely oxidized. This quality was shown to be absent in gunpowder, which has uncombined elements eager to seize on the oxygen of the air on being liberated by an explosion.

Another source of safety was contended for by the later French Commission on explosives in the appreciable length of time taken by mixtures of fire-damp and air to combine.\* Experiments went to show that it was actually possible to have a detonation generating flame that will not ignite fire-damp by having the temperature of detonation sufficiently low.

Marsh gas, the ordinary fire damp,  $\text{C}_2\text{H}_4$ , detonates at a temperature of 2000° Fahr. in a mixture having a temperature of 3000° Fahr. is a safe explosive. It will be noted in the following table that gunpowder generates a temperature very little in excess of that shown in explosion of marsh gas:—

	FAHR.
Nitro-glycerine.....	5700°
Nitro-mannite.....	5700°
Dynamite.....	5590°
Gun-cotton.....	4745°
Gunpowder.....	4015°
Fire-damp.....	4000°

These temperatures are all in excess of the assumed limit of safety, and yet it is contended by the French Commission nitro compounds can with safety be employed by reducing the temperature of explosion of any one of them, a lower average being obtained by a mixture with ammonium nitrate. The effect of a mixture being somewhat as follows:—

	FAHR.
30 parts gelatinized nitro-glycerine with 70 parts of ammonium nitrate yielding a temperature of.....	3450°
20 parts gelatinized nitro-glycerine with 80 parts of ammonium nitrate yielding a temperature of.....	2910°
12 parts gelatinized nitro-glycerine with 88 parts of ammonium nitrate yielding a temperature of.....	2730°

The explosive force of these mixtures being, in comparison with dynamite at 100, as follows: 122, 118 and 111 respectively.

Nitro compounds have the further advantage that the intense heat generated by the explosion wave is very local and the flame momentary and not extended by the oxygen of the air.

Still caution is necessary in generalizing, as the following records will demonstrate: A mixture of 30 parts gun-cotton and 70 parts am. nitrate, weighing some 1,540 grains, failed to ignite a gaseous mixture, but a charge of double the quantity with 20 parts only of gun-cotton and 80 parts am. nitrate, did ignite gas. Taking again the latter quantity with only 15 parts of gun-cotton and 85 am. nitrate, then the gas was not fired by an explosion of the mixture.

A similar experience was found when mixtures of dynamite and the ammonium nitrate were experimented with: A cartridge weighing 770 grains, composed of 60 parts dynamite and 40 parts of nitrate, when exploded unconfined, failed to fire a gaseous mixture, while one of double the quantity with the percentage of dynamite reduced to 50 and even 40, did fire the gas. On the other hand a second doubling of the quantity to over 3,000 grains accompanied by a reduction of the dynamite to 30 parts did not fire the gas.

These mixtures detonated completely with 8 grains of fulminate, but the decomposition was not complete when unconfined with less than 50 per cent. of dynamite. When confined a mixture of 20 parts of dynamite is completely decomposed.

The next step after treating with dynamite which leaves a solid and incombustible residue, was to substitute a nitrated hydro-carbon which was combustible and had no solid residue. Nobel's improvement consisted of substituting gelatine, a soluble gun-cotton, in place of the infusorial earth, the absorbent in dynamite, and he so produced a solid natural explosive throughout, and then by adding 10 parts of military gun-cotton, which is not soluble, he produced blasting gelatine of still greater power. It detonates easily with 112 grains of fulminate.

These compounds may be said to belong to the second

\*NOTE.—This conclusion seems hard to reconcile with the knowledge that an electric current of high tension will fire a gaseous mixture, and that the passage of such a current is made in an infinitesimal moment of time. This knowledge would advise caution before trying to obtain an amount of safety in the construction referred to, especially when it is also known that there is a sharp line in the scale of mixtures of gas and air, which varies somewhat with the composition of the gas, which is about 2% of gas, when a mixture from being quietly combustible merely, becomes instantly a violent explosive.

great class of explosives for which confinement is not necessary to produce explosion, nor is combustion necessary to be followed by explosion. When explosion does occur it is not by a rapid combustion as in powder passing from grain to grain, but an "explosive wave" is set up by a primary explosion, most conveniently, in practice, of some other material. The detonating substance generally employed is fulminate of mercury, so well known in the common percussion cap. Some explosives of this class carry stronger detonation than others, but do not do so necessarily by dissociation of molecules, and the passage of an explosive wave through the mass varies seemingly with the intensity of the initial detonation. While a train of gunpowder, unconfined, burns at a visibly slow speed, the explosive wave set up by detonation in an unconfined train of gun-cotton has been computed to travel at a speed of 18,000 to 24,000 feet per second, practically instantaneous. The rapidity with which the explosive wave is propagated in this class of explosives explains the reason for the local shattering action following detonation, and gives a valid excuse for the objection of the coal miner to the general substitution of one of such compounds for powder in coal getting.

The action seems to be in the so-called explosive wave striking within measurable distance, compounds of this class, which may be either solid or liquid or gaseous, and producing dissociation of the component elements which in the nascent state reunite under the influence of the heat produced and form chiefly the simple compounds water and carbonic acid, leaving the nitrogen uncombined. This is the result in laboratory experiments; but in practice the products of explosion are of doubtful composition and probably vary with the environment, as for instance, where there is a space about the charge, or there is a partial combustion of the charge, or the momentary heat of the explosion causes the carbon of the fine coal dust about the charge to combine with excess of oxygen in the composition employed. In the latter case it is suspected danger may accrue from heated carbonic oxide coming through a fissure in the coal and uniting with another atom of oxygen from the air. This is only suspected as a possible complication under exceptional circumstances.

Reference has been made to carbonite, one of the earliest mixtures that was accepted. It is a mixture of nitro-glycerine, with an excess of carbonaceous matter, preferably wood-meal, which, in exploding, generates 15 per cent. of carbonic oxide.

Rohrute is made of 14 parts of chloro-dinitro-benzol, with 86 parts of ammonium nitrate. Explosion under confinement breaks it up into water, carbonic acid and free nitrogens no carbonic oxide being generated. Gelignite, a compound in use in England, has 56% parts of nitro-glycerine, 3 1/2 parts of nitro-cotton, 5 parts wood-meal and 32 parts of nitre. It generates in explosion some 7 per cent. of carbonic oxide.

Ammonite contains 10 parts of nitro-naphthalene and 90 parts of ammonium nitrate. Produces no deleterious fumes and requires an extra strong detonator to explode.

But up in metallic cases, cartridges are unaffected by wet, it is not frozen like dynamite. It has apparently many good qualities, but has only been tried experimentally, not being made in this country, and it is too costly to import.

Reported relative strength of equal weights:—

Ammonite.....	100
Rohrute.....	94
Dynamite.....	86
Acadine.....	66
Carbonite.....	54
Gunpowder.....	45

Or taking

Blasting gelatine with ammonium nitrate at 100	100
Dinitro-benzol with ammonium nitrate 100	80
Dynamite with ammonium nitrate.....	75
Gun cotton with ammonium nitrate.....	72
Gunpowder.....	58

#### SAFETY IN HANDLING.

The makers of nearly all modern explosives claim their products can be handled with impunity, that packages of them may be let fall, that weights can be dropped on them from any height, and that they can be set on fire and will burn without explosion following.

When dynamite was first introduced these advantages were also claimed for it, and there is no doubt dynamite has stood a great deal of ill usage without accident. The writer at that time, in the confidence of the youth, held a cartridge of it in his hand and set it on fire; he has also seen a man enter a colliery store room and kick in, with his hob-nailed boot, the head of a 25 lb. keg of powder; but his curiosity for such experiments is satisfied; and now he prefers to see all explosives, regardless of their reputation, treated with respect. Dynamite, occasionally, has resembled too great familiarity. In a paper read before the Society of Engineers in 1884, the writer naturally expressed the opinion that the chief ingredient of flameless explosives, ammonium nitrate, was harmless, but it has since been shown that not only can it be detonated, though its detonation is uncertain, but that it also can be exploded in small quantities by percussion. It may, therefore, be assumed that it is impossible to be quite sure of any explosive, or of what products temperature, moisture, mixing, and decomposition may present in time, and hence remove the limit of safety may by experiment seem, that it is somewhere to be found may be relied on.

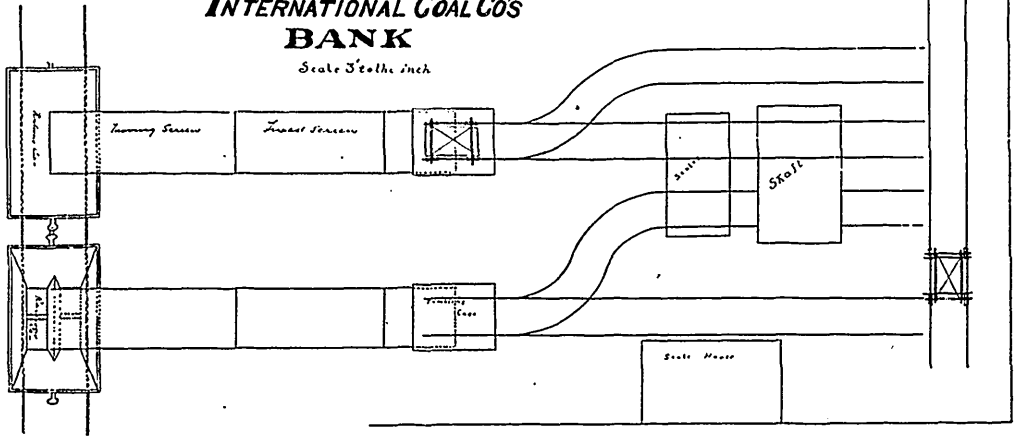
#### FUMES.

Nitro-glycerine and dinitro-benzol are both poisonous; the fumes of both when burnt are injurious to breathe, but



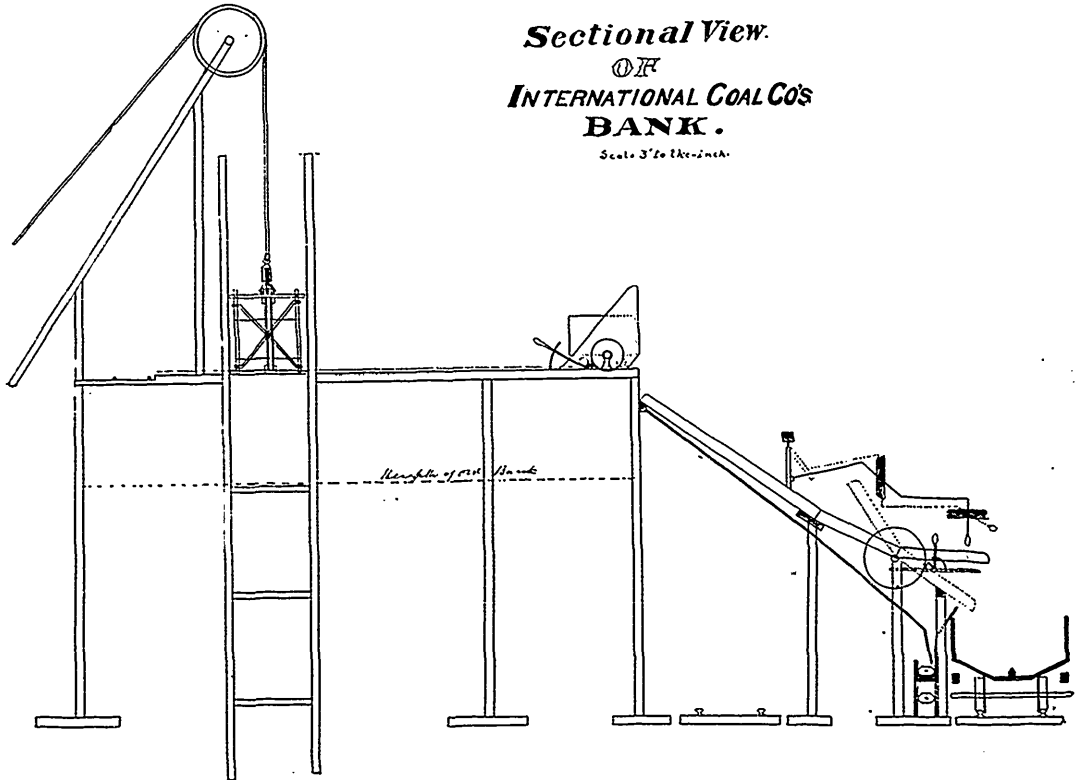
**Plan**  
**OF**  
**INTERNATIONAL COAL CO'S**  
**BANK**

Scale 3/8 to the inch



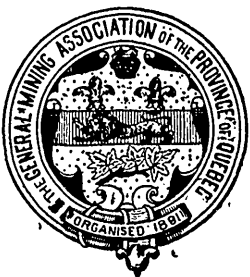
**Sectional View.**  
**OF**  
**INTERNATIONAL COAL CO'S**  
**BANK.**

Scale 3/8 to the inch



TO ILLUSTRATE MR. McLENNAN'S PAPER ON "CHANGES AT THE BANK OF THE INTERNATIONAL COAL CO."





### Successful Meeting and Excursion of the General Mining Association of Quebec at Black Lake and Thetford Mines.

On Tuesday, 14th ulto., the members of the General Mining Association of Quebec visited the asbestos mines at Black Lake and Thetford. Leaving Sherbrooke by the 8 a.m. ordinary train, to which a car for the convenience of members was attached, the party, numbering over fifty, arrived at Thetford a few minutes before eleven. Here they were met by the local committee. A visit was first made to the excellent property of the Beaver Asbestos Company, and an inspection made of the workings. The company has some fine shows of the mineral and is well equipped with an economic plant, including travelling and cable derricks, steam drills, 30 h.p. boiler, pumps, etc. While in the big pit Mr. Lainson Walls photographed the party. The productive mines of the Ward Bros., A. H. Murphy, and the Johnsons Company were visited in turn, although the inspection of the latter was abruptly shortened by a heavy thunderstorm which quickly drove the visitors under shelter. At 1 o'clock an excellent luncheon was served in the store house of the Bells Company. Here a surprise was in store. Ordinarily a bare and unpretentious building, the shed, by dint of the skillful application of evergreens and a profuse application of national flags and tannings, was found completely transformed into a tastefully decorated and well-equipped dining room. Too much praise cannot be given Mr. George R. Smith, the genial superintendent of the Bells Company, for his indefatigable efforts in this work. Mr. L. A. Klein, Engineer of the American Asbestos Company, in concert with Mr. Smith, made a great hit in the role of bar-tenders and caterers. After ample justice had been done to an excellent bill of fare, the chairman, Mr. D. A. Brown, in a speech characteristic for its point and brevity, bade the Assn. meet heavily welcome, to which Capt. R. C. Adams suitably replied. Lunch over, the members divided into parties and spent a pleasant afternoon inspecting the mines and works of the Bells Company and King Bros. These two concerns are the largest producers of crude asbestos probably in the world, and much interest was therefore taken in the various processes adopted for mining, cobbing and fibrecizing the mineral preparatory to its export abroad. En route to the mine a pleasant half hour was spent enjoying the well-known hospitality of Mr. William King. Much pleased with their outing and the many kindnesses showered upon them by the good people of Thetford, the members left on their car for Black Lake, arriving at the Club House shortly after four o'clock. Here a number of teams were provided and parties were driven to the mines of the Anglo-Canadian, Glasgow and Montreal, American Asbestos and other companies operating in the neighbourhood.

### The Meeting.

At half-past five o'clock the members assembled in the cosy Club House. Among those present were Capt. R. C. Adams, Anglo-Canadian Phosphate Co., Montreal; J. Lainson Walls, F.C.S., Ottawa; A. W. Stevenson, C.A., Montreal; C. Circle, Templeton Asbestos Co., Templeton, Que.; W. E. Bell, Toronto; J. Burley Smith, M.E., Anglo-Continental Guano Co., Glen Almond, Que.; R. T. Hooper, Asbestos Co., Montreal; A. M. Evans, M.E., King Bros., Thetford; C. Lucke and Mr. James S. Mitchell, Beaver Asbestos Co., Sherbrooke; John J. Penhale, United Asbestos Co., Black Lake; Capt. Matthew Penhale, Glasgow and Montreal Asbestos Co., Black Lake; D. A. Brown, Boston; Mr. Erhart, Sec.-Treas. H. W. Johns Asbestos Co., New York; Geo. R. Smith, Bells Asbestos Co., Thetford; Mr. William King (King Bros.), Thetford; L. A. Klein, American Asbestos Co., Black Lake; B. T. Kirkhouse, Montreal; F. A. Halsey, Canadian Rand Drill Co., Sherbrooke, Que.; B. T. A. Bell, Editor of the CANADIAN MINING REVIEW, Ottawa, and others. In the unavoidable absence of the president, Capt. Robert C. Adams took the chair. The Minutes and Reports of Council were presented and confirmed.

### The Visit of the American Institute.

The Secretary read the following correspondence:—  
NEW YORK CITY, June 4, 1892.

B. T. A. Bell,  
Ottawa, Canada.

DEAR SIR,—The Council of the Institute has voted that the annual meeting, beginning Feb'y. 21, 1893, be held in

Montreal, provided of course, that our Canada friends find it practicable to carry out their proposed arrangements, and that they confirm the preliminary invitation sent by way of inquiry.

This decision has not been publicly announced, and you need feel no embarrassment in notifying me of any change in the situation rendering the withdrawal of the invitation desirable, or rather, of any change, which, if you had known of it before, would have led you to postpone your plan.

If, however, you should be able to advise me before June 28, that your arrangements had been successfully completed, so that the meeting could be announced with reasonable certainty, it might be pleasant to speak of it at the Plattsburgh meeting. I shall probably not be at this office later than June 24. After the 23rd, therefore, you had better address me at Hotel Champlain, Bluff Point, N.Y.

Yours truly,  
R. W. RAYMOND,  
Secretary.

MCGILL UNIVERSITY,  
MONTREAL, June 9, 1892.

DEAR MR. BELL,—In reply to your favour of the 6th inst., I have no hesitation in saying that the University will be glad to do all in its power in aid of the proposed meeting of Mining Engineers. The details would have to be discussed later, and will be modified by the fact that the time mentioned is in the College Session, and that our classes would be going on during the time of the meeting. This, while it would limit our available space, might be an advantage in other respects.

Truly yours,  
J. WM. DAWSON.

After some discussion, it was resolved, on the motion of Mr. D. A. Brown, seconded by Mr. Walls, to leave the details of a convention in the hands of the Council, to report at the next quarterly meeting of the Association.

The following papers were then read:—

### The Labor Question in its Relation to Canadian Mining.

By J. BURLEY SMITH, M.E., Glen Almond, Que.

MR. PRESIDENT AND GENTLEMEN:—

In taking up this question as the subject of the paper I have the honor to read before you to-day, I find that however important and interesting it may appear to my view of the position, it is an extremely difficult and complex matter to condense within the limits of such a short paper as this must necessarily be.

It is at the same time a delicate subject to handle before an Association like this, on account of the social and political questions involved which cannot be ignored in dealing with it either as an abstract problem or from the standpoint of employers who are peculiarly interested in the employment of labor.

But it will not be forgotten that we have associated ourselves together, not merely to protect our interests as a trade organization, but with the higher motive of mutual improvement.

The labor question is one which employers always hesitate to discuss publicly—partly, perhaps, because there is a half-consciousness that we have not been quite guileless in our dealings with labor, and that free discussion might stir up our inner consciousness to a higher sense of duty and impel us to a line of conduct inimical to our self-interest.

A serious point for our consideration is the scarcity of good miners in Canada, even in the present extremely depressed state of mining industries of all kinds; and there can be no question that in spite of the efforts of the Government to encourage emigration from the older countries there is always a scarcity of labor; and it is strange that in spite of the great number of emigrants coming into the country all the time this scarcity should exist. It is stranger still to observe the curious exodus of labor which is going on constantly from Canada to the United States.

I have noticed that during the last two or three years that whatever may be the state of our industry, whether active or depressed, there is always the same difficulty in keeping up a complement of efficient miners, and it has been found necessary to increase the number constantly by the use of agricultural labor.

It would therefore appear that the ranks of the miners are being constantly and secretly recruited from the farmsteads to whose sons the rigidity and change from a drum-drum monotonous life offers an attractive charm.

There would be nothing especially remarkable in this, as it occurs in all countries, still it is always injurious to the general prosperity of a country and shows there is something economically wrong when the laborers leave the cultivation of the soil in too large a proportion; and it is a very serious thing indeed in a new country when these men, having deserted the land for the mines, get some knowledge of mining and accumulated a sufficient sum of money to travel with, leave the mining field of their own country for that of a neighboring and richer one from which they seldom return.

In older countries the occasional depressions in mining are always accompanied by the inevitable distress of the unemployed, who do not, however, necessarily leave the district or country, except in the case of those who are induced or assisted to emigrate, either by the too often seducing promises of the emigration agent or the pecuniary

assistance of well-meaning, though perhaps mistaken philanthropists.

There can, however, be no two opinions as to the value of this surplus labor as emigrants to a new country like Canada, with her vast undeveloped resources, and there is every excuse to be made for the large expenditure incurred yearly for this purpose, providing that this imported labor remains in the country, and does not, as is too often the case, make this a halting place only and pass on to the neighboring United States, ever ready to receive them, even though at Canada's expense.

Here, in times of depression, one does not see this army of unemployed and the palpable distress accompanying it, and though the storekeepers and tradesmen of the affected districts complain of and undoubtedly feel the bad times, and in such an event we may be sure of that, even that of the United States, and it would seem, therefore, as if this draining off of the population to the United States was a silent yet steady exodus (unnoticed except for the continual bankruptcies of storekeepers and the figures of the census returns) which, in spite of the enormous importation of foreign labor, tends always to keep down the population and natural increase of the national wealth.

Though the mineral wealth of the Dominion is magnificent and the efforts of speculators to boom or develop it unremitting, the industry cannot by any means be considered flourishing.

It is, however, within the bounds of possibility that the rapid discoveries and inventions in the industrial arts of modern times, may, in the near future, create a new and sudden use and demand for mineral products, and a period of unequalled activity and prosperity come to us, and in such an event we may be quite sure that the labor question would be a very serious one to consider at that moment, and it is quite certain there would be great difficulty in getting a sufficient number of efficient miners to work and enable mine owners to take full advantage of it.

Such mining activity would not necessarily mean a rush of labor to the scene, for it is in the event of the sudden discovery of fabulous finds of the precious metals that a rush is made by all kinds of men, who, however, do not swarm there with a view of finding work so much as of participating in the general luck. One never hears of an asbestos, coal, copper or phosphate rush. We do certainly hear of a boom sometimes, but that does not attract an considerable number of men who are over-anxious to labor.

The labor question before us is an economic one, and can only be determined by the conditions which affect all wage labor, whether miners, or weavers, and it is from this point of view that we employers have to look at it.

Granted that there is a scarcity of miners in the proper sense of the term, and that this scarcity would be felt still more in the event of the prosperity we are anticipating, and granting that there is a constant shifting or moving on of the population to the neighboring country, it remains for us to consider the cause of this state of things in order better to find a remedy. And it is a matter worthy the consideration of all patriotic Canadians, because no greater calamity could happen to a new country requiring all her population for her own welfare and prosperity than for her people to find that they can be individually more prosperous and happy in an adjoining country than in their own.

Primarily it must be admitted that the great attraction for Canadian miners in the United States is the higher rate of wages; and although it can be shown that this does not necessarily mean a greater acquisition of wealth to the recipient, because the well known conditions of wage labor, which have been reduced to a formula known as the *Iron Law of Wages*, prescribes that wages, however high, are never much above the cost of maintenance. Still they are higher there than here, and have the attraction of the higher figure to those who cannot naturally be expected to look at it from an economic point of view. To a single man, having only himself to provide for, it appears a great advantage, for he is able to save or spend, according to his proclivities, the balance in excess of his necessities. But to the people in the aggregate it is not, because the married family man does not receive the same wages than the single man, though he has much more to pay out of it.

The wages in Great Britain are considerably less than in the United States, yet the work people enjoy the same amount of comfort—that is to say, their wages buy nearly as much as they actually need.

The thrift and economy of a people collectively does not necessarily mean an increase of wealth, though individually it may raise one's personal condition above the rest of the community.

The higher figures of the United States do undoubtedly attract Canadian miners as well as laborers of all kinds. The rate of wages is pretty nearly the same, or likely at any time to become so in all the States, because although they have a policy of protection on the common frontier they enjoy absolute free trade amongst themselves. Canada, adjoining a number of these States, cannot alter the conditions of her labor market to suit this order of things, and cannot, therefore, prevent the exodus of her people by offering the same high wages, because her labor market is ruled by her own political economic conditions, which are different to those of the United States.

The rate of wages in the United States is higher than it is in Great Britain because of the former's policy of protection, which imposes a duty on imported goods, with the result that the consumer pays the productive cost of these goods in unprotected or free trade countries, plus the duty imposed, and a little more. This increased

price increases the cost of his maintenance and raises his wages to meet this, and no more.

The rate of wages is higher in Canada than in Great Britain, and lower than in the United States, because her geographical position will not allow her under present conditions to have the same measure of protection as the United States, or the same measure of free trade as Great Britain, the rate of her wages being subject to the same economic laws which govern the cost of production everywhere. At the same time it must be borne in mind that these economic or natural conditions are at all times liable to be interrupted by the misgovernment of a nation, by bad laws, by unfair taxation, by wanton waste of public treasure, by speculation and the sacrifice of the commonwealth to the private interests of those who are elected by the people to represent them in her councils. This is the political situation, and is dangerous ground.

The social view of the position perhaps touches us more intimately, as we must be more or less familiar with the social life of those laborers we employ in our mines, and as far as my knowledge and experience go I cannot help thinking that our disregard of the personal comfort and social wants of our miners has had not a little share in causing the exodus of this class of labor.

The housing of the men and the food supplied to them have not been as creditable to us as such matters should be, and savors not a little of the iniquitous "truck and Tommy" system of the old countries of fifty years ago, happily now a thing of the past.

It would appear as if our method of barracking and feeding the men had been copied from the lumbermen's shanties in the backwoods, for which there may have been some excuse, considering their extreme isolation and the difficulty of getting supplies. But the system is not well adapted to mining settlements, which, from economical reasons of transport, are never very far away from civilization and means of communication with the rest of the world.

The system common in mines—of paying wages and board and deducting an arbitrary sum from the former to pay the latter—is not a just dealing, and leaves too many openings for speculation on the part of managers, bosses and board masters, and does not leave the workman free to economise his earnings to the best advantage, and can only be designated as "taking it out" of the men.

The plan of barracking and boarding the men tends also to make the miners roving and shifty as a class, and careless and disinclined to settle; and I cannot help thinking that if more cottages were built by mine owners, or land given for miners to build cottages around the works for themselves, we should have a much more stable and settled mining population. The men would marry and become domesticated; they would cultivate gardens and perhaps small farms, and thus have other leisure occupations than horse-play and cards and the inevitable quickstep and fiddle. Population would increase and there would always be an hereditary race of miners springing up. It is superfluous to remind you how beneficial this would be to a mining country. It is hard to pass this subject without paying a deserved tribute of praise to the owners and managers of the mines we have visited to-day, for whilst passing through the mining settlements of Thetford and Black Lake, with their neat and pretty cottages and the unmistakable signs of general comfort and happiness, it was impossible not to feel that the asbestos region had already realized what some might consider a dream of Eutopia. I regret to say that this is not the case in all the mining districts of Quebec.

If a mining population could be established on a more settled basis, schools—the great want of which is most seriously felt in the neighborhood of many mines—would be established as a matter of course, with enormous advantage to the rising generation.

Canada, with her boasted educational system, seems to neglect the miners and outlying districts altogether. In our district some time ago I made out a list of over thirty families with grown up sons and daughters who were unable to read or write; and this evil is more disgraceful from the fact that in many instances the parents could both read and write. On our side of the river Lièvre the nearest school is five miles away, the road to which is impassable in winter.

The custom common in so many mining districts of Canada, of closing down mines in winter, cannot be defended. It has the effect of practically leaving the miners six months out of work during the year. This alone must have the effect of driving them to seek more permanent and regular employment elsewhere. It is a bad system altogether, for while the workmen drift away to other parts the capital of the employers invested in plant and machinery, to say nothing of that expended in opening out and developing the mine, is lying idle and unproductive during this period, and though the works are stopped there are certain fixed charges which go on all the same. There is, moreover, really no necessity for it, if the mining is carried on scientifically and on correct principles, because nearly all mines—I do not refer to quarries—can be worked more economically by subterranean excavation than by open cast, the latter being ill-adapted for such a climate as that of Canada, with her deep snows and severe frosts. With a proper system of underground working there is nothing to prevent mining operations being carried on all the year round to the greater advantage of both owners and laborers.

It is quite evident that if miners have to earn enough wages in six months of work to support them for the remaining six months of enforced idleness they will require a higher rate of wages for the period they are able to work. The fact of miners getting so heavily into debt as they do with the storekeepers of the neighboring villages

proves the economic truth of this. I am sure all of us are familiar with the regular visits of the bailiff with his writs of seizure on the miners' wages for old debts, most of which, I find on enquiry, have been incurred during the unemployed winter time. And it may not be out of place here to express my heartfelt opinion that nothing could be more unfair to the working men of our Province than this harsh law of seizure for petty debts. A man incurs a debt for the necessities of life, say during the unemployed time of winter: this is allowed to run on; interest accumulates; the creditor obtains judgment against him; costs are added to costs, until shortly the unfortunate debtor finds himself saddled with a debt of twice the original amount, and with diminished power of paying it, and a seizure is made, not merely on part, but the whole of the wages coming to him. The employer is appointed garnishee and is himself held responsible if he fails to pay over the man's wages to the court, and thus finds himself a party to a transaction of which he is ashamed. On enquiry he finds that only one-fourth of the amount due to the man can be legally taken; but to carry this out he has to attend the court to make a declaration as to this amount, which entitles him to his expenses if he chooses to claim it. Further costs are thus added in various ways to the burden already too heavy for the debtor, and he usually finds that hard as it is, it is better to pay the whole of his wages, even though his wife and family have to starve or incur fresh debts, or "skip." Can it be wondered at that there is an exodus? Is it credible that these men have votes, that they send representatives to Parliament, without asking for the repeal of such laws?

After these remarks I think you will agree that the labor question is one of the deepest importance to the industry we represent, and that the miners, *i.e.*, the producers of mineral wealth, are unavoidably involved in the question of successful mining, and that it is incumbent on us as an Association to care for the welfare of our miners from motives both of policy and duty.

It behoves us to enquire into the political view of the question and to use the strength of our organization in effecting such constitutional reforms as are desirable for bettering the condition of our miners in order that they may not be driven out, but remain to develop the mineral resources of Canada, and especially our Province.

It behoves us to look to ourselves and see that the social welfare of our miners is not neglected. And bear in mind, gentlemen, that Canadian miners, taken as crude material, are as fine a class of men as can be found anywhere, and that our neighbors in the United States are well aware of it, and are—so much the worse for us—always ready to welcome and employ Canadian mining labor and pay more for it.

### The Canadian Asbestos Industry.

By L. A. KLEIN, M.E., Black Lake, Que.

The asbestos industry of Canada has assumed a rank which makes it well worth while to study how to further develop the same, and many have turned their eyes towards our Province and its serpentine regions: Governments, capitalists, mining men, speculators, prospectors and so on—all have contributed in their own way to this purpose.

Many things have been said and written on asbestos, asbestos formation, asbestos industry, asbestos uses and markets, and it is certainly not the lack of talk on the subject which has induced me to take it up for this paper. I have been led to do so in consideration of the facts that by former writers on the subject a good many practical points have not been touched—points which must be of special interest to those who are about to interest themselves in the industry, be it with money, be it with actual work—but also in consideration of the fact that amongst those not intimately connected with the industry, opinions of an altogether erroneous nature as to the value and character of the industry are spread about, which may occasionally lead to a very inconvenient disappointment. There are even a good many things amongst us mining men out here on which the difference of opinion has not as yet reached a settlement, as it is naturally with an industry in such a young state as ours.

I have tried to get the co-operation of all my fellow miners in the industry to make my statements as complete as possible, and I tender my heartiest thanks to those who have complied with my request. I must, however, add that the opinions expressed in this paper are individual and under no other authority than that of my own observations and my own judgment.

I had still another object in delivering this paper, and that is to show the asbestos industry in Canada from a national and economic point of view, or in other words, to look at it as a whole and a resource for our Province and the Dominion of Canada, respectively.

You have to-day looked over the asbestos mines in Thetford and Black Lake, and while the time has been very limited and no chance whatever could be given to follow up a special line of the business in which we are engaged, you have, however had an opportunity to see in general the mode of occurrence and production of asbestos. While you have done so you have seen the area which I may safely say produces about 85% of all the asbestos used in the world.

Serpentine covers quite a large area in Canada and especially in the eastern townships of Quebec. It is not my object to-day to describe its extent, which has been done in an exhaustive way as well by members of the Geological Survey as by the authorities of our Provincial Government, but I will confine myself to those districts

which have as yet received prominence and which practically supply the demand of the world. These are, in the districts of Thetford and Black Lake, with some more or less encouraging developments to the north and south; the district of Danville, with, so far, one prominent mine in the production of asbestos; and the Templeton district, in which, however, the industry has not yet assumed more than an exploratory character.

If you compare these very limited areas representing the region of the big serpentine belt which produces asbestos in a quantity and quality which will, economically worked, yield a profit to the investor, with the comparatively enormous extent of serpentine rock, you will readily come to the conclusion that it takes more than the finding of the serpentine to have a paying asbestos mine, and that is one point I would like to pick out and submit to your consideration.

While the undoubted success of some of the existing mines, in combination with erroneous ideas on the formation, occurrence and of production and so on, nursed by speculators, lead many to believe that they struck a fortune when a locality was shown to them which contained serpentine of a very good or just the right color, with occasionally a small asbestos seam in it; and while many have been induced to spend a considerable amount of money under these false impressions, I may state that not one enterprise has proved successful in this industry which has not had anything else to look on than serpentine of a good color. All those successful mines had as surface indications asbestos in good and large veins of real commercial value, and I do not hesitate to say in some cases larger veins than they can get to-day. We may be unable to declare a locality worthless as an asbestos mine, judging from color and sections of serpentine, but I am certain that neither I, nor any of my confreres who have devoted some of their time to the study of the subject would commit ourselves in recommending a locality as an asbestos mine from the good look of the serpentine, without having seen besides really valuable and marketable asbestos veins in sufficient quantity, and this notwithstanding the expression of one of our scientific authorities that the rock likely to prove asbestos-producing can be determined by certain peculiarities of texture, color or weathering.

I will not take up your time with a detailed description of the mineral, but merely make a very few general remarks.

Asbestos is a fibrous variety of serpentine, and is, chemically speaking, a hydrous silicate of magnesia. From several analyses of a number of specimens all over the world, which I had at my disposal, the percentage of silica is from a little over 40 to 40½%, while magnesia is from 41½ to 43%; other more prominent admixtures were ferrous-oxide and alumina in quantities of from 1 to 3%, and further, traces of lime, potash, soda, chlorine and sulphuric acid. This composition is completed by water, to which we have to attach the most importance from a business point of view. This, of course, is not water in the form of a moisture, but water intimately associated with the silicate of magnesia. The importance of this water has been shown by the fact that good and fine asbestos fibre, may it be from the Italian variety or from the Cambrian rocks of the Eastern Townships, or the Laurentians from the north of the St. Lawrence, contains from 13½ to 14% of this water, while some very harsh and brittle specimens of asbestos have shown considerably below 12%. Experiments have further shown that it is comparatively easy to dissociate a part of this water from a fine and silky specimen of asbestos fibre and to render the same hard and brittle by heating it to a certain extent. This peculiarity leaves us to conclude why we find such considerable differences in the qualities of asbestos in comparatively close proximity, as, for instance, the larger percentage of "thirds" in Black Lake than in Thetford; and then even at the best mines, qualities of no, or very little, commercial value. The asbestos in these localities has been rendered harder by the influence of heat through the intrusion of heated matter, following the original formation of it, and this heated matter has been the masses of granulate which we find throughout our serpentine region, with the exception of a small knoll of serpentine in Thetford, where granulate appears only in very small dykes. And here is another point where I differ from some of our fraternity who hold that the presence of these masses of granulate are a good indication of asbestos—a theory which I think can scarcely be maintained, at least, however, as to asbestos of commercial value, in the close neighborhood of these masses of granulate.

Thirteen incorporated companies, with an authorized capital of about three and one-half millions of dollars, of which a part, however, is employed in the manufacturing business in England, with a number of very prominent private concerns, occupy themselves to-day with the production of asbestos and asbestos mining, and I believe that my estimate that about two and one-quarter millions of dollars are invested in the industry in Canada comes very close to the reality.

While until about four or five years ago, with one single exception, hand work, occasionally connected with horse-power hoisting, was exclusively used in asbestos mining, the leading mines are now equipped with more or less extensive plants of machinery to carry on the work.

This work consists, Firstly—Of the proper mining operations, such as the drilling, blasting, removing of the broken rock out of the pits to the dumps, hand in hand with the gathering up of the asbestos veins and transport of same to the dressing establishments or cobbing sheds.

Secondly—The dressing or cobbing, that is, the separating of the asbestos fibre from the adhering rock and the grading of the former in different qualities, followed by packing, transport to railroad, loading, shipping and marketing. It may not be unwise to review these different operations shortly, as the circumstances under which asbestos is produced are entirely different from nearly any other mineral or ore, and we find nearly every item which we were used to consider as a thoroughly established rule greatly changed by these circumstances.

This is readier understood when we consider the large

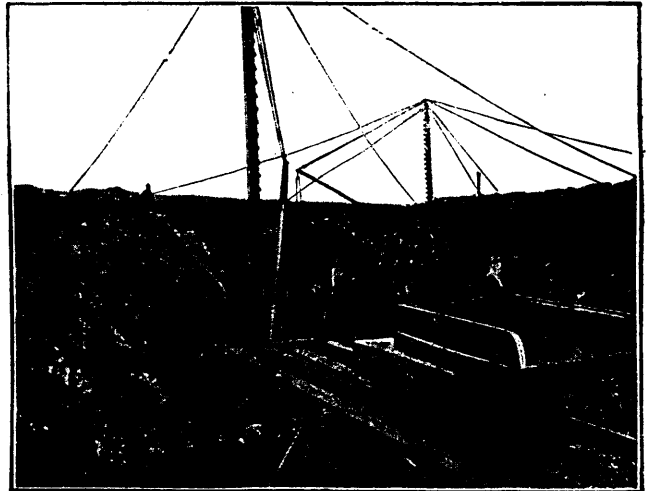
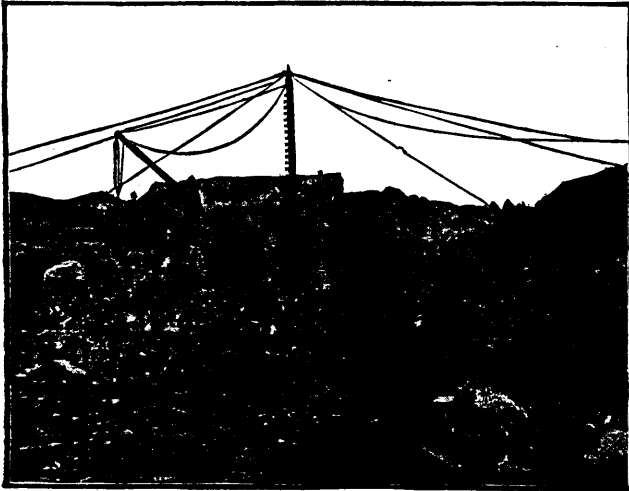
larger mines the blasting is done by electricity; still there are some which hold to the system of one hole blasts, claiming that by this system less of the asbestos veins are smashed to small particles and scattered all over the place, therefore involving more expense to pick them up. The expense for explosives is about 3 cents to the ton of rock broken.

The next operation is the removing of the broken rock from the pits to the dumps with which the picking up of all the asbestos veins goes hand in hand. If the bottom of the pits are on the same level with the top of the dumps,

the operation is simply to load the refuse rock on trucks, stone-boards, wheelbarrows, etc., and bring it by one or the other of these means to the dumps; where this is not the case, as in most of the more extensively worked mines, where pits vary in depth from about 30 to 150 feet, the rock has to be hoisted up by means of derricks. At the disposal of this industry there are at the time about 75 derricks, of which, in two cases hand, and in twelve or thirteen cases horse power is applied as motor, the rest being steam derricks. Hand and horse derricks have of course only a right to exist where there is a comparatively small amount of rock to be handled and where the works are of a more or less exploring character only, and the first expenses of putting in steam plant seems inadvisable. The steam derricks are to be distinguished in two classes, boom and cable derricks; from the latter class only two being

so far in use. Boom derricks consist of a mast held by means of guys in a vertical position and turnable on its own axle, while to the foot of the mast a boom or arm is attached and suspended in a more or less horizontal posi-

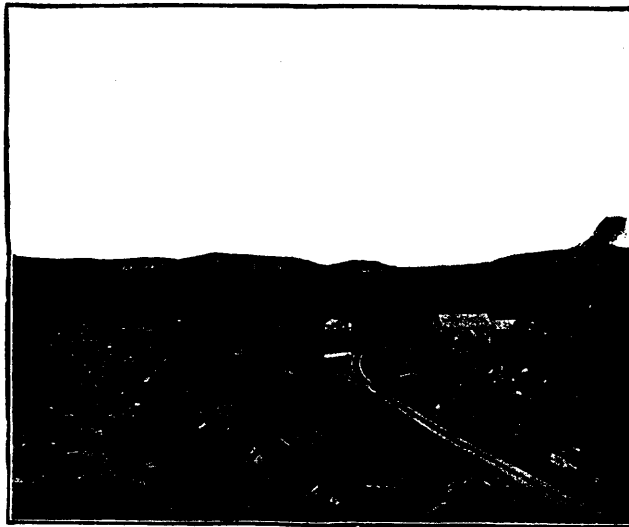
The transport of the crude asbestos to the dressing or cobbing sheds is in most cases done by the simple means of a cart and a horse, or where sheds of a more or less provisional character are placed right on the edge of the pits, carried in by hand. Where the cobbing is more concentrated in a special and permanent establishment we find rail connection for the purpose. Two of the mines, however, have a more or less systematic handling of the stuff in this state—consisting of iron self-dumping skips, which are loaded directly from the pits, hence they proceed down an inclined railroad and discharge their



amount of rock which has to be handled in comparison to the ore, the peculiar nature of this rock, the character of the ore, which is a fine silky fibre, and must be carefully protected from injury and so on.

As to the drilling, hand drilling is still in exercise in all the newly opened mines for prospecting work, and even in one or the other of these mines which have already reached considerable prominence. It is further nearly exclusively used for block-holing—only very recently one of the mines has introduced a small size machine drill for the purpose. It is done by three men with 1 inch octagon steel, and 6 to 7 lb. hammers. The average capacity is about 15 to 16 ft. a day of 10 hours, and the cost about 20c. per ft. The depth of holes is thus seldom exceeding 4 ft. Some of the mines have not long ago adopted a plan of block-holing with one man only, using  $\frac{3}{4}$  inch steel, and 3 to 4 lbs. short-handled hammer. The capacity is thus about 8 feet for 10 hours' work and the cost only about 14 cents.

Most of the mines do their drilling, however, with steam or compressed air, 45 ft. per day of 10 hours in the former case, and from 50 to 55 feet in the latter being considered a fair day's work. The expense per foot may be set, considering the present prices for fuel, at from 7 to 8c. per foot, not including wear and tear on machinery and interest for capital involved in the buying of the necessary machinery. There are in all 7 compressors with a total of 44 drills capacity in use, 4 of them being built by the Rand Drill Company, 2 by the Ingersoll Rock Drill Company, and 1 by the Norwalk people. At present also, 44 steam drills are employed in the industry, of which, however, 11 are run by steam. About one half of all drills in use are Rand's Little Giant No. 3, 3 Rand Sluggers,



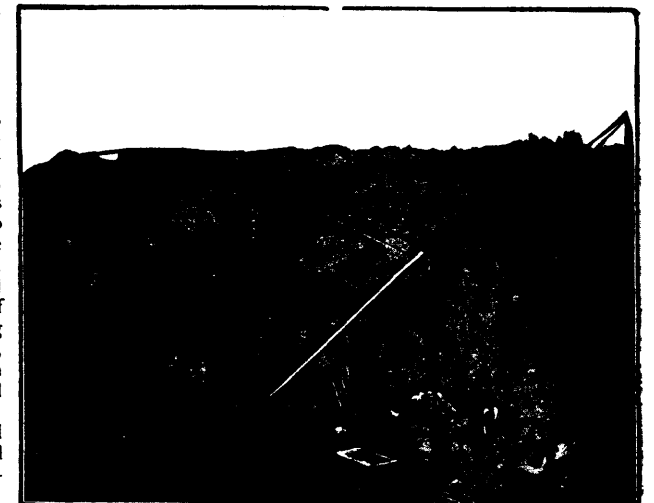
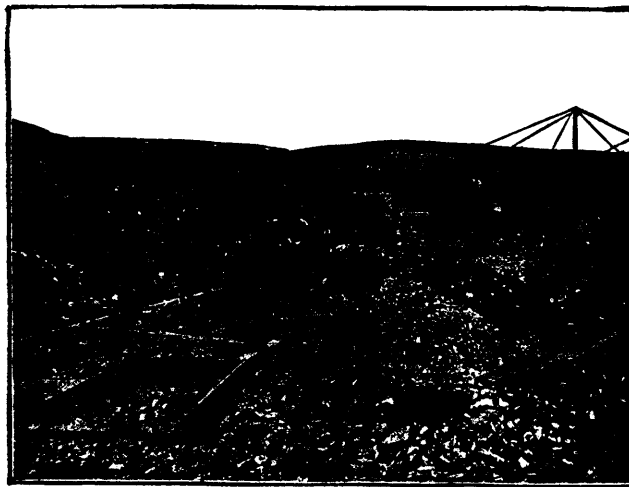
tion by means of ropes stretching from end of mast to end of boom. The length of the latter is generally from 40 to 50 feet, and it is clear that the working space of such a boom is limited by its length and can, economically, hardly be extended to more than say 50 feet.

The cable derricks have a mast somewhat similar to the former, but instead of a boom, a cable with a traveller on it, which cable is stretched from top of mast to some point across the pit, allowing by means of the traveller, to hoist from any point of the cable. As this may be stretched to a length of 400 and more feet the enormous advantage over boom derricks seems clear, and I have no doubt that its general introduction is only a question of time. The ropes used for hoisting are  $\frac{3}{8}$  to  $\frac{3}{4}$  in. crucible cast steel, the guy ropes generally  $\frac{7}{8}$  of an inch; the cables  $1\frac{1}{2}$  or 2" steel ropes.

There are eighteen double and twenty-four single drum hoisting and winding engines employed in the industry, or a total of sixty drums.

loads directly in the cobbing establishment. The skips are brought back by means of winding engines. The cost of the above-described operations, viz: Removing of refuse rock, hoisting, picking of asbestos and its transport to sheds, are of course somewhat influenced by the size of the veins in the respective bed rock, the heights and accessibility of the pit's face, lengths of dumps, and so on, but may with fair certainty be set at 22 cents per ton of rock handled in summer time, which figures unfortunately increase in winter time, in some cases to 35 cents, and may be accepted with 25 cents for all year round work.

The second part of the operation at the asbestos mine is the dressing, or commonly called cobbing, which comprises the freeing of the asbestos veins from rock as much as possible, (the crude asbestos in the market still contains from 15% to 40% of rock, some manufacturers even claim more than that while they are negotiating new contracts), and the grading in two, three or four different grades. This operation is as a rule done by hand by little boys, with the aid of a hammer weighing about  $1\frac{1}{2}$  lbs. Some of the mines, however, have partially or entirely adopted the aid of machinery, and this more particularly for the transformation of the so-called cobbing stones—i.e., larger pieces of rock with a more or less valuable asbestos vein in it, a vein, however, which did not give away from the blast, and which requires the breaking away of the adhering rock by means of powerful blows, (sledge hammers), or compression, (crushers). The first to try and solve the problem was the Scottish Canadian Asbestos Co. Unfortunately the development of the process sustained a sudden interruption



5 Ingersoll 3 inch, and 12 Sergeant's—a couple or so being of other manufacture. The steel in use is  $1\frac{1}{4}$  octagon and costs in the neighbourhood of 10c. a pound. As a rule the drills are worked under 80 lbs. pressure to square inch. We may consider an expense of  $3\frac{1}{2}$  cents to the ton of broken rock as the average cost at present.

The blasting is now generally done with dualin, which contains about 35% of nitroglycerine, of which the cost is at present 20c. per lb., but which prices will be very likely further reduced through the competition of a newly erected powder factory in the district. With all of the

The so hoisted refuse rock is placed on lorries and wheeled out on the dumps either by hand, or where the dumps are somewhat long, by horses, and there discharged. In some of the mines, to a great advantage, self-dumping cars of a very simple construction are being used. While now nearly all the larger mines use iron or steel rails, and lately, specially of the lighter sort, (19 lbs. Canadian make, at a price of \$40 per ton delivered), there are still some wooden rails with band iron top in use, which practice, however, with the growth of the industry, will have to be soon abandoned.

by the closing of the mines in the autumn of 1888. Their plant consists of a 50 h.p. engine, Blake rock breaker, travelling picking tables, set of Cornish rolls, revolving screens, elevators, shakers, two large blowers, and so forth. Next the American Asbestos Co. started in to experiment in the winter of 1890-91. The main object then was to do away with the somewhat indistinguishable grade of No. 2, an object, however, which was difficult to reach, unless the fibre could have been thoroughly loosened and freed from stone. Their plant consisted in the main of a Blake crusher, to which the crude asbestos is conveyed by an in-

clined railway, and automatically dumped in front of the crusher. The jaws of the crusher are set at  $1\frac{1}{2}$  inches, the crushed stuff drops on an inclined sieve in shaking motion, which separates all the loose fibre and the dust from the larger pieces of rock and asbestos veins, the former going directly to the cleaning or grading machines, the latter dropping on a revolving picking table, where the barren rock is removed by hand to one side of the table, the asbestos veins being left on the other. At the end of the table is a receiving chute which is divided into two compartments, and into which rock and asbestos are discharged respectively. The rock drops from the chute directly into a lorry and is wheeled to the dumps, while the asbestos is conveyed either to the dry kilns, as necessary in winter time or rainy weather, or to the fine crushers for further manipulation. These latter are of unique construction, of which the object is to allow particles of a certain size and loosened fibre to go through, without being further crushed, as thereby the asbestos fibre is likely to be injured. This so reduced stuff is brought to the cleaning and grading machines, consisting mainly of a set of inclined sieves in rapid shaking motion in connection with blowers, fans, etc.—remaining unbroken stone and unloosened fibre going back to a set of still finer crushers to undergo the process again. The plant at King Bros. mines in Thetford, which was principally erected for the extraction of asbestos out of large pieces of rocks on the old dumps works—which some years ago did not warrant the expenses for block-holing and further handling—consists of a Blake crusher, from which the stuff is conveyed on a set of Cornish rolls with the intention of having all stone reduced to powder—from there to a revolving screen of which the object was to screen out all the dust and leave the clean fibre. This object, however, has not been fully realized, owing to the failure of the rolls to break up the rock entirely, and an additional blowing and screening plant has been put in, which produces now a very clean product of one grade. The Anglo-Canadian also runs a crusher and a set of sieves, and the Johnson's Co. has recently put in a couple of crushers to overwork the old dumps. None of the processes at their present state, however, may as yet be considered complete, the main difficulties being two:—

1. That, if asbestos is crushed with a considerable amount of stone together until the latter is reduced to powder—the long and most valuable asbestos fibre is partially destroyed.

2. If the stone is not entirely reduced before grading it is nearly impossible to free the fibre from the stone, and a large amount of waste is the result.

Besides, development of this part of the industry has to stand other very trying circumstances, as the objections of a good many of the manufacturers to buy prepared fibre; the trouble with the customs, which is rather inclined to classify the so prepared asbestos as manufactured, and to levy a duty of 25% of value on same, and the considerable amount of low grade waste which is found very hard to dispose of.

The cost of cobbing varies, of course, considerably, according to the quality of material. While some stuff will break from the stone very easy, other requires considerable labor; then larger veins will sooner be gathered than small ones, and while some stuff occasionally may be contracted at \$3 per ton (this, however, never includes the manipulation of cobbing stones), others may cost as high as \$15 or \$18 and more dollars per ton. I believe that, including the breaking of the cobbing stones, \$7 is the average cost of cobbing of asbestos for a ton at the leading mines of this section.

The stuff after being graded, which is, however, in the entire discretion of every particular mine, (prices of some number 2 and number 3 last year differed about 400%), is put in bags of 100 lbs. each. Cost of bags are from 5 to 6 cents each, cost of bagging, 20 to 25 cents per ton. The cost for transport to cars and loading on this section vary from 10 to 60 cents a ton, according to distance from railroad.

To complete this part of my statement I may add that in this industry there are 40 boilers with a capacity of 1825 horse power, and about 2,000 men employed. The value of plant, that is, machinery, buildings for stores and dwelling purposes, water reservoirs, roads, etc., is estimated at \$355,000.

If I try to give now in the following an idea about the cost of asbestos mining it must be understood that it cannot be applied to any individual mine. The cost of every one will naturally depend in first line upon the quality of the ground the mine is on, and upon how near the respective mine comes to the average with regard to purchase price, invested capital or plant, expenses of management, and so on. As to the quality of ground I have, therefore, chosen to calculate the expenses on the ton of rock, and the cost of asbestos production will depend upon how many tons of rock in a certain mine have to be removed in order to produce one ton of asbestos. On this subject the opinions of the asbestos miners are considerably different, and while some claim to mine only on 50 or so tons of rock to the ton of asbestos, others go as high as 150. I am of the opinion that as a rule the quantity of rock mined to the ton of asbestos is greatly underestimated. Basing, on the capacity and actual work of our machinery appliances, the known quantity of lorry loads removed from a mine during a year, and the known average weight of each load, in relation to the totals of asbestos produced, I hold that 1 ton of asbestos to 100 tons of rock is a fair average. If we accept this the cost of production of asbestos may be set down as follows: drilling,  $3\frac{1}{2}$  cents; blasting, 3 cents; labor for removing rock and gathering asbestos in the pits, 25 cents, making a total of  $31\frac{1}{2}$  cents to the ton of rock, or

\$31.50 to the ton of asbestos; \$7 for cobbing; \$1.50 for bags and bagging; 50 cents for loading; \$5.50 for supplies that includes fuel, tools, iron, steel, timber, other materials and repairs; \$6 for general business expenses, such as management, insurance, offices, marketing and others; \$3.75, 10% wear and tear, calculated on a total of \$355,000 in plant and 9,000 tons production, making a total of \$55.75 to produce one ton of asbestos. If we calculate now that we have to pay interest on a total invested capital of about two and one-quarter millions of dollars, for which at least 10% must be expected, we have in our sales to average a price of at least \$80 per ton of asbestos. Relating to the totals of production for the last eleven years, the figures at my disposal show for 1891 an output of nearly 9,000 tons, with a value of about \$1,000,000, thereby ranking third or fourth as far as value of mineral production in the Dominion of Canada goes, being exceeded only by the coal production, valued at about seven and three-quarter million dollars, and on about even terms with copper, petroleum and brick. The output of asbestos in 1880 (eleven years ago) has been but 380 tons, amounting to \$24,700. Since then the industry has steadily increased, with the only exception of 1888, and has reached in 1890 9,860 tons, with a value of \$1,200,240, taking the official figures as given by the Geological Survey, which, however, seem to me rather high, especially as far as the value is concerned. During the period between 1880 and 1890, the increase has been nearly 2,600% in tonnage and 5,100% in value.

It may be interesting to see what the average value per ton for these last ten years has been, as this is the only measure by which we can judge the industry from a national and economic as well as a business point of view. The years 1880, 1881 and 1882 brought to the asbestos miners a price of \$65 in average, while the price per ton in 1883 reached \$72. From here we find the average price steadily decreasing, owing to the large proportions of No. 3 asbestos, until it reached the lowest point in 1887 of \$49. The respective figures are a trifle over \$65 for 1884, \$58 for 1885, \$59.75 for 1886 and, as stated before, \$49 for 1887; 1888 yielded an average of \$60; 1889, \$69.75, until 1890 brought the large figure of over \$127 as an average price for every ton of asbestos, if the statements made by the Geological Survey are correct. This enormous increase in prices was due to several circumstances, chiefly relating to the state of the European market, and in particular that at the time a number of speculators had bought and kept from the market considerable amounts of stock in expectation of a further rise, while manufacturers as well were anxious to lay in as much stock as possible, under the impression that the mines had nearly reached the top of their capacity, and that prices would be driven to the utmost if stocks should run short. The real state of affairs transpired only when speculators tried to unload. Here a reaction set in, and while manufacturers before were very anxious to buy, they then decided to first await a settlement of the affairs. This, however, was promptly answered with the slacking down in the working of the mines last summer, and led in consequence and in consideration of other obnoxious circumstances—such as the Quebec Mining Act—to the entire shutting down of nearly all the mines in November last. Since then things have somewhat changed.

It is clear that a mineral which has been successfully exposed to a heat of 4,500 to 5,000 degrees F., which is a nonconductor of electricity and which may be spun like cotton and flax, has its merits in itself and will stand on those merits. The uses of asbestos are steadily increasing. I cannot, however, dwell on this point, and have to refer those who are especially interested in the subject to an excellent paper read before the Asbestos Club in September last by Mr. Ed. Wertheim. One thing though I would like to mention with regard to the market for crude asbestos, and that is that it seems as if the American market is now rather inclined to buy as good grades as the European, while vice versa, manufacturers on the other side of the water are taking up lower grades along with first qualities—circumstances which never prevailed before. So it seems that those two main buyers of our products—America and Europe—are coming on more even terms than ever before.

There is no doubt that the industry is still on a steady and very healthy increase, and while we may have temporarily to stand a slough reaction, things will brighten up before long. The sound judgment of those men interested in our industry will soon restore the balance between demand and production and will continue to develop the asbestos industry as wonderfully as they have done so far. The spirit of congeniality which assembles us to-day, and which has found its expression in the formation of the General Mining Association of the Province of Quebec and the Asbestos Club of Black Lake, will aid to this end for the glorification of the Dominion of Canada and its world-known asbestos industry.

#### Recent Practice in Economical Air Compressors.

By F. A. HALSEY, Sherbrooke, Que.

It has long been a source of surprise to the writer to note the degree by which the steam engineering of air compressors has lagged behind that of other consumers of power in connection with mine work. The indicated horse-power allowing for stoppages and averaged throughout the day, for the compressor of the average mine is not less, probably, than from ten to twenty times that of the hoisting engines of the same mine. Nevertheless, engines of the most refined and economical construction are often seen in use for hoisting purposes, while beside them will be compressor plants of,

as stated, from ten to twenty times the developed power, and driven with perhaps plain slide valve engines. In the mining section, where, so far as the writer's knowledge goes, the steam practice is more advanced than elsewhere on this continent—Northern Michigan—the above statement is emphatically true. Hoisting and pumping engines of the finest and most advanced design and construction have been in use there for years as a matter of course, but until recently very ordinary engines have been considered good enough to drive compressors.

When compressed air mining machinery was first introduced it was of course of a somewhat experimental nature, and the air compressor occupied a less prominent position as a fuel consumer, both relatively and absolutely, than now. Under these circumstances it is not to be wondered at that the first compressors should have been built chiefly with a view to economy of first cost. That day, however, has long passed, and there is not now, as indeed there has not been for the past five years, any justification for the continued popularity of compressors designed in absolute defiance of every principle of steam economy. Persistent advocacy has indeed rendered the merits of the plain duplex type of compressor comparatively well understood; nevertheless, for the sake of completeness to the argument, it may be worth while to rehearse them here. The chief point of superiority lies in economy of fuel, the reason for which is as follows:—

In compressing air the resistance of the air against the piston is nothing at the beginning of the stroke, from which it rapidly increases, reaching its highest near the end of the stroke. If steam is to be used with economy it must be cut off early in the stroke, after which its pressure rapidly falls, being at its lowest at the end of the stroke. Thus we have, at the end of the stroke, a high air pressure with only a low steam pressure to overcome it. If the steam is to be used with economy, as above outlined, the deficiency in the power of the steam must in some way be made up. To accomplish this there are two means at disposal with the duplex construction, while with the straight-line form there is none.

1st. The two cranks may be placed at right angles to one another, with which arrangement each steam cylinder is at its best advantage at that point of the revolution where the other is weakest.

2nd. A large, heavy fly-wheel may be employed.

The first device is, from the nature of the case, impossible of application with the straight-line form, and the second is almost equally so. While, of course, fly-wheels are added to straight-line compressors, they are entirely inadequate to the work required, for the reason that there is not room for wheels of sufficient diameter or weight, while in the duplex form there is plenty of room for any wheel desired. In duplex compressors it is customary to use a wheel of double the diameter and double the weight—that is, four times the regulating power—of the largest which it is practicable to employ with the straight-line type of the same size of cylinder. The result is shown to the eye in trying to run the two types at a low speed: owing to the deficiency of fly-wheel the straight-line machine works with an unsteady motion, slowing up at each centre and stopping if a too slow speed is attempted, while the duplex works with a steady motion at a much slower speed than it is possible to run the straight-line at all. The duplex machines can be run with a full load at as low as ten turns per minute, while the straight line form cannot be run with a load at a slower rate than about thirty to thirty-five per minute. The result of this superiority in fly-wheel capacity is, that while it is entirely feasible to run the duplex machines with the steam cutting off at one-fourth the stroke, it is not practicable to run the straight-line machine with a shorter cut-off than about two-thirds of the stroke, and the superior economy of the duplex machine is represented by this difference in the cut-off.

The practicability of using steam with an early cut-off is not, however, the only source of economy in the duplex machine. The capacity for running with extreme slowness at times is an extremely valuable one in connection with regulation. It frequently happens in every mine that the demand for air becomes temporarily almost nil, and the feasibility of running with extreme slowness enables the duplex machine to be brought down to a speed which will meet this condition, but a speed, nevertheless, at which it is producing air in proportion to the fuel consumed. With the straight-line machine it is impossible to run with such slowness, and "unloading devices" are introduced to stop the machine from compressing air that is not wanted and can only be thrown away at the safety valve. This purpose is accomplished, but at the expense of running an idle machine, and also of forcing the air back and forth through the small passages of the unloading device. Of several indicator cards in the writer's possession, taken with this unloading device in operation, the most favorable shows an area of 14 per cent. of the regular compressor card, and if to this we add the percentage customary for the work of driving the idle machinery, we shall see at what a cost of fuel this unloading device accomplishes regulation.

The only objection that has ever been urged against the duplex compressor is, that it "produces a torsional strain on the shaft." Granted; but what is a shaft for? How many engine or other shafts are there in the world that do not carry a torsional strain? Who ever heard before that it was objectionable to have a shaft carry a torsional strain? In point of fact there is no strain except, perhaps, simple tension that is so easy to provide for and which gives so little cause for anxiety as torsion. What shall be said, however, of the alternate bending strain of the long cross-head of the straight-line machine? This is, perhaps, of all strains, the most difficult to provide for; and in point of fact, while no one ever heard of a duplex



12 x 18 DUPLEX AIR COMPRESSOR,  
With Compound Condensing Engine and Positive Motion Air Valves. Designed and Built by the Canadian Rand Drill Co., Sherbrooke, Que.

ompressor shaft giving out, the same cannot be said of the straight-line cross-heads.

The above course of reasoning is so entirely in accordance with the first principles of steam economy that it has to a large extent prevailed, and the said plain duplex type of compressor has become a popular and standard one; but there the matter has rested. Despite the merits of the plain duplex, as compared with the straight-line compressor, no one in this day and age can claim a simple, non-condensing engine to represent a high development of engineering practice. Now it would seem that the first thought natural to a man after being convinced of the soundness of the above reasoning would be: "But your duplex machine contains two steam cylinders; why not make one larger than the other, connect them in series instead of in parallel, and thus, at the trifling additional cost of a few pounds of iron and the boring and fitting of a large cylinder instead of a small one, secure all the economy of a compound engine—an economy so great that ten times the amount required here per horsepower is often expended to secure it, and the result proven to be a paying investment." Unlike hoisting engines, moreover, compressors are well adapted to be connected to a condenser, and where water is available no reason can be found why they should not be so connected. If our supposed enquirer were a little further versed in steam practice it would soon occur to him that since a compound engine requires less steam than a simple one, its boiler may be smaller, and that slight as is the additional cost of the compound condensing machine, it would be in considerable measure offset by the saving in the cost of the boilers.

The writer has presented arguments similar to the above for more years than he likes to own; but he has, until recently, presented them to deaf ears. During the past two years, however, there has been a decided awakening on this subject, and the American company with which he is connected has put out a considerable and increasing number of compound condensing compressors, and the same influence has been at work to at least a proportionate degree here.

The first machine of this description built here is shown in the accompanying illustration, and a larger size has since been called for, the first of which is now being erected and will soon be in commission.

It is not necessary at the present day to present figures of fuel economy of compound engines to show that the money spent on them is well invested; nevertheless, the adaptability of the duplex compressor to compounding is so great, and the consequent additional investment is so small, that the figures in the present connection are of such a surprising nature that the writer gives them as a matter of general interest. The writer's firm was, on a recent occasion, asked to furnish alternative bids for three plants of the same capacity, boilers included, but of the straight-line, plain duplex and compound condensing duplex types, respectively. The figures submitted furnish the basis of first cost, from which the following results are obtained. As a basis of fuel consumption the compound condensing

compressor is rated at 2 lbs. of coal per horse-power per hour, and the plain duplex at  $3\frac{1}{2}$  lbs., which figures fairly represent the results from those types of engine when operated under working, not test, conditions. Of the straight-line machine the writer is not aware of any careful measurements having been made, but considers 5 lbs. per horse-power per hour as a fair assumption. Using the above as a basis, it is a simple matter of multiplication to determine the length of time necessary for the more expensive plants to return the additional outlay in the saving of fuel effected, and the astonishing results obtained are, that with the compound compared with the plain duplex, the extra first cost of the former will be returned in three months; with the compound as compared with the straight-line, in four and one-half months, and with the plain duplex as compared with the straight-line, in six months. In these calculations the mine is assumed to run two shifts of ten hours each per day, and coal to cost \$4 per ton.

The illustration shows a compressor fitted with the writer's positive-motion air valve gear. The subject of this paper relates, however, to the economics of air compression, and no description of the valve gear will be made further than to call attention to the fact that the suction valves are surrounded by hoods properly fitted for connection to flues for leading cold out-of-door air to the compressor. This is a minor source of economy which has been strangely neglected in the past. The economy of fuel obtained by this provision is one per cent. for each five degrees difference of temperature between the inside and outside air. In a climate like that of Canada this can be easily made to aggregate eight or ten per cent., and there are few sources of economy of that extent which can be secured at such a trifling outlay.

#### The Club House Dinner.

After a vote of thanks to the chairman, to the asbestos mine owners for their kind reception and entertainment, and to Messrs. Halsey, Smith and Klein for their papers, the members adjourned to the dining-room. Here the local committee had gone to much trouble and inconvenience to provide an elegant repast. The menu card, too, was quite a work of art, and deserves notice for the fine artistic and literary tastes displayed by its designers, Messrs. John Penhale and L. A. Klein. A brief toast list was submitted, after which the members spent the remainder of the evening in social intercourse. The party broke up about one a.m., having thoroughly enjoyed one of the best meetings since the organization of the Association.

A trial was made on 18th ulto., at Nanaimo, B.C., of the electric locomotive in the New Vancouver Coal Co.'s shaft. The locomotive made a number of trips on the track drawing a few cars with coal. Mr. Wise, District Engineer of the Edison Electric Co., and S. M. Robins, Superintendent of the Vancouver Coal Co., were present. When thoroughly established these locomotives will do away with a large number of mules now employed in hauling cars.

#### LEGAL.

##### Kimberley v. Stewart—More Side Lights on the General Phosphate Corporation.

The last English mail brings advice of the action of Kimberley v. Stewart, which was tried lately before Mr. Justice Wright and a common jury, at the Guildhall, London.

Mr. Nathaniel Gold Kimberley, an engineer residing at Southgate, sued Mr. Geo. Stewart, of Buckingham, in the Province of Quebec, Canada, to recover £660 commission, on the sale of certain phosphate properties in Canada, known as the High Falls and the Upper Lots, to the General Phosphate Corporation, Limited. Plaintiff also sought to recover the value of 2,340 fully paid up £1 shares, agreed by the defendant to be allotted to him as further commission on the sale, or the sum of £2,340 as damages for breach of agreement. In the alternative, he claimed £3,000 for commission for services rendered in relation to the sale. Mr. Herbert Reed and Mr. Carrington were counsel for the plaintiff and Mr. Clavill Salter for the defendant.

Plaintiff's case was that prior to March 13, 1890, defendant was interested in the phosphate properties in question and being desirous to sell the same to a company requested the plaintiff to take steps with a view to their sale, and agreed, in the event of their sale being carried through, to pay him a commission of £660 in cash and cause to be allotted to him or his nominees fully paid up shares in the company purchasing the property of the nominal value of £2,340 out of the shares taken by the defendant in part payment. The payment was to be made to the plaintiff at such time as the defendant received payment for the properties. In July, 1890, a sale was carried through, and in consequence of the plaintiff's introduction, the properties were purchased by the General Phosphate Corporation, Limited, for £40,000—pounds, £10,000 in cash and £30,000 in fully paid up shares. Plaintiff now sought to recover his commission on the transaction, together with £3,000 for work done and money expended at the plaintiff's request. The defendant admitted that he was the owner of the properties and that the sale was effected to the General Phosphate Corporation, but said it was not upon the terms arranged. Defendant was willing, in March, 1890, to accept for the properties £27,000, but the plaintiff and his associates, proposed that the price should be raised to £54,000 in order that they might form a company to purchase at that price, and in order that the difference between that sum and the sum which the defendant was willing to accept, might be divided between the plaintiff and his associates, and the agreement alleged by the plaintiff was conditional upon a sale at such increased price being carried into effect by a time fixed or within a reasonable time. The plaintiff and his associates, however, entirely failed to carry the sale into effect and to bring out the proposed company or any company for the purpose of purchasing

the defendant's properties, and after several extensions of time, the defendant, in or about the month of May, 1890, withdrew the sale of his properties from the hands of the plaintiff and his associates, and made other arrangements. In June of the then year the sale was terminated, but was under no obligation to purchase the defendant's properties, and in the month of September the defendant contracted to sell at the nominal price of £10,000, but the defendant was only able to effect the contract by accepting onerous terms, in particular, the deposit of £10,000 and the payment of an other sum, £11,000, to another person, and no money or shares ever became payable to the plaintiff in respect of such sale. The statement admitted that he ever employed the plaintiff to work or render services or pay money for him as his agent or otherwise. He contended that any work done, or money paid by the plaintiff, or by him, was paid and done on his own behalf by the plaintiff and in his own interest, and not at the request or on the behalf of the defendant. The defendant had never received either money or shares on behalf of the plaintiff. It appeared from the evidence on Mr. James Davidson, (solicitor), that in the General Phosphate Corporation the public subscribed between 19,000 and 20,000 £10 shares, that the shares were not now quoted on the Stock Exchange, there being no dealings in them, and that they were of no value for purposes of realization, though what they were worth for the purpose of holding the witness could not say. The amount Mr. Stewart had received in cash for his properties was £11,000, though the total sum which he was to receive in one form or another, was £40,000.

The jury found for the plaintiff for £660 pounds and estimated the value of the shares at £5.  
Judgment was given for the plaintiff accordingly.

**Aggravated Assault upon Mr. J. Lanson Wills.**

At Aylmer, on Tuesday 12th inst., before Magistrate St. Julian, W. R. Stewart, one of the employes of the General Phosphate Corporation, and son of Mr. George Stewart, vendor and late contractor to the company, was charged with an aggravated assault upon the person of Mr. J. Lanson Wills, the manager to the company. The assault took place at Buckinghamham on the evening of the 9th inst. The prisoner, pleading guilty, was fined \$10 and costs.

The filed suit brought by Robert Robertson, underground manager at the Sydney mines, against the Seclairton Journal has been dismissed.

Several cases interesting to workmen were tried at the supreme court in Sydney lately. A man named Alex. Whyte sued the Sydney & Lunsburg Coal and Railway Co. for damages for injuries received while repairing a boiler. Whyte was in a boiler which was one of a set of four. A fireman blew off one of the boilers the consequence being that Whyte was scalded, as the blow-off cut the boiler on which he was at work as usual. The judge ruled that Whyte had no cause of action. The case was appealed.

Three miners named Evans, Jol, and Hannington sued the General Mining Association for injuries received by being precipitated, while riding in the cage, to the bottom, through defects in the hoisting machinery. After considerable evidence had been heard the jury awarded Evans \$1,000, Jol \$200, and Hannington \$100 damages.

**Notes on the Detonation of High Explosives.\***

By WILLIAM J. OSBORN, F.I.C., F.C.S.

To realize thoroughly the difference between the older explosive mixtures—as typified in gunpowder—and the modern high explosives now coming more generally into use, it is necessary to understand what part the question of time plays in the decomposition of any explosive substance. To this end we may divide explosions into two distinct classes: firstly, those caused by intense rapid combustion, such as may be obtained by applying a light to a mixture of coal gas and air, or by the burning of an intimate mixture of carbon, sulphur and nitre, as in ordinary powder; whilst in the second class you have many substances which do not come under the head of combustible bodies, such as nitrate of ammonia and most compounds of gases, nitric oxide, and even carbon disulphide gas, which may be composed or split up into their elements by means of an intense shock. This shock can be brought about by the formation of an explosive wave, called detonation, and is most conveniently started by the explosion of a small quantity of mercury fulminate. There are other known bodies more powerful than this, for instance, fulminate of silver and iodide of nitrogen, but these are so sensitive that they decompose at the slightest touch, and it is only a matter of degree in obtaining a sufficiently powerful detonator when ordinary substances will decompose and become explosives.

We are apt to consider the explosion of gunpowder as being instantaneous, but the time occupied is enormously greater than in the detonation of the high explosives, and it is for this reason the powerful effect is so great. Our 100-ton guns require hundredweights of powder to execute the given work, whilst a few parts of the weight, say of dynamite, would shatter the breech and perchance,

not eject the projectile at all. With the slow-burning powder the *vis inertie* of the projectile is overcome gradually, the increasing impulse being applied till the ball reaches the mouth of the cannon, when it has its greatest velocity; but with the quicker decomposition of a high explosive the full shock is applied at once, and all the surrounding parts alike are acted on. As an example of the rapidity with which such bodies decompose under the influence of a detonating wave, the decomposition of a train of gun cotton, laid from Wigan to London, would take about one minute. As nearly as much gas being given off from gunpowder as from an equal weight of dynamite, the extra work done by the latter must be due to the quickness of explosion and the powerful action of the high explosives is due to this circumstance.

The next thing to decide is, which of the high explosives is the safest and most economical to use? As the question of safety is of the first consideration, I will mention the following heads which will conduce to this condition:—

1. The temperature of detonation must be as low as possible.
2. The products of decomposition shall be entirely gaseous.
3. The explosive shall not be liable to detonation except by means of a detonator.
4. The explosive shall not be liable to ignition by means of a spark, fire, or partial misshot of a detonator.
5. The products of decomposition, that is to say, the resultant fumes, shall not be poisonous.
6. The cartridge must not be liable to freeze.

To fulfil the above requirements seems at first blush to be a difficult task, but I hope to show you that it is possible to satisfy them to a remarkable extent, provided the explosive be properly handled.

No. 1.—As regards temperature, the following table, compiled from the researches of the most eminent men, will show the differences between the most prominent explosives:—

	Degrees Centigrade.
Blasting gelatine.....	3,220
Nitro-glycerine.....	3,170
Dynamite.....	2,840
Gun cotton.....	2,650
Tonite.....	2,648
Picric acid.....	2,620
Roburite..... (below)	2,100
Nitrate of ammonia.....	1,130

Coming to the second, the gaseous properties of the ultimate products is most important, for here the dangerous properties of gunpowder are very prominent. All explosives containing metallic salts or infusorial earths, such as potassium, sodium, or barium compounds, kieselguhr, clay, etc., and these include powder, tonite, dynamite, gelignite, etc., when they are detonated, fail, to use a sporting expression, that is to say, a large amount of solid matter is projected at a high temperature, and such solid matter coming in contact with mixtures of coal gas or coal dust and air invariably causes explosion.

The third and fourth conditions must be patent to every careful thinker of the subject, as the liability of any explosive to catch fire and burn in the hole is a circumstance that ought not to be allowed of for any material, or to try any new explosive the experiment of inserting a lighter piece of tafe fuse in a cartridge will give ample evidence of the safety in this direction. Cases have repeatedly occurred owing to a partial mis-shot, of the cartridge being projected out of a burning condition. If it is unsafe to use a cartridge of this description, it is equally unsafe to use tafe fuse, and for the detonation of really safe explosives the electric fuse should be resorted to. Many accidents have occurred, as at the Hoythorpe Colliery, through the use of tafe fuse, and invariably the blame is shunted on to the explosive. With regard to the fumes question, much has been and can be said, but until the workmen have a more accurate knowledge of the composition of the explosive and the deduction therefrom of the actual amount of composition, 'very little headway can be made. The experience of the last few years and the action of the Miners' Committee in Durham, ought, however, to have some weight, and I should like to lay down as a general rule, that only those explosives having an excess of oxygen, that is to say, containing enough oxygen to completely burn up the carbonaceous matter, can be called free from poisonous gases when exploded. Many attempts have been made and with partial success to tone down the temperature produced by the explosion of nitro-glycerine compounds, such as gelignite and carbonite, by means of wood meal. The ultimate effect has been, and carbonite is the worst offender of all in this respect, that the production of a large volume of that odourless, colourless, but most poisonous gas carbonic oxide or carbon-monoxide. This gas (1 per cent. in the air being fatal) acts in a peculiar way on the blood, robbing it of its oxygen, and thus taking away its life-giving power.

We can easily show that carbon-monoxide is formed when carbonite is detonated, for if we explode say 10 grains of this explosive in a confined space and collect the gases formed, we find that these gases burn with the characteristic blue flame as given by carbon oxide, and further analysis shows its presence to a remarkable extent.

The following table gives the composition of the six prominent explosives, and shows the composition of the gases formed on explosion. The gases are collected by detonating ten grammes of each in a closed strong steel cylinder having an internal diameter of five inches:—

Explosive.	Volume of Gas Formed.	Composition of Gases. Per cent.			
		CO <sub>2</sub>	CO	OH, & H	N.
<b>GUNPOWDER— Parts</b>					
Nitre..... 75	2214	51.3	3'5	3'5	41.7
Sulphur..... 10					
Charcoal..... 15					
<b>GELIGNITE—</b>					
Nitro-glycerine..... 56.5	26	7	..	..	67
Nitro-cotton..... 3.5					
Wood meal..... 8					
Potass. Nitrate..... 32					
<b>TONITE—</b>					
Nitro-cotton..... (varies)	30	8	..	..	62
Barium Nitrate..... 3750cc.					
<b>ROBURITE—</b>					
Ammonia nitrate..... 86	32	..	..	..	68
D-i-nitro-chlor-benzol..... 14					
<b>CARBONITE—</b>					
Nitro-glycerine..... 25	19	15	26	40	..
Wood meal..... 40					
Potass. Nitrate..... 34					

Mr. H. HALL said there was one point in Mr. Ashworth's paper worth while calling their attention to. Mr. Ashworth states that in stemming a hole there is as much strength in 7 inches of tamping in a 1 inch hole as there is in 18 inches of tamping in a 2 inch hole. He also points out that many people who are using the high explosives are using them in the same size of holes as they originally used gunpowder in, and he goes on to point out that there would be much advantage if the size of the hole were lessened, and they would get a better tamping and safeguard against blown out shots. He thought there was another point, and that is that when they put a high explosive into a large hole they get all the force at the back of the coal, and it was doing its work at one particular point of the coal, whereas if they brought it along the hole the same as gunpowder they got a bearing on a greater length of the whole, and it might lessen the breaking up of the coal, and so they gained an advantage in that way. There was a statement which he thought must be a mistake. Mr. Ashworth said that when one of the shots was fired in the Ashton Deep Pit the ventilation was at the rate of 50 ft. per second. That appeared to him (Mr. Hall) to be a mistake.

Mr. GRUNDY said Mr. Ashworth had not seen the plan. He told him (Mr. Grundy) so. The circumstances connected with the firing were peculiar, and the velocity was great.

The HON. SECRETARY said the paper had been submitted to Mr. Ashworth before publication for correction. Mr. GRUNDY: I do not think he is far out of it. I can give you the exact figures.

Mr. COCKSON pointed out that there was clearly a clerical error on pages 340 or 345 in reference to the explosives that were used in the shot that caused the accident at Ashton Moss Colliery. Roburite was mentioned in one of these contradictory paragraphs, and had the reader of the paper been present he would have asked him to withdraw any mention of roburite, as it certainly had nothing to do with the Ashton Moss accident. Looking at the main conclusion drawn by Mr. Ashworth, he agreed with all of them, except his theory of detonating vibration, and disagreed with Mr. Grundy when he said that the experiment of trying to ignite a high explosive with ordinary fuse was not of much service. In his opinion it was a most useful test, as an explosive that could be ignited in such a way was not suitable or safe to use in fiery or dusty mines. With regard to the use of solerite for high explosives, there was no doubt by so doing the explosive would give better results, and there would be less work in boring; but as there was no risk of inflaming gas by a vamped roburite shot blowing out, the question of greater safety did not apply to that explosion at any rate. He agreed with Mr. Ashworth that at Alton's Colliery sprinkling by water had not proved a safeguard against the use of gunpowder, nor could he think it practical in any way to effectively collect water dry and dusty mine, of any considerable length against what he considered the very serious danger of an explosion of coal dust caused by a gunpowder shot or other unsafe explosive.

**Growth of Mining in British Columbia.**—The collieries of Vancouver Island and the province are growing in importance, and giving employment to 3,194 hands. The output of coal for the year 1891 was 1,029,097 tons, compared with 678,140 tons during the previous year, notwithstanding the foreign coal markets have for some time past been unfavourable. The quality of this coal is not equalled on the coast. In the interval between 1st of July 1858 to December 31st 1891, the province has yielded coal valued at \$53,113,122. The district of Cassiar still heads the list as a gold producer. The Kootenay district is undoubtedly rich in silver-bearing ore, but development work is backward. However, an 80 ton smelting plant now being erected on Kootenay Lake, will no doubt help to improve matters at an early day.

\* Transactions Manchester Geological Society.





### Extraordinary General Meeting of the General Mining Association of Quebec.

An extraordinary General Meeting of the General Mining Association of Quebec, was held on Wednesday, 20th inst., in the offices of the treasurer at Montreal. Among others present were: Hon. George Irvine, Q.C., (Johnson's Co.), Quebec, President; R. T. Hopper, (Anglo-Canadian Asbestos Co.), Montreal; J. Burley Smith, M.E., (British American Phosphate Co.), Glen-Almond, Que.; Dickson Anderson, Montreal; Capt. Robt. C. Adams, (Anglo-Canadian Phosphate Co.), Montreal; S. C. Stevenson and A. W. Stevenson, Montreal; Hon. John McIntosh, Compton, Que.; W. E. Bell, Toronto; B. T. A. Bell, Ottawa, Secretary, and others. Hon. Mr. Irvine presided. The meeting having arranged some preliminaries, opened the forthcoming Mining Convention, proceeded to discuss Quebec's mineral exhibit at the World's Fair. The Hon. John McIntosh, Commissioner of Quebec, explained that the Government's grant for the whole provincial exhibit amounted to but \$12,000. He asked for the co-operation of the Association promising free transportation of, and safe return of specimens. He thought that the exhibits should be properly explained by some competent person conversant with the mineral industries and the extent of the Province's resources, and asked that the expenses incident to this might be borne by the operators. Mr. S. C. Stevenson, who has had much experience in Government exhibits in different parts of the world, claimed that the principle of the various Provinces being represented by independent exhibits in addition to a general exhibit by the Federal Government, was wrong. In minerals there was at Ottawa in the Museum of the Geological Survey, and the thoroughly representative collection which should be utilized. The Government at Quebec could not make a better, and representations should be made to have this collection sent. After some further discussion by Capt. Adams, Mr. Hopper and Mr. J. B. Smith, it was moved by Capt. Adams, seconded by Mr. A. W. Stevenson: "That Mr. James King, M.P.P., J. Burley Smith, and the Secretary, be a committee to co-operate with the Hon. John McIntosh, and that said committee be authorized to interview Dr. Saunders, the Canadian Commissioner at Ottawa, with a view to securing the co-operation and assistance of the Dominion Government in the proposed exhibit of minerals from the Province of Quebec." The meeting then adjourned.

### Diamond Drill Tests for Proposed Tunnel Scheme, Straits of Northumberland

Messrs. McRae & Company, Ottawa, who have the contract for test borings on above work, received the following report a few days ago:

The tests on the New Brunswick shore were completed about the 5th July. The carboniferous base work has been traced and penetrated at 3 distinct points; and it is clearly shown that the soft red shales and sandstone of the lower Permian of Prince Edward Island runs across the straits and repose with a gentle incline on the northern border of the New Brunswick system.

A point of serious investigation has been to determine whether the Tormentine anticlinal runs right across to Cape Traverse, or turns to the eastward in the direction of Hillsborough Bay. The latter now appears to be its true direction, so that the tunnel beds lie in an undisturbed position in a broad syncline, whose eastern extension underlies the rich green swells of southern Prince Edward Island.

Two test borings have been completed out on the water, and 24 more will be made across the straits, and two on the Island.

Iron tripods 100 feet long are anchored firmly. A 3 inch heavy iron casing pipe is then driven about 15 feet into the bed clay, and the drill outfit is attached on a frame work above the tripod. Steam is supplied from the boiler which is placed on a scow anchored alongside. The first hole was completed in 1 1/2 days; the second, however, owing to stormy weather, took three or four days longer.

Allowing for delays by storms, in two months the submarine tests should be completed, and a week or so longer would be sufficient for the terra firma borings. The outfit was manufactured by the American Diamond Rock Boring Co., of New York, and has been specially equipped with double core barrels, casing pipes, etc., for submarine work. The average drilling has been about 30 feet per day. Mr. Albert Palmer, C.E., of New York, directs the work, and the drill outfit is under the management of Mr. James Kelly, an expert driller, of Ottawa.

## MINING NOTES.

(FROM OUR OWN CORRESPONDENTS.)

### Nova Scotia.

In our next issue we will publish in these columns an illustrated article by Mr. John E. Hardman, S.B., M.E., of Oldham, on "Recent Gold Milling Practice in Nova Scotia." A complete set of Mr. Hardman's drawings will accompany the paper.

A capital hoisting record was made for Cape Breton on 9th inst. at the International colliery, when 1,508 boxes, or 1,452 tons of coal were hoisted from a single shaft. 2,600 tons were shipped on the same day from the company's pier.

### Quebec.

#### Lievres River District.

The phosphate in bins and at the mines of the General Phosphate Corporation was seized by creditors during the month. The demerment cannot be far off.

The Phosphate of Lime Co. is working a reduced force at High Rock. Mr. Walter Pickford, the former superintendent, is expected from Florida on a visit to the mines during the month.

The property of the Squaw Hill and Atna mines was formally transferred from the Anglo-Continental to the British Phosphate Co., Ltd., last month, and the conveyance was duly registered at Hull.

The phosphate deposit lately struck in the Crystal Pit at Atna, operated by the same company, bids fair to hold on to a good thing. "We are still sinking in the vein," writes Mr. J. Burley Smith, the manager, "which continues to widen as we go down, and the ore is of a very pure quality. It is undoubtedly a true right-running vein N. E. S. W. We are driving on it at three levels, three drifts to the S. W. and two to the N. E., and as we descend shall drive others in the same directions at lower levels. Having discovered this deposit at such a considerable depth, 105 ft., there is every prospect that it may continue to a great depth. The shaft is inclined in accordance with the inclination of the vein on which we are sinking. Self-dumping cars are let down on a cable and run off on to tramways laid down in each drift. The ore is thus put into cars at the point at which it is blasted out, and taken right up into the cobbing house at once and washed and cobbled. The shaft and different levels are lighted by 25 incandescent electric lights of 16 candle power each, by means of which the miners can see much better how to mine without waste, as the different colours of the associated vein stuffs are readily distinguished and the ore can in a great measure be separated in the pit and sent up to bank, thus saving considerable cobbing labour. This pit is now making a considerable weekly output of high grade ore, which, I am happy to say, increases in quantity from week to week, and will, I am sure, very shortly produce an output something in accordance with our first anticipations. The electrical energy for the lamps is supplied from a small engine and dynamo, worked by surplus steam power from steam hoist boiler. The pit and various levels are kept cool and thoroughly ventilated by a Sturtevant steam blower."

#### Township of Hull.

Mr. A. W. Stevenson has leased his phosphate-mica property to the Waters company, who are now operating it for the latter mineral.

#### Eastern Townships.

The asbestos mines have resumed operations and are working, with but one or two exceptions, full force.

At Thetford, the Beaver Asbestos Co. are working a good strong force and are turning out a quantity of nice asbestos. They are also building, near the line of the Quebec Central Railway a large cobbling and store house, 30 x 100 feet.

Mr. Geo. R. Smith has been appointed superintendent of the mine of the Bull's Asbestos Co. This company are working a good force of men.

The Ward Bros., Ross & Co., have not reopened their mine as yet.

Messrs. King Bros. are mining both at Thetford and Black Lake.

Dr. Jas. Reed has re-opened his mine and is getting out some good asbestos.

Some good finds are reported on the Johns property, adjoining Dr. Reed.

At Black Lake, the Glasgow and Montreal Asbestos Co. has a large force of men on and they are getting some fine fibre from the lower end of their property. A number of new devices have been put up this spring and the capacity of their hoisting engines increased by the addition of two drums to their engines.

The United Asbestos Co. has a strong force mining, and the output is very good. They are, in addition to their regular mining work, working a large force of men cutting

and grading for a tramway over the hill, to convey the waste rock and rubbish from the pits to tip back of their property, which, when completed, will be of great service to them in unburdening valuable ground of the rock that now covers it.

Capt. W. Prichaux, has been appointed superintendent at the mines of the Anglo-Canadian Asbestos Co., Ltd. This mine is being worked with the usual force, and their output is very good.

Some good asbestos has been discovered at East Broughton in the openings made by Mr. H. N. Williams. The formation there is different from that at Thetford or Black Lake.

Some work is being done on the Laubley mine at Coleraine station. Some very fine samples of asbestos are shown from this place.

#### Templeton District.

The Lomer Mine has been showing up remarkably well for the past six weeks. In the big pit, 20 tons of high grade ore are daily taken out, in addition to about 20 tons No. 2. Work for the past few weeks has been confined exclusively to the big pit. One hundred men and boys are employed.

The Templeton Asbestos Co. are working a gang of 16 men. Some good sized stuff has been struck. The serpentine rock is being sawed and shipped to mill at Buckingham, where it is being ground for German market. It analyses as follows:—

	Per cent.
Silica .....	40.52
Magnesia .....	4.05
Iron oxide .....	1.97
Alumina .....	2.10
Water .....	13.36
	100.00

The Templeton and North Ottawa Co. are doing some development work on their properties near McGregor Lake, where large surface shows of amber mica are being tested.

The Electric Mining Co. have a gang of 18 cobbers preparing phosphate for shipping. Mining will not be resumed until November.

### Ontario.

#### Port Arthur District.

Favorable reports continue to be received of the work done on the Climax property.

Work has been resumed on the Badger-Porcupine mine. This mine, like that of the West End of Silver Mountain, is one of the solid mines of this district, and it is much to be regretted that misunderstandings and consequent litigations should have resulted in even a temporary suspension of work while there is smelting and other ore in sight.

The following are the statistics of the export of silver ore by companies from this district:—

Silver Islet .....	\$3,250,000
Duncan .....	20,000
Thunder Bay .....	12,000
Beaver .....	309,700
Badger .....	294,064
Porcupine .....	1,000
Silver Mountain (West End) .....	15,450
Crown Point .....	7,800
Huronian (gold and silver) .....	6,700

In addition to shipments enumerated above, the East End Silver Mountain expressed \$50,000 worth of silver to Liverpool, Eng. There are also various smaller mines which have shipped considerable quantities of ore of which the consular or customs departments have no records easy of access. It is, however, admitted that the actual shipments largely exceed four million dollars.

For the year ending 31st December, 1890, we learn from the same reliable sources, that there was shipped to the United States, the following:—

Beaver .....	\$ 80,000
Badger .....	95,000
West End (Silver Mountain) .....	2,450
	\$177,250

For the year ending 31st December, 1891, the shipments to the United States were:—

Beaver .....	\$104,800
Badger .....	104,100
Silver Mountain (W. E.) .....	10,000
Pallades .....	1,000
Various prospects .....	300
	\$220,200

Thus showing an increase for the year 1891 over 1890, of \$41,950.

Port Arthur is likely to be the first city in Canada to have a mining school. The town of Port Arthur has passed a by-law granting \$3,000 toward the erection of

the school and will give \$1,000 a year for ten years toward its maintenance, while the Ontario government has placed in its estimates a sum equaling that of Post Arthur for the erection and also \$2,000 a year for the maintenance of the school. The municipality of Shumail will also, it is thought, pass a by-law making a grant for its maintenance.

#### Sudbury.

Reports from the nickel mines here show that all the works are in full blast, the Copper Cliff, Hazelard and Murray mines being worked to their full capacity.

#### British Columbia.

##### Nanaimo.

The shipments of coal for last month amounted to 54,317 tons, or a decrease on the previous month of about 5,000 tons. The exports by companies was as follows: New V. C. Co., 30,047 tons; Wellington colliery, 14,344 tons; East Welling colliery, 965 tons; Union colliery, 8,956 tons.

At the annual general meeting of the employees of the New Vancouver Coal Co., held the other day, the report of the medical committee and their financial statement was presented. A medical and accident fund has existed among the miners of this company during the past three years, which is maintained by a monthly subscription of 25 cents per head of every employee. Last year's balance sheet showed a deficit of \$153.45. This year there is a balance of \$184. The receipts during the year ending May 30th, 1892, amounted to \$18,075, and the payments to \$15,095.75, including the surgeon's salary of \$9,817.30. The number of accidents that came under the committee's notice for the same period and in which relief was granted, was 133. At this meeting the appointment of a mines director took place, with the result that Dr. E. H. Fraeger was retained. There had been a movement among a number of the miners to do away with the present system of every man employing the same medical man, and to make arrangements whereby each man could employ whoever he chose; however, when the time came, the feeling had veered around in favor of the present incumbent, who is beyond doubt a thoroughly capable surgeon, and he was re-appointed with the almost unanimous consent of those present.

Mr. A. Dick, government Inspector of Mines, who has returned from an official inspection of the Union mines, reports everything to be going on very satisfactorily. The number of men employed is not so great as it might be, but those that are working are employed steadily. A new electric pumping apparatus for the No. 1 shaft has just been received, and is one already in use in another mine has been found to work with the greatest success.

Extensive operations are now, and have been for some time past, being carried on at the Newcastle Island quarry of the New Vancouver Coal company of which Messrs. Carter and Nightingale are the lessees. About 20 men are regularly employed in getting out stone, and they have lately been doing so with the aid of the various contractors. Messrs. Carter and Nightingale have the contracts for supplying stone for the new buildings now being erected in Vancouver for the banks of Montreal and British North America, and also for the drill shed at Victoria. The gang of men employed in the quarry are comfortably lodged and boarded on the island, where good, substantial buildings have been erected in close proximity to the works. The sandstone quarried out has not yet been equalled by that turned out of any of the other quarries in the province; it is used in almost all the large buildings erected either on the Mainland or Vancouver Island.

(From the Miner.)

J. Shieble claims to have 12 feet on his claim, the Lucky Jim, in the Ocean district. Other reports say that he has only 30 inches. There is little doubt, however, that he has at least 12 inches of exceedingly high grade stuff. Five-sixths of the claim is bonded for \$40,000.—\$5,000 down.

An agreement made in 1890 between the original owners of the Silver King and Richard Day Atkins has been renewed, substantially the same as the present one for Silver King, Kootenay Bonanza and American Flag, have also been re-recorded. The dry-lanes are beginning to rattle.

The owners of the Dictator intend to sink a 100 foot shaft on their claim, and mean to put in the assessment work on the 4 or 5 other claims which form the group.

On Tuesday the United was visited by S. P. Palmer. The drift to the south is in 3 feet of ore on the same slute from which ore was shipped last year. Galena has been struck in the 150 foot level.

A. I. Davenport has a force of men stopping from the cropping of the Poorman hole down to the tunnel about 50 feet below. They are working at present on a proposed quartz running high in fine gold. Whenever development work is done on a large enough scale the Poorman will become one of the biggest mines in West Kootenay. The richest ore yet found running \$500 to the ton in gold was got at the foot of a veinize sunk 80 feet from the level of the main tunnel. A tunnel has been begun and run 20 feet west of the present one, and the prospect of this vein. Quite a little development work remains to be done before the property can be said to be fully shown up.

## CANADIAN COMPANIES.

**Canada Coal Co.**—This company has applied for letters patent under Dominion laws for the following purposes: (a) To buy and sell and otherwise operate and deal with coal, wood, iron and mineral ores; (b) To purchase, hire, charter, navigate and maintain such steamships and sailing vessels for the carrying and conveying of goods, chattels, wares and merchandise, and to carry on such business as carriers of goods as their business may require, with power to sell and dispose of the said vessels or any of them; (c) To purchase, rent, erect and hold for the purposes of the company such lands, wharves, docks, warehouses, offices, elevators and other buildings as it may find necessary and convenient for the purposes of the company, and to sell, mortgage and dispose of the same for the purposes of the company; with a capital stock of \$50,000, divided into 500 shares of \$100. The applicants are: Harry Jackson Watson, James Thorold Mathews, Albert Ernest Mathews, James Mathews and James Morgan, all of the City of Toronto, in the County of York, Province of Ontario.

**The National Oil Co.**—Applies for letters patent under Dominion laws. Capital, \$150,000, in 1,500 shares of the value of \$100, to be paid in Cash. The applicants are: John McDonald, oil refiner; James Eddies, oil refiner; William Adam, Braybrook, blacksmith; and William Edward Langford, accountant; all of the said town of Petrolia; and Charles Henry Schooley, of the city of Toronto, in the Province of Ontario, oil merchant; who on the said John McDonald, James Eddies and Charles Henry Schooley are to be the first and provisional directors of the said company. The purposes within the purview of the Act, for which incorporation is sought, are: The purchase of refineries, plant and machinery; the carrying on of the business of buying, leasing, letting and selling petroleum oil lands and other lands; buying, selling and producing oil and crude petroleum oil and other products thereof; and putting down salt and oil wells, and otherwise developing salt and petroleum oil lands; working, leasing, buying, letting and selling oil refineries and salt works; manufacturing, buying and selling salt and petroleum oil and other products thereof; storing, tanking and warehousing refined and crude petroleum oil and other products thereof, and granting warehouse receipts in the same; constructing and operating pipe lines for the transportation of oil and the doing of all such other things as are incidental or conducive to the attainment of the objects aforesaid throughout the Dominion of Canada.

**The Eagle Nest Gold Mining Co. of Ontario, (Ltd.)**—Gives notice that application under the Ontario Act for incorporation, to be made by Toronto and Ottawa people, has had most satisfactory results in the two wells sunk—one at each of the above places. The first well was drilled at New Toronto, to a depth of 1,300 feet. The first gas was struck at 575, and the largest body at 875 feet. At 1,300 feet the well was exploded and has been flowing at the rate of from 75,000 to 100,000 feet daily. The gas has been used by a factory alongside, for heating, lighting, etc., and the pressure seems to be existing considerably from time to time. The second well, at Minico, was sunk 1,100 feet, and the output from this time, from 300,000 to 350,000 cubic feet daily. A third well one and a half miles further west, has been started. A large area of land has been leased, and ten or fifteen wells will be sunk within a radius of 8 miles from the city. Experts claim that the gas belt lies in the close proximity to the city, and wells of "pushers," yet they will more than repay the cost of sinking them. \$10,000 so far has been expended, and a similar amount will be used during the next three months. The stockholders, who include a number of Ottawa gentlemen, are more than satisfied with the results, and look to a bright and prosperous future for the undertaking. The gas is of a high quality and absolutely free from sulphur, and its close proximity to the city makes the manufacturers and real estate men of Toronto hope for satisfactory results.

**The Kramer-Irwin Rock, Asphalt and Cement Paving Co., (Ltd.)**—Gives notice that application under the Ontario Act will be made for incorporation, to make, lay and repair all kinds of flooring, pavements, roofs and walks, in the Province of Ontario. Head office, Toronto. Capital stock, \$500,000. The applicants are: Herman Kramer, paver, Buffalo, N.Y.; Thomas Irwin, John Thomas Irwin, roofer; Wm. James Kingdon, clerk; and John Franklin Monck, all of Hamilton.

**The New Toronto Natural Gas and Oil Co.**—Which was recently organized by Toronto and Ottawa people, has had most satisfactory results in the two wells sunk—one at each of the above places. The first well was drilled at New Toronto, to a depth of 1,300 feet. The first gas was struck at 575, and the largest body at 875 feet. At 1,300 feet the well was exploded and has been flowing at the rate of from 75,000 to 100,000 feet daily. The gas has been used by a factory alongside, for heating, lighting, etc., and the pressure seems to be existing considerably from time to time. The second well, at Minico, was sunk 1,100 feet, and the output from this time, from 300,000 to 350,000 cubic feet daily. A third well one and a half miles further west, has been started. A large area of land has been leased, and ten or fifteen wells will be sunk within a radius of 8 miles from the city. Experts claim that the gas belt lies in the close proximity to the city, and wells of "pushers," yet they will more than repay the cost of sinking them. \$10,000 so far has been expended, and a similar amount will be used during the next three months. The stockholders, who include a number of Ottawa gentlemen, are more than satisfied with the results, and look to a bright and prosperous future for the undertaking. The gas is of a high quality and absolutely free from sulphur, and its close proximity to the city makes the manufacturers and real estate men of Toronto hope for satisfactory results.

**New Vancouver Coal Mining and Land Co., (Ltd.)**—The annual general meeting of this company was held during the month at the offices, 12 Old Jewry Chambers, London, E.C., Mr. J. M. Savage, secretary, presiding. The directors, in their report, stated that the net output for the half year was 204,500 tons, and the sales 202,350 tons. Prices, which up to the middle of the year

were fairly remunerative, fell considerably and continuously, so that the accounts showed that the working for the past half year had been less satisfactory, and they regretted to say that the prospects for the present year were even less encouraging. The directors recommended the payment of a dividend at the rate of 1½ per cent. for the half year (free of income tax), making, with the interim dividend paid in December last, 4 per cent. for the year. In view of the indebtedness of the company to its agents and the prospects of the company's operations for the current year the directors regretted that they were unable to recommend a larger dividend. They were also desirous that outlay on capital account, especially in these depressed times, shall be curtailed as much as possible, and all endeavours directed to getting the coal that must be taken to market at as low a cost as possible. The report and accounts were unanimously adopted; the dividend was declared, and the retiring director and auditor were re-elected.

**Quebec Asbestos Co., (Ltd.)**—Registered by H. O. Mellor, 23 Clements-lane, London, E.C., with a capital of £25,000 in £1 shares. Object, to carry into effect an agreement, made March 17, 1892, between G. White of the one part and J. S. G. White of the other part, for the acquisition of certain asbestos-bearing properties of the township of Cleveland, Quebec, Canada, and to carry on business as miners and smelters in all its branches, whether for asbestos or other minerals. There shall not be less than three nor more than ten directors; the first to be elected by the signatories to the memorandum of association. Qualification, £250. Remuneration to per cent. of net net profits, the same to be divisible.

**Meeting of the Sydney and Louisburg Coal and Railway Co., (Ltd.)**—The thirteenth ordinary general meeting of this company took place last month at London, Mr. G. W. Melley presiding. In moving the adoption of the report, the chairman said during the past year they had raised 170,853 and 100,000 tons, and 155,907 tons in 1890, and 122,600 in 1889. That was the largest quantity ever raised by the company, and under ordinary circumstances they would have had very good profits to show, but owing to causes which he would explain to them the anticipated profits could not be put into the coffers of the company. They had disbursed, in the first place, for general repairs and constructions, an amount of £1,238,858, and in consequence of the cylinder pier through an impact of ice. There had also been an increase in wages of £1,200, for a demand had been made by the miners of Cape Breton, asking for 15 per cent. increase, or at the rate of 3d. per ton; but they had, after negotiations, consented to accept an increase of 7½ per cent. or 1½d. per ton. There was also an item of £439 for new piping. The year's revenue account had, moreover, to bear a charge of £1,968 under the heading of depreciation, being one-third of the cost of the stone drift, new coal cars, and of payments on account of the new coal area, and £845, one-third of the cost of opening up the Emery mine, the payment for which was spread over three years. 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## The Minerals of Ontario.

AN ADDRESS BY MR. A. BLUE, DIRECTOR OF MINES,  
TORONTO, TO THE STUDENTS OF UPPER  
CANADA COLLEGE, MAY 6, 1892.

It is about thirty years, since, in a country school section in one of the Lake Erie counties, I gave my first talk to boys and girls. Never much gifted in that way, I feared to trust myself to make an oral address in a room of College boys; and especially upon a subject that demands care in the statement of facts. Therefore, I have thought it wise to speak to you from paper.

Thirty years is a long time in the life of a man, as the life of man goes; a long time to be spent in well or ill doing. In that school section where I taught a generation ago, I am reminded that there were forty-eight or fifty persons each of whom had then reached my present time of life, or over. They were men and women in the vigor of their days and strength, who had cut for themselves homes out of forests of oak and maple, and walnut and chestnut, and a hardier or healthier lot of men and women you could never find in the whole of bread America. Where are they to-day? The answer is the old, old story. Of all but two of their number it has now to be said that there are other toiling hands where theirs have ceased from their labors, and there are other weary feet where theirs have completed their journey. It is the old, old story. One generation goes and another generation cometh; and the world goes on.

You have read of Waterloo, an event of seventy-seven years ago. You recall the brilliant cavalry attacks of Marshal Ney upon Wellington's Fifth Brigade, and Wellington's unflinching order at sunset when arose that stern and appalling shout which the British soldier is wont to give upon the edge of battle, and which no enemy ever heard uttered by the Fifth Brigade which withstood and repulsed the charges of Marshal Ney's horse and joined in the shout when the order to advance was given, was an Irish soldier, Maurice Shea, one of the 24,000 of English, Irish and Scotch who shared in the glory of that fateful day. Maurice Shea was the last survivor of the 24,000, and his death at the age of 97 took place a few weeks ago in the town of Sherbrooke, in the Province of Quebec. In the Fifth Brigade which defeated France the last survivor of the marines who fought and lost under Villeneuve off Cape Trafalgar. Eighty-seven years—nearly seventy-seven years—is a long time in the life of a man, and such last survivors as those of Waterloo and Trafalgar are not often met with in human annals, so fleeting is our stay upon this world's stage.

In his book on Minerals and Man, Lyard observes that a deep mine-shaft over Assyria, Babilonia and Chaldaea. With these names, he says, are linked great nations and great cities dimly shadowed forth in history; mighty ruins in the midst of deserts, defying by their very desolation and lack of definite form the description of the traveller; the remnants of mighty races still roving over the land; the fulfilling and fulfilment of prophecies; the death of the past and the cradle of the future alike look as the cradle of their race. For six centuries Nineveh was one of the great cities of the East, or perhaps it might more accurately be described as a group of cities. It was the capital of a great empire, in which a series of palaces surrounded by great and high walls had been built by successive kings. It was a city of about three days' journey, with its palaces and its streets of sixty miles circumference, according to the geographer Diodorus; and it had a population computed to be not less than 600,000. Nineveh perished with the last Assyrian king 2,500 years ago, and from that time until the explorations of Botta and Layard were commenced, fifty years ago, its place on the world's map was blotted out. Having been abandoned by its people, its palaces and walls were gradually buried under the fine yellow dust which in the course of centuries the wind had drifted over them. Xenophon, who commanded the retreat of the Ten Thousand, encamped upon the site of the city without knowing its name. When the battle between the Romans and the Persians was fought within sight of the mounds in the seventh century of our era, the city, and even the ruins of the city had long since disappeared as its one old in Gilbon. And also, 125 years ago the traveller Niebuhr, father of the historian, passed over Nineveh without perceiving it; he mistook for a ridge of hills the dust-covered rampart of brick and earth.

Then there is Troy, the old Troy of your Homer, if you read old Homer here. That city was taken and burnt by the Greeks more than 3,000 years ago, and its place on the map has been a subject of contention with scholars down to a period of less than ten years ago. "The question is now decided for ever," Dr. Schliemann tells us. "On the hill of Hissarlik Dr. Schliemann has uncovered the ancient palaces of Troy, has laid bare its colossal fortifications, and brought to light its treasures of gold and silver. Moreover, in the country round about, his unwearied exertions have proved the accuracy of many details, which show a coincidence, astonishing even to the most credulous, between the picture unfolded in Homer and the one preserved to this day." The mound

of Hissarlik is shown by Dr. Schliemann to be the remains of seven successive cities, one built over the ruins of another, and the second of which was the Troy of Homer. The first lies on the virgin rock, 115 feet above the sea, while the full height of the hill at the beginning of the excavations was 162 feet. The second is separated from the first by a layer of debris eight feet in thickness, covered by a layer of alluvial soil five feet in depth, which proves that the site had been deserted and not built upon for a long time. The walls, the towers, the palaces, the pottery, and the gold and silver cups and bowls and vases and ornaments uncovered in the second city are remarkable evidences of its strength and civilization, and fully justify the observation of Dr. Schliemann in his last report that "Troy was burnt." The proof of which he found in the charred and decayed the vitrified brick of its walls. And he was able also to establish this further fact, to quote Schuchardt again, that "there existed on the site of Hissarlik, at a period far anterior to any we know of on Greek soil, a proud and royal city, mistress of sea and land; and the singers of the Trojan war, just as they were familiar with Ida and Skamander, with the Peloponnesus and the islands of the Aegean, knew of this city, knew of its golden age and of its mighty downfall."

I have said this much by way of preface in the hope of giving you some idea of the lapse of time as we find it in the annals of human events. What it means when we come to consider the history of the earth itself, how we measure the time of geologic events, we can hardly conceive, far less determine. The rock at the base of this building was one of the brown clay of the Drift age, Sauguenay clay of the geologists, which you find extending over a wide area of the province, underlying the humus or vegetable mould and perhaps a few feet of gravel or sand. It is as old as the glacial era, or the closing period of that era, and doubtless older than our great lakes as they now exist, and very much older than the formation of the Niagara Falls, or of any of the older rocks, of the granites and clay slates of the Huronian and Laurentian areas, ground to dust by glaciers, or decomposed by the action of water and weather, or dissolved by carbonic acid in a moist atmosphere. Much older is the lime in the plaster of the walls, the material of which we get at the nearest point from the Niagara group of rocks, whose aggregate thickness is estimated at over 100,000 feet. Whether built up by the entities whose forms are so plentiful in the upper beds, or by the deposition of calcareous matter chemically separated from the primary rocks in the ancient seas, or as seems most likely, by both these agencies working together, the process must have occupied thousands of years. Still more ancient is the brown sandstone used in the foundation of your building, taken from the upper beds of the Medina formation, near the base of the Niagara escarpment. Where this stone is quarried at the Forks of the Credit the Niagara limestones overlie it to a height of nearly 200 feet; and this sandstone, like the limestone and the clay, is material reworked from the primaries. Very much older than the clay or lime or sandstone are the slates on the roof. The slates we see here are beds of the only part from the Province of Quebec or the State of Vermont, where they occur in the so-called Quebec group of rocks in the Lower Silurian system, but which is probably of pre-Cambrian or Huronian age. We know that the best slates are found among ancient lavas and rocks which have been faulted and tilted, and we have reason to believe that they have been formed under the influence of great pressure and heat. In this Province if slates of good quality and cleavage exist at all they will no doubt be found in the Archaean formations of the north, and explorers report their discovery there. On Temagami Lake and the Matachewan river there is said to be enough to supply the continent—let the stories of explorers must be received with a grain of salt.

It is for these ancient limestones, and clays of which the walls of this college building have been constructed are old, what is to be thought of the age of those primary rocks out of whose ruins they were brought, and worked over grain by grain, and slowly laid down again by the waters of the sea in new beds removed by hundreds of miles in distance and by eons of years in time from the parent bodies? And what is the life of man compared

To be continued.

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12 p. 92.

\*This reminds me that after the Mining Commission had taken the evidence of Sir James Grant at Ottawa, the witness volunteered a piece of wholesome advice. "You must be very careful, Mr. B. James said in his deliberate Scotch way, 'of what these mining men tell you; they are so prone to exaggerate.'" "Yes," I said, "I have no doubt David had them in his mind's eye when he made that happy remark. You know David prepared a hundred thousand talents of gold, and a thousand thousand talents of silver, and brass and iron without weight, for the building of the temple; and when he said in his haste, that he sometimes regretted that he had before him his experience with the mining men of his day." Sir James thought so too.

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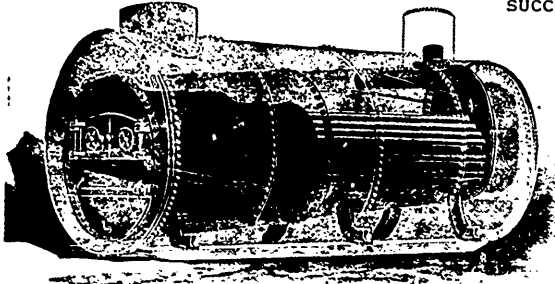
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\*Dr. Schliemann's Excavations, an Archaeological and Historical Study, by C. C. Schuchardt, p. 18.

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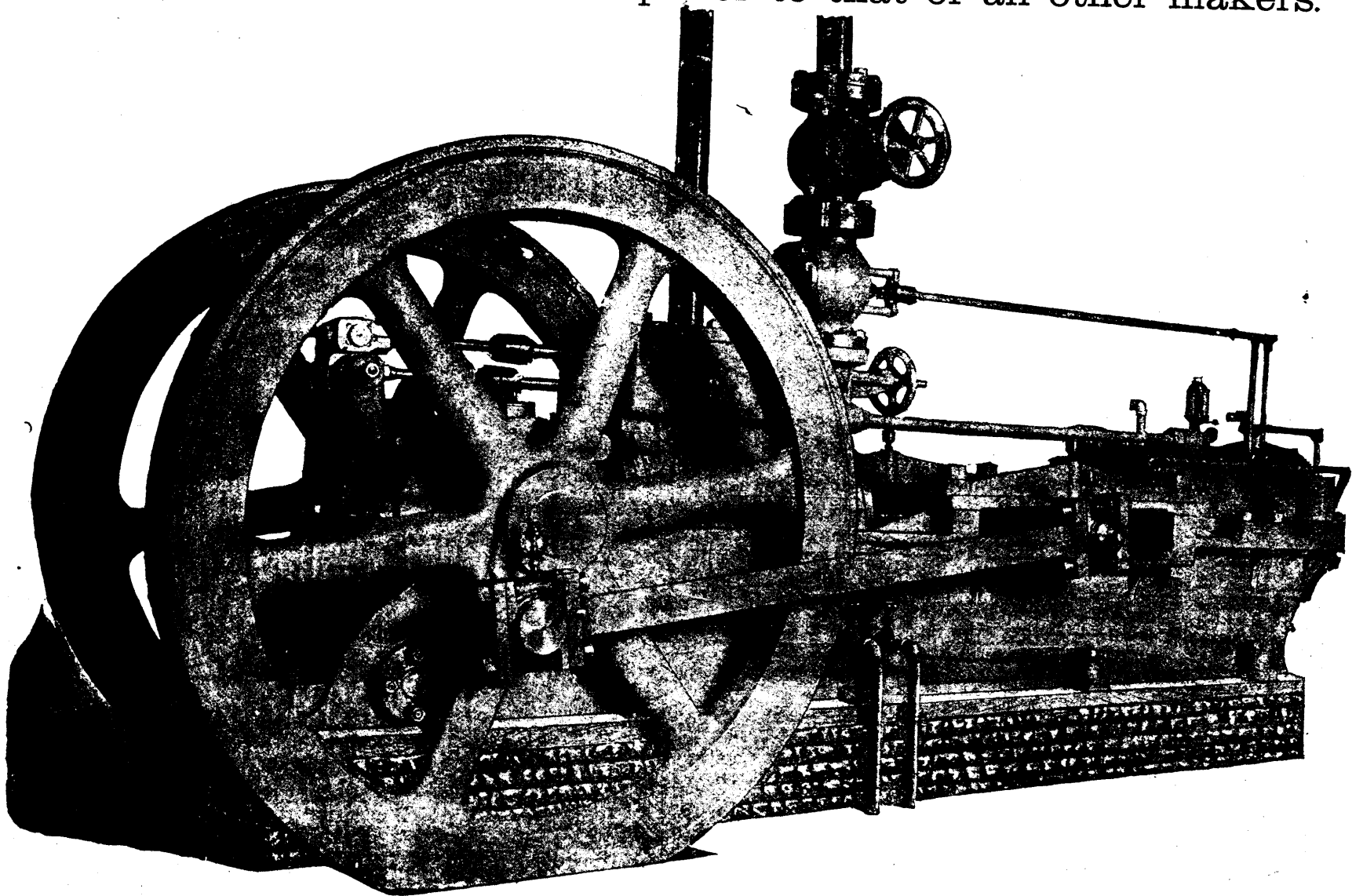
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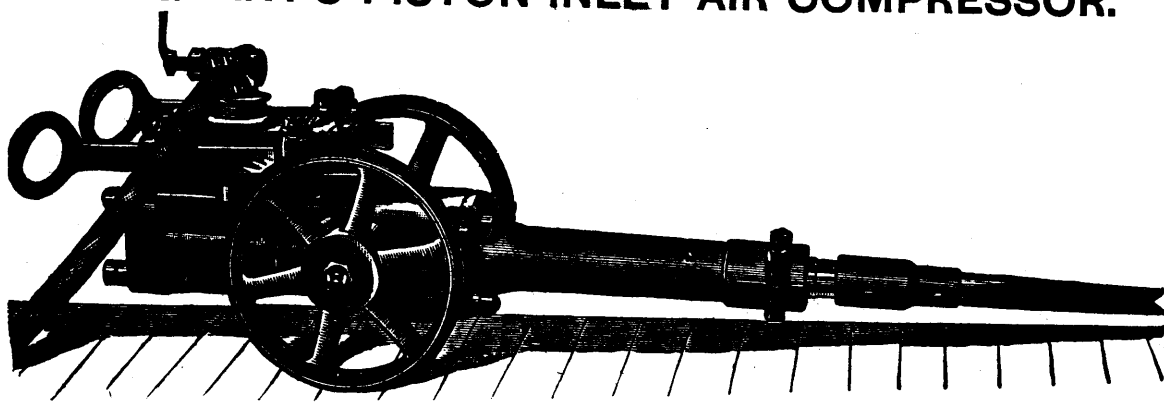
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