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Canadian

Established 1882

Vol. XIII.—No. 2.

1894—OTTAWA, FEBRUARY—1894.

Vol. XIII.—No. 2.

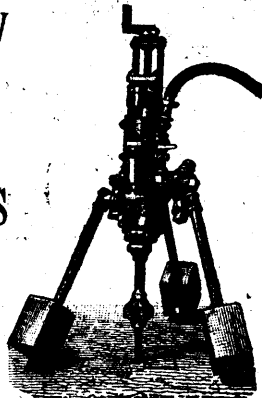
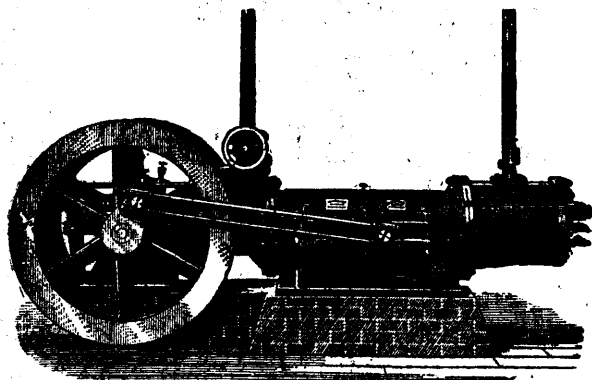
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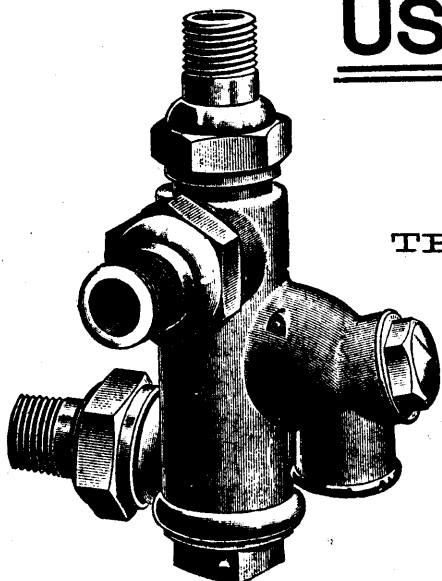
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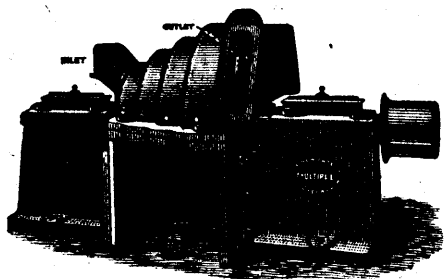
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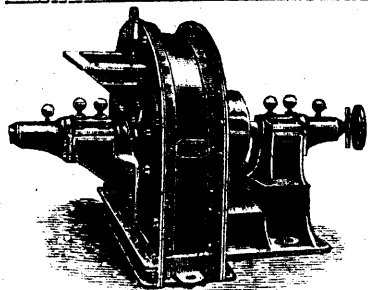
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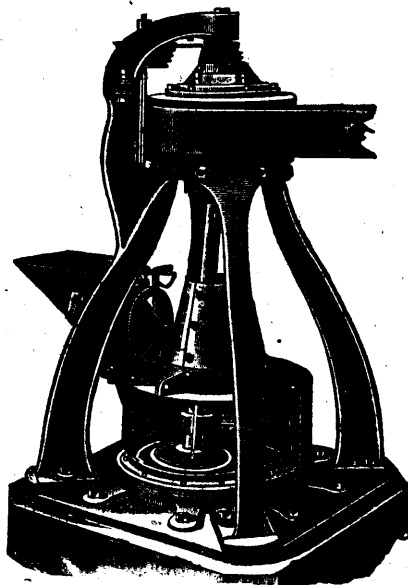
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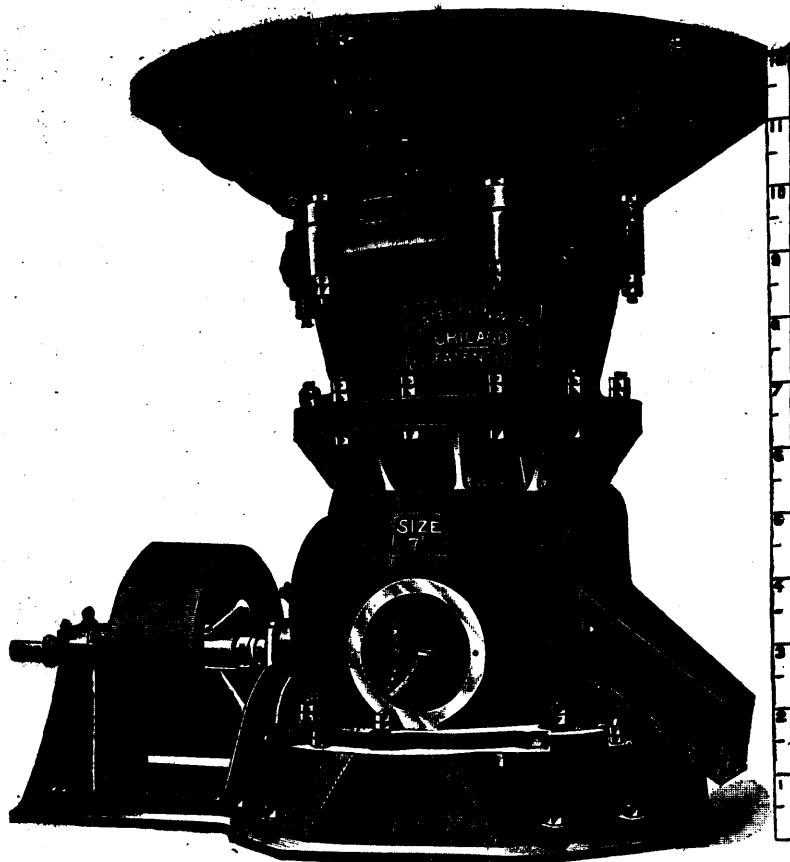
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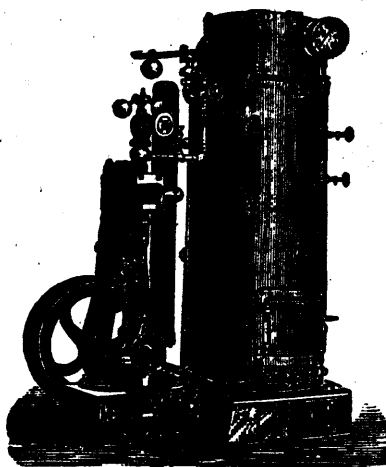
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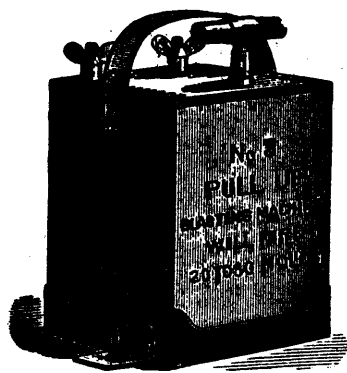
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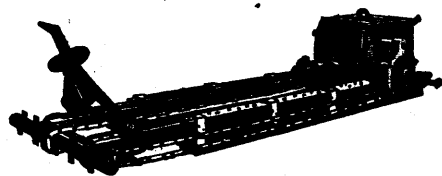
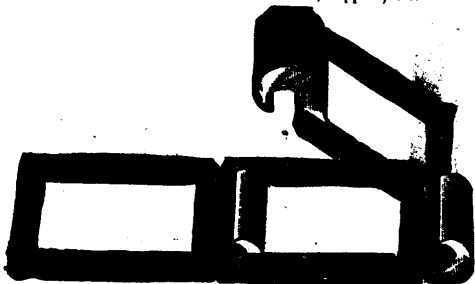
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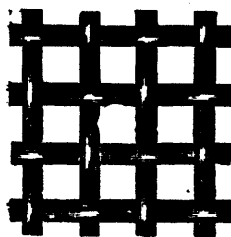
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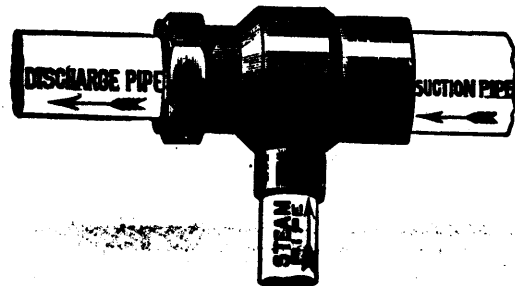
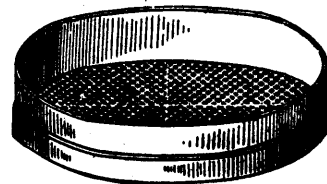
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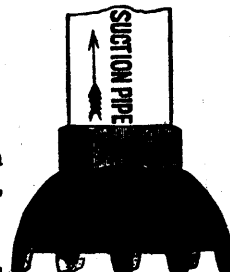
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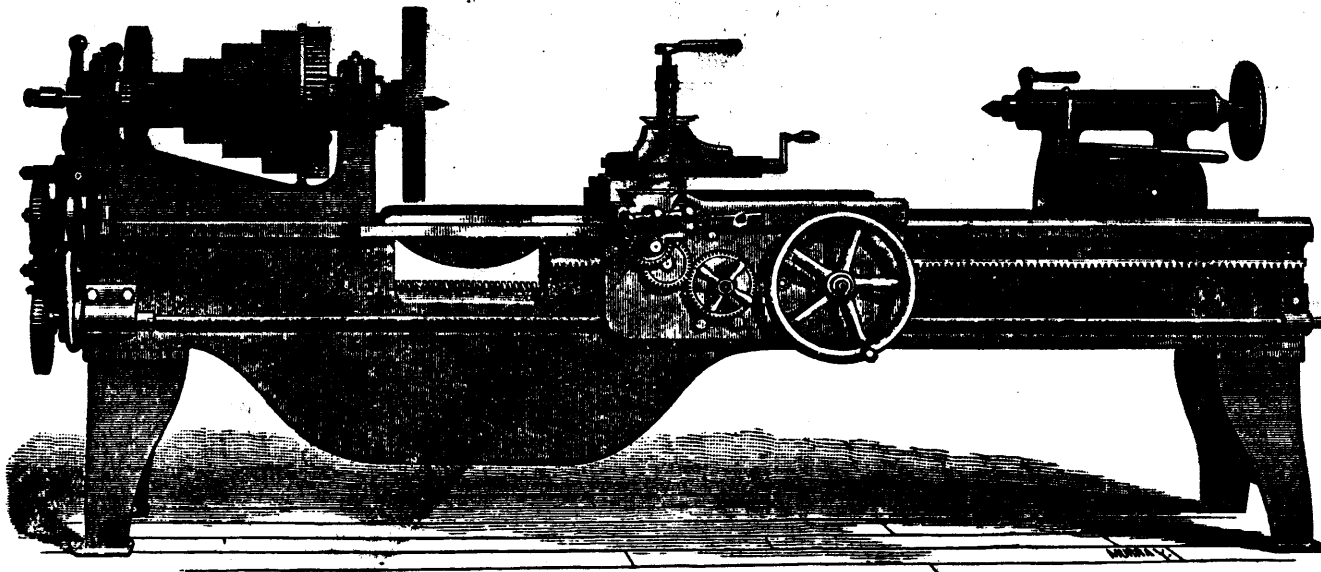
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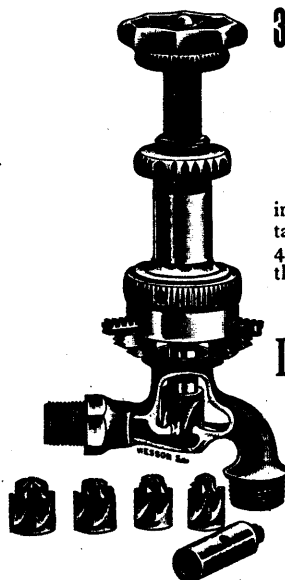
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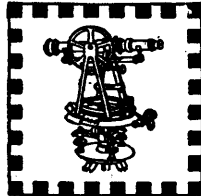
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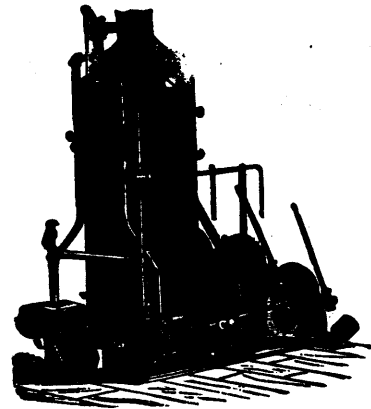
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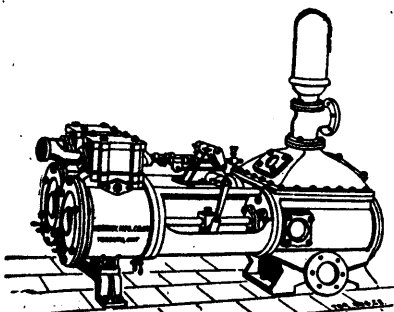
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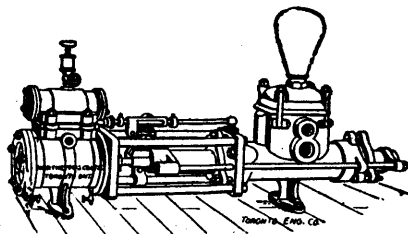
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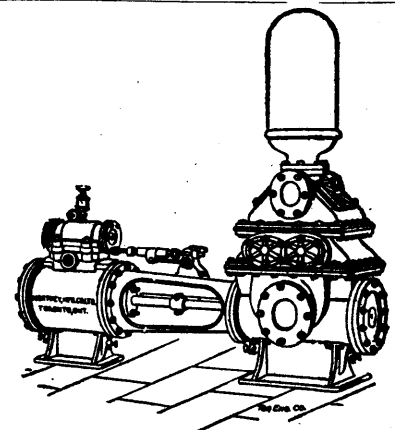
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THE following Resolutions of Council indicate beyond a peradventure the status of THE REVIEW as the exponent of the Canadian Mineral Industries:—

The Gold Miners' Association of Nova Scotia.

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

The Mining Society of Nova Scotia.

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

The Asbestos Club, (Quebec.)

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

The General Mining Association of the Province of Quebec.

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

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Vol. XIII. FEBRUARY, 1894. No. 2

The Gold Mining Industry of Nova Scotia for 1893.

The decrease in Nova Scotia's production of gold during the past year was not so great as the earlier months of the year indicated. From the best data obtainable the output for 1893 was 20,260 ozs., against 21,080 ozs. in 1892.

Of this amount of 20,260 ozs. nearly seven-tenths was the product of the four districts of Stormont, Oldham, Caribou and Waverley, each of which produced in excess of 2,000 ozs.

The districts which show a substantial increase in yield over 1892 are: Stormont, Waverley, Tangier and Oldham. The chief districts showing a decreased yield are: Malaga, Uniacke, Montagu, Fifteen-Mile Stream and Caribou.

The main district of the year has been Stormont, which from a production of 2,482 ounces in 1892 has jumped to a yield of 5,753 ounces in 1893, an increase of 130%. There have been four producing mines in the district, two of which, the Richardson and the Copeland, stand about equal as to production, each showing about 2,000 ounces for the year.

The other two mines, the North Star and the Country Harbor Co., each produced between eight and nine hundred ounces, but the latter

mine only had about eight months' run during the year.

The results of the last year's work in this district are very encouraging, and have been very gratifying to shareholders, and there is every reason to expect still better results in 1894.

The ore bodies worked are large, yielding at the rate of \$7 to \$8 per ton, and show no signs of exhaustion.

The second largest producing district for the year is Oldham, with 3,412 ounces against 3,093 in 1892. Of this amount 3,300 ounces is the product of the mines owned by Hardman and Taylor. Oldham has also kept up its record for high yields per ton, August, 1893, recording a yield of over 125 ounces per ton of quartz. The total yield is the highest ever recorded from the district.

The district coming third on the list is Caribou (and Moose River), which, however, records a loss of 500 ounces from the yield for 1892. The production for the year was 2,542 ounces. The cessation of work on the Truro Co's mine will readily account for the decreased yield. The Dixon and Touquoy properties have continued to be steady producers. During the year the old Lake Lode mine was unwatered, and a small amount of bullion produced. For 1894 this district may show an increase, as the Truro Co's property has changed ownership, and the Lake Lode may contain reserves of quartz unknown to present owners, but development is necessary and cannot be done quickly.

The remaining district showing a yield of over 2,000 ounces is Waverley. For the first time since 1868 this district has reached the above figure, the total amount produced being 2,110 ounces, which is entirely the output of the West Waverley Gold Co's mine. The East Waverley Tunnel Co. has not pushed work, and all other mines in the district have lain idle.

The largest decrease is shown by Malaga district, which reports 322 ounces against 2,656 for 1892, a decrease of over 2,300 ounces. During the year work has been practically suspended, and in the closing months some transfers of property were made which may prove beneficial and considerably increase Malaga's yield in 1894.

The next largest decrease is reported from Uniacke district (in which is included South Uniacke), being 1,300 ounces less than for 1892. This loss, as we predicted a year ago, has come principally through the decreased output of the Thompson-Quirk mine. The boundaries of their territory on the pay chute have practically been reached, and any increase of yield from this district must come from new developments. An attempt is now making by a new syndicate to reach the pay chute on ground east of the Thompson-Quirk territory, but should the attempt prove successful it will influence the production of 1895 rather than 1894.

Montagu shows a falling off of 1,100 ounces. The product of the Salisbury and Symon-Kaye Companies has been very small, and the poor ground encountered on the Annand property

has precluded any large output by the English company.

Salmon river yields about the same as last year, as does Lake Catcha. Sherbrooke, we note, has been dropped as an independent district from the tables of the Mines Office Reports.

Fifteen-Mile Stream, in spite of consolidation, shows a decrease of nearly 700 ounces.

Tangier's output is increased nearly 400 ounces, entirely the work of the Mooseland Gold Mining Co.

The year as a whole has been unmarked by any salient features other than the rapid development of Stormont district, and the general interest taken in improvement of milling appliances. The gradual and general disappearance of some old fads as to incompatibility of capacity and large saving in the stamp mortar, has accompanied the demand for cheaper milling, and the number of tons crushed for 1893 will not fall far short (if any) of the maximum tonnage for any year since 1862.

Towards the close of the year several new companies have been incorporated to work (chiefly) old districts, and from the success of these companies must come any substantial increase for 1894.

The Phosphate Situation.

The remarkable depression which has so continuously characterized the phosphate industry of the world during the past three years, still shows no real signs of relief, and we are not yet justified in looking forward with much hopefulness to the immediate future.

Without indulging in the useless iteration necessary to an elaborate discussion of the various causes which have contributed to bring about the prevailing state of affairs, we may recall that in the year 1890 the prices of phosphate had reached an exceptionally high limit. They had, in fact, been steadily advancing, until they touched 1/4d. per unit for very high grade material. It was, therefore, possible to work the Canadian mines by modern methods on a sufficiently large scale to insure a reasonably profitable return on any amount of capital judiciously invested, and there was consequently great activity in all directions. New enterprises were started, new mines were opened up and interest was awakened in such kindred Canadian interests, as the mining of pyrites, the local manufacture of sulphuric acid and the utilization of low grade or waste phosphates by transforming them into manufactured fertilizers. Suddenly came the news at this juncture, of the discovery of phosphates in Florida, and this, followed by the inevitable Southern "boom," and the unlimited and indiscriminate offerings of high grade material to the buyers of the world by those who had hardly commenced breaking ground and who were entirely ignorant of the world's wants and of its absorbing capacity, created a revolution in the phosphate trade, the effects of which have been universally disastrous.

Under the continuance of the senseless and

unreasonable policy of the Florida "boomers" and in compliance with the immutable law governing supply and demand, the market values have steadily receded until they have now reached a point at which, even under the most favorable conditions, there can be no possible profit in any kind of phosphate mining.

That this view is not unduly pessimistic may be shown by a very brief examination of facts.

The total yearly consumptive capacity of the entire world does not exceed 2,000,000 tons of mineral phosphates of all grades and from all sources. Of this quantity probably 1/3 is of a grade varying from 30 to 45 per cent. and is used as a direct fertilizer without chemical treatment. About 6/8 are of a grade varying from 45 to 70 per cent. and are used in the manufacture of ordinary low grade superphosphates. The remaining 1/3 is of a grade ranging from 70 to 82 per cent. and is used partly for the purpose of enriching or bringing up to any desired standard the lower grade materials and partly in the manufacture of a high grade superphosphate containing about 18 per cent. of water soluble phosphoric acid. The sources of supply for at least 15/16 of the total quantity called for have long been accessible and are practically inexhaustible. The remaining 1/16 or that portion which contains from 75 per cent. and upwards of phosphate of lime, with a restricted minimum proportion of oxides of iron and alumina, has always been a much rarer commodity, and it was because of this rarity that its selling price was maintained by the miners at a properly remunerative level.

When the Florida phosphate raisers, in the first burst of their enthusiasm, undertook to supply the total quantity of this high grade material required for the world's consumption, the hitherto sufficient reason for high prices naturally cease to exist. Eager competition and cut rates soon brought them down to the proportionate parity of the lower grades, and such mines as those of Canada for example, which had hitherto produced very high grades at rather a high cost were not long able to hold their own and were, consequently, forced to be closed down.

The Florida miners, thus soon monopolized the business, but the cost of the monopoly has been a heavy one, and its preservation has involved a never ceasing slaughter of prices.

In proportion as they have been made to believe in the boundless nature of the supply, buyers in Europe have grown more and more capricious in their contracts and timid in their operations.

Contracts have been entered into and broken by them without scruple as prices have gradually broken away, and they have not hesitated to seize upon the slightest and flimsiest pretext for rejecting cargoes that have been shipped to them in good faith, or for claiming disastrously heavy allowances for insufficient discrepancies in the results of a chemical analysis. When these conditions are coupled with the lowest selling prices on record, and very high rates of

freight, it is easy to realize that there is not a single mining enterprise in Florida which can claim to have earned a *bona fide* profit on the money invested in it.

The generally bad condition of the phosphate business is, therefore, no better in Florida than anywhere else, and in fact it may be justly regarded as very much worse, for the reason that its production of really high grade phosphate has fallen so far short of anticipations, that the average analysis of the 500,000 tons of hard rock already shipped, does not stand higher than 76 per cent. for the phosphate of lime, or lower than 3 1/2 for the oxides of iron and alumina.

In order to at once better the quality of their product, and materially cheapen its cost, the Florida miners now wash their entire output by passing it through "Tennessee Log Washers," and large numbers of washing plants have been erected in different parts of the State. Whether the average quality really will be permanently improved by this method of treatment is actually an open and a very doubtful question, but the cost of production has been decreased by it to an all round average figure which may be put at \$3.50 per ton for mining, washing, drying and loading on the railroad cars at the mines, or at about \$6 per ton free on board outgoing vessels at the shipping port of Fernandina.

The average amount of phosphate rock and gravel of the above mentioned quality obtained from the total material removed from the mines and passed through the washers and over the picking belt, is about 10 per cent., and the average capacity of the washing plant being placed at 500 tons of dirt per day of 12 hours, it follows that its actual net daily capacity is some 50 tons of clean rock phosphate. It would appear from this at the first glance, that the quantity to be produced from any given mine was merely governed by the capacity of the plant, but as a matter of fact, the all important question is narrowed down to the productive capacity and extent of any given phosphate pocket. If the pockets under exploitation are sufficiently productive, the miners may realize a small profit if they sell all their product and receive full payment for it on the basis of \$1 1/2 per unit, or £2 1/2 per ton delivered in Europe on usual European terms. If, however, these pockets turn out, as they most frequently do, to be of only limited capacity, it becomes necessary to occasionally remove the entire plant from place to place, in order to operate in paying ground, and the possible profit of the previous work is thus swallowed up by the expenses incidental to the stoppage and the removal.

It is hence no exaggeration to say that no net profit has been realized on the five or six hundred thousand tons that have been already mined and sent to Europe, and that the mine owners would be far richer and in every way better off if they had left it in the ground, or at least gone about their mining in the first instance with more prudence and discrimination.

Up to the present time they have been merely

governed by an insatiable eagerness to do a gigantic business, and they have thus become easy prey for unscrupulous agents and dealers, who have systematically "beared" the market in order to cover their own speculative sales, and force weak holders of stock to realize at approximately the mere cost of their production.

The "weaker vessels" are, of course, being crushed rapidly to the wall and are dropping out of the race, and there can be no doubt that those who prove strong enough to hold their ground, will eventually consider the advisability of entirely changing their method of sale. Instead of assuming the enormous, unfair, and unbusiness like responsibility involved in their present system of delivering their phosphate at their own risk to buyers in Europe, and of relying upon the caprice of these buyers to pay them for it after it has been received, or to reject it and sue them for damages while they hold it as a security for alleged claims, the miners will sell it on this side of the ocean, and see that it is weighed, sampled and paid for, ere it passes out of their possession.

If they somewhat diminish or restrict their trade by the adoption of this course, they will on the other hand impart a healthy tone to their own affairs and give a chance for other producers to come into the market with higher, more uniform and more costly material.

They will thus facilitate the reopening of Canadian and such other mines as may be able to supply the high quality needed for the manufacture of superphosphates containing 18 per cent. of water soluble phosphoric acid, and will at the same time weed out of the industry those parasitic speculators of the "nothing-to-lose-and-everything-to-gain" order, who have hitherto been pushing them forward into bankruptcy.

----- "Fully Paid" Shares. -----

The widespread adoption of the principle of limited liability in mining and commercial enterprises, and the growth in public favor of shares in joint stock ventures as a means of investment, makes it highly desirable that the other side of the question should not be forgotten, and that investors should be made fully alive to the dangers which unwittingly they may incur. To one of these particularly it is our desire at present to draw attention. There is no more commonly accepted idea, even among those who are accustomed to dabble among stocks and shares, than that no danger or liability can be incurred by anyone accepting a transfer of shares, so long as these appear in the certificate issued by the Company to be fully paid up; and while there are very few who would accept a transfer of shares having uncalled liability attaching to them, in however good repute the Company concerned, without making some inquiry as to its financial stability and prospects, most men would without any hesitation accept the shares of any Company, however unsound, appearing to be fully paid. Indeed it is no uncommon experience for a commercial man to accept in

payment of an obligation, which would otherwise prove a bad debt, shares of which his debtor may happen to be possessed, and which may or may not be saleable at the moment, without making further enquiry than to satisfy himself in a cursory way that there is no uncalled liability which may involve "throwing good money after bad." If no good should result, no harm will be done.

This, however, may be an entirely erroneous idea. Under the provisions of "The Companies' Act," Revised Statutes of Canada, 1886, Chapter 119, Section 27 provides:—

"Every share in the Company shall, subject to the provisions of Sub-section 4 of Section 5 of this Act, be deemed to have been issued and to be held subject to the payment of the whole amount thereof in cash, unless the same has been otherwise agreed upon or determined by a contract only made in writing and filed with the Secretary of State at or before the issue of such shares."

(It is worthy of note that this Section is also applicable to many of the Provinces.) And the cases are not few in which shareholders, confident in the belief that, if they are not to gain anything by the liquidation of the Company of which they were members, the matter is at least for them at an end, have been rudely awakened from their fancied security to find that under the Section just quoted they are liable to the liquidator for the full nominal value of the shares standing in their name.

The evil usually arises in the following way, which will also serve to illustrate the practical danger involved. It is quite a usual thing at the time of the inception of a new Company for a vendor to the Company of goodwill, or patents, or property of any kind, to receive in part or full payment of the agreed on price, shares of the Company nominally fully paid, and, indeed, this is one of the favorite methods of proving to the public the *bona fides* of the vendor, who is also not seldom a promoter. This arrangement will no doubt be embodied in a contract between the parties, but very probably through the neglect of the solicitor, or for other causes, the terms of the Section of the Act above quoted will be overlooked, and the arrangement will be carried out and the shares allotted and issued in implement thereof without the contract having been filed with the Secretary of State. If the company succeeds, well and good; but if liquidation should ensue it at once becomes the duty of the liquidator to place the names of the holders of these shares upon the list of contributors, and to make a call upon the full amount per share, since no contract having been filed the shares must be deemed to have been issued, and to be held subject to the payment of the whole amount thereof in cash. Still, so far as we have gone, there is no danger apparent to the general public. The vendor must be held to attend to his own interests and to be responsible for his own negligence, and however harsh may be the consequences, he cannot be said to have anyone but himself to blame. The doctrine, however, is pushed much further. The liability does not rest in the public but in the shares, and any third party who may have ac-

cepted a transfer of these is equally liable as the original holder, and that notwithstanding any consideration which he may have paid to the latter in exchange for the shares. This at once opens up great danger to the investing public. It is very unusual for any vendor, however sanguine of the success of the Company, to allow all his eggs to remain in one basket, and he will thus take the earliest opportunity of working off the shares standing in his name to purchasers in the market. There is no particular designation attached to these shares to distinguish them from those which have been allotted in the usual way, and for which the Company has received cash; the shares appear from the share certificate to be fully paid; there is nothing whatever to indicate any hidden liability; and yet, though the innocent holder may succeed in proving his want of knowledge, and thus evade liability, he may only be able to do so after an expensive and protracted litigation in resisting the proposal to place his name on the list of contributors. On the other hand, the holder may have accepted the transfer of the shares in full knowledge of the non-filing of the agreement under which they were issued, in which case he has absolutely no answer to the liquidator's demands, and the pleasant delusion which the phrases "limited liability" and "fully paid" have fostered may involve positive ruin.

There are no more vexed questions in company law than those arising under this Section of the "Companies' Act," and the circumstances of each case are so various that the decisions can very rarely be accepted as precedents; and as is natural, while demands are made which, however tenable in law, very rarely appear to be so in equity, no obligations under company law have been fought with more bitterness or greater resistance than those arising on this point. The discussion of such legal points is, however, beyond the scope of this article, and we content ourselves with the desirability of transferees of shares satisfying themselves as to the history, or at least obtaining a certificate of the absence of liability from the transferer, upon which the latter could be held liable for any damage ultimately sustained.

It would appear to be a natural conclusion from what has been said, that a provision involving so much danger to innocent investors should be removed. It is extremely desirable that intending applicants for shares should be made cognizant of the whole arrangements which have been made with the vendors and promoters, and that some check such as is here provided for, should be made upon the power of directors to make allotments, otherwise in their anxiety to declare a company successfully floated large numbers of shares may be credited to parties from whom not a penny had been received in exchange. The necessity for publication prior to the issue of the shares of an agreement embodying any arrangement of this kind by registration at the Secretary of State's department, to which anyone may have access on payment of a small fee, undoubtedly takes from it its under-

hand aspect and enables *bona fide* subscribers for shares to go into the transaction in the full knowledge of the circumstances. A way out of the difficulty, avoiding either objection, might be found in a provision that all shares in respect of which, though nominally fully paid, no cash has passed, should bear a distinctive mark or name, so that future purchasers may be alive to their character. This would naturally increase the difficulty to the original holder of disposing of his shares in the market, and in turn make him more anxious to see that the formality of registration, which to avoid expense he is often at present glad to have dispensed with, is carried through. In the meantime, as already pointed out, purchasers will require to be all the more cautious in examining into the history of any shares which they may acquire before accepting the transfer. There are to our knowledge at the present moment not a few holders of "fully paid" shares whose fancied immunity from "calls" is a pure myth, and who would be only too anxious to have their names removed from the register of members were they aware of the liability which their ownership involves. Apart from this, so much doubt has arisen from the decisions and cross decisions in cases arising under this Section, that it seems only reasonable that Parliament should throw more light on its intentions in this respect, and define more exactly the limits to which liability shall extend where transferees with or without knowledge of the shares are involved.

The Importation of Mining Machinery.

Since our last issue we have to acknowledge the following from Sherbrooke under date of 19th instant:—

"We wish to deny *in toto* the statement appearing near the top of first column of second page of your January issue, to the effect that we led in opposing the admission to the Customs Department of the list of mining machines not made in Canada. It was the general impression of the Sherbrooke meeting of the committee that if a complete list of mining machines made in Canada were submitted, that would answer every purpose, inasmuch as all machines not on that list were necessarily not made in Canada, and hence that the second list was superfluous. Had we led in this opposition, we cannot see that it could be construed as an antagonism to the miners; but in point of fact, we did not lead.

In this, as in the remainder of your remarkable article, we consider that regardless of facts, you are simply using your position to excite animosity against Canadian manufacturers.

We wish to remind you and to inform the mining public of the fact, which you conveniently suppress, that Mr. Halsey made the motion which we both voted for, favoring the extension of the scope of the Act so as to make it include quarrying, smelting, metallurgical, and allied lines of machinery. This fact alone is sufficient to show the falsity of your statements as to our narrow spirit in this matter."

(signed) F. A. Halsey,
J. M. Jenckes.

We cheerfully give prominence to this communication, for nothing is further from the action and policy of the *Review* "than regardless of facts" to use our position "to excite animosity against the Canadian manufacturers."

Referring to page 382 (*Journal of the Gen. Mining Ass'n Prov. Que.*), we find: "Messrs. Halsey and Jenckes made objection to furnishing the Department with any statement showing the machinery that was not manufactured (in Canada), claiming that a statement of what was made would serve the purpose equally well." Furthermore, being present at the meeting we have a very distinct recollection of the circumstance. Both gentlemen were, we surmise, shrewd enough to foresee that the proposed statement of the various classes and kinds of mining machinery not manufactured in Canada (a very voluminous document embracing an immense area of specialties in mining plant), would be irresistible proof of the comparative insignificance of our mining machinery manufactures in comparison with other countries, and an unanswerable argument in favor of the Government's policy to encourage the extension of our mining industries and great mineral resources by the continuance of the present law.

Regarding the latter portion of the letter, upon which so much emphasis is laid, Mr. Halsey is certainly entitled to whatever credit there may be in proposing the resolution mentioned, although it is well to point out that he certainly was not the promoter of it. The necessity of an extension of the language of the Act so as to include machinery not only used in mining but also in "quarrying, smelting, concentrating, refining and treating ores and minerals," was introduced in the course of business by the Secretary, and it was only after an unanimous expression of opinion had been passed in favor of its adoption that Mr. Halsey *pro forma* put it to the meeting that is all. Why should we suppress such an insignificant matter?

That the mining men of Quebec and Nova Scotia have throughout treated the manufacturers with the utmost consideration is undeniable. They were specially invited to all meetings, and asked, one and all, to furnish information respecting their manufactures, while on the committees that prepared the statement they were cheerfully accorded equal representation with the miner. In return we find them furnishing ambiguous and misleading statements to the Government, and inspiring articles in the press calculated to injure the interests of an industry which is their best friend, and from whose extension they have everything to gain.

Further, we may remind Mr. Halsey and Mr. Jenckes, and all the other Canadian manufacturers, that at every meeting in which this subject has been discussed, the REVIEW has invariably upheld their right to reasonable protection within the meaning of the Act: but they will excuse us if we resent, flat-footed, such distinctly untruthful emanations as the article in the recent issue of the *Manufacturer*.

The Victoria mines of the Low Point, Barasois and Langan Mining Company, Ltd., have been acquired by the Dominion Coal Company. Price £85,000 stg.

Par Nobile Fratrum.

Charles Ochiltree Macdonald, erstwhile an itinerant writer on space in the *Colliery Guardian*, and at one time the promoter of a windy and short-lived English financial sheet, and whose proposed "corner" in the Canadian spruce gum and maple sugar trade the REVIEW on a previous occasion referred, has joined hands with Howard Clark, a fanciful and eccentric scribbler of mining items on the Halifax *Critic*; and this brilliant galaxy of intellect and genius, supported by a "powerful company," will henceforth cater to the public under the high-sounding and pretentious title "*The Canadian Colliery Guardian Critic and Journal of the Iron and Steel Trades*." Among the vicissitudes of his journalistic career, we understand the promoter of the new enterprise did a 'turn' with the pick (also short-lived) in the pits at Cow Bay, and it is quite evident he there inhaled freely of the atmosphere that is gassy. An explosion may follow when the English *Colliery Guardian* takes steps to interdict what is unquestionably a characteristically impudent infringement of its old established and world-wide trade mark. In the meantime, while anticipating a new source of amusement from the perusal of this weekly *omnium gatheringum* of political, commercial, financial, mining and general news, edited by the paste pot and scissors, we cannot restrain a tear for such of the unfortunate investors as may have been induced to put their money into what cannot fail to be a short lived and unprofitable venture.

The shipments of asbestos from the Eastern Townships last year were in the neighborhood of 6,000 tons so we are informed.

Purchasing Silver, Gold and Lead Ores.

B. H. VAN F. FURMAN, E.M.*

At our western metallurgical centres, as Denver, Pueblo and Salt Lake City, the margin in the ores has become so slight, owing to the fierce competition between rival smelters, the prevailing scarcity of desirable fluxing ores, and the declining price of silver, that ores are no longer purchased upon the assay value in silver, gold and lead, and a rough guess as to the probable cost of smelting, but the price paid for a lot of ore is based upon the assay value of the ore and upon its chief constituents, as determined by chemical analysis and calculation as to the actual cost of treatment.

In determining the price to be paid for an ore, the following points must be taken into consideration:

First.—The assay value of the ore in silver, gold and lead; copper also being determined provided much is present.

Second.—The chemical composition of the ore. SiO_2 and Fe are almost invariably determined. Mn, Zn and CaO are frequently determined, and S, As, Sb, BaO, MgO and Al_2O_3 are occasionally determined.

Third.—The silver, gold and lead losses in roasting and smelting.

Fourth.—The cost of roasting. Fifth the cost of smelting, including the cost of fluxes and the cost of coke and charcoal.

Sixth.—The character of the ore (coarse or fine.)

Seventh.—Desirability of the lot at the time of purchase.

Eighth.—Market value of the bullion at the time of purchase.

The assay value in silver, gold and lead is always determined on each lot of ore unless any of these elements are known to be absent. Fire assay is the method adopted. Copper, if present in sufficient quantity, is determined by volumetric cyanide assay or by gravimetric battery assay.

* School of Mines Quarterly.

The analysis of the ore for its chief constituents, as silica and iron, is quite as important as the assay for silver, etc., as the cost of treatment depends largely upon the mineralogical composition of the ore.

The losses in silver, gold and lead in treatment must be known in order to make the proper deductions from the gross value. These losses, will depend largely upon the general character and composition of the bulk of the ores treated and the individual practice at any particular works. The Colorado practice (Denver, Pueblo and Leadville) is to pay for 95 per cent. of the silver content, settlement being made on the basis of New York quotation for silver on the day of purchase, \$19 per ounce for the gold, and so much per unit for the lead which the ore contains. The price per unit for the lead is based upon the market price of lead in New York upon the day of purchase and the cost of handling the bullion, including the freight to New York and refining charges.

The cost of roasting will depend upon the price of labor and fuel, the character of the fuel, and the type of roasting furnace adopted. For example, with the new automatic roasting furnace which Dr. William Pearce has lately patented and put in operation at the Boston and Colorado Works at Argo, Colorado, the cost of roasting at Argo is considerably less than \$1 per ton. With prices of labor and fuel such as prevail in Denver, the cost of roasting in a long hearth reverberatory furnace (the usual practice), with a capacity of from 10 to 12 tons of ore per furnace per day, is about \$2 per ton. As the ore is never roasted "dead," the roasted charge usually carrying 5 to 6 per cent. of sulphur, allowance will have to be made for the treatment of the matte (flaming and roasting), which will be produced from the roasted ore when it is smelted, and the interest on the silver, gold and lead value which the matte has. Under the same conditions as above, \$0.25 to \$0.30 will generally cover this item, so that the cost of roasting in reverberatory furnaces will be about \$2.25 per ton. As 100 much fine ore cannot be treated in the blast furnaces, some of the roasted ore will have to be fused or slagged. This involves an additional expense of from \$0.25 to \$0.75 per ton, so that the total average cost of roasting, at Denver, in reverberatory furnaces, may be stated to be about \$2.50 to \$2.75 per ton.

The cost of smelting will differ in each locality and according to the general practice of each individual works, and will, moreover, depend upon the composition of the ore (cost of fluxing), the cost of fuel, the character of the ore (raw smelting, roasting, coarse or fine), the cost of fuel, the cost of labor, etc. Being made up of so many variables, this question will necessarily have to be determined in each individual case by the actual results obtained in working and after quite extensive operations. With prices as follows: Common labor (10-hour shift), \$1.75; feeders, ore choppers, etc. (12-hour shifts), \$2.50 per day; furnacemen (12-hour shifts), \$3 per day; engineers and foremen, \$3.50 to \$4 per day; coke (10 per cent. ash), \$7 per ton; limestone (50 per cent. excess CaO), \$1.25 per ton; iron-ore (70 per cent. excess FeO), \$5 per ton; and steam fuel (lime-slack), \$1.50 per ton; and with a large sized modern plant (capacity about 400 tons per day), the cost of smelting a neutral ore (composition $\text{SiO}_2 = 30$ per cent., Fe = 30 per cent., Pb = 13 per cent., Zn = 8 per cent., and S = 5 per cent.) will be about \$4.50 per ton. This cost is distributed somewhat as follows:—

Labor	\$1 90
General expenses (office exp. management), etc.	0 27
Fuel for power	0 10
Interest, depreciation and repairs	0 50
Coke (15 per cent. charge)	1 36
Limestone (0.3 ton)	0 37
	\$4 50

This figure of \$4.50 per ton is the basis of the ore calculations at some of our large Denver and Pueblo works. Of course, this cost is liable to fluctuation from time to time. Having arrived at the cost of smelting a neutral ore it becomes necessary to determine what charges or allowances to make for each unit of silica, iron, zinc, etc., in excess of the neutral point. Taking the above figures as a basis we find that each unit of SiO_2 in excess of iron should be charged for at fifteen cents, and that each unit of iron in excess of silica should be given credit to the amount of fifteen cents. Each unit of lime should be given credit to the amount of six cents. The same credit is given for manganese as for iron, and the same credit is given for magnesia and barite as for lime, provided the ores do not carry a high percentage of MgO or BaO. Over 4 to 5 per cent. of MgO and BaO in the slag is undesirable (see "The Calculation of Lead Blast Furnace Charges," *School of Mines Quarterly*, vol. xiv., No. 2, p. 136). It is customary with the Denver smelters to charge fifty cents per unit for all zinc in excess of the 8 per cent. limit. A charge of fifty cents per unit for arsenic should be made.

The character or condition of the ore should always be taken into consideration. Fine ore is undesirable, as it causes the furnaces to run slow, thus increasing the cost of smelting, and if present on the furnace charge to too great an extent it is liable to cause trouble with the furnaces. When an ore requires previous roasting fineness is an advantage, as if in lump form it will require crushing.

The desirability of the lot at the time of purchase will frequently be a considerable figure in the price which will be paid for the lot, especially when the lot is sold on the public market to the highest bidder. This will depend

at right angles to the belt, divides the coal into nuts and small. Lower down the shoot is a second set of bars with 3-inch spaces for making cobbles. The large coal is delivered into wagons over a balanced shoot.

The feature of this arrangement is the tippler, designed by Messrs. Edward Jones & Evans, which does its work efficiently and economically.

The tippler (Plate 17) moves on a shaft, and by means of a chain is connected to a piston working in a water cylinder; a hand lever on the tipping platform controls the movement of the piston.

The downward stroke of the piston brings the tippler into a vertical position, and at the same time compresses a set of springs fitted at one side.

As soon as the water is released in the cylinder, the springs give to the tippler a side motion, the speed of which is regulated by the hand lever.

The cover of the tippler consists of a wrought iron shutter hinged at one end and in the middle, and on commencing to tip, there is very little space between the shutter and the top of the coal in the tram. By means of a spring the shutter is locked in this position until the mouth of the tippler is within nine inches of the screen, when the spring is automatically released and the front half of the shutter opens and allows part of the coal to pass on to the screen; when within three inches of the screen, the second half of the shutter opens and the remaining coal passes out of the tram.

The tram is held in the tippler by four claws, which grip the side angle irons of the tram; at one side also a heavy fork, working on a centre, follows the motion of the tram in the course of tipping and prevents any movement sideways.

The tippler is capable of dealing with 150 tons of coal per hour.

Another plant has been in operation for some time at the East Elliot pit, New Tredegar, belonging to the Powell, Duffryn Coal Co., Limited.

The output of this colliery is dealt with over two screens, and the ordinary tipping plate is in use. The screens are fixed and of the usual dimensions; immediately below the delivery plate of each screen a jiggling screen is fixed, over which the large coal passes before reaching the picking belts. The jiggling screens are 2 feet 6 inches long fitted with bars having 1½ inch spaces, and vary in width from 6 feet at the upper end to 4 feet at the delivery end.

The two picking belts are fixed in the same line with the screens, and are 50 feet in length and 4 feet 6 inches wide. They are built up on three double and single link chains, to which the plates are attached by means of hook bolts, allowing the plates to be easily and quickly changed when required.

From the ends of the picking belts the large coal is delivered into wagons over shoots fixed at right angles to the belts.

The types of coal cleaning arrangements differ in the several collieries with the varying conditions which have to be provided for.

Midland District.—A peculiarity of the coal worked in this district is that, in several of the seams, the different beds composing the seam contain coal of two or more different qualities. House coal and steam coal are often produced from the same seam, and as it is in most cases impossible to separate the qualities in the process of filling the tubs underground, arrangements have to be provided on the surface for doing this work.

At a typical colliery the method of sorting and cleaning was as follows:—

The tubs are of wood, and carry 10 cwt. of large coal, no small being lifted underground. Instead of having a door at the end of the tub, the largest pieces of coal are built up to form a wall.

After being weighed, the tubs run into a tippler delivering the coal, by means of a shoot or a screen, on to a picking belt fixed at right angles to the shoot or screen.

The picking belt is 250 feet long and 2 feet 9 inches wide. On each side of the belt twenty-five men are stationed to pick out the different qualities of coal and to remove any dirt that may be found. Empty trucks stand on both sides of the belt on lines of railway laid parallel

to the belt, and the coal, which is of a hard nature, is thrown into the wagons, or packed carefully by a man standing in the truck, the belt being fixed at a convenient height for this purpose.

The smaller pieces of coal, which are not picked off, are delivered at the end of the belt into an elevator having buckets of the same width as the belt. This elevator delivers the coal on to a jiggling screen, which divides it into two or three sizes.

The belt is composed of iron plates 12 inches broad, which are riveted to two long link chains, and is supported on rollers fixed 9 feet apart.

Separate engines are used for driving the belt and the screens, one having a cylinder 14 inches in diameter with 30 inch stroke geared to 10 to 1, the other having a cylinder 6 inches in diameter and 14 inches stroke.

The quantity of coal passing over this belt is 150 tons per hour. The system of loading from the tub into the trucks with hand-labour is extensively in vogue in this district; by this method it is easy to keep a perfect check on the filling of the coal underground, both as regards freedom from dirt and small coal; the cost, however, is high, ranging from 4d. to 6d. per ton.

Any considerable quantity of dirt found in a tub is weighed and deducted, and the small coal is also deducted if exceeding ½ cwt in a tub.

Lanarkshire.—In this district good examples of screening and cleaning plants are to be met with.

Jiggling screens are used with perforated plates, or composed of iron rods woven like a riddle, and forming apertures about 4 inches square. In some cases Lyall's patent screens with a shaking motion from side to side have been adopted. These "riddles" give to the coal a rolling motion which displaces any small coal that may be carried by the larger pieces.

Underneath the main screen a second screen is fixed, of similar construction, but with a finer mesh for dividing the nuts from the small coal.

The picking belts are of various lengths—up to 150 feet, and from 2 feet to 4 feet 6 inches wide—they consist of either wrought iron or steel plates, and in some cases of cotton.

At one colliery, visited by the writer, an extensive system of cotton belts for cleaning had lately been put in, and the process of screening and cleaning was as follows:—

The tubs run into a side tippler, which, on being put into gear, made a complete revolution in a direction backwards from the screen, and delivered the coal on the top end plate.

The tippler consists of three annular rings, the end ones resting on rollers. The centre ring is turned and grooved the outside and fitted with a corresponding friction pulley actuated by spur gearing, which is brought into play by a lever worked by a boy.

Whilst in the tippler the wheels of the tub rest in hollows in the rails, thus preventing any backward or forward motion, whilst two longitudinal angle irons overlap the side edges of the tub and keep it in place during the revolution of the tippler.

Lyall's side-shaking screens are used.

The large coal is delivered from the end of the screen on to a cotton belt running at right angles to the screen; this belt is 50 feet long and 2 feet 6 inches wide. On one side of this belt women are placed, who take off all coal requiring any dressing or clipping, and transfer it on to an auxiliary belt running parallel on the right hand side. This auxiliary belt delivers the coal to a man specially employed to dress it. After being dressed the coal is placed on the main belt, and the dirt is thrown into a bunker conveniently placed for the purpose.

The women also pick out all dirt and throw it on to another auxiliary belt on the left hand side of the main belt; this belt delivers the dirt into a cross belt, inclined at an angle of 30°, and leading to a bunker into which the dirt drops and is drawn off periodically into wagons standing below. The auxiliary belts are 12 inches wide. This arrangement is capable of dealing with 100 tons per hour.

In some instances a system of revolving tables has been introduced for cleaning the large coal. The coal being delivered at the end of the fixed screen, is carried round on the tables, whilst a number of boys stand at the side

and pick out the dirt. When the coal has been thoroughly cleaned, a lever and vertical stop is actuated which causes the coal to slide into a shoot and thence into a wagon. The revolving table is then ready to receive another load.

The capacity of a shaker screen probably depends upon the size of the meshes of the small riddle, the rate at which it is driven, and the percentage of small coal to be passed over it. If the small riddle has too much to do it soon becomes choked, and a large portion of the small coal riles over instead of passing through.

The limit to the quantity of large coal that can be passed over the 4-inch meshes seems to be governed by the capacity of the tippler.

In the case of coal containing 60 or 70 per cent. of small, the capacity of the screen will be from 50 to 55 tons per hour; on the other hand, where the small amounts to only, say, 30 per cent. the capacity will be quite 100 tons per hour.

It may be mentioned that with end-shaker screens the coal travels forward intermittently, and is delivered only on the back stroke. The side shaker gives to the coal a forward and side rolling motion, a constant delivery whilst at work, and an equal distribution of the various sizes of coal upon the different belts.

In an example of end-shaking screens (Plate 18), the main screen carries two meshes in one frame, and is vibrated by an eccentric fixed on each side of it. The lower or nut coal screen, is driven by another pair of eccentrics working in an opposite direction to those of the upper screen in order to balance the strain upon the frame and machinery. The upper screen has a traverse of 4½ inches and the lower one 5½ inches, and both make 110 double strokes per minute.

The coal is tipped upon the screens at A; the nuts and small coal pass through the screens at A; the nuts and small coal pass through the ½ inch mesh and fall upon the sloping tray B, which delivers the mixture at the top of the screen containing the ½ inch mesh. This screen takes out the small, which passes down the boxes D to the bottom of the two elevators and mixes with the coal which has passed through the crushers. The elevators deliver the coal into the bunkers, where it is stored for coking purposes. The nuts which pass over the ½ inch screen are delivered upon the picking belt A, and thence into railway wagons.

The coal passing over the ¾ inch mesh slides down to the 3 inch mesh, through which the cobbles fall on the belt B. The largest lumps are delivered on the belt C, and thence into wagons after being cleaned.

At the ends of belts A and B trap doors are fixed at E, so that whenever required, the cobbles and nuts can be diverted into the crushing pan H by means of the shoots F and the short carrier belt G. The shoots I convey the crushed coal to the foot of the elevators where it mixes with the small passing down the shoot O.

Balanced shoots are used at the end of the picking belts to avoid breakage in loading the coal into wagons.

Northumberland.—In this district small wooden coal tubs are in use, and the screening and cleaning is as follows in the most improved plants:—

The tub runs by gravity into a side tippler, worked by friction gearing, which delivers the coal on to a jiggling screen; this screen is about 100 feet long and 5 feet wide, and its surface is composed of wire gauze, forming apertures about 1½ inch square.

By means of eccentrics the screen makes about 100 vibrations per minute, with a throw of 4 to 5 inches.

From the end of the jiggling screen the large coal passes on to picking belts of various lengths and widths, travelling at a speed of about 50 feet per minute.

In some cases a partition is provided in the centre of the belt by means of angle irons, and into this space is thrown the dirt picked out from the coal.

At the ends of the belts balanced shoots or telescopic plates are used to prevent breakage in falling into the wagons.

The small coal, passing through the meshes of the main screen, falls on to a jiggling screen below, where it is further sized, and conveyed away for various uses.

A few examples are found in the northern coal fields of revolving tables on which the coal is delivered from the jiggling screen. These tables are 10 feet in diameter,

CANADIAN PIG IRON STATISTICS 1893.

The following Table has been compiled from Returns kindly furnished "The Review" by the Officers of the respective Companies, for the Year ended 31st December last.

COMPANY.	SITUATION OF FURNACE.	QUANTITY OF PIG IRON MANUFACTURED.	VALUE AT FURNACE.	TOTAL ORE CHARGED.	QUANTITY OF FLUXING MATERIAL.	QUANTITY OF FUEL CHARGED.	NUMBER PERSONS EMPLOYED.
Londonderry Iron Co. Ltd.	Londonderry, N.S.	23,474 tons	\$275,366	56,390 tons	13,500 tons	34,484 tons	400
New Glasgow Iron Coal and Ry. Co. Ltd.	Ferrona, N.S.	22,500 "	270,000	44,856 "	12,890 "	30,846 "	480
Canada Iron Furnace Co. Ltd.	Rainford Forges, Que.	7,422,111	185,575	16,700 "	1,680 "	750,000 bush. c.	600
Pictou Charcoal Iron Co. Ltd.	Bridgeville, N.S.	*498 tons	Not given	853 "	124 "	68,220 "	100

* It should be stated that this company only resumed operations towards the end of the year, and the furnace was only in blast for a few months.

making three revolutions per minute, and are capable of dealing with 30 tons of coal per hour.

Scotland.—In the Scotch coal fields considerable attention has been paid to the question of screening and cleaning.

The tubs are of wood, carrying about 10 wt. of coal. After being weighed they run into a tippler, usually worked by hand, which delivers the coal on to a jiggling screen; the small coal passes through perforated round holes, about 1 1/4 inch in diameter, and falls into a wagon below or is taken by a conveyor to be sized or washed.

The large coal passes from the end of the jiggling screen on to a travelling belt, from thirty to sixty feet long and 4 feet wide, and the dirt is picked out by boys stationed at each side.

Upon reaching the end of the belt the large coal passes over a fixed inclined screen, with bars about 6 feet in length, to take out any small which may have been made in the process of cleaning the large coal.

From the end of this fixed screen the coal passes on to a balanced lowering plate which delivers it gently into the wagon.

The small coal is either sold without further screening or is first washed. In other cases it is separated by means of revolving riddles into two or three sizes, each size falling on to its own belt, where the dirt is taken out by boys. Each size is disposed of at different prices.

In these cases the belts move at about 20 feet per minute, as against 40 feet per minute in the cases of the belts dealing with the large coal.

At some collieries an arrangement is in use which brings about very effective screening.

In these cases the tub is emptied into a small hopper, from which the coal is taken to the screen by means of a slowly moving conveyor about 8 feet long.

The bottom of the hopper lies below the level of the top of the screen, and the conveyor is inclined upwards at a proper angle. By this arrangement the coal is delivered on the screen, which is either fixed or jiggling, in thin layers and in a continuous stream.

Costs.—These remarks would not be complete without some reference to the cost of screening and cleaning plants and to the cost of working them. Both these items must necessarily vary within very wide limits, owing to the great variety of circumstances to be found at different collieries.

Probably the largest quantity of Welsh steam coal which could be properly dealt with by a single belt is 70 tons per hour, and a fair estimate for a plant of this capacity, fixed ready for work, would be from £1,200 to £1,400, exclusive of the cost of the ordinary screen.

The cost of working will depend principally upon the amount of labor required for cleaning, and is found to vary in different coal fields from 3 d. up to 3l. per ton of coal cleaned. This cost is for labor only, and includes screening, cleaning, and loading into wagons, but nothing is charged for coal and stores used by engines, nor for repairs, interest on capital, or depreciation.

Undoubtedly the question of official screening and cleaning is one which must shortly claim attention from those connected with South Wales collieries. Most of the members are familiar with the complaints which are so frequently received from foreign buyers of dirt and excessive small mixed with large coal. Owing to the natural circumstances surrounding underground working

in this district, it is inevitable that a certain quantity of dirt will be found in the trams. The weak roofs contribute to this result, and it is not uncommon to find crusts of dirt of greater or less thickness sticking firmly to the coal from some seams. It is equally certain, also, that an official system of cleaning can be carried out underground, although much can be done by strict supervision on the part of those officials whose duty it is to make frequent visits to the working faces.

To the keen competition of our home coalfields there has lately been added that of other coalfields, which have sprung up in almost every quarter of the globe, and, therefore, South Wales cannot afford to lag behind in the provision of such appliances as shall ensure that what is undoubtedly the best article in the world of its kind shall be supplied to the market in such condition as shall continue to secure for it the premier position and the highest price.

On the Deepening of a Shaft under the Cages.

Mr. Thomas Grundy (*Manchester Geological Society*), describes an arrangement used in the sinking of a shaft under the cages at Wigan Junction colliery. The shafts are situated in a tram, owned by the Wigan Junction Colliery Company, and known as the No. 3 and 4 shafts respectively. The pits had been sunk to the depth of, in the No. 3 pit, 600 yards; and in the case of No. 4 pit, to the depth of 510 yards; and the mine known as the Wigan six feet. It is to deepening of the No. 4 shaft under the cages and the system of getting rid of the debris which we have for our consideration. The shaft was fitted up for winding coal and cammel from the Penlberton five feet, Bickershaw seven feet, and the Wigan four feet. It is fourteen feet in diameter, and in it are worked two cages having a length of seven feet six inches and width of three feet five inches, the cages are kept in position by means of eight conductors, four to each cage, and allowing a distance for clearance between the cages of two feet six inches. The rods were weighed at the ends by the ordinary cheese weights to the extent of about 50 cwt. to each rod. The cages were three decked, two tubs in each deck, and the cages were worked to the Wigan four feet mine, the mine next above to where the shaft was already sunk to, and having a distance of 30 yards between the two seams. You have now an idea how the shaft was arranged before commencement of sinking.

It was found necessary to deepen this shaft to the depth of 120 yards further, and knowing that strata which would have to be passed through would prove troublesome, in consequence of numerous faults running across the shaft, it was found desirable to dispense with a running jiddy as it would be necessary to make a rather wide excavation and put down an arrangement of falling doors. This was done and put in position in the shaft immediately opposite to the Wigan six feet mine, and a communication having been made in this mine between the No. 3 and 4 shafts, it was decided that all the debris, from the sinking and material for bricking, should pass through this mine to and from the surface. Arrangements being already in work in the No. 3 shaft by means of a single cage and conducting rods, whereby the material could be hoisted on and sent to the surface or vice-versa.

The means adopted for winding were as follows: A rope 130 yards long was secured to the coupling immediately under the detaching hook, the rope being passed through holes eight inches in diameter cut through each deck of the cages, and as the rope was passed through the deck the men in charge of the work held the capping under the detaching hook till connection was made by screw, nut and pin. This was the only connection to be made or disconnected, and the time usually taken was about three minutes. The rope hanging then to the bottom where the debris was taken off, and when not in use in the day time was put on a reel on the lower side of the level. It was found that the length of the rope hanging down the pit between the two mines was rather an objection in making a quick connection, and to facilitate this a pair of clamps, with a hook at one end, were fixed on the rope about two yards underneath the cage.

These clamps serve the purpose of keeping the under-hanging rope up when disconnection or connection was taking place, by the hook in the end of the clamp being brought to the side of a bearer and hooked into an eye bolt fixed on the bearer. You will see, from the sketch exhibited, the position of these, and that when disconnection had taken place the rope underneath is hanging by these clamps, the upper part and capping having been lowered underneath the scaffold and secured out of the way of the cage. It occurred to me to put a kind of false scaffold immediately under the conductor weight, as a safeguard in case of anything falling down the shaft or the vibration of the rods causing any of the cheese weights to come off.

In conclusion the writer points out that as the connecting of the rope to the link under the detaching hook was important, the persons engaged to do this work were the underhooker (in charge of the mine), the back fireman, and hooker-on; and these persons had written instructions given to them to stay there after the completion of their work of connecting the rope till the engine-man had stretched all the rope off the reel, and the hopper had been hooked on to the rope, and run down and up; this time took about five minutes. These men were then at liberty to proceed to the surface, and the men in charge signed a special report that every thing was all right.

The sinking commenced at 4 o'clock in the afternoon, was continued till 5 o'clock in the morning, and any one entering the mines between those times did so from the No. 3 shaft.

The Limitations of the Gold Stamp Mill.

Last year our readers were furnished with a reprint of the excellent paper on this subject read before the American Institute of Mining Engineers. Since then the paper has been discussed by a number of eminent engineers as follows:—

R. RICKARD, Berkeley, California: I have been much interested in Mr. Rickard's description of the method of gold-milling now in use in Colorado.

There has always been a very wide difference of opinion regarding the merits of the Gilpin county method of dealing with the ores of that district. The present system of milling was introduced into Gilpin county at a time when there was no market for low-grade ores. Freights and

NOVA SCOTIA COAL DISPOSALS 1893.

From Returns kindly furnished "The Review" by the Officers of the respective Companies, the following Table of the Nova Scotia Coal Disposals for the Year has been compiled. As will be seen, the Mabou Coal and Gypsum Company is not included, along with one or two small operators, whose figures, however, would not make any material addition to our Statistics for the Year 1893.

COMPANY.	Nova Scotia.	New Brunswick.	P. E. Island.	Quebec.	Ontario.	New found'd	St. Pierre Miquelon.	United States.	West Indies.	Colliery Employees.	Colliery Consum'n Railways, Engines, etc.	Bunker Steamers.
Interoceanic Coal Co.....	100,651	3,565	15,943	\$5,895	33	880	.....	.....	.....	3,666	11,749	.....
Canada Coal & Ry. Co.....	10,793	48,750	.....	.....	..	23,774	.....	248	.....	2,494	5,191	.....
Cumberland Ry. & Coal Co.....	129,515 1/2	133,290 1/2	.....	119,284	..	.....	.....	9,049 1/2	.....	7,513	27,694	.....
Dominion Coal Co.....	109,822	35,391	9,834	499,873	..	30,054	4,220	13,664	4,325	10,024	29,043	32,195
Acadia Coal Co.....	178,429	19,329	24,500	9,557	..	.....	.....	.....	.....	5,803	22,634	12,954

The General Mining Association of London, Ltd., and the Low Point, Barrasois and Lingan Co., are given below in aggregate.

RECAPITULATION.

Interoceanic Coal Co.	222,383
Acadia Coal Co.	273,206
Canada Coals and Railway Co.	91,250
Cumberland Coal and Railway Co.	426,346
Dominion Coal Co.	868,445
General Mining Association.	195,609
Low Point, Barrasois and Lingan Mining Co.	95,345
	2,172,584

smelting charges were such that only the highest grade of ores was profitable to handle. Had the present condition of railroad facilities and ore market been in existence, it is more than doubtful whether the system would have been so universally adopted. For the purpose of discussion, I would suggest whether a modification of the present system would not be advantageous.

In the early days of milling, and when there was no market for low-grade concentrates, the material flowing from the amalgamating-plates went direct to the creek; but later, when the large smelting industries of Denver opened a market for such by-products, concentration was resorted to with a very considerable increase in the yield of the ore.

In the paper under discussion, it is admitted that the gold and silver are chiefly contained in, and associated with the pyrite; and the reason given for the high drop and consequent slow mining is the necessity of reducing the sulphides to a very great degree of fineness in order to liberate the precious metals for amalgamation.

In an article written by the same author and published in the *Engineering and Mining Journal* of September 10, 1892, the result of a careful test of milling 8,400 pounds of ore from the California mine in the Hidden Treasure mill is given as follows:

	Gold ounces.	Silver ounces.
Contents of ore	7.46	32.86
Yield:		
By amalgamation	5.25	14.00
By concentrates	1.74	10.22
	6.99	24.22

Equal to 93 per cent. of the gold and 73 per cent. of the silver contents of the ore treated.

It will be seen by these figures that slow work and fine crushing do not liberate all the gold and silver, as only 70 per cent. of the former and 42 per cent. of the latter are arrested by amalgamation, while 33 per cent. of the gold and 31 per cent. of the silver are still held by the pyrite, or such portion of it as is saved by concentration.

In view of the result shown by these statements, the question naturally arises whether it would not be advantageous to introduce concentration at an early stage of the operation, crush coarser and faster, thereby avoiding the certain increased loss from excess of slimes due to fine crushing, placing the concentrating tables at the outlet of the battery and removing at this stage of the operation all of the pyrite and its gold and silver contents, before passing the remainder of the pulp over the amalgamating tables.

In the article referred to, a comparison is made between milling and the treatment of the same ore by the smelter, with a result favorable to milling. The figures are as follows:

	Wet.	Dry.
Ore treated.....	8,400 lbs.	8,064 lbs
Obtained by milling, bullion.	\$107 20	
Concentrates, net.....	36 03	
Less milling, 84 cents per ton.....		\$143 23
Net return by milling.....		\$139 70
If sold to the smelter the same ore would yield.....		109 18
Leaving a balance in favor of milling of.		\$ 30 53

If we take the same quantity of ore and treat it as suggested above, it will be found that the result will not show the present mode of milling in such a favorable light.

The contents of the ore are 7.46 ounces of gold and 32.86 ounces of silver.

The losses under the present system are probably greater than they would be if the ore were crushed coarser. For the purpose of the calculation, we will take the yield of gold at 93 per cent. and that of silver at 80 per cent. The original dry weight of 8,064 pounds would be reduced by concentration to 2,822 pounds, since 60 or 70 per cent. is the estimated proportion of soft feldspathic gangue in the ore, and this is easily removed.

2,822 pounds yielding 6.93 ounces gold.	
at \$20 would give	\$136 60
And 26.28 ounces silver at \$1.....	26 28
	\$162.88
Smelting charges and freight, \$8 per ton.....	\$11 29
Milling, 30c. per ton by the fast-drop mill of California type ..	1 26
	\$ 12 55
Net return.....	\$152 33
Milling as at present.....	139 70
In favor of proposed change.....	\$ 12 63

The price of silver has been taken at \$1 per ounce, because that is the value which figures in the article referred to.

It would be of great service to the mining industry if some of the mine owners in Colorado would make a test on the proper scale and with such thoroughness of detail as would make the experiment trustworthy.

HENRY A. VEZIN, Denver, Colo. (communication to the Secretary): About 1873 a well known metallurgist made some experiments in dressing ore from a mine in Gilpin county. It was done by a hand-jig and a tossing-kieve. No attempt was made to treat the refuse by

amalgamation. The result was so favorable that he suggested to the manager of the mine the policy of crushing and jiggling his ore, and allowing the tailings to go to the stamp-batteries, where all the ore was then being treated. Stamps were at that time the only available amalgamating machinery; but the metallurgist referred to anticipated that in order to obtain the best results, the ore would have to be crushed by successive comminution so fine that the tailings could not be fed to stamps; and he therefore had in view the use of other machinery to prepare the tailings for amalgamation. However, for the purpose of the experiment they could go to the stamps, provided coarse material was fed at the same time.

The manager understood so imperfectly one of the important points in the matter, that he placed his experimental works on the creek, about 200 feet below his stamp-mill. The ore was crushed to a diameter of 1/4 to 3/8 inch by a Dodge breaker, screened by hand and jigged. The whole arrangement was crude, and required much manual labor. The tailings of all sizes were run to waste, no recrushing of drudge; no amalgamation. It was impossible to obtain samples of either ore or concentrates, or any data upon which to base a calculation, to determine the quality of the work. The only answer given to inquiries, was that it "did not pay." This result is not to be wondered at, considering the crude methods, small scale and incomplete treatment. Since then nothing better has been tried, so far as I know, in the way of carrying out the metallurgist's suggestions.

Some years later, dressing works were erected in Black Hawk, Gilpin county, on North Clear Creek, to do custom work. The ore was crushed in a breaker and rolls, and treated on Collom jigs and buddles. The tailings were discarded, no attempt being made to crush as fine as would be necessary to save included grains of pyrites, or to crush very fine and amalgamate. This enterprise proved a failure. Since then, as I learn, the works have been remodelled, other jigs have been adopted, and stamps have been added for the treatment of the tailings from the coarse-grain jigs. The ore is crushed in a rock breaker and three pairs of rolls; is sized through 4, 6 and 8-mesh screens, and these coarser sizes are passed over jigs. The tailings from these are crushed by stamps weighing about 500 pounds, having a drop of 14 inches, and making 36-38 drops per minute. Stamping is done, presumably, through 40-mesh screens, and the stuff passes over amalgamated copper-plates outside the batteries. After amalgamation, the slimes are treated on slime-jigs and buddles. Here, I wish to call attention to the error in this treatment. Stamps are unsuited to prepare ores for dressing in which the valuable portions are friable, such as those containing the sulphides of the base metals. Even with fast speed and short drop, stamps produce, when crushing to, say 30-mesh, nearly three times as much slime, i.e., stuff below 250-mesh in diameter, as good rolls crushing to the same size. With Gilpin county stamps, which have a high drop and slow speed, the product is still worse, i.e., worse for dressing. If the coarser tailings from the jigs in this mill were crushed fine, by suitable machinery, the final tailings, to be treated by amalgamation, would be too fine to be fed under the stamps, unless they could be fed together with much coarser material. It would, however, be perfectly feasible to obtain, by other machinery, the inner comminution of the product required for amalgamation. The limit of fineness of stamp stuff is, probably, 8-mesh, or, say 2 mm., in diameter. This is the reason why the tailings of the 4, 6 and 8-mesh stuff are fed directly to the stamps. And, as long as the Gilpin county mill-men insist on preparing ore for amalgamation by their favorite stamps, so long will a comprehensive method like that outlined by the metallurgist fail to receive a fair trial at their hands.

I have had no opportunity of examining this mill myself. It is said, that it cannot compete successfully with ordinary gold stamp mills, except when treating ores carrying galena, or a good deal of pyrites. The charge for treatment is \$2.50 per ton, and the capacity is 25 tons with 6 men, or 4.16 tons per man. Considering the size of the stuff treated, this capacity is very small. Though the ordinary stamp mill, in which a certain portion of the pyrites is recovered after amalgamation, does not return as much of the value of the ore as the other mill, its charge is so much less that the former must save from \$1.25 to \$1.50 more per ton in order to compete with it successfully.

E. E. OLCOTT, New York City: Much has been written on the subject of gold milling, including papers by Dr. Raymond (*Trans.*, i., 40); Professor H. S. Munroe (*Trans.*, ix., 84); Professor Egleston (*Trans.*, xii., 379); A. N. Rogers (*Trans.*, xi., 29); A. J. Bowie (*Trans.*, x., 87); Professor H. O. Hoffman (*Trans.*, xvii., 498); and John Hays Hammond's "Milling of Gold Ores in Cal." (*Report of State Mineralogist, 1888*).

I learn also, that Messrs. J. Ross Brown and John Hays Hammond are, at the present time, writing a book on stamp milling.

While, as has been pointed out by Mr. Rickard, the mechanical defects of the stamp mill are apparent, the advantages of the system are numerous. Its simplicity, adaptability and uniformity of work, are good points in its favor. The new machines which have been put on the market with the claim that they would supersede the stamp mill, have been numerous, but, so far, they have been unable to silence their clumsy prototype. The stamps still pound on, and are likely to continue to do so. Mr. Rickard has likened them to hammers. The ingenious inventor may get up a hammer, rule, and screw-driver, all in one, which may please the lover of novelties, but the skillful workman wants the old tried

tools, not alone from prejudice but because he can do better work with them.

Wear and Tear.—The facility of renewing the wearing parts of the stamp mill is not an insignificant advantage, and counteracts in some measure the heavy consumption of iron per ton of ore crushed, and the necessity of discarding the castings before they are entirely consumed.

The shoes and dies are made of either iron or steel, experience varying greatly as to which is most desirable—much naturally depends on the hardness of the ore. As Mr. Rickard says, the die should be softer than the shoe. It is sometimes made of mild steel, and the shoe of chilled iron. Excellent results have been obtained by me with mottled iron, a mixture of 85 per cent. hardest white iron and 15 per cent. of tough gray iron.

Iron shoes and dies last from one to three months in wet crushing, and the consumption of iron in the mortars averages about 1 1/4 pounds per ton of ore crushed. In South Africa, where the quartz is both hard and tough, the consumption of iron is high.

Messrs. Fraser & Chalmers are now manufacturing shoes and dies of what they call ferro-alumina, a highly crystalline hard white iron. Chrome-steel and Bessemer forged steel have been used with excellent results. Anything that increases the life of the wearing parts of a mill is important, for, we have not only to take into consideration the cost of the castings and labor of repairs, but also the loss of time, interruption to amalgamation, and the escape from the battery of unground ore every time the battery is opened. It is evident, also, that the work done by shoes and dies, that wear down evenly, is greater than where the faces become irregular and uneven.

In localities remote from the base of supplies, a cupola connected with every large stamp mill is very desirable. In it, with ordinary skill, the old iron can be recast, and, by varying the percentage of white and grey iron, and even old steel, excellent wearing parts can be made.

The screen is important. Formerly, slotted or punched Russia iron was almost always used, but of late, brass, phosphor-bronze, aluminum-bronze, and steel wire-cloth, have been employed, on account of their greater discharge area. I have used phosphor-bronze screens in silver mills with the best results. By ordering the wire slightly heavier than in standard brass screens, a wear was secured several times that of the best brass screens that could be purchased. Aluminum-bronze is said to give as good results—in one case, wearing seventeen weeks, as against three weeks for Russia iron. Russia iron screens last from five to thirty days, average fifteen days.

Cams and tappets are now usually made of cast steel. Cams last from one to three years; the average in the California mill, Nevada, is sixteen months. Tappets should last four or five years.

Practice in Different Localities.—Mr. Rickard makes a comparison between Gilpin county, Colorado, practice and the more generally adopted California milling. The latter is unquestionably the best for most ores, and was adopted in the Black Hills, South Dakota, with few modifications.

As Prof. Munroe pointed out in the *Trans.*, ix., the gold stamp mill may be described as a combined crushing and amalgamating apparatus. The intimate admixture of quicksilver with the ore, by the swash in the battery, assists amalgamation; and copper plates inside the battery are to be recommended, except in cases where the percentage of sulphurets in the ore is very high. A good rule is to get your gold as soon as possible; and the following table, furnished by Mr. E. L. Young, will show, among other things, what a large proportion of the gold is saved inside the mortars in three mills, in Amador county, California:

	Keystone water power.	South Spring Hill water power.	Stewart water power.
No. of stamps.....	40	30	40
Weight, pounds.....	750	750	850
No. of drops per minute.....	96	90	85
Duty per stamp per 24 hours, tons.....	2 1/2	2 1/2	4 1/2
Screens, slot-punched Russia iron.....	No. 8	No. 7	No. 6
Miners' inches of water per 24 hours.....	125	70	100
Head of water in feet.....	254	325	200
Cost of mining per ton.....	\$3.50	\$2.50	\$0.40
Cost of milling per ton.....	.75	.65	.20
Percentage of amalgam saved in batteries.....	.85	.65	.60
Percentage of amalgam saved on plates.....	6.7	30	40
Percentage of sulphurets.....	1 1/2 to 1 3/4	1	1/2 to 1
Value of sulphurets, per ton.....	\$110	\$125	\$60
Cost of working sulphurets per ton.....	\$20	\$20	\$20

Some Stamp Mill Designs.—A diagram is presented herewith of a recently designed gold mortar. This is being built by Messrs. Fraser & Chalmers, for the Phoenix mill in Arizona. There is a recess for a copper plate at the back; but it is intended to use the battery without a copper plate in the front. In order to equalize the height of the discharge, iron filling up pieces are intended to be used under the screen, so that when new dies are put in, three thin filling up pieces will be put under the screen, and as the die wears down these can be removed, one by one. A more common means is to make the top bar of the screen-frame a little narrower than the bottom, so that by reversing the top and bottom of the screen

different heights of discharge are obtained. The introduction of the steel lining-plate under the dies seems a doubtful experiment, the steel being under the inside of the mortars above the dies are good.

The outward inclination of the screen (8° to 10°), spoken of by Mr. Rickard, is to be recommended.

Double discharge mortars have never seemed to give satisfaction for gold milling; theoretically they should effect a saving, but our best mill men do not believe in them.

It is inclined to consider as purely imaginary the grinding action on the ore, produced by the turning of the shoe on the die. Practically speaking, the stamp turns only when being lifted, and drops almost straight; the principal object of this rotation is to cause the cam and tappet, and the shoe and die, to wear more evenly.

In the west, and grease is usually employed on the face of the cam, but the practice in South America is to use molasses and water, so as to avoid any grease falling on the copper plates.

The cost of breaking rock in the crushers is far less than under the stamps, hence every mill man should see that as much work as possible is done by the rock crushers. When the ore coming from the mine is in very large lumps, it is better to use a large breaker, and a rock breaker feeding into two smaller ones, so that the work of the stamps may be reduced to a minimum.

Various Notes and Comments.—I do not see how the rise in the temperature of the water caused by the friction in the battery can be sufficient to liberate bubbles of air which may float the slimes ore. Authorities do not agree with Mr. Rickard's theory of air being introduced to have the jar of the battery transmitted to the plates, but on the contrary say that they should be supported independently.

The amount of quicksilver employed in the gold-batteries varies according to the richness of the ore and the experience of different localities. In Venezuela, at the Callao mills, the practice was formerly to keep the amalgam, both inside the battery and on the outside copper plates, quite hard. In the Black Hills, the amalgam is kept much softer. The amount of quicksilver that gold in different ores requires to make it adhere to the copper plates, can only be found by experiment.

The coarser and purer the gold in the ore the smaller is the percentage of quicksilver required to form the amalgam. The loss of quicksilver is variable, depending on the amount of sulphurates in the ore, etc. Hammond gives the average loss as ½ ounce per ton.

Regarding the supply of water in gold mills, they can be run when necessary on a supply of 500 to 700 gallons per ton of ore; but it is desirable to have if possible an allowance of 1,000 to 1,500 gallons per ton of ore.

COST OF MILLING ORES IN VARIOUS LOCALITIES.

Stewart mill, Amador county, California,	\$0.20
At the Spanish mine, California, belonging to F. W. Bradley, the ore only yields 90 cents per ton. It is mined for 40 cents per ton, and milled in Huntington mills, at a cost of	0.23
Treadwell, Alaska,	0.38
Deadwood, Terra, Black Hills, South Dakota	0.55
Homestake, Black Hills, South Dakota,	0.64
South Spring Hill, Nevada county, California,	0.65
Keystone mill, Amador county, California,	0.75
Mr. Rickard gives for Gilpin county Colorado El Callao, Venezuela,	1.18

Concentration and the Percentage Extracted.—There are a few gold mills in California that do not concentrate the tailings, and treat or sell the concentrates.

Fine or other vanners, revolving buddles, Colorado bumping tables, and blanket sluices are among the concentrators employed. The careful sampling and assaying of the tailings from all mills should be insisted on, so as to give absolute information as to the percentage of the gold that is saved. In the best mills in California the average results can be stated to be a saving of from 85 per cent. to 95 per cent. of the assay value of the ore.

PHILIP ARGALL, Denver, Colo.—The limitations of the gold stamp mill resolve themselves (according to Mr. Rickard) into the slow speed, long drop and high discharge, represented by the Gilpin county practice on the one side, and the fast speed, short drop and low discharge represented by the California practice on the other; while in the contrast between these systems he illustrates the very elementary axiom "that the treatment must be suited to the character of the ore." On this latter point, at least, we can all agree.

The high discharge is invariably used where fine crushing is desirable, or where stamping and pulverizing in one operation are necessary for the liberation of the fine gold. This practice is not by any means limited to Gilpin county or to any recent dates. As early as 1868, mills were running in Victoria, Australia, with drops of 18, 16, and 15 inches, the number of drops varying from 35 per minute upwards, and the weight of the stamp from 300 to 500 pounds.

At the Morro Velho mine, Brazil, the high discharge has long been used in the treatment of pyrites ore. Some carefully conducted experiments with high and low discharge at this mine, are given by Mr. J. A. Phillips, and are well worth quoting:

"With a 6 inch discharge, 75 per cent. of the stamped ore passed through a 120 mesh screen, and the loss in gold amounted to 44-70 per cent., while, with a 20 inch discharge, 87.5 per cent. passed through a 120 mesh screen, the gold loss being only 30.96 per cent. In other words, the high discharge reduced the material

retained on a 120 mesh screen 15½ per cent., and thereby increased the gold saving 33½ per cent."

If a well established rule that at slow, short drop, low discharge and heavy stamps are to be used for coarse crushing, while for fine crushing, slow speed, long drop, high discharge and light stamps are in order. The point at which fine stamping should cease, and from which the further pulverization of the ores should be conducted in Chilian or Hungarian mills, arrastras, or similar pulverizers, is not, however, very clearly defined. The use of a stamp is a very inefficient pulverizer, at best, and were it possible to get on the die at any one time all the fine particles requiring further reduction, the philosophy of lifting a 500 pound stamp 20 inches to crush these minute particles of ore, is not very apparent. Mr. Rickard claims that the turning of the shoe causes the abrasion of the surface of the gold, etc. This action is, I believe, so insignificant in the stamp battery as to be almost unworthy of notice; and hence, when the grinding or abrading action is necessary to prepare the gold for amalgamation, resort is usually had to arrastras and similar grinding machines. This has been well illustrated at the Pestarena mine in Italy, where the best possible extraction with stamps did not exceed 65 per cent., while the use of arrastras and similar machines effected an extraction of 83 per cent.* The ores were principally iron pyrites, or carrying the gold in minute particles, more or less enfolded in micaceous schist. Not only fine grinding, but also time and attrition were found necessary for successful amalgamation.

Amongst the advantages claimed for the Gilpin county mortar is that it is better adapted to the treatment of

(1.) "The deep discharge causes the pyrites to remain in the mortar long after it has been pulverized to a size smaller than the screen openings." Now, it is manifest that if the pyrites remained longer in the mortar than the other portions of the ores, the mortars would eventually be filled with pyrites to the depth of the feed used. This causes the pyrites to not fourfold in practice. It is not understood if, at the time of the longer retention in the mortar than in a shallow one; they are, therefore, crushed finer, and consequently the friable ores are reduced to an extremely fine state of division, and in great part converted into slime.

(2.) "The long drop gives the interval of time required to allow the fine gold to float to the surface." The coarse gold, which the liability to settle in the mortar and is amalgamated; the fine gold, however, would be thrown upwards by the splash, and caught in part on the copper plates, and in part discharged through the screens.

(3.) "The roomy character of the mortar aids the deep discharge in affording a chance for the gold to get out of the way of the falling stamp, and to become amalgamated on the copper plates." It is not understood how the roomy character of the mortar, or the deep discharge can either jointly or severally afford a chance for the gold to "get out of the way" of the falling stamp, unless on the hypothesis that the gold is endowed with the potentiality of locomotion.

Mr. Rickard believes that the hammering which gold receives in a stamp battery prevents amalgamation.

Professor Egleston says that hammering done on a smooth anvil with a clean, smooth hammer, prevented amalgamation; and he has further proved that hammering gold in a clean mortar, under water, also prevented amalgamation. It is important to note that, in both examples, gold was hammered between smooth iron surfaces, the action taking place in a stamp-battery, in which the gold, if hammered on a rough mortar and anvil, between tough and gritty ore, or at most, against but one iron surface—the result being the roughening and cutting of the gold flakes and particles, thus presenting new and clean surfaces to the mercury, and assisting the amalgamation. Indeed, Prof. Egleston's experiments confirm this view, for he found that when a freshly broken edge of the gold-plates came in contact with mercury, in every case it amalgamated at once. I have never found hammered unamalgamated gold in stamp-mill mortars where mercury was used, nor have I ever found a mill-man who has noticed such an occurrence. I am, therefore, warranted in the conclusion that the hammering (?) which gold receives in a stamp battery does not prevent amalgamation. On the contrary, I think it has a beneficial effect on that process.

We are told that the metallic sulphides commonly occurring in gold ores will be found, after stamping, in thin flakes and plates which readily float upon a running stream. These sulphides are iron, copper, and arsenical pyrites, zincblende, and galena, and I am not aware that they ever break up into plates and flakes under the conditions named in their description, or that they float in a stream, floating, as it were, but simply on account of their excessive fineness.

The action claimed for the air in floating the slime in a mortar is, I presume, applicable to the California as well as to the Gilpin county mortar, if, indeed, it has any application at all. Now, the only way air can reduce the specific gravity of fine gold particles, is by adhering in a fine film to the surface of the particles; and as the ore is wet from the moment it is put into the battery (and usually before it is put in) no air-film can form around the particles; therefore it is highly improbable that air gives

the result claimed for it. As regards the heating of the water and air in a mortar, it must, under ordinary working conditions, be infinitesimal, probably not 1 degree F. Of the many so-called contradictory features discovered in the stamp-mill, I will not note a few:

The vibration set up by the falling stamps is said to crystallize the iron work of the mill, and assist the work of gravity on the tables. I can see nothing contradictory in this. Vibration, under all conditions, will crystallize iron, and whatever good effect the vibration of the mill framework may have on the tables, it is not the same effect as the action of a jig.

The principal reason why the Gilpin county mill crushes less than the California is that it does more work because it crushes finer, and that, as the agitation of the water is less, the ore is not discharged so freely. The loss in efficiency, due to the greater depth of water is caused only by the resistance of the stamp in passing through it, and not to the loss of weight, for this latter is the same when it is lifted as when it falls.

Pause, during which the particles can settle, is counted by Mr. Rickard as the time between the successive drops of each stamp, that is 3½ = 2 seconds, but there is, in a 5-stamp set, a drop every 1/5 = 0.4 seconds; consequently, the water in the mortar is agitated by 150 drops per minute; the only real pause at each stamp is the fraction of a second that the stamp is passing through it.

In comparing the amount of water used, it should be calculated per ton of material crushed. On this basis, there is no difference between the Australian and Colorado stamp; the former crushes 2½ tons with 5 gallons, the Colorado 1 ton with 2 gallons.

The greatest defect in the stamp-mill as a crushing machine is in the discharge. The ore, even with a double issue, cannot escape from the mortar as fast as it is reduced to a fineness corresponding to the screen openings, and it is consequently slumped. Particularly is this the case with pyrites and other heavy and friable minerals. This defect is augmented by the high discharge used in the Gilpin county mills, and it is claimed by Mr. Rickard to be made an assistant to the mill-man. Now, if the greater part of the values were extracted from the pyrites, so that the tailings from the mills might run to waste, this practice would undoubtedly be the correct one to pursue; but inasmuch as the tailings are invariably concentrated, with a view to extract this very pyrite already reduced, in great part, to extremely fine slime, it is self-evident that "the mill-man's assistant" in the first operation is the mill-man himself, and he becomes his assistant in the second.

There is always a danger in comparisons and generalizations. I therefore prefer discussing specifically milling under the conditions that obtain in Gilpin county; and to this end, it is obvious that one must take the whole process into consideration. Gilpin county milling is, in brief, fine stamping and amalgamation (very fully and clearly described in Mr. Rickard's paper) followed by concentration and smelting of the concentrates. My experience is but that of an occasional customer of the mill. As such, I find the saving by amalgamation does not exceed 60 per cent. on average ores; and I freely admit that this is a good saving from ores carrying their principal values in pyrites. This statement of saving is confirmed by car-load lots that have been sampled at multiple points, and analyzed, and returned to the assayer for treatment, the complete returns of which I have had the privilege of examining, from time to time, as the tests were made. On straight iron pyrites, however, the saving by amalgamation in Gilpin county mills will not exceed 35 per cent. of the gold, as the following tests will show.

For the purpose of testing the extraction that could be made from pyrites, an entire car-load of 25 tons was put through a sampling mill, with the result that it assayed, gold, 1.06 ounces; silver, 1.74 ounces per ton. The ore was then shipped to one of the best mills in Black Hawk, Gilpin county, and the following result was obtained:

	Weight.	Percentage
Gold saved.	oz.	saved.
By amalgamation.	4.08	34.99
In blanket-tailings.	1.52	13.04
In concentrates.	3.16	27.10
Total.	8.76	75.13

Silver Saved.

By amalgamation.	1.17	6.0
In blanket-tailings.	1.52	7.9
In concentrates.	7.14	37.3
Total.	9.80	51.2

	Pounds.	Gold or.	Silver oz.
Weight of blanket-tailings.	416	containing	7.30 7.30
Weight of concentrates.	10,200	containing	.62 1.40
Total.	10,616	7.92	8.70

The gold might be described as fairly coarse. A few colors could be obtained from almost every panning. The amount of gangue in the pyrites was about 5 per cent., leaving say, 10.45 tons of pure straight pyrite. It will be noted, however, that about 50 per cent. of this was lost in the tailings, together with 25 per cent. of the gold, and 49 per cent. of the silver; while the 50 per cent. saved as concentrates contained 40 per cent. of the entire gold and 45 per cent. of the silver in the original ore. The concentration of the tailings in the Gilpin county mills is conducted on end-percussion tables (bump-tables). Now, as we have seen that much of the pyrites is reduced to slime in the mortars, the loss in concentration is

*The report of the Pestarena Company for the year ending June, 1880, shows that 20.5 Frankfort mills were kept working 372 days, treating 4,345,443 metric tons, giving an extraction of 81.1 per cent. The figures for a 20 inch discharge are 336 metric tons of ore treated, the figures for the following year are 5,724,000 metric tons treated in 25.0 mills working 344 days; extraction, 78.77 per cent.; loss of mercury, 230 grammes per ton.

†Trans., ix. 648. ‡Metallurgy of Gold, Silver, etc., vol. ii, p. 567.

necessarily heavy. It varies, perhaps, from 20 to 50 per cent. of the pyrites contained in the ore. Some of the Gilpin county gold-ores contain a fair amount of silver, the greater part of which is lost in the milling process.

The concentrates produced from the Gilpin county mills find a ready market at the Denver smelters, where the gold and silver are paid for at market rates, less 5 per cent., with a very moderate working charge, varying from \$4 to \$5 per ton.

It will be seen, that as the pyrites in the tailings is invariably concentrated and sold to the smelters, there is no gain in taking out part of its contained gold by amalgamation, more especially as in doing so, the ore is reduced to such a fine state of division that considerable loss is entailed in the subsequent process, a loss that far exceeds any advantage derived from extracting part of the gold in the mortars, and receiving the full market price for the gold so extracted. It appears, therefore, that concentration before amalgamation is the correct method to pursue in dealing with the average Gilpin county ores; and, in this connection, it is worth noting that this method is pursued in dealing with the *very coarse ores* from which the more or less solid sulphides are invariably picked out by hand and shipped direct to the smelters. It goes without saying, that if the principle is correct in the one case, it must be in the other; and if concentration by hand is applicable to pieces of ore from, say, one-inch upwards, mechanical concentration is equally applicable to the finer portion of the ore, as also to the mixed ores that require crushing preparatory to concentration.

I am fully aware that, in advancing the doctrine of concentration before amalgamation, I am going over old ground; nevertheless, I hold that it is the correct method to pursue, and, as such, cannot be set aside on account of the failure of previous crude tests, which were faulty in execution and incorrect in principle. Smelting is a very important step in the treatment of Gilpin county ores; without it, the present system of milling would cut but a sorry figure in the metallurgy of the west.

The full importance of smelting does not appear to be thoroughly understood by the mill owners, and it is not to be wondered at that the full advantage to be derived from concentrating and smelting is neither admitted nor practiced.

R. W. RAYMOND, New-York City: Mr. Argall criticises Mr. Rickard's statement that the vibration of falling stamps, on the one hand causes a pulsation of the water flowing over the plates, and, on the other hand, crystallizes the iron of the working parts of the mill. But Mr. Argall's criticism is, that these two features are not "contradictory," as Mr. Rickard has called them. The point is an exceedingly fine one. The evident meaning of the author is, that one of the effects he names is advantageous, and the other disadvantageous. But it is much more important to note that Mr. Argall is himself not "contradictory" of Mr. Rickard, as I think he ought to be, with regard to the alleged crystallizing effect of vibration on the iron of the mill. He goes so far as to say that, "vibration under all conditions will crystallize iron." This is, beyond question, incorrect. It is not even settled that vibration will crystallize iron under any conditions. Mr. Howe* has compiled a summary of the evidence on the subject, adding an elaborate argument of his own to show that, possibly, vibration may sometimes have the effect mentioned; but the impression left by the whole discussion, is very strong, that, as a rule, the said effect does not take place as the result of vibration. Percy tried to find evidence of it, and failed. Stephenson found no change in a locomotive connecting-rod which had received 25,000,000 blows, at the rate of 8 per second; and he reported a similar absence of change in the beam of a Corliss engine which had received a shock of 50 tons eight or ten times a minute for twenty years. These, and many other pieces of evidence, will be found in Mr. Howe's book. The fact is, that Messrs. Rickard and Argall have adopted a current fable, which may or may not have a basis in occasional and exceptional experience, but which owes its vitality chiefly to its availability as an excuse to shield manufacturers from the blame deserved for bad work.

COLLIERY ENGINEERING NOTES.

Ventilation in Driving Levels.—G. Engeleke, (*Zeitschrift für das Berg Hutten- und Salinenwesen im preussischen Staate*), describes the method of ventilating narrow workings at the Dudweiler mine, Saarbrücken, by means of small fans driven by compressed air, and taking their supply from the main air-ways. Two forms of Ser fan are used, one of an early form, about 20 inches in diameter, and driven by a strap from the engine; the other is slightly larger, and its axis carries the crank of a driving engine with a 2-inch stroke, so that no intermediate gearing is used. Twenty-one of these latter fans are in use, and they cost about £29 each. Compressed air for driving these fans and for other underground work is supplied from three wet compressors with an aggregate of 150 horse power. The air is compressed to four atmospheres and supplied by pipes, of which there are over five miles in the workings. The diameter of the

pipe varies from 5'11 to 1'18 inches, and the pressure falls to two atmospheres in them at the extreme limits of the workings. The fans are kept locked in, and are under the charge of a special attendant.

Ventilation by this means is much better than when bratticing is used; the smoke from blasting is very quickly removed and the faces are cooled. The volume of air delivered by these fans varies from 180 to 724 cubic feet per minute, at distances from 150 to 293 yards from the inlet, when the fans are running from 189 to 435 revolutions per minute. There is a certain amount of loss at the joints and resistance at the bends, but two or three men can be supplied with sufficient air at 300 yards from the intake. The author then enters into the question of cost. Parallel drifts and stopings for 200 metres (218 yards) cost £168; brick brattice, £41 10s.; and fans and pipes £44 11s. In the cost given when brattice is used no account is taken of the extra work done at the main fan.

Shot-Firing Lamp.—The Roberts shot-firing appliance can be attached to any form of safety-lamp. A brass tube $\frac{1}{8}$ inch in diameter is inserted through the oil cistern, and its top is terminated in a brass box covered with gauze. A hole is made in the tube opposite the flame, and is normally closed by a sleeve pushed up by a spring. The lower end of the tube is also closed by a plate pushed over it by a spring. A blowpipe also passes through the oil cistern and is closed like the lower end of the tube. To fire the fuze it is pushed through the tube, the sleeve is drawn down by the pricker, and the flame is directed on to it by the blowpipe. When it is certain that sparks will not be thrown from the end of the fuze, it may be withdrawn.

Lock for Safety Lamps.—M. Rateau (*Societe de l'Industrie Minerale*) describes the special key used to open the lock on the safety lamp of Postolka and Eliasch, which is used at the Karwin collieries. This lock consists of a screwed bolt and a sleeve screwed both externally and internally. It can only be opened by turning the parts at an equal rate in opposite directions, and this is done by means of the key, which consists of a sleeve enclosing a spindle, these two parts being geared together by bevel gearing consisting of three wheels. A key for closing the rivets is also shown.

Utilising the Waste Heat from Coke Ovens.—M. Rognieux, in a paper read before the *Societe de l'Industrie Minerale*, recommends the greater use of the waste heat from coke ovens for the purpose of raising steam. He refers in this connection to the arrangements adopted at a battery of 100 Coppée ovens at Haveluy, the waste heat from which converts in twenty-four hours nearly 180 tons of water into steam of four atmospheres tension.

Accidents from Blasting in Collieries.—Mr. J. Ashworth, (*Manchester Geological Society*), deals with some recent accidents from blasting in coal mines, and suggests some methods by which explosives might be tested. The first is that they should be fired by a bare fuse without a detonator, and that they should be tested in bore-holes of different sizes. Experiments should also be made when an air current of high velocity is impinging on the mouth of the bore-hole. High explosives should be used in bore-holes of a size proportioned to their strength as compared with black blasting powder. When a small sized bore-hole is used, the tamping is stronger, and the explosive is distributed over a greater length, so that it can act over the same area as the powder. With regard to the air-current test, it has been noticed that the worst accidents have taken place when the shot faced ventilating currents of high velocity, perhaps because a detonating wave is set up. No explosive is safe in a fiery or dusty mine if its detonating vibration is like that of a mixture of fire-damp, coal dust, and air. A wet length of road is invaluable in arresting coal dust flame, but mere sprinkling the sides of the road with water is of no preventative value.

In discussing accidents from blasting in mines, Mr. J. Grundy criticises a recent paper by Mr. J. Ashworth, which describes amongst others an accident at Ashton Moss colliery. The author shows that this may not have been due to a secondary explosion of gunpowder, but might be due to the sudden compression of the air generating heat. In testing explosives it is scarcely useful to explode them with a bare fuse, and without a detonator, and without any precautions, but they should be tested under the conditions in which they are to be used. It would be a suitable field of research to investigate the question of resonance of sound under varied conditions, so as to ascertain whether an explosive or vibratory wave is concerned.

Removal of Fire-Damp.—H. Brenner (*Zeitschrift für das Berg, Hutten und Salinenwesen im preussischen Staate*), gives an account of experiments carried on by D. Hilt at the König colliery, Grevenberg, near Aachen, to determine the possibility of removing fire-damp by exhaustion. The seam varies from 6 to 6½ feet in thickness, and from 20° to 50° in dip. A bord-and-pillar system of work is used and arranged so as to carry the air well up to the working face. A disused compressor was altered so as to exhaust at the rate of about 244,000 cubic feet per twenty-four hours. From the engine a pipe, 3¾ inches in diameter, was carried down the pit

for a distance of 1300 yards, when it branched off in 2-inch pipes for about 300 yards. Finally, pipes of 1-inch bore were led into the workings, and terminated in perforated rose-ends or boxes covered with wire gauze placed near the roof. Gauges showed a vacuum of 9¼ inches of water near the pit bottom. This fell to 1.58 inch at the end of the main and down to 1.58 to 0.08 at the suction openings. A steam jet-exhauster was used, but with less success. The gases were exhausted alternately into one of two gas holders at first, but afterwards they were sent directly to the delivery pipe. As a whole, the experiments were decidedly unsuccessful, as the gas varied so greatly, and so much attention was required to keep the pipes and roses in order. The gases were used under boilers, but without appreciable economy.

Contributions to our Knowledge of Coal-Dust.—Dr. P. Philips Bedson in a paper (*Fed. Inst. M. and M. Engineers*), gives an account of experiments made with samples of dust collected on the Ryhope screens, the general outcome of which is to confirm the results of his previous investigations which formed the subject of a paper read before this Institute some five years ago. The Ryhope coal-dust yields, when heated *in vacuo* at temperatures from 30 degs. to 100 degs. C., gases consisting of carbon dioxide, nitrogen, oxygen and combustible gases, which latter consists of paraffin and olefine hydrocarbons. The paraffine hydrocarbons are undoubtedly mixtures of marsh gas and some of the higher members of the same series.

An account is also given of the results of an investigation of the gases enclosed by samples of coal-dust taken from the coal box or hopper, shortly after the accident which occurred in April, 1889, at Messrs. Straker & Love's colliery at Brancepeth. These dusts are entirely different in character from the Ryhope dust, one, viz., that collected from the timbers at the top of the box, yielding no combustible gas, but only carbon dioxide, oxygen, and nitrogen, whereas the second sample taken from the dust accumulated in the box gave a small proportion of combustible gas.

CANADIAN COMPANIES.

Dominion Coal Company, Ltd.—The first annual meeting of the Dominion Coal Company, the syndicate which secured control of the principal Nova Scotia mines, and which includes a number of well known Canadians in its list of shareholders, was held this month at Boston. A report of the operations of the company since its organization about a year ago was submitted by Mr. H. M. Whitney, president of the company. All the properties under option a year ago had since been secured and paid for in full. Two hundred thousand dollars had been spent on the Louisburg railway, \$150,000 for discharging plants and mining machinery and \$100,000 for tugs and barges. The company mined 834,019 tons of coal, exclusive of the output of the Victoria mine, which will appear in next year's statement of business. The shipments increased 90,000 tons and the Canadian demand is steadily increasing. A new pit and the improvement of old pits are in progress. The report of the treasurer, Mr. J. S. McLennan, shows a gross profit on coal of \$231,162.71, and profit on steamships, barges and gear, \$163,267.95, a total of \$394,430.66. For this has been written off to profit and loss expenditures for machinery, tugs, barges and equipment, with 10 per cent. of the cost of the discharging plant at Montreal and 33½ per cent. of the Sydney Hotel investment, \$87,721.22, leaving a net profit of \$246,709.44. A dividend was paid on the preferred stock of \$105,000, besides interest of \$14,731.96 on the sinking fund, leaving \$51,977.48 to profit and loss. If the full year's charges were deducted from the net profits there would have been \$21,967.48 to profit and loss. The Board of Directors was elected as follows: Messrs. Henry F. Dinnock, Hugh McLennan, F. S. Pearson, W. B. Ross, Q. C., Sir Donald A. Smith, W. C. Van Horne, Henry M. Whitney, Alfred Winsor and Robert Winsor. There is a rumor that Mr. A. McKenzie, car accountant of the Canadian Pacific Railway at Winnipeg, has accepted the position of discharging and loading superintendent of the company at Montreal.

Sydney and Louisburg Coal and Railway Company.—A special meeting of the shareholders was held in London on the 14th inst. to pass resolutions for voluntary liquidation, the company's properties in Cape Breton having passed into the hands of the Dominion Coal Company.

The MacLaurin Phosphate Mining Syndicate, Ltd.—From the observations of the Official Receiver and provisional liquidator, Mr. C. J. Stewart, issued under a winding-up order made against this syndicate, it appears that it was formed in November, 1890, for the purpose of carrying on the business of phosphate and general miners, and to adopt and carry into effect an agreement for the acquisition of phosphate mines in the townships of Templeton, etc., in the province of Quebec, Canada. The nominal capital of the syndicate is £20,000, divided into 20,000 shares of £1 each. Of these, 11,445 have

* *Metallurgy of Steel*, p. 196.

been issued; 6,455 were subscribed for, and the balance of 5,000 allotted in part payment of the property acquired. The Official Receiver asserts that no dividends have been paid, the operations of the syndicate having been conducted at a loss and the shipment of phosphates appears to have greatly decreased since 1891, and latterly no business has been done. The unsecured liabilities are returned in the accounts at £3,795, against assets £1,538, the total deficiency as regards contributories being £13,708. The failure of the syndicate is attributed to the low state of market values and inability to discover phosphates at the mines in sufficient paying quantities.

Alberta Railway and Coal Company.—The Trustees, Executors and Securities Insurance Corporation announce that they have received instructions to pay on the 1st of February 10s. per cent. on the 6 per cent. mortgage debentures of the Alberta Railway and Coal Company. It will be recalled that in 1891 an arrangement was made for the payment of interest on these debentures in 1892, 1893 and 1894, partially in cash and partially in bonds of the Lethbridge Land Company, Limited. Engagements under this scheme were duly met in 1892, but in January, 1893, when 1½ per cent. should have been paid in cash and 1½ per cent. in bonds, the only payment was £3 9s. in Lethbridge Land Company's bonds for each £3 coupon. On July 1, 1893, no payment whatever was made either in cash or bonds, the bondholders having agreed that net earnings to July 1, 1895, should be applied each half-year, as far as they would go, to the payment of the coupons maturing at the end of that half-year, and this system to be pursued until July 1, 1895, when coupons then falling due are to be paid in full, all arrears to be met out of subsequent earnings. The payment just announced of 10s. per cent. is therefore in respect of the earnings of the half-year ended December. We understand that the company has received satisfactory news as to the earnings of the railway in the second half of 1893, while the coal sales are also increasing.

The Harrison Mining Company, Ltd., is applying for charter of incorporation under the Companies Act of New Brunswick. Authorized capital: \$200,000, in shares of \$10 each. Chief place of business to be at Fairville, Parish of Lancaster, St. John County, N.B. The directors are W. Wheeler, St. John, N.B.; C. W. Davis, Waterville, Maine, U.S.A.; E. C. Elkin, St. John; M. S. Hest, Silverton, Colorado, and C. T. Bailey, St. John, N.B.

The Kootenay & Columbia Prospecting and Mining Co.—At the annual general meeting held at their offices in Ottawa, on 14th ulto, the reports showed that notwithstanding the depression in the silver market a satisfactory business had been done, the fine quality of ore mined having brought good returns. Work will be pursued vigorously during the coming season. The following directors were appointed: Archibald Stewart, Hector McKae, S. H. Fleming, W. A. Allan, and G. P. Brophy, all of Ottawa.

Intercolonial Coal Mining Company Ltd.—The annual general meeting of shareholders will be held at the offices of the company in Montreal, on 7th March.

Cumberland Railway & Coal Company, Ltd.—The annual general meeting of shareholders was held at Montreal, on 11th inst. The old board of directors was re-elected.

Ledyard Gold Mines Company, Ltd.—A company is being incorporated under the name of "The Ledyard Gold Mines Company, Ltd." to work the gold veins on east half Lot 19, in 1st Concession, Belmont, Ontario. Shaft No. 1 is now being continued, and it is intended to sink 100 feet in depth. Arrangements are being made to sink a Huntington mill, which seems well suited to this ore as it contains a good deal of sulphurets which will have to be concentrated.

The Armstrong Lime Company has been formed in New Brunswick to purchase from the owners all right in the trade mark "Green Head Lime" and to take over and carry on the business of manufacturing lime, owned by Messrs. J. and F. Armstrong. Head Office: Green Head, Parish of Lancaster, St. John County, N.B. Capital, \$60,000, in shares of \$100. Directors: J. A. Armstrong, F. Armstrong, F. W. Armstrong, and J. A. Armstrong of Green Head, and J. G. Armstrong of St. John, N.B.

The Strathroy Oil Company, Ltd. has been incorporated in the Province of Ontario, to carry on the business of producing crude petroleum oil, etc., in the Township of Enniskillen, County of Lanark. Authorized Capital, \$100,000, in shares of \$100. Directors: G. A. McGillivray, London; D. R. Lindsay, and Chas. Grist, Strathroy, Ont.

The Londonderry Iron Company.—The sixth annual meeting of the Londonderry Iron Company, Ltd., was held at their office in Montreal this month, when the annual report for the past year was submitted and adopted. The following board of directors was re-elected: Lord Mount Stephen, Sir Charles Tennant, Bart., Hon.

Donald MacInnes, A. T. Paterson, John Turnbull, A. S. McClelland, and R. MacD. Paterson. At a subsequent meeting of the directors A. T. Paterson was re-elected president and managing director; Hon. Donald MacInnes, vice-president; J. Phymister, was appointed secretary, and F. C. Budden, treasurer.

Broad Cove Coal Company, Ltd.—This company has been incorporated by Act of the Legislature of Nova Scotia, to mine and deal in coal, coke, ironstone, copper, manganese and other minerals in the Province of Nova Scotia. Authorized capital, \$3,000,000, in 30,000 shares of \$100. The principals are: W. P. Hussey, Danvers, Mass.; W. H. Munroe, Edgarton, Mass.; John V. Payzant, Halifax; W. H. Wiswell, Halifax; and the Hon. J. M. Raymond, St. John, N.S.

Caribou Gold Mining Co., Ltd.—Incorporated under Act of Legislature, N.S., 1894. Authorized capital, \$200,000, in shares of \$1. The principals are: James T. Burgess, J. B. Neely and Walter H. Covert, Halifax. Formed to operate in Nova Scotia.

Golden Lode Mining Co., Ltd.—Authorized capital, \$50,000, in shares of \$5. Formed to acquire gold areas at Mount Uniacke, Halifax County, or elsewhere in the Province of Nova Scotia. Principals: A. M. Jack, Henry Bell and A. A. Hayward, Halifax.

Tudor Gold Mining Co., Ltd.—Authorized capital, \$100,000, in shares of \$10. Principals: James C. Ayer, New York; Frederick Taylor, Lowell, Mass.; Sydney W. Thurlow, Lowell, Mass. Formed to operate in Nova Scotia.

Cochran Hill Gold Mining Co., Ltd.—Authorized capital, \$500,000, in shares of \$1. Principals: George Clark, D. F. Quigly, J. B. Neely, J. T. Burgess, A. P. McQuarrie, Alfred G. Cunningham and Walter G. Brookfield, Halifax. Formed to operate in Nova Scotia.

Pictou Development and Mining Co., Ltd.—Authorized capital, \$100,000, in shares of \$1. Principals: Wm. McKenzie, Thos. Tanner, C. L. Ross, Alvin J. Craig, Victor N.S.; George A. Byles and Hugh D. McKenzie, Halifax; and D. G. McDonald, Elmsdale. Formed to operate in Nova Scotia.

North American Gold Co., Ltd.—Authorized capital, \$250,000, in shares of \$50. Principal: Adams A. MacKay, Halifax. Formed to operate in Nova Scotia.

Victor Gold Mining Co., Ltd.—Authorized capital, \$200,000, in shares of \$1. Principals: Jas. P. Burgess, A. G. Cunningham, George S. Campbell, W. G. Brookfield, A. N. Whitman, Halifax. Formed to operate in Nova Scotia.

Northumberland Coal Co., Ltd.—Authorized capital, \$250,000, in shares of \$10. Principals: Thos. F. Wetherorth, Charles D. Ross, New York; John E. Marsh, N. John; Herman D. Wallbridge, Washington; John O'Connell, New York; J. G. Blanchard, New York; F. V. Wedderburn, Hampton. Formed to operate in New Brunswick.

ONTARIO MINING ASSOCIATION.

Successful Meeting at Sudbury—Some of the Papers Read.

The annual meeting of the Provincial Mining Association of Ontario was held at Sudbury on Wednesday, 14th inst. Amongst those present were: C. F. Farwell, South-Steele, Marie; R. McConnell, Mattawa; W. J. Miller, Thessalon; W. Melie, T. Roberts, Whitefish; Mayor O'Connor, ex-Mayor Fournier, J. B. Hammond, A. McCharles, J. R. Gordon, C. E., Geo. Mickle, M. E., L. V. Rorke, D.J.S., R. W. DeMoret, D.L.S., A. A. Quillell, P.M., Jas. McCormick, C. M. Biggers, Dr. Strathers, F. Cochrane, Dr. Howey, J. W. Evans, M.E., T. J. Ryan, Geo. Tuftsdenham, A. H. Smith, A. W. Colter, Jas. Franky, Dr. Mulligan, Rev. W. K. Shortt, R. T. McEwan, G. W. Jackson, P. Makowsky, L. McKinnon, J. W. Edwards, A. Ferris, S. E. Wright, A. Paul, A. McL'rye, Dr. Arthur, F. Sinclair, M. McCormick, W. Holditch, B. Washburn, D. Baile, W. J. Ford, S. R. Eyre, P. McGregor, R. Ross, J. Bald, Wm. Chalmers, R. Martin and J. B. Veach.

Election of Officers.

The following officers were elected.
J. B. Hammond, Sudbury, President, re-elected.
Rinaldo McConnell, Mattawa, 1st Vice-President.
John McKay, South Stee, Marie, and Vice-President.
George Mickle, M. E., Sudbury, Secretary.
R. W. DeMoret, Treasurer.

Ontario Mining Law.—Resolutions Passed.

1. That all royalties on minerals should be abolished.
 2. That all applications for mining claims should be null and void at the expiration of sixty days, including all present applications in the Crown Lands office.
 3. That any person, by paying the Government \$1 an acre within sixty days for any mining claim taken up by him, and expending \$2 an acre in development work within two years from the date of application, should be entitled to his patent.
 4. That there should be a local office in every mining district to give all needed information to prospectors and others about mineral lands, and to record claims in, the same as in British Columbia.
 5. That this district being the principal mining centre of the province the mining inspector should have his headquarters in Sudbury and be a practical mining man.
 6. That the Ontario Government should do everything in its power to promote the opening up and development of the unsettled portions of the province, by giving liberal assistance to railways, colonization roads, and otherwise, as the best means of preventing the exodus of our young men.
- That the members of this Association use their vote and influence to elect only such candidates as will pledge themselves to support whatever party in the Legislature will endeavor to carry out the wishes of the Association with regard to a proper mining policy.

President's Address.—The Desirability of Independent Representation for the Mining Districts of Ontario.

MR. J. B. HAMMOND.—The members of the Provincial Mining Association and Gentlemen. In choosing the subject just named as the basis of this paper, I have been guided by the consideration that we are here not only as members of this Association, but as citizens, alive to the importance of all the measures that will promote the development of our mining districts. The whole Province and our fair Dominion as well, will share our prosperity if we succeed in doing this. I shall first recite a few of the most important ways of doing this, and pass next in review a few ways of not doing this, and conclude by a comparison of these ways.

As the basis of this paper I have chosen to discuss briefly the industries of the district of Nipissing and Algoma which must go hand-in-hand with our mining industry. (I refer to our timber and agricultural resources) I am guided by the same consideration, that it is highly proper even from the special view of one who is a member of this Association, merely that such a one should be intensely interested in not only mining affairs, but also in all matters touching mining affairs, and in our own privilege, nay, our duty in looking as interested citizens after our welfare from this higher ground.

Upon the principle then that we are studying, not only our own personal interests, but also those of our neighbors and those who may be induced to unite their efforts with our own, in this way we can see, for instance, the growth and development of our Ontario. We all agree that, as an accomplished fact, the existence of the Canadian Pacific Railway, opening up to us as it does nearly all the settled parts of Canada, the United States and even distant countries across the seas, giving us outlet and inlet at all times for all purposes, is the greatest fact and factor in our development to-day. Were not such a road built, how many of the vastest of spending time, energy and money in such an inaccessible portion of the Dominion as this would then be? What mine would be worked, how many settlers would we have, how much more difficult and expensive would be the vast operations of our lumbermen in these districts? Therefore, the patrons of industry on this one point, in the contrary notwithstanding, no one here who has spent months and years in seeking out our natural resources in our forests, hundreds of miles away from more thickly settled portions of Ontario, will for a moment deny that we have in these districts elbow-room for millions of people, at present locked up for the lack of means of inlet and outlet, except for a few miles each side of this line, in this vast country. In the interest of laying bare and making more accessible the resources of these districts and in aiding the discovery and utilization of illimitable resources, we are here to advocate the right and advisability of our Governments to grant liberal aid in donations of land or otherwise, towards promoting the building of such railways. Our most ardent prospectors tell us of large deposits of mineral and fuel riches of possibilities almost beyond the west of this town. How long are they to remain unworked? Until they are reached by railroads. A rich mineral country is reported to the south of us from Georgian Bay northward. More railroads are needed in the Sudbury district. What can we do with the best nickel, copper and iron mines twenty, or even ten miles from a railroad? We must have lines, devoted to the most energetic men in the Dominion Parliament and Provincial Legislature who, bound by no party chains, study our interests and press our interests in this and all other respects from the sole standpoint of country first, and we can aid the country by sending such men to our houses of parliament. There is no way we can help so much. It is only in importance to such a railway policy is a policy developed into mining, and the most efficient laws regulating and inducing the thorough development of our natural resources as regards mining, agriculture, and the utilization of our forest supplies. That

wise legislation is needed in these respects has never been in dispute, and that it is needed now more than ever before is admitted on all hands. Yet what do we see but waste on the one hand of the precious supply of pine, irritating and worse than useless restrictions in our mining law, and on the other, whole tracts of country withheld from both prospector and settler! Do these things aid the development of this country? Where are our supposed representatives? What are they doing to act in this way? They are party men, perhaps, but not men for this country. Again I say, having given them fair trial and found them wanting, we must send down only men pledged to country first. We can do this, and so help our country.

Is it right to have our pine kept from the settler who spends his time and tries to make a living in this country, to sell it in large blocks to the highest bidder who then proceeds to slash it all down, not even forgetting to take four and five inch tops of young trees? This is a shame! But I forget; there are but few settlers, and such as face such privations only serve to discourage the general settlement of the fertile valleys of these districts. People are starving in all our cities, and there is plenty of good land up here, but the government must have the ready cash for the pine at any cost. And how is it that we see so little of the hundreds of thousands of dollars got yearly in this manner from this country expended in opening up these regions? It is ridiculous, Gentlemen! You and I who are trying to do all we can for this country and to gain an honest livelihood from it do not like to see our resources wasted. We say that this waste should be stopped. Our true representatives will use every effort to have it stopped, and to give the settler here rather than the fat government official, his just share of what he works so hard for. He has a right to this not surpassed by that of any alien, at all events, and where can we find the craven spirited individual who dares to say it is not a superior right. Let us send down men who will see to this matter before it is too late. We are told by some people who should know better or keep silent until they find out the facts, that we have no lands worth speaking of for the purposes of agriculture in northern Ontario. I regret to see signs of the spread of this erroneous impression in the second report of the Bureau of Mines. Dr. A. P. Coleman, Professor of Metallurgy and Assaying in the school of Natural Science of Toronto, in a paper contributed to that report on Ontario's Mineral at the World's Fair, page 185, says: "The Laurentian and Huronian country in the greater Ontario to the north and west was non-existent to the hard working man of the south except as a region of barren rocks and muskegs, where you might get some good pine lumber if the fires had not destroyed it, but that was worthless otherwise because you could not farm it. In spite of its immense area Ontario has reached its limit of rapid advancement according to old methods, and yet its people are afraid to venture on new and risky enterprises to develop the richness of the mining country to the north." After citing the former failures in the Madoc region some twenty years ago, where now again, however, gold mining is being actively pushed, he closes the paragraph with the remark that "for some time to come we may expect Americans, Englishmen and everyone else except Canadians to develop and profit by our mineral resources until we have time to learn from them and gather the knowledge and courage to do our own mining and smelting." As regards the first part of the quotation, a little more study on the ground would show the gentleman that there is no reason whatever, under a continuation of the fostering care, encouragement and supervision given the farmers to the south of us, why settlers up here in Nipissing and Algoma should not prosper as well as the settlers below did under similar circumstances. The fact that hundreds are comfortably well off here already in spite of drawbacks not suffered by earlier settlers in southern and eastern Ontario, is sufficient proof of the fertility of the soil (which is already estimated to amount to from ten to twenty-five per cent. of the total area) of a generous climate and of the capability of the pioneer to adapt himself to both. The gentleman evidently did not see the potatoes grown in Algoma which took the first prize at the World's Fair! The latter part of his remark I shall deal with later on.

Again, what provision under the present timber policy is made for mining purposes? The lumberman and the mine owner are both seen racing for a tree, and the first man gets it, with this difference, that should the miner appear first on the scene, his uncut store is rudely seized by the second man, no matter how hardly pressed the miner may be in the present or in the future for the timber and wood standing on his claim. Gentlemen, I must blush for such a policy. Nor am I joking when I say that the question of fuel here is a burning one. But when has this not been so? Again, all mines and mining and smelting plants need, and must have large quantities of good sound timber, such as is fast disappearing under the present plan of operations, whereas not one tenth of our mines, even as yet found, are yet in operation, nor will be for years under our present law. Observe what an item of expense the getting out of wood already is, what branch lines of railway and numbers of wood trains must be utilized. These are facts which must be met and provided for by every mining company. When a prospector pays for a mining claim his right to the pine and all other wood on it should be strictly protected. It may be that for years it will not be used, but he has the first right to it on fair terms. Are our representatives representing and urging that right with might and main? If not, what are they representing? Perhaps the word is

rapidly losing its meaning altogether. Think this matter over, gentlemen. We can help ourselves to our rights by settling up this country with farmers and miners, and by sending good men and true, who are not fighting party battles, to our houses of parliament, to see that we get those rights as inhabitants of this country, or know the reason why. We have responsible government in the country, and we fail of our duty when we fail to see to it that it is responsible.

Now, as to our present mining law. A residence of nearly five years in these districts has enabled me to make a few observations and get at some facts which I now intend to present to you. For the first time during all these years I shall request your indulgence for introducing my personality with that of others in the following account of a serious struggle with our legislature in Toronto with reference to those laws, a struggle that is not yet ended by any means, but which is to be continued until we have secured a just measure for mining life—not death.

The discovery of nickel ore in large quantities in association with the copper ore, of these districts, has drawn here a large number of people who, upon exploration, bought mining lands in the laudable hope of thereby bettering their fortunes, myself amongst the number. Coming here in '89, when prospecting for mineral was still the rule amongst energetic men, young and old, I joined in aiding and prosecuting this important work. In the latter part of 1890 I was in New York advertising and negotiating the sale of a large and valuable mining property in the district, when, on reaching the line at Prescott, on my return, I learned that the Ontario Government had just withdrawn from sale all mineral lands for some forty or fifty miles east and west of this town, (Sudbury), two of my own claims included. I could hardly believe my ears. I telegraphed right and left. It was too true. I tendered the purchase money in person having received no notification of any such intended action, and for the further reason that the claims had been located but a short time before. The money was refused. Thus, without warning, we were left in the dark for months, some for a year. Meantime, there was general consternation and much bitter and distrustful feeling throughout these districts. This feeling culminated in the convening of a mass meeting here by our then reeve, Mr. S. Fournier, the outcome of which was the sending of a delegation to Toronto to present an address drafted at that meeting, embodying the opinions of mining men and prospectors in the Sudbury mining district on questions of vital importance to them. The fate of these people was felt to lie in the hands of the Provincial Legislature. The deputation was composed of Messrs. Stobie, Fournier, O'Connor and Ryan, and was sent down early in March, '91. A back-set in our development was feared, and as the sequel only too well proved, it was rightly feared. Mining and prospecting here, as Father Taylor described the state of religion in a certain town, has been looking up ever since. You may have heard that this good man once went to a conference at which his ministerial brethren compared notes as to the state of religion in their respective parishes. Presently he was called upon to report for a town in which he had lately been laboring—a town somewhat noted for the low state of religion in it. "Oh," said Father Taylor, "religion is looking up there." The answer occasioned much surprise. "How is that?" inquired the leader. "Is there any general awakening in the church?" "No." "Any special interest on the part of those outside the church?" "No." "Well, then, what do you mean when you say that religion is 'looking up' there?" "Why," said Father Taylor, dryly, "religion is flat on its back, and it has to look up if it looks anywhere."

The deputation asked for the first privilege of purchase for thirty days only; that a prospector by right of discovery and paying a fee of \$5 be allowed to hold 80 acres one year on doing \$100 worth of work, with the option of purchase within a year; that the territory withheld from sale be declared a mining district with a local office at Sudbury; that prospectors be thus encouraged to discover minerals. The document went on to state that selling mineral land as timber land was sold would discourage actual workers, and lead to locking up the country by monopoly; that a royalty on ore, or an increase in the price of land would also tend to limit the number of those engaged in the work and thus check development; also, that much of the mineral development in many states of the union was due to the fact that the above-mentioned recommendations were in force. Mr. Stobie advocated a school of mines, supported by Mr. O'Connor, on the ground of the Government's being able to smelt ore for small producers who could not purchase smelters. Mr. Connee thought such an institution could be made self-supporting. Mr. Stobie showed that ore had to be sent abroad for treatment and report. Mr. Ryan called attention to the successful operation of schools of mines in the United States. These suggestions doubtless got Mr. Mowat's most serious consideration. I next notice the action during that same week of the geological and mining section of the Canadian Institute in advocating a Provincial Department of Mines, and calling a meeting for the 31st of March to consider measures for the advancement of the mining industry, and the advisability of establishing a Provincial Department of Mines. The arrangements were in charge of a committee composed of Hamilton Merritt, George Mickle, Allen McDougall, Arthur Harvey, R. Clougher and R. Dewar. Rumors of royalty were in the air. The convention took place and waited upon the Ontario Government on the third day with resolutions advocating a Department of Mines, a

provincial museum, the pushing of surveys, mining education, local agents, right of staking out, development work, sustaining of the price of mining lands, aids to roads and railways and emphatically pronouncing against all provincial taxation in the shape of royalties and ground rents. Mr. Mowat replied that he thought it would be found before the session was over that the Government had taken all the matters brought to their attention into consideration in the regulations they would submit to the House. The Dominion Government was also memorialized to do for the Dominion what the Royal Commission had done for Ontario, to see to the lowering of rates on ore railways, and the belief expressed that a free market for mining products would be of advantage to both parties and greatly tend to the development of the mineral resources of Ontario. Mr. F. L. Sperry was the special representative of Sudbury on this occasion and a member of the committee on resolutions.

We come now to the mining bills early in April, wherein we face royalty, agreed to by both political parties! There was considerable excitement in Sudbury that Friday evening. A meeting was held, and Messrs. Ryan, Skynner, Hammond, Sperry, Pings and Fournier were appointed a committee to draft a petition and have it circulated as widely as possible. At a public meeting on the Monday following the following resolutions were unanimously passed: That in the opinion of this meeting the proposed royalty of 3 per cent. upon the output of our mines imposes a heavy and unequal burden upon such mines as shall be discovered in the future, and would stop the further development of this important industry; that the prospectors will be obliged to stop work, as the most valuable mine would be unsaleable under the proposed royalty; that copies of these resolutions be sent to our representatives at Toronto, with the supplement of the *Journal*, with the request that they will support our views by every legitimate means in their power, and if they are unable to do that, in the opinion of this meeting that they no longer have our confidence, or are fit to represent the mining districts; that copies be also sent to the Toronto Board of Trade, with the request that they will use their influence to have the royalty clause eliminated. The township council also held a special meeting at which a resolution moved by Mr. O'Connor, seconded by Mr. Anctil, was passed, that the royalty clause, in the opinion of this council, would be detrimental to the interests of the Sudbury district, that it will frighten away capitalists and will prevent them from doing any work to further develop the mining industry of this district which needs all the help and care that the Government can bestow upon it, and humbly praying the members to remove said clause.

I may state that I found no difficulty in getting the supplement of the *Journal* well filled with able letters on this subject. We had six twenty inch columns of them contributed by John Hall, W. J. Skynner, James Stobie, F. L. Sperry, R. W. DeForest, Stephen Fournier, Alexander Paul, J. R. Gordon, C. A. Russell, A. McCharles, A. Hoffman Smith, J. H. Babcock, W. Canning, and myself, not forgetting a vigorous editorial by the editor, J. A. Orr, and I took copies for each member of the House and for general distribution to the press and Board of Trade of Toronto, saw them faithfully put on each desk in the Assembly Hall and I may add well read by the members. Mr. Connee gave me valuable assistance in this matter. A large deputation waited upon the Government that week, and I had the pleasure of reminding the Attorney-General amongst other things, that if agriculture needed and obtained help from his Government, I claimed that mining requires even more assistance, since we could not grow mineral, once gone, gone forever, and the mine so much the poorer. Mr. Connee predicted a serious reduction of the revenue of the Government from the lands should the royalty clause stand. This prediction has been amply verified. Mr. McKellar said that the royalty imposed in 1868 had to be repealed in 1869, because it put a stop to mining development of every kind. Mr. Mowat said: The subject is an important one. It has received a good deal of attention and it will continue to receive attention until we make up our minds what it is best to do. What did they do? They disregarded us all and imposed the royalty. Stock in the town of Sudbury took a heavy drop that day. We had been snowed under by over-selfish farmers, lawyers and doctors in the House. The prices of land ranged now from \$2 to \$4.50 per acre. True, we wrung from those people some trifling concessions. A seven years' respite was held out, or four years if rich in nickel. The royalty was to be calculated upon the value of the ores at the pit's mouth. I shall not soon forget Mr. Hardy's attitude in this whole matter and in insisting that four years was enough for nickel. He may be a big man, but he is not big enough for this country.

We presented James Connee with an address in Sudbury for the brave fight he made in our behalf early in May, 1891. Our own representative was both in it and "not in it." He was for the royalty. A Bureau of Mines was established, and a man by the name of Mr. Blue, a gentleman not eminently known to our mining public as a mining man, was appointed director. It was a blue outlook all around. And so things drag along till the 7th of October, when the Sault Ste. Marie Board of Trade called a convention of all parties interested in mining to be held in that town on the 7th, 8th and 9th of that month. A series of eleven questions touching our interests was issued throughout the province, and many answers were obtained and read at the convention, which was duly held. Sudbury was represented by Messrs. Stobie, Hammond, Orr and Holditch. This convention was largely attended and was of a most interesting

character. A full dozen of resolutions, including a request that we be properly represented at the World's Fair was passed, and thereupon was formed the Provincial Mining Association, whose constitution and by-laws lie now before you, and whose aim it has been and will be to know no party as an Association, to do all in our power to advance the mining and prospective interest of this country, and to offer a bold and united front to all oppression. Our work during the past two years will be fresh in your memories, and though not yet crowned with success, never before have we had such golden opportunity to speak and act, each man of us, by our ballot, in upholding a platform we have conceived to be in the best and truest interests of our country.

I may, however, be allowed to recite briefly how, at the next meeting of the Ontario Legislature, we asked some assistance in connection with a customs smelter we endeavored to float, and the establishment of a government laboratory in connection with it; how we were refused, although the Toronto Board of Trade supported our claim; how a mining reputation consisting of Messrs. John Mackay, Thos. Marks, J. J. Skynner, J. Bowden, Dr. A. S. Thompson, Arthur Harvey, T. D. Ledyard and Aldermen Leslie and McDonald of Toronto, introduced by Dr. Commee, waited on the Government on the 8th March, 1892, and presented a petition asking in strong terms for the repeal of the royalty, and for the establishment of schools of mines; how vigorous speeches were made in support of the petition by Dr. Thompson, Mr. Marks, Mr. Harvey and Mr. McKay; how Mr. Hardy supported his policy of royalties; how the proposed laboratory would cost \$3,000, and the officers in charge \$3,000 more; how these gentlemen were dismissed with the everlasting promises of consideration; how the charter of the Customs Smelting Co. (Ltd.) was issued; how thousands of dollars are subscribed to the purchase of the site of the future laboratory; how capitalists and that for us good-for-nothing Ontario Government are still frightened; how Mr. Hardy proposes amendments; how certain people hate to confess that they were wrong; how the value of ore is now calculated (Heaven knows how) at the pit's mouth, less the cost of labor and explosives for mining and raising it; how nickel is to be fully paid on the same basis as other ores; how fifteen years hence it is allowed to be sold at the market; how the prices of land are again changing, ranging from \$2 to \$3.50 per acre; how a scheme for leasing lands is introduced; how we are not quite certain that it is much patronized even at the rate of \$1 per acre for the first year; how, in view of all our discouragements we decide not to ask for any further subscriptions to the stock of the Customs Smelting Co. Ltd. How great was the failure of the new mining law; how capital continues to give shifty mining legislation a wide berth; how we try to make the best of it; how Quebec takes back water on questions relating to royalty; how we try to induce Canadian capital to lead the way; how whole townships are withheld from sale; how Mr. Blue takes up the cudgels in defence of the Government; how our Association sends twelve more questions through the country in 1892; how we spend hundreds of dollars a year and one day after the other in trying to sell good properties at reasonable prices without success; how the two or three companies here are clearing from one hundred thousand to two hundred thousand dollars a year working on a very small scale; how some of us that are not in it and can see or understand nothing of getting into it, have to starve or leave the country; how \$2,308,475 were taken by the Ontario Government at a sale of timber limits in these districts on the 13th of October, 1892; how unlikely it is that very much of that \$2,308,475 or of the many other minerals taken out of this country by the Government will ever be returned to it; how the Algoma Land and Colonization Co. tries to settle Algoma; how nickel is raised in the estimation of the nation; how Mr. Blue and Mr. Stobie get along; what efficient aid the *Sudbury Journal* gives us; how the fur flew as our Mr. McCharles and Blue had their set-to; how Mr. Clemons spoke out in meeting on the unrighteous timber policy of the Government; how Hammond wanted nickel-steel produced in Canada; how Mr. Stobie and Mr. Hardy had it out; how we met in Sudbury on the 17th of February, 1893, and what the International Mining Convention in Montreal came off; how the royalty was sat upon, Mr. Ian Cameron, a Scotchman managing a mining company in the Sudbury district to the contrary notwithstanding; how a certain disclosure at that convention elicited the fact that Mr. Blue had "changed his mind," but without assigning his reasons since pronounced himself against royalty in the report of the Royal Commission; how our petitions take in the country; what extracts from the Report of the Royal Commission were circulated; how another Customs Smelter fails to float (April, 1893); how our petitions are reported as gone astray in Toronto; how Mr. McCharles continues to keep his end well up through it all in spite of everything; how Mr. Hardy claimed that he did not have information enough; how Sir Oliver writes to Hammond that the Government's mining policy should be announced before the House closed (May 18th, 93); how this was not done; how Mr. Meredith wakes up and charges the government with delaying the matter in order

to use their mining policy at the next election; how we conclude that we need not ask that government for assistance; how we begin to feel as if we had better take the matter into our own hands and put in men who will do something for us besides building fine places to sit in at the expense of this country; how Commee criticized in the House and out of it, Ontario's so-called mining policy; how it is reported that Messrs. Long, Stratton, Brown, Proctor, Ireland, Jones, Dunstan, Cheeseworth, Ann, Hillyard and Hunter, get Commee to preside at the organization of a society to be called the Ontario Mining Association (June, '93); how Rat Portage's petition to Sir Oliver in the August or September of '93 looks as if we might have drawn it up; what we did at the "500" on the 4th of October last; how two representatives of large English capital are bluffed by the royalty clause at Rat Portage; how we now have the government between the devil and the deep sea.

But enough of this, gentlemen. I come now to the consideration of this question from a different side. What induced the government to act thus? What has their action amounted to, or how benefited any part of the Province? And how is this state of things to be remedied?

The inducement could only be, and undoubtedly was, revenue, direct provincial revenue. This can be derived by a fixed price for the sale or lease of mining lands, by royalty, or by both. The Government took what appeared to be the best policy, and, and to both a most miserable failure was never kind to it. The revenue from Nipissing and Algoma from mining lands in '92 was less than 6,000 (\$5,921), and from Rainy River, Thunder Bay and elsewhere, less than \$10,000. The paltry sum of \$15,273, gentlemen, is the total revenue from mining lands in '92! The monthly expenses alone, in any ordinary mining company in operation easily amounts to more than that. All our predictions were only too well fulfilled.

I suggested to the Attorney-General and his advisers in this matter, before that Act was passed, another—the indirect—way of enriching the Province as a substitute for government royalty, fearing that a fixed or clumsily alterable per cent. imposed as royalty, would deter capitalists, on whom we had to rely, from embarking in the venturesome operation of mining, and that if it failed, the whole cause would be lost. The inducement could only be an imaginary one. The absence of royalty then, would be an added inducement to capital, of considerable power in establishing new companies and pushing development and manufacture in this country to the limit of the demand.

Prices would come down as a result of keen competition and improved processes, the usual work would increase immensely, and the result would be that such vast amount of work and supplies would be needed at each mine in operation that ten thousand-fold more benefit would be derived by the country at large in furnishing labor and supplies, and from the finished product, than from any amount of imaginary royalty. Besides which, under this plan, each man in connection with the industry, and the more so, would be enabled to handle his own money and stand a good chance to be able to pay the tax-gatherer. Thus you get both direct and indirect revenue, instead of losing both; should royalty keep or help to keep our mineral under the ground. Capital is like quicksilver. If you make a grab for it you will get very little. Make trenches and channels for it to run in and you can lead it anywhere and make it do almost any work you wish. In our case, however, in which the grabbing process would work. Should our resources as a country be taxed to the utmost to supply the demand, you could ask anything you wanted and get it. What is the chance that this will ever happen? I should say a man would be safe in stating that there is a very small chance, if any. Not one in a hundred. We have vast quantities under the old law untouched and doubled in value by the fact that such bare no royalty. This produces speculation and little development or selling except at what some call fancy prices, if the owner so choose. The capitalist, again, looks at it from the standpoint of its being a flaw in his title to be forced to the payment of a fixed government royalty on a property which may prove so expensive to work under the law of demand and supply that the royalty amount to the interest on an investment or even encroach upon his capital. A private royalty, subject to private terms as influenced by competition, the law of supply and demand and paid as part of the purchase money, or even as pure royalty, would be under more control and is not therefore so objectionable. It is open to negotiation, option, etc., and the capitalist is able to feel his way.

Again, and this is the element that is supposed, the unsettled feeling with regard to the stability of our mining laws, the unequal conditions already obtaining in Ontario, and the dread of their further complexity and variety have had much to do with hindering capital seeking mining investment from locating itself here. The precarious nature of mining needs added terrors. I leave the further discussion of this part of the subject to other members of the Association.

Finally, how is this state of things to be remedied? In this connection it will not be out of place to glance for a moment at iron. We have, confessedly, the best of ores, the Dominion Government gives a bonus of two dollars per ton on pig iron manufactured in Canada from Canadian ores, the customs tariff on pig iron is four dollars per ton, a total bonus of six dollars per ton on pig iron. We have not yet, however, a single pig iron plant in Ontario, but are still fond using imported pig and scrap to the tune of \$9,383,420 in making products worth \$33,000,257? How is that? What are our legislators doing about it?

Are they really aiding the growth of smelting plants in a practical business way? If so, what has it amounted to? Have they placed sufficient duty on scrap iron? Have they guaranteed the bonds of an iron or nickel smelting company, holding the property as security? Have they made a loan to the substantial company on the same security? Have they given a cash bonus of even \$100,000 to start these great industries? No. They sell our timber for millions of money, and give us nothing back to help a community so poor that it cannot even mine its own ores in creating an industry, and a market that more than any other, by reason of natural facilities, would fill this country with population and prosperity. And still they persist in collecting royalties that are sleeping quietly under the ground! They never think of us or this country except when they want money; they sell us the land at their own prices and turn round and make it difficult for old and new comers to do business by putting us upon an unequal footing as regards titles to our purchases and in refusing our petitions for needed help. We have got too many party-first men, tinkering lawyers and good doctors of medicine making our mining laws, and neglecting the true interests of mining in both houses of parliament. We can alter this state of things, gentlemen. We mean to do it. We are going to send down party-first men. The time has arrived when party bias disturbs the financial equilibrium of this country, and hinders its development.

There is another way we can improve the present state of mining. We can educate the people of our own country who have money for legitimate investment in sound methods of mining and smelting. We can encourage the formation and working of development companies to search out and test good properties. Such a company if it finds one good property in seven at an expense in exploration of \$25,000 or \$30,000 on each acre, and if it can simply locate and encourage to use the sale and reorganize or expand for mining and manufacturing saleable products. We would thus learn to feel our own strength more, and rely less on outsiders. The difference between the raw and the manufactured product would be kept in this country, as is being so continuously stated. We would soon hear of nickel-steel being made in Canada, instead of seeing a Scotchman's, Mr. Cameron, giving a premium on the product of his company here, spread on the pages of the report of the Mining Bureau (92), page 148, for instance, where he says, "I do not know that it would be a very great advantage to have the refining of nickel done in this country." The reasons assigned are, that wet processes would require the importation of acids, etc., freight charges on refined nickel for Europe would be greater (how much is not stated) than on matte, consumption must increase first or chemicals bought as cheaply here as in England or France, the duty on nickel in Europe, admitting, of course, that there is none in Great Britain, etc. Gentlemen, we have all the necessities for manufacturing acids and chemicals cheaply in Canada; we are not confined to wet processes, as we are not in the production of nickel oxide and nickel steel, and it would be well for all such people to know that we will not stop short of the realization of all this, that the sturdy sons of Canada refuse to be sat upon by any outsider or insider, that we are not blustering but organizing our forces and clearing the road to our work. And if the Government wants to make money or royalty on mining lands what is to prevent them from entering the field of nickel and smelting, and making money for their people? They run these factories and model farms, and here, they merely survey townships from time to time, name a price per acre, put on a royalty and stand off and cry quits! If we have not got the education, as some assert, why not start schools and smelters that would give the needed education? A few years of this kind of work would furnish a far different looking yearly report. This effort to help ourselves as a province, no matter what odds we face, will do more lasting good than the misrepresentations of Mr. Archibald Blue and his sneers in his last Report of the Bureau of Mines at those holders of mining lands who, after having spent years of time and the hardest kind of work, to say nothing of the expenditure of thousands of dollars of hard cash and running that he has not faced now offering mining property for sale or to some one else, and then coming back to get nothing in return. Is it for this that he pockets his allowance from the public funds? Is this the way to develop this country? or to bring any credit to himself? Is it apologists for the tinkered mining laws of party lawyers that we must have as public servants? What state of things is this in our country? Labor, thank heaven, is creating demand for it, forming rapidly to a class.

Speaking of the last report of the Bureau of Mines, it is especially interesting to note the cheerful and patriotic, not to say arrogant, style of Mr. Blue's argument. Take a few of his ideas. He quotes in the foot note to page 146 from the *New York Engineering and Mining Journal* of May 13th, 1893, in showing the rapidly increasing demand for it, allowing for various purposes, as follows: (read the foot notes)

Again, on pages 147 and 148 he says: (read marked portions)

He states, then, in his summing up, in the first place, that no little misapprehension however prevails as to the demand for nickel, but he does not venture to state who it is that declares that there is no limit to the quantity which our markets are capable of absorbing. It would be highly interesting to know the names of the men who would make such a statement as that and who have been so honored by Mr. Blue with his particular notice.

Again, he is impudent enough, in the face of the ascertained facts of his government of the last few years, to expect that those are dreamers who are in just as good a position to know about this matter as he is and who state that there have been cases of policy, want of capital and lack of enterprise in blocking the wheels of progress in the Sudbury mining districts. But that is not all. Such men are not only dreamers, they have mining locations to sell. Again, we see extreme optimism with locations of unknown value to sell (page 148). That is their crime. They should not have mining locations to sell! Again, (page 147). "There is no hindrance to investment in Ontario." Again, we consume upwards of 300,000 tons of pig iron every year, and yet, of iron mines there is not one that is worked, although there are mines in great abundance. Neither is there one blast furnace to smelt iron ore, and he winds up by saying that all the indications point to a steady increase in the consumption of nickel. Gentlemen, you may easily judge such a man for yourselves. Then Mr. Cameron is pulled in again, and in some peculiar way, his statements seem to be taken at their face value all through his report. It is evident that it is a case of "the man that has the man lately from the old country, and a mine manager for a company who have no royalty to pay, is so largely quoted to bolster up a mining policy unworthy of the name.

The effort to help ourselves will be better for us than clinging to Prof. Coleman's opinion that "for some time to come we may expect Americans, Englishmen and everyone else except Canadians to develop and profit by our mineral resources." This is a most humiliating confession from a Canadian. It has been made by many Canadians. True, we wish to keep nobody out. They are all welcome. There is room for all. But we would be pretty slow and small spirited if we did not find a way of justly sharing in the credit and profit connected with this business. Now is the time to strike and to strike high. Put in men who will see to this.

Finally, more mining schools will aid education. (These factories are good. So are customs smelters. Mining schools are good. Let us have one here as well as at Kingston.) It is a custom smelter here connected in connection with a well equipped laboratory and testing works we may reasonably expect to get upon our feet without waiting another fifty years in Ontario for others—outsiders—to come in, pick up a little here and there, and leave us in our original and fast becoming chronic condition and disposition of waiters. Our stomachs refuse to wait any longer.

To close, gentlemen. In pleading the cause of independence in politics in the interests of this country, I am obliged to define what I mean by that word. My definition is simple. That citizen is independent, as I take it in the political sense, who will prefer and defend by all lawful and honorable means, and put before any other consideration our common country, our common welfare. Such a citizen is not a party-first man, nor is he pledged to support any party, nor is he an apostle for any strange doctrine. What we have and prefer in common in this way is the basis of our present civilization. We have not yet fully developed or adopted a higher style of civilization as citizens of the body politic. Are we seeking, then, or have we found that common country, that common constitution, and that common welfare as determined by the majority of our citizens from time to time, and are we seeking to have a government that we are then acting as responsible and independent citizens. A minority or a majority may use petitions, moral force, discussion, education, criticism, reason, appeal, organization, in a word, agitation (small shot, but plenty) enough to bring down gamblers for pressing what seems to the individuals composing that minority or majority to be legitimate claims, and may also try by all lawful and honorable means, for example, by representation in the common councils of the country to have laws limiting their right to common existence and common welfare altered or repealed, or may try by the same means to have laws passed which they believe would advance or protect their interests; but that minority or majority, whether entirely composed of responsible citizens or otherwise, has no means of redress. The ballot is the independent man's bullet.

A true friend of his country is first and foremost a citizen and his perfect right to speak and act upon equal footing in this country with any other citizen in that capacity in the political field. Upon this field we may all meet in the common light of the sun. As to matters affecting the relation of man with his Maker and his religious belief, our constitution requires and demands the utmost freedom in the interests of peace. This is not a political relation, or a political union, and it is not a question of majorities or minorities. It has nothing to do with politics. We can, then, only have political independence by being bound together by majorities for the common welfare. When political parties or individual representatives fail to represent the common interests they fall to pieces or are replaced, and reconstruction takes place in the interest of that welfare; but we saw the lateral seeds of discord and confusion, and destruction the purpose for which our constitution was set up when we fail to observe as a rule of action "the vast difference which exists between our political union and our connection with our Creator.

Thanking you gentlemen for this hearing, I take my seat.

A New Method of Mine Models.

MR. J. W. EVANS, M. E.—In this paper I wish to touch briefly on methods of representing our nickel deposits which will give ever a truer conception of their nature and extent. The method on which I wish to touch particularly is that of representing them by complete models—made from plans and profiles to a convenient scale and having ore and rock accurately shown as they occur on the ground. The method of working is as follows:—

A survey is first made of the property, parallel lines being laid out along the whole deposit from 15 to 25 feet apart, according to the nature of the ground. These are chained and stakes are planted at given distances on each line. Careful measurements are then made to establish the exact positions of ore and rock, both on the surface and in any test pits or shafts there may be on the ground. The levels are then taken at each stake and between them where necessary, and plan and profile are then made from which the figures are taken for the model, a suitable scale having been chosen. The first kind I refer to are models of surface shows (surface model of a large exhibit in Denison here shown). To admit of easy handling it is well to make the model of blocks of wood from 5 to 6 inches square. They are cut to the proper shape according to the plan and profile of the rock as shown on the ground, they occur on the ground by having ore and rock (which has previously been crushed to a suitable size) glued on in their respective places. In this way surface exhibits can be shown exactly as they are, and in a manner easily understood by all; which cannot be said for plans.

For mine models, where there are a number of levels, the work is more complicated, and connected surveys have to be made of each level.

In the model of the largest nickel mine in the Sudbury district, *i.e.*, Copper Cliff mine (which was here exhibited), which has seven levels, the blocks are 5 inches square and are made to the scale of 20 feet to one inch, each block representing 100 feet square of ground. They are put out where openings occur according to the plans and profiles of the mine, the blocks corresponding to the distances between the levels, so that the top of each layer of blocks represents the floor of each level. By removing them layer by layer, one gets a plan of each level, and tier by tier, sections through the mine. The different kinds of ore and rock are glued on in their respective places in the same manner as is the case with the surface models, little mica and scales are placed about the drifts and slopes to better illustrate their sizes and extent.

In this manner a whole mine can be accurately shown to the shareholders or intending stock buyers, who could get but a very crude idea of its form and extent from plans.

An Old Prospector's Views and Criticisms of the Ontario Mining Act.

MR. JAMES STORIE—Ontario, between the Ottawa River and the Lake of the Woods, is in round numbers, 1,000 miles, and between the north shore of Lake Superior and Huron on the south and Hudson Bay on the north about 400 miles. The question now arises what can be done with this vast unknown territory? It is too far north to be of much use for agriculture, and the greater part of it is of little value for timber. These two facts are well known. But what can be done with the future value of the mineral resources? It cannot be travelled over on horseback like the prairies or even like the Rocky Mountains. The only way of access is by canoe routes, and these routes are often very many miles apart, and consequently the country lying between them is unknown, and even if known will have to be examined on foot, and the wherewithal to exist on will have to be borne on human shoulders. The reason when this vast country can be explored for mineral is short, and the difficulties many, and not the least are the flies during part of the summer when there is no frost. These are some of the physical difficulties that have to be contended with. I will let some other prospector give the financial troubles which we get into. Were I to give an account of my own experience in this respect during the last 25 years, it would be very amusing though instructive, but nevertheless very serious.

A Common Error.—Old Ontario need not think that all this northern country is like the Sudbury range. The most of it is barren of any of the useful minerals. I class the surface rocks for exploring into four different kinds, as follows:—

1. The barren rocks, which occupy by far the greatest area.
2. Rocks with indications of useful minerals.
3. Rocks with enough of the useful minerals to tempt the explorer to take up claims and spend time and money on them, but having no paying mines. This class is the most ruinous to the explorer and capitalist.
4. Rich or ranges containing some of the useful minerals in paying quantities. The Sudbury range may well be classed as such. Comparatively speaking the Sudbury range has been like a picnic excursion to explorers, but how many have made any money on it? By far the greatest number have spent years of hard labor as well as money, and up to date have not received any returns, while several poor fellows have lost their lives in the search for mines in the country north of the 47th parallel. All will have to be examined in the manner already mentioned, whether barren

or productive. The first thing the prospector has to do is to find a range or belt bearing mineral in paying quantities. This is the rub. He cannot tell in what direction to travel if in a barren district, unless he find drift boulders carrying mineral. These do not travel from the south, east, west or north, but from a direction a few points east. This is a much greater aid to the prospector than a mineral belt than to find a mine on such a belt when it is discovered. A great many spend their time and money on the third class of rocks. A considerable part of the Algoma district belongs to this division.

An Explorer's Qualifications.—Now what kind of men are competent to overcome the many difficulties which have to be faced north of the 47th parallel in Ontario? The fat and wealthy man cannot do it. Neither the capitalist, office-seeker, dupe or miser will make such sacrifices nor those who are fond of luxury. The man who will be successful must be sound in mind and body. He requires indomitable pluck and great power of endurance in order to contend with all the difficulties he will be sure to meet with in this rock-broken and pathless wilderness, and also to be well posted on the general question, so that he can tell a paying range from a poor one. He must not get home sick or lost in the woods, neither be afraid of the bites of bears or black flies. I might add a great many other qualities he must possess and some that he must not possess to fill the bill of an explorer.

What Returns?—The reward offered to such men by the Ontario Government is that he may acquire this now worthless territory and search for minerals. They do not stipulate that they are bound to sell him the mines he may discover, and if they do allow him to go on and develop the claim he has to pay from \$2 to \$3.50 per acre, and yet it is not his, but must continually pay 3% royalty on the output of the mine whether rich or not. This pressure on the explorer from the Government, in place of, and he is always too poor to work it himself. It is a financial impossibility for the explorer to make anything under the present Mining Act of Ontario. Let any person calculate the difficulties the explorer has to contend with and his running expenses while exploring, and he must come to this conclusion, namely, that the explorer should get whatever he finds as his reward, in place of, and not the explorer who has both muscle and brains, the mineral, which is now of no value as it is hidden in the ground, will forever remain as useless as a snowdrift. Old Ontario may make all the selfish and prohibitory laws she wishes. They will only have this effect, that is, to retard the development of what is now useless and therefore worthless. All the country need ever expect to derive from the Ontario mining is increased taxation on trade and commerce in all its branches. The old settled parts of Ontario ought to be satisfied with such important returns for the little the poor explorer may be given under the most liberal mining law.

Good Advice Thrown Away.—If the advice of the Royal Commission had been carried out and their recommendations adhered to, and the present policy of the dog-in-the-manger policy adopted by men who had no practical experience of mining, we would now be advancing towards a prosperous and well developed condition in the mining industry, instead of having the prospectors frightened away from this vast territory by this bad policy. No doubt but the people who read Mr. Bruce's report will feel as they are feeling, demanding a royalty from the mines in Algoma and St. Mary's. It would not object to paying a royalty if his reports were true. In his report of 1891 he states that ore is worth \$7.50 per ton at the pit's mouth, and in his report of 1892, he says that there is in sight 650,000,000 tons on the Sudbury range. This would amount to \$4,875,000,000, which would make millions for every man, woman and child between North Bay and Sault Ste. Marie. I have to say that there is not that amount of metallic ore in sight on the surface in the whole known world. The director of mines tries to bolster up the Mining Act by such windy statements as the above. They are so easily pricked that you cannot touch them without letting out the gas with such a rush as to disturb his equilibrium.

My remarks I have written in this paper might be very much enlarged, but if we are to live in this northern country we will have more to do than write papers and send petitions to Government. These have all been ignored for the past three years; let us now move in another direction.

Reservation of the Public Domain for the Actual Explorer and Settler.

MR. J. F. McKAY, Sault Ste. Marie.—The Provincial Mining Association of Ontario has been approved of the principal of reserving at least a certain portion (say every other township) in the district for the actual explorer and settler. However, at a joint meeting of representatives from the Patrons of Industry, the Dominion Grange, Toronto Trades and Labor Council and the Social Problem Conference, a resolution was agreed upon and made the first in their plan that the public lands should be reserved for the actual settler. The platform of the Liberals of Canada also contains a plank that the public lands should be sold to the actual settler only and not to the speculator. Both the Republican and Democrat party at their conventions held in 1888 affirmed the policy that the public domain should be reserved for homesteads for American citizens and settlers, and also by alleging that policy to have wrought their great western domain into the magnificent development which it has acquired. Other representative organizations have

passed resolutions and approved of this principle, and considering that this principle has been accepted by both the great parties of the United States for years and that the great representative parties in Canada have declared in favor of this policy, I will try to point out a few of the many advantages which the actual explorer would derive under a law of that kind. We all agree that all possible encouragements and assistance should be given the explorer if we hope to have the mineral resources of our country developed, and the more explorers we have in the country the more likelihood there is of a speedy development.

One of the first objections to the present mining regulations is that when the explorer makes a discovery he has no way of protecting his discovery whatever except by paying \$1 per acre, and to accomplish this he usually has to give a large interest in his location to get some person to advance the necessary money. He would be relieved from this hardship if he was allowed to locate 100 acres by paying \$5 and taking possession at once, so he makes the discovery. He then should explore his location and if it did not turn out satisfactory he could have his location ticket delivered up to the agent and cancelled and commence to explore for new locations, and in this way he would have only lost his time which is quite sufficient. If the location was valueless and if the location proved to be a failure he then could control all interests in it within himself.

Another objection is that when a valuable discovery has been made in the past it has been customary for speculators to buy up the Crown Lands in that neighborhood and explorers are thus deterred from giving their attention to what would otherwise be the most alluring field for exploration.

(3.) Under this policy intending explorers knowing that the lands adjacent to a valuable discovery is open for location until some person has discovered mineral and resides thereon, would crowd into that portion of the district where rich mineral was known to exist, and could do each other in matters of transportation of supplies, and in many other ways by helping to advertise that portion of the district and attract the capitalists. The explorer should perform 90 days work on his mining location the first year, and one year after the date of his location should be allowed to sell and assign same, but such purchaser should be obliged to perform development work for two succeeding years before the patent issued to secure a large amount of proper exploration and development work throughout the district.

Northern Ontario has about at least 120,000 square miles, while Michigan has only about 58,000. Statistics show that Algoma is far ahead of Ontario in the yield of farm products per acre, and we have practically an empire of rich agricultural timber and mineral lands, and all that we require to develop these is men. The speculator in mineral timber and agricultural lands is almost always the greatest obstacle to the proper development of the country. While some may be satisfied with the policy to keep this entire Northern Ontario tied up from the actual settler and explorer, and sell off a few square miles of timber limits from year to year, and point to this country as having a timber wealth of at least \$50,000,000, which must be kept up to furnish revenue for the government of coming generations, I think most of us and most of the organizations in lower Ontario of which I have already mentioned, prefer a policy that points to the development of this Northern Empire, a policy that would put us in a position like that of Michigan, which had in 1890 nearly 2,000 saw mills, a lumber product of \$68,141,189, iron ore to the value of \$15,500,224, copper \$15,855,427, charcoal from nearly \$4,000,000, and many other valuable products, and in 1890 had a population of over 2,000,000, and property of the value of over \$1,130,000,000.

Algoma has the greatest and most valuable resources of any part of Canada, and all that is necessary to make it a great country is for our Government to give the same inducements to actual settlers, and explorers as were held out to the pioneers who rushed in Oklahoma and the Cherokee strip.

The Ontario Mining Law—The Worst Features of the New Act.

MR. A. McCHARLES, (Stouffville).—The royalty, in its deterring effect upon capital, is of course the worst feature of our present so-called mining law. But the whole Act is bad from beginning to end, and for the very simple reason that it is founded upon a wrong principle. A proper mining law should be framed with the view of promoting the development of the mineral resources of the country; but the expense and purpose of the new Act is to obtain revenue from our mines and mineral lands. No wonder, therefore, that it has paralyzed the mining industry all over the province in so short a time.

Effects of the Royalty.—All sorts of attempts have been made by the Government apologists and others to justify the imposition of a royalty on our mines, and to belittle its effects. But let us look at the plain facts of the case. During the three years before the passing of the present Act over 40 mining claims (of 160 acres each) were sold in this district, not for speculation, but for actual mining purposes; and several companies, such as the Dominion Mineral Co., the H. H. Vivian Co., the Chicago Nickel Co., and others, came in and began operating here. Besides, a large number of other properties were opened up more or less in those years, and public interest in our mines was in an active, promising state. But for the

three years since the new Act came into force, except a few small dickers in part shares in claim by hard-up prospectors, in order to get some money to live on, I have not heard of a single sales taking place; and not a single new company of any account has come into the district, or any new plant been put up. There is no disputing these facts, nor the story they tell.

As an instance of the evil effect of the royalty and the agitation it has caused, upon English investors, I may give a short abstract from a letter I received last year from a London broker. "It is very difficult to interest capitalists in your nickel mines. Apart from the present state of the money market, when your own prospectors and miners are so dissatisfied with your mining law people here naturally suppose there must be something very wrong about it." And so there is.

Other Districts.—Now, we are often told that the limited demand for nickel and not the restrictive mining law, is the sole cause of the slow progress of mining in this district. But last spring, before the collapse in silver, the Port Arthur *Seminal* said of the disastrous effect of the new Mining Act of that district: "The Act has had a fair trial and what are the results. Where we were, two years ago, hunting for nickel, we are now exploring for diamonds and prospectors in dozens exploring for new ones, we have now absolute quietness and stagnation, not one mine working and not an explorer in the field." Then the same or worse complaints are heard from the Lake of the Woods gold district, though the whole world and his wife are after gold mines now; and last summer the people of Rat Portage presented Sir Oliver Mowat, during his visit there, with a strongly-worded petition against the most objectionable clauses of the Act, almost in the same terms as we have been using here. They even went farther, and asked for bonuses, in lands or money, for the establishment of mining works, and also for monthly premiums on the output of the mines. The highest authority on mining affairs in America called this an Act for the district which is a "strongly-worded mining in Ontario," which very aptly describes it.

The Government Reports.—There is one hopeful sign however, that a more liberal and progressive mining policy may be adopted by the government, perhaps this coming session. The sooner the better for the country. In the first report of the Mining Bureau not less than 48 pages were devoted to a special defense of the royalty clause; but in the second report, issued last fall, the question of royalties is treated very briefly and in a series of foot notes in very small print, as if half ashamed of being discussed at all. There are several things in this last report that I would like to criticize, but have only time to point out two of them just now. For instance, it is argued that because some mines in the United States and the tin mines in England pay large royalties to private owners, a government royalty cannot be so very wrong here. But our mines are not in the United States or England—the two principal mining countries of the world—but in Ontario, where the conditions as to capital, mining enterprise and market for ores are entirely different, and they are neither coal nor tin. The director of the mining bureau seems to conveniently forget another thing in this connection, or that there is no similarity whatever between government and private royalties. The one is fixed and compulsory and applies to all mines alike, the poorest as well as the richest; while the other is voluntary and usually agreed upon in lieu of part or whole of the purchase value of the property, the rate depending on the character of the mine and various other circumstances. In order to make the comparison fair, the government should do their own prospecting, find the mines, bring in the capitalists, negotiate the sales, and take the same risks and chances as the private individual from first to last. But instead of doing all this or any part of it, they simply pass a law, very much after the fashion of the Meles and Persians, and coolly exact an unearned tribute out of the discoveries made by a lot of poor men, who are the pioneers of the mining industry everywhere, and who deserve the most generous consideration at the hands of the government and the country at large.

Then the local manager of one of the companies here is regarded as an oracle and almost lovingly quoted in the same "bundle of rubbish," as approving of our present one-sided mining law, no doubt on the well known principle of "you scratch my back and I'll scratch yours." But it is positively adding insult to injury, that the mere opinion of a single foreigner—who has not been two years in the country yet, and whose peculiar distinction among mining men since he has been here will never permit him to perform a tale—should be paraded in the report as of far greater importance in the eyes of the government than the united representations of over 3,000 Canadians in the district, including mining engineers, business men, settlers, prospectors, lawyers, doctors, all classes in the community in fact, who petitioned last year against the Act. Truly our patriotism would need to be made of good stuff here to stand all the slighted put upon us.

A Common Sense View.—But the most pointed and emphatic condemnation of the royalty and the leasing of mineral lands, which are the two leading features of the new Act, has not come from us but is to be found in the report of the Royal Commission sent out by the Canadian Government four years ago to investigate the whole subject of mining, and which cost the country nearly \$15,000. On page 306 of that report we find this sensible paragraph, without any political frills on it: "To place a burden or restriction upon the mining industry in one section of the country from which it has been freed in another

would be a fruitful cause of irritation. But even if the policy of restricting and burdening the industry could be generally applied, no one can believe that greater activity would follow. One might, with as good reason, hope to see a man's locomotion improved by attaching a cannon ball to each of his legs. At any rate, as long as mineral development in Ontario continues to depend largely upon investments of foreign capital, and especially of American capital, a liberal policy must be followed; mining lands must be not less free here than in the United States, where, with the single exception of New York, there is neither restriction nor royalty. So, as regards the leasing of mineral lands, the influence of the United States system would make its adoption well nigh impracticable here."

No more need be said on this point.

Patry Excuse.—We are sometimes asked, if the new mining law is so bad, why the companies actually at work here do not take part with us in protesting against it. How childlike and bland? The present Act suits these companies only too well, as it tends to keep others from coming here, and they are all working on properties taken under the old law, and will, therefore, never have any royalty to pay.

Another lame excuse frequently heard is that the Government, not being practical mining men, did not know what they were doing when they passed the ill-advised Act. But after all the information they got from their own expensive Royal Commission, and the endless discussion on the subject in the press for years, if the Government did not understand the matter, they simply did not wish to. Lastly, it is asserted in some quarters that we are not agreed as to what kind of a mining law we want. The best answer to this charge is that we have passed virtually the same set of resolutions at all the annual meetings of our Association for the past three years. We are agreed not merely on what we want, namely, a simple, just, well defined law for permanent mining law, but fully as much on what we don't want, and that is, the present arbitrary complicated and unworkable Act.

Other Bad Features.—Next to the royalty, the most unrighteous feature of the new Act is the clause reserving power in the Lieutenant Governor-in-Council to set apart, without any previous notice, and even to withdraw from sale altogether, the whole or part of any locality or territory that is "shown to be rich in mines or minerals." Now, who is to show this? Not the government, but the poor, hard working prospector, and then as soon as his discovery is made known the land is withdrawn from market. The township of Garson here is a case in point. Two years ago several parties took up claims there and spent time and money in opening the properties up, but only one of them has not yet his lease from the government yet. But this clause in the Act is really absurd. If a district is not rich in mines or minerals no one but a fool would want any mining claim in it.

Another mistake was doubling the price of mineral lands. In justification of this step we are told that the price of mining claims in the Western States is \$5 an acre, which is quite true. But it must be remembered that claims there are on veins, and limited to 300 x 1,300 feet or about 11 acres, and need not be paid for at all if worked; while here, on the whole, the mode of occurrence of the ore beds, the average claim is 160 acres, and mining companies generally want a much larger area to work on. Worse still, the price of mineral land in the eastern part of the province, which is more accessible and nearer shipping points, and where labor and supplies are cheaper, is put at \$1 an acre less than in the western part, which is traversed by only one railway line, and harder to explore and mine in, and more disadvantageously situated in every way. There would be more justice and common sense in the exact reverse of this plan, grading the price of mining claims, not on an upward but on a downward scale from west to east.

Only Want Our Rights.—We have never asked for anything but our just rights, and we should not take less if we are not to become abject slaves, instead of free men. The laws affecting all other industries in the country are made to suit the wishes of those engaged in them, such as agriculture, manufacturing, commerce, railroading, navigation, fishing, as well as the different professions, and even the sportsman down below have the game laws made to their own liking. Why then, the poor, struggling, unestablished mining industry, be legislated upon without any regard to the wishes of those engaged in it. The legislatures in most of the Western States adopted the laws the miners made for themselves in the early days, and we know with what excellent results. It is difficult under the most favorable circumstances to interest capital in mining enterprises in Ontario, but we have the same result as in the rest of the world, and it is almost impossible to do so, as many of us here know to our cost.

A number of other papers were submitted, and the meeting adjourned at eleven p.m.

Mining Society of Nova Scotia.—The annual general meeting and dinner of this Society will be held in Halifax on 7th March. A number of interesting topics are up for discussion.

EXPLOSIVES.

The Explosive Properties of Ammonium Nitrate.

Berthelot (*Abstr. J. Ch. Soc.*, 1882, 353) and Thorpe (*Trans. Ch. Soc.*, 1889, 220) proved that endothermic combinations decompose explosively under the influence of mercuric fulminate, and it is well known that explosives require a variable initial impulse to cause their decomposition. The following experiments were made with shells of 3 cm. calibre, weighing 7 kilos, and capable of holding about 200 grammes of explosive, the force of the explosion being estimated by the number and weight of the collected pieces and the distance to which they were scattered; the difference between this weight and the original weight being reckoned as shell reduced to powder by the explosion. In the case of black gun powder fired electrically by a platinum bridge, 10 pieces were collected whose collective weight was nearly that of the original shell, but when a fulminate cap was used, 77 pieces whose collective weight was but 2.8 kilos was obtained. Shells filled with bellite, dynamite, and cotton powder, exploded by means of 1 gramme of mercuric fulminate, were reduced to powder. One gramme of mercuric fulminate produced no effect on a shell filled with ammonium nitrate, except to evaporate a small amount in the immediate vicinity of the fuse, whilst the screw holding the shell was moved. Three grammes of fulminate caused a low, rattling explosion, and 62 pieces of shell were collected which weighed 6 kilos. A shell containing 180 grammes of ammonium nitrate and 20 to 30 grammes of bellite (composed of dinitro-benzene 1 part and ammonium nitrate 4 parts) yielded, on explosion by 1 gramme of mercuric fulminate, 230 pieces weighing 2.75 kilos. Hence it appears that ammonium nitrate requires a stronger initial impulse than either dynamite or dry cotton-powder; that its employment, unless it is mixed with charcoal or aromatic nitro-compounds, is negatived on account of its weaker action, although for coal mining purposes its employment would seem to be advantageous, as but a slight rise in temperature accompanies the explosion.

Combustion Temperature of Explosives.—Although regarded with skepticism, the calorific intensities recorded in our literature for black gunpowder lie between 3,000° and 4,000° C. for gun cotton, 5,000° and 6,000° C., and for nitro-glycerine, 7,000° and 8,000° C., the most obvious objection to the adoption of these figures resting on the fact that the lowest of them is above the melting points of gun metals.

Col von Weich, taking the data of Noble and Abel, Banan and Schickhoff, E. Wiedeman and others, at the outset finds that the cardinal error of previous methods of determination or estimation consisted in assuming the specific heat of the products of combustion to be independent of the temperature, the constants used were then determined at their freezing points, whereas von Weich finds it evident, from simple logic based on the phenomena of nature, that thermal capacity "decreases as the quantity of heat in a given body increases," and he proceeds to estimate the specific heats of the products at the higher temperatures.

As the result of this computation, when calorific intensities are, as he states, the combustion temperatures, are obtained with the specific heat determined at 0°, he gets 3,340 C. for gunpowder, 4,893 C. for trinitro-cellulose, and 7,240 C. for nitro-glycerine. Using this newly developed expression for the specific heat, he obtains 1,874, 2,516 and 3,005° C. for gunpowder, gun-cotton and nitro-glycerine, respectively.

Trials of Explosives. A further series of trials of explosives has been made in the experimental lab at the Kong Colliery near Neunkirchen, in the Saarbrücken district. H. Lohmann (*Zeit. Schrift für das Berg- und Hüttenwesen*), observes that the admixture of dynamite with hydrated crystallised salts is a great improvement over the ordinary explosives intended for use in very mines. Dynamite mixed with 40 per cent. of hydrated salts (soda) gives a comparatively high degree of safety both as regards fire damp and coal dust, and gives a large percentage of lump coal. *Carbonate.*—The samples of carbonate tried in this series of experiments showed a much higher degree of safety both for fire damp and coal dust. *Water Cartridges.* in which the explosive is surrounded on all sides by water, are very safe. *Ammonia Dynamite.*—The sample tested consisted of 40 per cent. of ammonium carbonate, 10 per cent. of potassium nitrate, and 50 per cent. of nitro-glycerine and kieselguhr, this latter being added in a quantity sufficient to produce a plastic but not an oily cartridge. Other ammonium salts, such as the oxalate, may be used instead of the carbonate, provided a sufficient quantity of an oxidising substance is added to convert the whole of the carbonic oxide produced into carbonic anhydride. Ammonium carbonate proves to be less suitable than the oxalate in preventing explosions. A useful mixture consists of 45 per cent. of ammonium oxalate, 15 per cent. of sodium nitrate, and 40 per cent. of nitro-glycerine and kieselguhr. The results of further experiments made with explosives consisting of ordinary black powder, to which ammonium carbonate was added, led to the belief that by changing the ordinary composition of the powder it

will become possible to use it in the presence of fire damp or coal dust. It appears probable that a fine grained powder of the composition of sporting powder, in which ammonium oxalate is substituted for a portion of the carbon, might prove a satisfactory explosive, and the author is experimenting in this direction. *Securite.*—Whilst further experiments with this explosive in its old form gave bad results, a greatly improved and satisfactory variety was also tried. *Rohrute* gave perfectly satisfactory results when employed in the absence of fire damp. It is generally thought that this explosive consists of chlorinated and nitrated hydrocarbons, but the analysis of a sample showed not even a trace of chlorine being present. The *Wolf benzene lamp* was experimented with, in order to ascertain whether the explosion of the lighting capsule inside the lamp would lead to an ignition of gas outside the lamp. This only occurred on the 250th explosion, after the lamp had become very hot.

In a further series of explosions a steel mortar was used, and the explosive charge did not exceed 550 grammes. *Ammonia dynamite* proved itself a very safe explosive. *Kieselguhr dynamite* and *gelatine dynamite* are about equally dangerous. *Rohrute* is safer than *gelatine dynamite*, but worse than *ammonia dynamite*, but it is believed that an improved form of *rohrute* has recently been manufactured. *Carbonite*, the new form of *securite*, and dynamite mixed with 40 per cent. of soda (*Wolterdynamite*), are very safe explosives. *Blasting gelatine* is extremely dangerous. *Carbo dynamite* gave negative results. *Securite.* This explosive is usually compressed into small wooden cylinders, and is thus protected from the damp. As, however, the compressed explosive is difficult to ignite, a hollow is left in the centre of the cartridge, which is then filled with loose explosive, the ignition of which explodes the compressed portion. As with *rohrute* and *securite*, the transport of *particulate* is very free from danger, and it can be immediately destroyed by water. To prove its safety when used in the presence of fire-damp or coal-dust, experiments were made with five different sorts, one of which—No. IV.—proved to be a very safe explosive. It consists of dinitro-benzene and mononitro-naphthalene, together with ammonium and sodium nitrates.

Safety Fuse and Lighter.—According to Mr. J. Grandy, *Manufacturer Geological Society*, though safety fuse may be more convenient under certain circumstances, it is difficult to see why electric shot firing is not more generally used. The author gives a description of Lickford's collery fuse, safety lighters, and nippers. The lighters consist of a thin tin tube about 2½ inches long by ¼ inch in diameter. It is open at one end to allow the fuse to be inserted to a depth of 1¼ inch, and holds a small glass bulb containing acid; this is broken by the nippers, so as to allow the acid to come into contact with some substance which causes the ignition of the fuse. The essential factors for then we are that they should be kept dry, that the end of the fuse is in good condition, and that suitable nippers are used and applied in the right position, namely, at the end of the igniter. This system of electric shot firing is preferable to the use of a wire heated in a safety lamp.

Firing Shots in Fiery Mines.—M. Taurin, *Comptes Rendus Mensuels de la Société de l'Industrie Minière*, describes the fire-syringe (*Arrière-poussoir*) of Bouchonnet for igniting the long firing shots in fiery mines. The fuse is held by a rubber washer, which is caused to grip it when the cylinder is screwed down. An air tight piston works in this cylinder, and is forced down by a rapid blow so as to compress the air and thereby ignite the fuse. The cylinder can then be unscrewed so as to release the fuse after the first sparking is over. An attachment to the base of this device allows it to be placed on the ground while the piston is being forced down. This device has been adopted in several mines with success. At the Concordia Colliery at Oelsnitz, in Saxony, blasting has only recently been introduced in winning the coal. The dynamite cartridges are surrounded by water, only one shot is fired at a time, and that only after taking the precaution to lay the dust with water to a distance of 33 feet from the hole before firing.

CORRESPONDENCE.

The Walker-Carter Process at Marmora. Ont.

To the Editor of the Review

SIR,—The very radical commendations made by Messrs. Beckwith and Murdoch regarding the operation of the Walker-Carter gold extraction at Marmora, as published in the January issue of the CANADIAN MINING REVIEW, would leave the impression to general readers, that the whole problem of the treatment of the so-called refractory auriferous minerals was now successfully solved, and having given much study and attention during the past season of 1893 to the Hastings county gold deposits, and the means of extracting the precious metal from their characteristic mispickel ores, I would venture a few observations from

the point of view of one who is earnestly searching for the best practical process for treating these sulph-arsenides.

The operation of roasting or calcination divides all gold extraction methods into two broad classes (1) treatment of raw ores, and (2) treatment of roasted ores, which limits their respective economic application to certain localities where the cost of fuel is not excessive, and even where the necessary combustible may be obtained at average prices, the cost of roasting, especially where wages are highly paid, affords a very considerable margin in favor of a non-roasting method.

The rational process for treating refractory sulphures, and not embolizing a previous calcination is the leaching by cyanide so successfully adopted in South Africa and elsewhere, and in the working of which improvements are being made almost daily. It is unfortunately true that, although a weak solution of cyanide of potassium will readily leach out from 85 to 90 per cent. of the assay gold contained in the Hastings county mispickel ores, yet the arsenical compounds exert such a decomposing action on the cyanide, as to render the method impracticable without adopting certain modifications. The results attained by recent experimentation in this direction are highly encouraging and promise ultimate success.

Mr. H. Beckwith has given a very fair description of the Walker-Carter process as operated at the small reduction mill at Marmora, and which I had an opportunity of examining during a visit of three days made a few months ago, but my own observations do not permit me to render such glowing eulogies of every point and effect of the process and the results obtained by it. The ore under treatment was not of a very refractory nature; it contained from 3 to 5 per cent. of sulphures, part of which were arsenical, but free gold was often visible in it, even to the naked eye, and abundant color of free gold always obtainable by "panning." The superintendent stated that the ore averaged \$10 per ton by his assay, and upon this basis he figured out the 90 per cent extraction effected, to his own satisfaction, and I note that Mr. Beckwith guardedly says respecting this, "I am informed that the percentage of gold saved averaged 90 per cent. of the value contained in these ores," and I respectfully beg to challenge the correctness of the assay of the raw ore, which I afterwards verified to be \$16 in place of \$10, and I wish to ask Mr. Beckwith control this very important factor and base of his conclusions? The complicated retort furnace employed in this process certainly does deliver a well roasted product; the ore takes some five hours to travel through it, and the output was from 4 to 5 per cent. of the amount of the input of the Hastings Gold Reduction Co., who are the Walker-Carter process in Canada, informed me that the cost of such a furnace was \$25,000, and if a larger output was required, the furnace must be duplicated. It is a pretty piece of mechanism, requiring constant attention to regulate, and suggesting the comparison of taking a man's measure for a suit of clothes with a sextant. There certainly are other roasters capable of delivering a perfectly "sweet" product, while not possessing the objectionable complications of the Walker-Carter machine, and although to the eye of anyone visiting these reduction works, the furnace appears most conspicuously, I can hardly imagine that Mr. Beckwith intends to convey that it is a *sine qua non* to the alleged success attained.

The method of amalgamation forms the special characteristic of the Walker-Carter process, the separation of mercury by heat in contact with the pulverized and roasted ore, and which appeals to the mental conception of the most perfect means of catching every atom of gold already rendered "free" by the previous roasting; and so far I agree with the purpose of the invention and the results attainable, but unfortunately such finely disseminated mercury is not so readily re-amalgamated, and as will be easily conceived, this method of re-amalgamation gives rise to a large proportion of "floured" mercury, the dread of all amalgamator-mill men, and "floured" mercury running to tail carres of gold, being in fact "floured" gold-anagum.

While the superintendent of the mill informed me of his small loss in mercury, I mentally observed that the tailings from the settling tubs were most carefully allowed to run direct into the rapid running river; "dead men told no tales," but my credulity had been strained, and I could not do him the injustice to disbelieve him, until he had recently verified the point at Marmora. I therefore clandestinely obtained a sample of the tailings, by catching a few buckets of slimes outside the mill at various intervals of the operation of running off the overflow, and from the deposit thus secured, I obtained abundant "shows" of "floured" amalgam by "panning." I would wish to know if Mr. Beckwith investigated this point before stating that the process "is a success," and that there does not know of any process or system of extracting gold from its ores, that can compete with the method.

Now as regards known means of gold extraction applicable to the arsenical ores of Hastings county, and employing the roasting operation, chlorination stands foremost both as regards effective duty in recovered gold, and the purity of the bullion. But there is one other point, and an important one, which must not be lost sight of when dealing with the highly arsenical sulphures of certain zones in the Hastings county gold belts, and that is, that the arsenic has a far greater value than the accompanying gold, and from this point of view, I presume that the Walker-Carter process and its admirers do not lay claim to any advantages obtained from their plant, although Mr. Murdoch's testimony affirms that "so far as his knowledge goes, the condensation of the poisonous

arsenical gases is something never before accomplished in a continuous operation?"

With this special occurrence of auriferous misspickel the economic advantages of saving the *arsenic* is imposed and thereby the profitable roasting of the sulphures. Chlorination, however, demands a "lead" or perfect roaster for its success, and is more costly in chemicals than the cyanide treatment, which works like a charm, with auriferous misspickel which has been previously subjected to even a *partial roasting*, so that as far as present facts and experiences go, I hold the opinion that with these misspickel ores or their concentrates, a roasting with the object of securing commercial white arsenic should be first effected, and the calcined ore then subjected to leaching by cyanide, and in cases where the gold is found to be somewhat coarse, an amalgamation before the cyanide treatment should be resorted to, and with such a combination I find that practically all the value of arsenic and gold is secured, at a working cost below that of the Walker-Carter process as operated at Marmon.

In conclusion, the Hastings county gold region is in my humble opinion destined to revive in the near future, and offers steady rewards to intelligent investors. If the Walker-Carter process is to be the saviour of these hitherto rebellious products, it merits a well earned recompense, but we have a right to demand more tangible facts and results, before giving it the confidence intended to be accorded to it by Messrs. Beckwith and Murdoch as referred to above.

Nothing but the disastrous records of the process failures, as at Deloro and more recently in the case of the Crawford mill, has been keeping the development of this district in abeyance, and we would like to think that the Walker-Carter results were not following in the same train of historical events.

J. LAINSON WELLS, M.E.

NEW YORK, Feb. 22nd, 94.

Silver-Lead Mining in British Columbia.

DESCRIPTION OF THE MINES OPENED IN THE FAMOUS SLOCAN DISTRICT.

The Nelson *Tribune* in its issue of 10th instant gives an excellent description of the mineral development of the Slocan district, British Columbia, from which we quote: The **Read & Robertson** mine is located in the four mile section of Slocan district. The group consists of the Tenderfoot, Read, Robertson, Cosmopolite, and North Star. The Jenny Lind corners on the vein, and it is on that claim and the Read and Robertson where the immense croppings are which attracted so much attention to the property. The surface showing is 20 feet wide and can be traced for 1,000 feet. Formation, argillite and shale. The vein filling, lime ore and galena. In places from 2½ to 4 feet of solid galena can be seen, while the entire vein is a rare concentrating proposition. An average sample of the croppings yielded 142 ounces silver and 70 per cent. lead. This property was bonded for \$14,000 to the London Mercantile Association, in October, 1892. They paid down 10 per cent. of the bond and expended \$2,000 in development. The same cause is given for forfeiting this bond as is given for forfeiting the bond on the Great Western. Many claim the Read and Robertson group is the coming great mine of the North American continent. J. A. Finch and associates now have the property bonded. No work is being done at present, on account of the depth of snow and lack of accommodation for a working force.

The **Payne Group**—The Payne was the first location made in the Slocan district, and the first to pass into the hands of monied men. The group is made up of the Payne, Maid of Erin, Mountain Chief and Two Jacks, all located on one ledge. The formation is slate shale, the vein trending about 35 degrees east of north. The width of the vein is from 8 inches to 4 feet, carrying galena from 6 inches to 2½ feet in thickness. One hundred tons are now being shipped, which samples 225 ounces silver and 70 per cent. lead per ton. On the Maid of Erin there are 40-foot tunnels. Five openings on the Payne range from 22 feet in depth, and 100 feet on the Mountain Chief a 110-foot tunnel taps the vein 100 feet in depth. Scott McDonald owns one-half of the Payne claim, and S. S. Bailey the other half and the remainder of the group. Present working force eight men.

The **Noble Five Group**.—Many persons contend that the Noble Five group is equal to the Slocan Star in extent and value. The discovery was made on Sept. 28th, 1891, by W. M. Hennessy, J. J. Hennessy, Frank Flint, J. L. Seaton and J. G. McGuggan. The claims staked were named Noble Five, Knoxville, Bonanza King, World's Fair and Maud E. The owners claim the formation is slate and porphyry, the vein having a northerly and southerly direction. Width of vein varies from 2½ to 6 feet, though in one place it is much wider, as in an upraise 9 feet of solid ore has been encountered. This winter 350 tons of ore have been shipped, which, it is claimed, yielded 150 ounces silver, and 69 per cent. lead per ton. The claims were worked through adit tunnels, except in one instance where an 80-foot cross-cut has been run, so as to ensure safety from snowslides. The

three tunnels on the property aggregate 600 feet. The working force is 20 men.

The **Mountain Chief**.—This great little mine is located within a mile and a half of New Denver and is the property of George W. Hughes, he having purchased it in 1892 for a consideration of \$15,500. The vein is from 2 to 6 feet wide, with a pay streak of clean galena from 1 to 3 feet. Upwards of 100,000 tons have been mined, the shipments giving returns of 120 ounces silver and 70 per cent. lead. The property is worked through tunnels driven on the vein. From 15 to 20 men are steadily employed.

The **Dardanelles Group**.—The property of this company consists of seven claims, located in the Dardanelles basin on the summit of the divide. The claims are named the Dardanelles, Antelope, Buffalo, Okanagan, Diamond Cross, Hillien treasure and Caribou. The Dardanelles and the Antelope, so far, are the only ore producers. The formation is slate and porphyry, the vein trending northerly and southerly, ranging from a narrow seam to 5 feet in width. The Antelope claim has been leased to different parties; 50 tons of ore has been marketed, which yielded 99 ounces silver and 51 per cent. lead. The most development work has been done on the Dardanelles. An incline shaft has been sunk 200 feet, as the vein is very flat, the total vertical depth from the surface to the bottom of the shaft is not over 100 feet. Smelter returns from 150 tons shipped range in value from 248 to 322 ounces silver and from 26 to 30 per cent. lead per ton. On account of the great flow of water, heavier machinery is required before further sinking can be done to advantage. In the meantime, the company will run levels on the vein, exploring for additional ore chutes. There is a steam hoist and pump on the property placed there at quite an expense, as the freight over the 4-mile trail was 10 cents a pound. Although the expenditures so far have been in excess of the receipts, yet the company is sanguine of future profits.

The **Washington Mine**.—The Washington mine is owned by the Washington Mining Company, in which J. L. Montgomery, T. E. Jefferson, and Ralph L. Clarke are the shareholders. The vein is in slate formation and has a north-east and south-west dip. Previous to the time of the company taking hold 560 tons of ore were shipped. Since the company took over the property the shipments have increased, but the exact tonnage and value of the ore is not attainable, as the officers of the company refuse to give information. The equipments of the property are the best of any in the district, and the company evidently feels as though it had a valuable mine and the working is being done on a business-like basis. Thirty-eight men are on the pay-roll.

The **Blue Bird**.—The Blue Bird belongs to the Washington Mining Company and is not being worked. It is in black lime formation intersected by porphyry dykes. The shipments of ore have aggregated 300 tons, averaging 144 ounces silver and 71 per cent. lead. This is one of the early producers of the district, and is considered by many a valuable property.

The **Slocan Star**.—This is the bonanza mine of the district, and many are of opinion that it is the "big mine" of British Columbia. The group consists of the Slocan Star, Slocan King, Jennie, and Silversmith. They were located on the 7th of October, 1891. Formation, slate, which the vein cuts obliquely on a north-east and south-west trend, dipping with the hill at an angle of about 45 degrees. On account of the strike of the vein along the mountain on the west side of Fandon creek, it is tapped by crosscut tunnels. The present working tunnel is 140 feet in length, piercing the vein at a depth of over 100 feet. Here the vein is fully 50 feet between walls, every particle of which—aside from the first-class ore—can be profitably concentrated. A drift runs to the north-east on the foot-wall, where the ore is mixed. The drift, however, is continued across the vein to the hanging-wall, where a large body of clean galena was struck. On drifting north-easterly this body widened out to 12 feet, without a particle of waste, therefore the company was not long in extracting the 500 tons which have been stored at Three Forks, awaiting completion of the Nakusp and Slocan railway. An upraise has been made to the surface through ore continuously. A lower tunnel, to tap the vein at a depth of 400 feet, has been started and work on it will be pushed. It is likely the company will stop 1,000 to 1,500 tons before the sleigh road from the mine to Three Forks breaks up. There is one ton of ore sacked in the ore chute which runs over 1,000 ounces of silver. The average value of the first-class ore now being shipped is 100 ounces silver, \$8 gold, and 70 per cent. lead per ton. The Byron N. White Company, organized under the laws of Wisconsin, with a capitalization of \$500,000, is the owner. Fifteen men are employed at present.

The **Northern Belle Group**.—This group is located on Kaslo creek, four miles from its junction with Kaslo river, and is 21 miles distant from Kaslo. The group comprises the Northern Belle, Queen, Kootenay Star, and Ophir claims, each 1,500 feet square. The property has been worked continuously since the date of location, in June, 1892. The hanging-wall of the vein is

slate shale, on which there is a foot of porphyry capping, the same as the other bonanza mines of the argillite belt. The foot-wall is lime and slate, through which the vein cuts. The lode is from 6 to 12 feet wide, all the filling being concentrating ore. There are, however, chutes of clean ore from 18 inches to 3½ feet in width, which are simply broken down and shipped. Developments of the property consist of two tunnels, each 250 feet in length and another started, which is in a distance of 15 feet. Winzes are being sunk and uprisers made to connect these tunnels. Six hundred tons have been marketed or are in transit from the mine to smelters since the company assumed possession on June 1st, 1893. From 300 to 450 tons per month is the proposed output for the future. This ore has an average value of 100 ounces in silver and runs 80 per cent. lead per ton. It costs less to transport it to Kaslo than any other mine in Slocan district, being only \$10 per ton. It is claimed there is a profit of \$50 for the company on each ton handled, which appears like huge dividends. The Northern Belle Mining Company of Seattle owns the property. Dr. E. C. Killbourn of that city is president. The capital stock is \$250,000. The present working force is 24 men.

The **Surprise**.—The Surprise is in slate and porphyry. It recently changed ownership, Chicago parties whose names are withheld being the purchasers. Rumor states the consideration at \$60,000, half cash. Recently a shipment of 100 tons was made, which a vague report values at 229 ounces of silver. Except that 8 men are employed, no other information could be obtained.

The **Whitewater Basin Mines**.—Whitewater creek empties into Kaslo river about 17 miles from Kaslo. Along the mountains bordering this stream and in the basin near its source quite a number of locations have been made, some, it is claimed, carrying a large percentage of gold on the surface. From the Whitewater claim, J. C. Eaton, in 1892, shipped 7 tons of galena ore which netted him about \$900. During the past year the Wellington mine shipped several carloads, the figures for which are not obtainable, as the manager is absent in Canada. The Canada Mine was used on the Wellington, but owing to the seamy character of the formation its use had to be abandoned. The Virginia, bonded by J. A. Finch, is being worked by a small force.

The **Noonday Group**.—The Noonday group is made up of the Noonday, Fourth of July, and Great Eagle claims on Cody creek, and is the property of G. J. Atkins & Co. Formation, slate and porphyry. Have an 8 foot vein of concentrating ore. Fully 100 tons on the dump of clean ore, which will run 115 ounces silver and 78 to 80 per cent. lead. Total length of tunneling 300 feet. Employ 12 men.

The **Idaho and St. John**.—This property consists of two parallel locations, about 200 feet distant from each other, the veins on which are from 5 to 6 feet wide with the ore is galena carrying grey copper. The pay streak is 2½ feet wide and solid in places, often averaging 200 ounces in silver. One tunnel is in 300 feet, from which three cross-cuts have been run varying from 20 to 40 feet in length. Another tunnel is 60 feet long. Besides the above there is an additional 200 to 300 lineal feet of development. Total figures of shipments not obtainable, but one carload of ore from these claims netted \$1,760. H. H. St. John, "Al" Behne, and E. C. Gore, are the owners. The working force is 20 men.

The **Lucky Jim**.—The Lucky Jim group, which lies within a few hundred feet of Bear Lake consists of the Lucky Jim, St. George, and Roadley claims. It was located in May, 1892; hence the claims are 1,500 feet square. James Shields, Charles Druin, and Robert Williams were the locators. The hanging-wall is dolomite and the foot-wall is slate. The trend of the vein is nearly east and west, dipping at an angle of about 45 degrees into the mountain, or south. On the surface the ore exposed was fully 8 feet wide in places. Tunnels and cross-cuts on the property aggregate about 500 lineal feet, the deepest workings being about 80 feet from the surface. Between 50 and 60 tons have been shipped, which, it is claimed, is an advance silver and 60 per cent. lead. This is one of the lowest grades in the district, but being located less than half a mile from the proposed Kaslo & Slocan railway, the savings in transportation will be quite an item. Dr. E. C. Killbourn of Seattle, owns one-half, Robert Williams one-third, and Thomas J. Roadley one-sixth. No work of consequence is now being done, only two men being employed.

The **Ruceau Group**.—For convenience, the owners of this group call their property the "Reco," their possessions consisting of the Ruceau, Texas, New Denver, Ephraim, and Giffon. The vein is exposed and cut through four of the claims. The formation is slate, intersected by porphyry dykes, through which the vein trends at nearly a right angle. Ten feet is the average width of the vein which carries galena and carbonates, the pay streak ranging from 18 inches to 8 feet in width. Forty tons have been shipped, which ran from 167 to 261 ounces silver and 65 per cent. lead. John M. Harris, F. S. Kelly, and S. M. Wharton, are the owners. Their working force is 15 men.

The Queen Bess. Located on south side of the mountain from Idaho basin. Slate and lime formation; vein trending northeast and southwest; development, 300 foot tunnel which cuts the vein at a depth of 95 feet, and a shaft 40 feet in depth. In places have 8 1/2 feet solid galena. On dump, ready to ship, 50 tons of ore. A parallel vein 14 inches wide carries galena and carbonates. Owned by Seattle parties and J. H. Moran. A force of men were put to work the last week in January.

The Vancouver Group. Located on south side of Four-mile creek, 1,500 and 2,500 feet above Sloean lake and distant 4 miles from the townsite of Silverton. Formation, slate; vein, northeast and southwest trend; said to be large fissures which can be traced three miles. The two carloads of ore shipped last winter averaged 250 ounces silver, one carrying 40 per cent, and the other 55 per cent, lead. Over \$4,000 worth of development work has been done. The claims are named Vancouver and Mountain Bloomer. Mahon Brothers are the owners.

The Grady Group. But little information can be gleaned concerning this remarkable showing on Four-mile creek. Five hundred tons of ore, valued at \$125 a ton, are on the dump ready to ship. The property is held under bond to the McNaught Land and Investment Company of Seattle, N. F. McNaught being in charge. It is claimed the price to be paid is \$70,000, of which two payments of \$5,000 each have been made.

The Cumberland.—The Cumberland is in the same basin as the Idaho, and is south-east of that mine. The formation is slate and lime; north-east and south-west trend and dips at an angle of 80 degrees from the horizontal; vein filling, galena and quartz; average width of vein 4 feet, and pay ore 14 inches, although in places it is 20 inches solid. Development consists of a tunnel 132 feet on vein, a crosscut tunnel 60 feet, one drift from crosscut tunnel 40 feet, another drift 70 feet, and one shaft 15 feet. Sixty tons of ore are ready to ship. Four men are kept at work. The owners are Martin Clair, C. M. Gething and F. F. Macnaughton.

The Alamo Group. Situated in Twin Lake basin and discovered in June and July, 1892. Claims consist of the Alamo, Twin Lakes and Ivy Leaf. It is a contact vein, between slate and porphyry. One tunnel 250 feet in length and another 165 feet. Ore, galena and carbonates, which run very high. One carload has been shipped

and other shipments are ready. Vein runs from 3 to 5 feet in width. Four men employed.

The Bon Ton.—It would be impossible under present circumstances to mention and describe all the many claims in various stages of development in the Jackson basin or on both sides of the creek. Outside the Northern Belle, the Bon Ton is the only one which made a shipment. It was but a few tons, and the returns were between \$300 and \$400 a ton. The Sunset, Lucky Boy, and others are said to be healthy prospects.

The Big Boulder.—So much has been written of the famous Big Boulder that a few brief notes regarding it in this article may not be amiss. Development in the upper works of the Sloean Star shows where this great mass of galena rested in the vein before it took its slide down the hill to where it was found by "Jack" Cockle. Evidently erosion of the country formation below the ledge matter caused the boulder to drop from its natural place in the vein, and it was carried down the hill by its own gravity. There has been shipped from the boulder 40 tons, which yielded 130 ounces of silver and 70 per cent. lead. The owners expect when the remainder is sorted to secure at least 25 tons more of the same grade.

The Chambers Group.—This group consists of the Chambers, Wellington, Eureka, and Jay Gould. It is situate on the south fork of Carpenter creek, above the mouth of Cody creek, and was located on October 26th, 1891. The hanging-wall is shale and the foot-wall quartzite. It is fully 80 feet between walls, the vein carrying strata of clean galena and concentrating ore. Sample assays return an average of 120 ounces silver and from 60 to 80 per cent. lead. There has been 300 feet of development work done. The present owners are the Bank of Montreal, G. J. Atkins & Co., and Ed. Becker, Charlie Kent, and Tom Lister. This is said to be the best concentrating proposition in the district. Not being worked at present.

The Sloean Boy.—This claim lies above the Washington, the vein passing through a portion of the ground. It is owned by Spokane parties, who on account of private financial embarrassments are not working the property at present. A quantity of ore is on the dump, but no shipments have been made.

The Great Western.—The Great Western was located

in October, 1891, by Tom McGovern and Charley Franklin, of Ainsworth, and is 600 x 1,500 feet. It is now a Crown grant claim. It is in the argillite slate belt. The vein is a very strong one, although but 2 1/2 feet in width, dipping at an angle of 60 degrees. From 3 to 14 inches is the width of the pay streak as far as developed, and there are about 30 tons of ore on the dump, which will average 120 ounces in silver and 70 per cent. lead. The development is made up of tunnels, alongside the vein, crosscuts, etc., which aggregate about 450 feet. The property was bonded in 1892 to the London Mercantile Association, who paid \$5,000 on the bond, and expended \$10,000 in development. The instability of the price of silver caused the company to throw up the bond and forfeit the money paid. The locators are still the owners.

The Eureka.—The Eureka and Mineral Hill claims lie north-east of the Sloean Star group on the same vein, and are the property of G. J. Atkins & Co. This ledge is at least 20 feet wide. They have run two tunnels, aggregating 500 feet, and have struck ore in the lower one. Assays have yielded 169 ounces silver, and 70, 72, and 74 per cent. lead. Nine men are employed on this property, and work will also be commenced on the Elgin, on Sloean Star hill, in the spring.

The Lorna Doone.—This claim is an extension of the Vancouver and carries 18 inches of very rich ore. Rathbourne & Culver, the owners, have been offered \$12,000 for it. Its location is 3 1/2 miles east of Sloean lake, near Four-mile creek. Several tons are on the dump, but no shipments have been made.

The Dayton.—This ledge was discovered last year by William Springer. It carries dry ore and is located in the granite belt, 3 miles east of and near the foot of Sloean lake, 20 miles from New Denver. The vein is 2 1/2 feet wide, carrying 10 inches of pay ore, averaging 215 ounces silver, and \$21 gold per ton. The highest assay was 920 ounces silver and \$40 gold. Mr. Springer has sold the claim to Mr. Hanauer, the Salt Lake smelter man.

The Greenhorn.—The Greenhorn claim is located on Cody creek, opposite the Freddy Lee, and is in the same formation. There is three feet of solid galena in sight which samples 100 ounces silver and 60 per cent. lead per ton. John McNeill of Ainsworth, is the owner. The vein has been traced through the entire length of the location, 1,500 feet.

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The Eureka Group.—To the north of Kaslo river, on the divide between Little and Four creeks, is a group of claims named the Eureka, Yosemite, Homestake, Scottish Chief and Parrot. They are in the trachyte formation, and trend northeast and southwest. The veins are from 5 to 10 feet wide, carrying chutes of ore from 16 inches to 2½ feet in thickness, all galena, assaying 125 ounces silver and 77 per cent. lead per ton. On the Eureka and Yosemite there is 150 feet of tunnelling and 44 feet of shafts with open cuts 60 feet in length. On the Echo, another claim of the group, there is a 25-foot tunnel on a pay streak from 6 inches to a foot wide, carrying fine-grained galena assaying as high as 327 ounces silver per ton. McDonald Brothers, McPhee and Moore are the owners.

The Jardine Camp.—The Jardine camp was discovered in September, 1891. The principal claims are known as the Trapper, Silver Tip, Beaver, Lone Star, Cornet, Snowflake and Mountain Dew. They are located three miles from McDonald Brothers' Halfway house and 1½ miles from Kaslo. The formation is trachyte with serpentine dykes, the veins trending northeast and southwest. A considerable amount of work has been done by the owners. The Beaver is 12 feet wide, carrying galena and copper. There are between 50 and 60 feet on the dump. There is four feet of ore in the upper tunnel of the Mountain Dew, which carries from 20 to 204 ounces silver. The Silver Tip carries dry ore, assaying as high as 400 ounces silver. Andrew Jardine, John (Lardo) McDonald and Jack Allen are the owners.

The Montezuma.—The Montezuma is only eight miles from Kaslo, on a tributary of the south fork of Kaslo river. The formation is slate, granite and lime, the vein cutting through the same. There was nine feet of clean galena on the surface, and development work has proved the vein to be from 3 to 4 feet in width. There is a crosscut tunnel 70 feet in length, tapping the vein 40 feet in depth. From the tunnel a drift has been run 40 feet, showing from 1 to 4 feet of ore. Its value is 80 ounces in silver and 60 per cent. lead per ton. Tom McLeod, Ed. Becker, and others are the owners.

The Fisher Maiden.—The Fisher Maiden, Stand-by and Sixty-Three are owned by W. A. Crane and Dan McDonald. They are in the granite belt, near Eight-mile creek, down the lake from New Denver. The veins are from 6 to 7 feet in width, carrying from 18 to 20 inches of ore, the lowest assay of which was 220 ounces in silver. Ruby and silver glance predominate. In one place 6 inches averaged 600 ounces per ton. The Fisher Maiden and Stand-by are held under bond to Seattle parties for \$30,000. This property is six miles back from Slocan lake.

The Navigator.—The Navigator adjoins the Alpha claim of the Grady group and is a parallel vein. It is a 3-foot ledge with a pay streak 8 inches wide, carrying 120 ounces of silver and 65 per cent. lead. The formation is slate, the vein trending northeast and southwest. Jasper King and Ben Anderson are the owners and they propose to do considerable development work, the coming summer.

The Grey Copper.—This claim lies between the Blue Bird and Reco, and cuts through slate, porphyry, and lime formation. The vein is 3 feet wide and shows ore for 200 feet, averaging one foot in thickness. Assays run from 145 to 160 ounces silver and 72 per cent. lead. This claim is owned by Jack Thompson, Ed. Becker and Charley Kent.

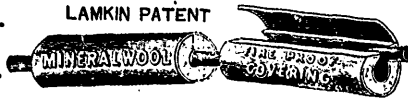
The Tom Moore and St. Lawrence.—North-east of the Great Western are located the above-named claims. The ledge is about 5 feet wide, composed of iron carbonates, decomposed lime and galena. Some ore has been extracted, but not enough to ship. These prospects are surrounded by the big mines of the McCulligan basin. M. C. Monaghan, G. Hawley and Tom Hennessy are the owners.

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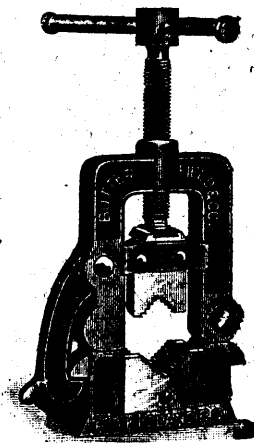
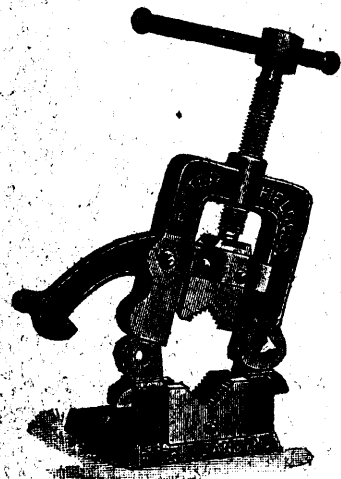
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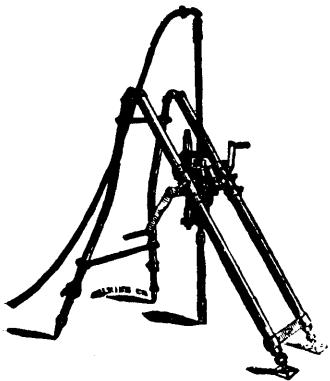
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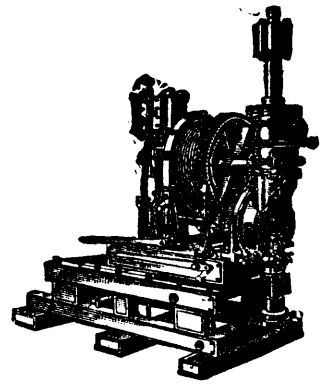
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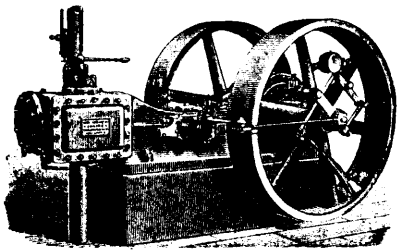


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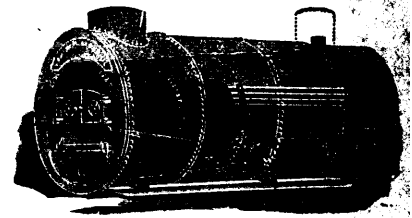
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