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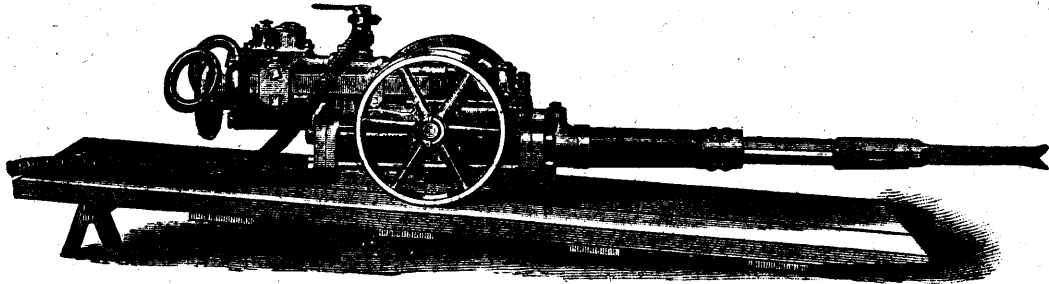
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Vol. XII.—No. II.

1893—OTTAWA, NOVEMBER—1893.

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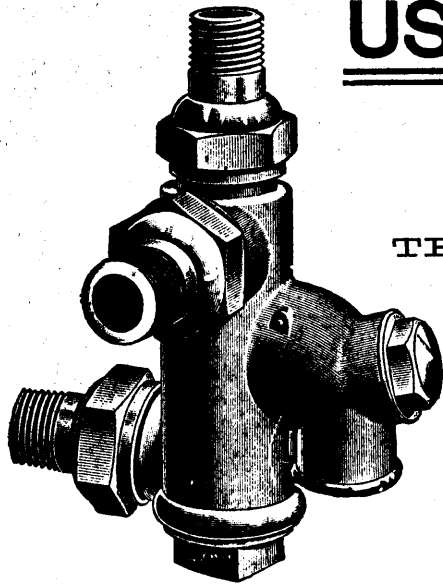
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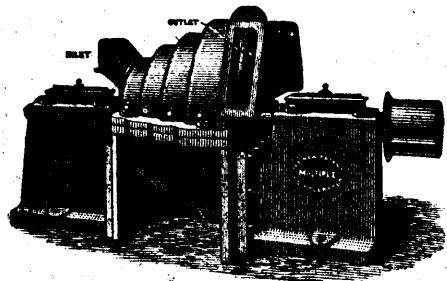
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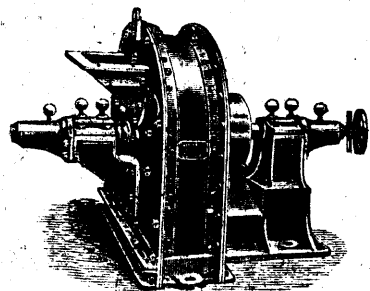
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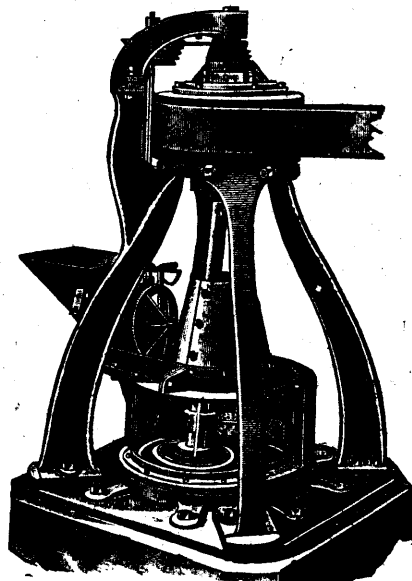
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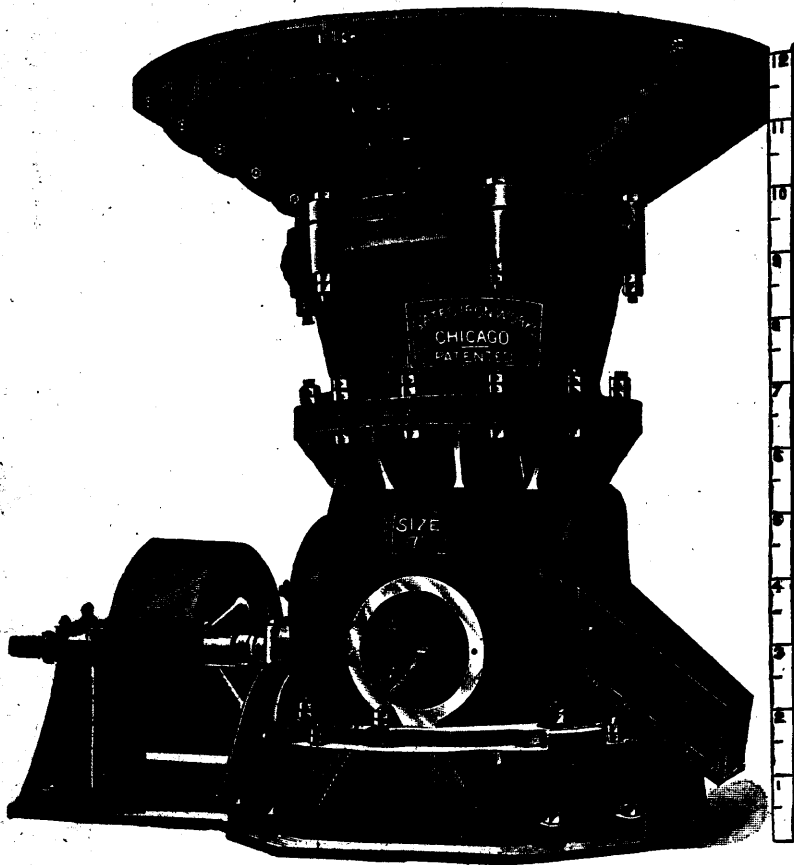
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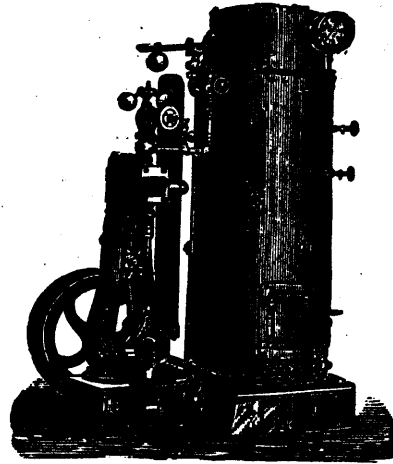
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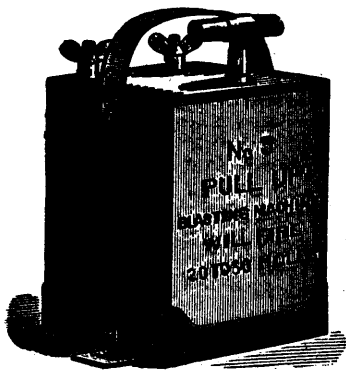
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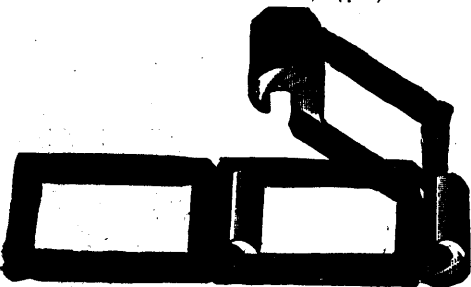
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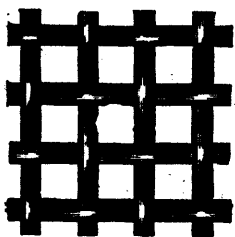
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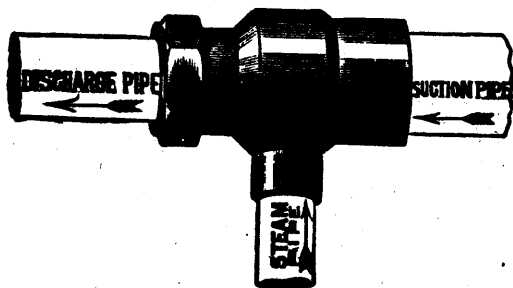
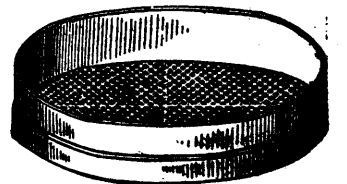
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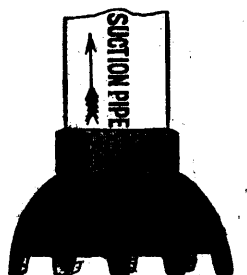
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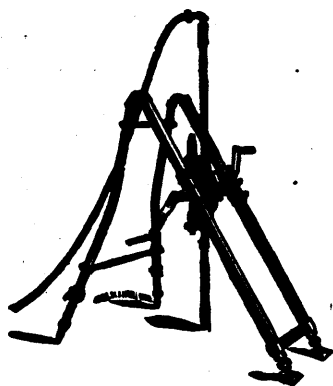
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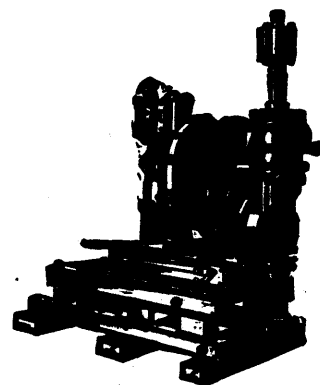
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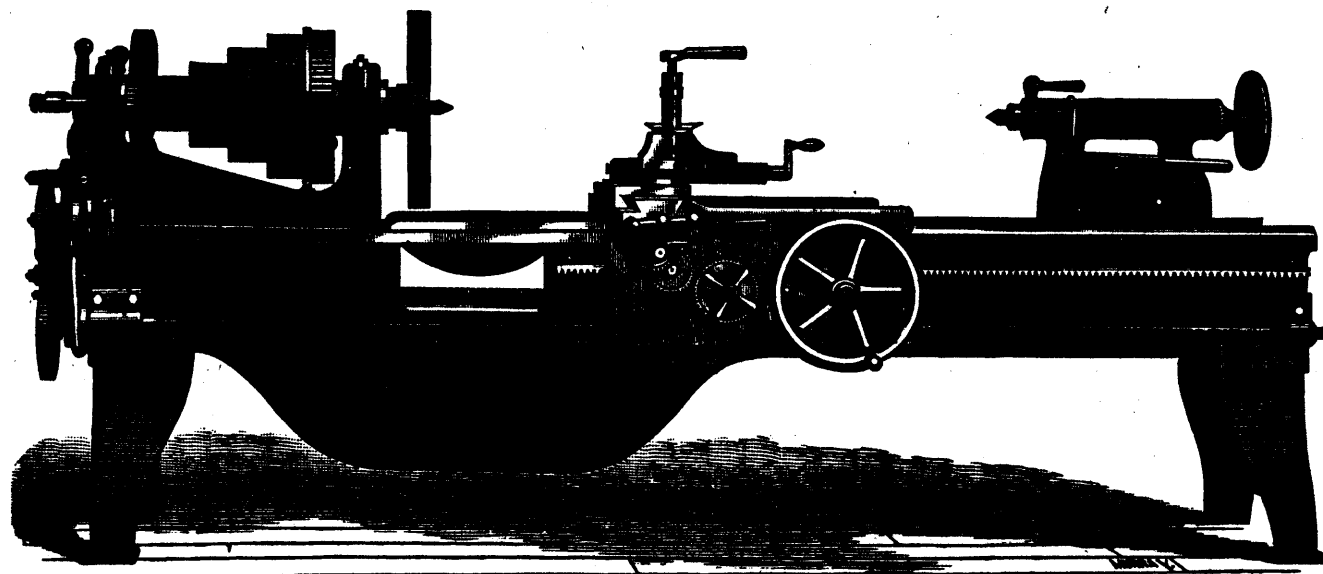
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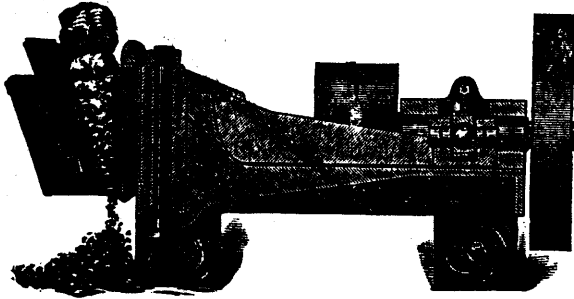
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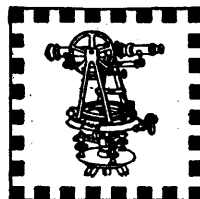
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Original discoverer of ore or mineral on claim entitled to stake out a second claim.

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

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

**ARCHIBALD BLUE,**  
Director Bureau of Mines.

TORONTO, April 24, 1892.



**PROVINCE OF NEW BRUNSWICK.**

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

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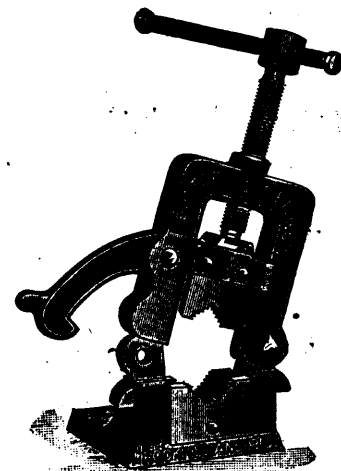
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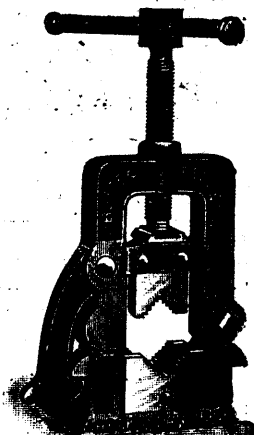


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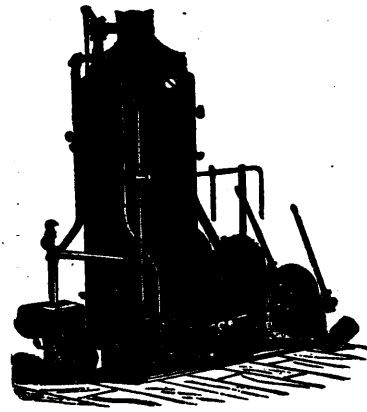
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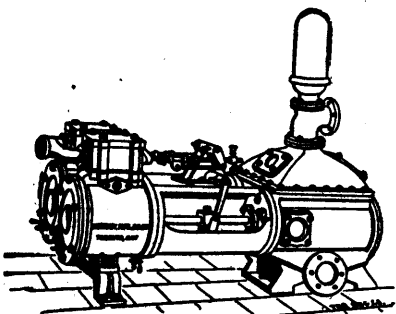
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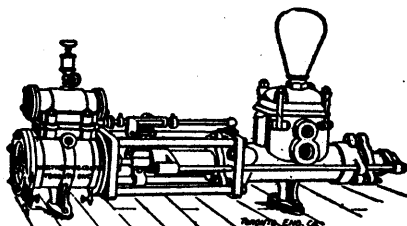
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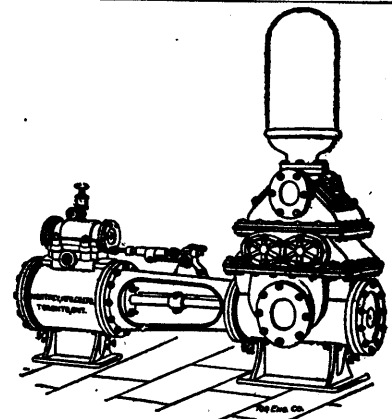
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Vol. XII. NOVEMBER, 1893. No. 11.

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#### The School of Mining at Kingston.

The report of the Royal Commission on the mineral resources of Ontario in 1890 touched strongly on the desirability of increased educational facilities for those who desired to undertake mineral and metallurgical development.

The Commission not only favored a school of mines at an educational centre, but they pointed out the excellent results that had been obtained in New Zealand by giving facilities for the acquisition of knowledge to prospectors, mine foremen and others interested in mineral development through the medium of short special courses of instruction.

The Ontario Government was impressed by this portion of the Commissioners' report and adopted a policy of giving assistance to any School of Mines who convinced them that they could raise the means to assist themselves.

Principal Grant of Queen's University, with his usual sagacity and activity, at once saw the opening which existed, and interested a number of gentlemen in eastern Ontario, with the result that the school has been established at Kingston under a strong individual Board of Governors.

The board is composed of such men as Mr. J. B. Carruthers, of Kingston (chairman); Mr. E. W. Rathbun, of Deseronto, Principal Grant, Messrs. Hiram A. Calvin, M.P., Wm. Hart, M.P.P., James Swift, G. M. Macdonnell, Q.C., C. F. Gilderleeve, M. F. Folger, J. L. Whiting, Geo. Y. Chown, all of Kingston, and Mr. Jas. S. Haydon, of Centreville.

The course which has been laid by the school for the degree of Mining Engineer (M.E.) will occupy four years, and it includes every subject which is necessary to a thoroughly qualified "expert."

Chemistry is taken up by Dr. Wm. L. Goodwin, F.R.S.C.; mineralogy, metallurgy and assaying by Mr. Wm. Nicol; geology and petrography by Mr. Willet B. Miller, B.A.; mining by Mr. Wm. Hamilton Merritt, F.G.S., who was one of the Commissioners on the above mentioned Royal Commission; engineering by Mr. R. Carr Harris, C.E.; mechanical or office drawing, etc., by Mr. William Mason, and the

laboratory demonstrators are Messrs. T. I. Walker, M.A., and Dr Isaac Wood, M.A.

The school has commenced its career not only with a very complete faculty, as above set forth, but its laboratories and facilities for giving the student practical demonstrations of the subjects are already very good, and as means are acquired these will from time to time be added to.

With regard to the special short courses of instruction we cannot do better than quote from a recent editorial in the *Globe* which in speaking of this School says "Besides providing for all the studies which will be necessary to entitle a graduate to put M.E. after his name, arrangements are made for the attendance of occasional students, to give opportunities to persons who do not intend following engineering as a profession to receive the benefits of courses likely to be useful in common life.

It is not at all improbable that this part of the work of the School may prove at first to be its most useful feature. The most important class in an unexplored mining field is that of the prospectors—the hardy, enterprising fellows who, at the expense of great privations, add by their investigations to the wealth of the world. Their knowledge of minerals is in the main empirical, and it would be a distinct advantage if it had a surer scientific basis. How much disappointment and how many broken hopes have been due to imperfect knowledge, and how much toil has been expended on places that the mere smattering of geological lore would have avoided, it is hard to estimate. Certain it is that few prospectors but could furnish their quota of experiences in this line."

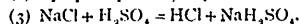
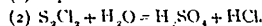
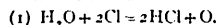
The short special course begins January 9th, 1894.

#### Every Man to his Trade.

We have received the full working details of a metallurgical process which is the invention of, and has been patented by, Admiral J. H. Selwyn of the British Navy, also a copy of the lecture which that gentleman delivered on the subject before the San Francisco Academy of Sciences last August. Admiral Selwyn is a brother of the distinguished director of our Canadian Geological Survey.

The Admiral, in this process, not only treats us to a new metallurgy, but to a new chemistry. He sets out by informing the public that this process "will extract the metals and the metalloids by a single treatment from their ores, no matter how refractory," and at a cost of about 10s. per ton. But as this process (?) has been known (more or less) since 1887, it is remarkable that no one has yet adopted so cheap a process as one that costs but \$2.50 per ton treated. The fact of the matter is that the whole so-called process is so ludicrously wrong in its chemistry that the only object served by taking notice of the matter at all is to notify the mining public generally to avoid new processes until examined by competent experts. As an example of the

Admiral's chemistry we give a few of his equations for the delectation of our chemical readers:



More of such equations are given, and for such of our readers as may feel interested we refer them to the issue of the *Mining and Scientific Press*, San Francisco, for Sept. 2nd, 1893.

In these days of rapid metallurgical progress, and equally rapid dissemination of so-called "Popular Science," it is perhaps to be expected that tyros will rush in where experts fear to tread. The patent offices are full of processes, some based on chemistry, some based on nothing, that exhibit heights of absurdity and abysses of error that are simply appalling to the metallurgist.

The rapid progress of the cyanide process in South Africa, where the conditions of the ores are most favorable for its successful operation, has stimulated others to evolve processes out of their congealed brains, and to flood the mine owner's mail with circulars and pamphlets that claim extraction to the very verge of plus 100%. An old rule of Emerson's regarding books—to read no new work until it had been published a year, when if it were still selling it would be worth reading, but if not we had lost nothing by not reading it might very well be changed to apply to metallurgical processes, if authenticated successes in practical working cannot be adduced, leave the process severely alone.

We have been constantly surprised at the number of patent amalgamators, pulverizers, mills, processes and appliances that were going to revolutionise modern metallurgical methods, but have sunk into oblivion speedily and forever.

One maxim may be taken to heart by our mining friends, which is, that the progress of metallurgical art is towards the sub-division of the work to be done, each part being perfected by itself, rather than towards the evolution or discovery of any one machine or process that can perform the whole work in one operation, and this is particularly true of gold metallurgy, into which the distinguished admiral has strayed:

"When an admiral meddles with chemistree,  
"He's just where an admiral ought to be—

"All at sea."

#### Examination Mad.

Nova Scotia has long been the happy play ground of the ideal statute menders, but of late it has excelled even itself. Its fertility in this way has thrown up examination stalks of strange growth within the last few years, and from one has burst into being an extraordinary blossom. To appreciate this *usus natura* it is necessary to explain that the mining law for years has required that the drivers of engines, with those in charge of gins and windlasses, shall be 18 years of age at mines where men are hoisted. New regulations have required such men to be certificated after examination; examiners were appointed and examinations held. With the unfolding of

the bud and the publication of the questions the pearl that it contained has been exposed to the vulgar gaze. The unpretending laborer on a windlass has been dignified among the ranks of engineers—from a being without cares outside his immediate surroundings he is to be taught to abstract his mind from the dangers of the man in the bucket below him as he bends over the crank, and he is expected to work out mentally the error in the height of the neighboring colliery chimney, the quantity of water necessary to condense the steam he sees escaping from the engines, to find the safe working pressure of boilers, the capacity of certain pumps, and similar light and airy nothings relevant to his calling. In the meantime examination's victim, in the bucket, has reached the surface and the mentally abstracted student at the crank has pinched his fingers on the rope-roll. We are not surprised that the *Stellarton Journal* asks for criticisms on the questions, and we await with interest the expressions of opinion its enquiry may produce.

### 15,000 Tons of Asbestos in Sight?

We have been favored with the prospectus of the International Asbestos Mining and Manufacturing Company (Ltd.), which has been formed under the laws of New Jersey, to acquire and work an asbestos property containing 130 acres of asbestos bearing land in the Township of Denholm, County of Ottawa, Que. From the report of H. C. Woltereck, Ph. D., a New York chemist and consulting mining engineer, we learn that:—

"The amount of rock taken out of the different veins and openings is taken by a very conservative estimate to be about 35 tons, which contain two tons of asbestos of different grades equal to 5½ per cent. of the rock mined. The grade of the asbestos mined distributes itself about as follows:

First quality, ¾ inch and longer . . . . .	12 per cent.
Second " ½ to ¾ in. and longer . . . . .	28 "
Third " shorts . . . . .	60 "

The amount of asbestos *in sight* is estimated at about 15,000 tons. This calculated yield should pay on estimated percentage of grades the following prices, \$150, \$60 and \$30 per ton respectively; \$270,000 for first quality, \$252,000 for second quality, \$270,000 for shorts, or third quality, total \$792,000, of which deduct cost of mining and other expenses \$20 per ton, or \$300,000, leaves a net profit of \$492,000."

From all of which exaggerated notions it is quite evident that Mr. H. C. Woltereck, Ph. D., has much to learn regarding the asbestos business. Admitting for the moment that the mineral exists in quantity on the property in question, which we gravely doubt, it would be interesting to know in what market he is going to realize the fabulous prices he quotes for such short-fibred stuff, and on what basis he computes his estimate of working cost. Mr. L. A. Klein, M. E., General Manager of the American Asbestos Company, an experienced and undoubted authority says (see paper read before the General Mining Association of Quebec):

"I am of the opinion that as a rule the quantity of rock mined to the ton of asbestos is greatly underestimated. Basing, on the capacity and actual work of our machinery appliances, the known quantity of lorry loads removed

from a mine during a year, and the known average weight of each load, in relation to the totals of asbestos produced, I hold that one ton of asbestos to 100 tons of rock is a fair average. If we accept this, the cost of production of asbestos may be set down as follows: drilling, 3½ cents; blasting, 3 cents; labor for removing rock and gathering asbestos in the pits, 25 cents, making a total of 31½ cents to the ton of rock, or \$31.50 to the ton of asbestos; \$7 for cobbing, \$1.50 for bags and bagging, 50 cents for loading, \$5.50 for supplies, that includes fuel, tools, iron, steel, timber, other material and repairs, \$6 for general business expenses, such as management, insurance, offices, marketing and others, \$3.75, 10% wear and tear, calculated on a total of \$355,000 in plant and 9,000 tons production, making a total of \$55.75 to produce one ton of asbestos. If we calculate now that we have to pay interest on a total invested capital of about two and one-quarter millions of dollars, for which at least 10% must be expected, we have in our sales to average a price of at least \$80 per ton of asbestos."

A few years ago the Templeton Asbestos Company (Limited), paid \$125,000 for a property in the same county containing exactly the same short-fibred asbestos, and although \$20,000 were expended in development at a time when prices were much higher than to-day, they were compelled to close down and the mine is now in the hands of the Receiver. It cost that company, under the most careful and economic management, exactly \$85 per ton at the mines, to which had to be added the cost of crushing and separating the material and cartage to the mill, an additional \$10 per ton, or in all \$95 a ton. In two years working, the asbestos and serpentine sold did not realize enough to meet working expenses. Perhaps if Mr. Woltereck will apply to the management of that concern he will receive some much needed enlightenment on the strong improbability of a working profit to be derived from the Denholm property. In the meantime investors are warned to accept with caution the highly colored and wholly erroneous statements he has made, and the opinion of some competent authority on the asbestos business should be obtained before contributing their quota to the 1,000 shares of very doubtful stock now offered for subscription.

### EN PASSANT.

We have frequently referred to the dormant wealth and abundance of the iron ore deposits of Ontario and the various aids and suggestions to bring about their utilization and development, but the hard fact still remains that in spite of a protective tariff of \$4 per ton and a bounty of another \$2 per ton, this province does not produce a single ton of pig iron to supply her own demands, but continues to pay heavy tribute to foreign labor and foreign sources of the raw material. The contemplated revision of the mode and extent of taxation in the United States, has given a gleam of better prospects in store for these mineral resources, and prospectors and owners of iron-ore claims are anxiously looking for a material reduction if not an entire abolition of the seventy-five cents duty per ton now existing on iron ore entering the American territory. Perhaps no portion of the Dominion possesses such an extent and variety of iron ores

as that comprised between Lake Ontario and the Ottawa River, which is at the same time conveniently served by rail and water ways permitting the transportation of our ores to the American blast furnaces in Ohio and Pennsylvania, and a reduction of fifty cents upon the present United States tariff, would undoubtedly not only revive the operations that formerly existed in the iron ore working, but promote a great activity in new enterprises and developments. It is an anomaly that an augmentation of half a dollar or seventy-five cents per ton in the market value should suffice to inspire investors, while the Dominion bonus of \$2 per ton on the domestic production of iron fails to encourage the establishment of a single blast furnace, and the only apparent explanation is our lack of confidence and technical skill necessary to successful iron smelting. However this may be, the next best thing to utilizing this dormant wealth of iron for our own requirements, is to employ Canadian capital and labor in its extraction and transport.

As mentioned in our mining notes an enquiring movement is showing itself in gold mining in the Hastings county, Ontario. The discovery of gold in this region dates from the autumn of 1866, and for a few years very active researches were carried on. Several mines were rapidly opened up, proving the auriferous nature of the veins over the zone of rocks to the west of the Moira River. Further research and discoveries have shown the extension of the gold rocks into the townships of Belmont, Madoc, Elzevir, Kaladar, Methuen, Lake Tudor, etc., comprising an area of some 1,200 square miles. Vennor, who was the first to examine these deposits, assigned to them four different modes of occurrence which would appear to demand careful discrimination in order to select those deposits of most economic importance. The associated minerals also are seen to vary with certain belts and geological horizons, so that the suitable process for successful extraction of the precious metal may change with the locality. Arsenopyrite or mispickel is the characteristic sulphuret accompanying the richer deposits, and to its refractory behaviour by amalgamation, may be chiefly attributed the failure of former efforts to secure the assay value of the ores. Modern improvements in gold extraction methods, notably the perfection of concentrating machines, and the wonderful results attained in South Africa and elsewhere with the application of the cyanide lixiviation process, justly encourage the resuscitation of gold working in the Hastings county, and other refractory ore regions.

Referring to that portion of Ontario mentioned in the preceding paragraphs, we are reminded of the great necessity of a better knowledge of its superficial geology, and by looking over the Reports of the Geological Survey of Canada, we find that a very considerable amount of time and money has been expended precisely on the

region in question, but of which no corresponding report has been made public. According to the Summary Report of 1884, Mr. E. Coste and a topographical surveyor were engaged from the 1st May to the 25th October in a detailed examination and micrometer survey of Rawdon, Huntingdon, Madoc, Marmora, Wollaston and Belmont, embracing 35 square miles, the published report of this work is given in a résumé of thirty-four lines (page 7A Report 1885). During 1885 Mr. Coste was assisted by two topographers, Mr. Vautelet and Mathewson, and continued his examination of Hastings County, extending them into the Counties of Peterborough and Victoria; his résumé of 30 lines is all that was made public of this season's work. In 1886, Mr. Coste continued his third season's work of the same region with the assistance of Mr. J. White as topographical surveyor, and we find 28 lines from him on page 21A of the Report for that year. But we are informed in Dr. Selwyn's report, p. 20A, that a map covering 700 square miles on a large scale had been completed, and further that "the detailed report on the Madoc and Marmora region, may not be ready for publication for some months, though it is anticipated that it will form a portion of the next annual volume." Mr. Coste eventually resigned his position in the Geological Survey in March, 1889, but neither the map of 700 square miles nor his report of the result of three years' time and money has been published, and the only souvenir to be found in the publications of the department beyond the few lines in the annual summary reports of Dr. Selwyn, is a geological map of part of Madoc and Marmora, comprising 100 square miles, issued in 1887, without any report of reference. Is it possible that the information derived from the three seasons' work of Mr. Coste and his field staff, and carried out at considerable public expense, is now entirely lost to the public weal? Has Mr. Coste appropriated all the material and notes of the work, and if so is he right in so doing, or is this only another instance of the peculiarly shiftless and unsystematic methods that characterise the publications of this branch of the public service.

One of the greatest evils afflicting the gold-mining industry is the plundering of the mines or the reduction mills by employes. In the early days of gold mining in Nova Scotia the speculation of rich quartz in the mines was notorious and old mining captains can give examples of the dishonesty which has surrounded them while working rich ground. The general view among a certain class of miners is that a mine is a milch cow, which should provide them with a means of support outside of their wages. But the law is strict and offenders who have been caught have been invariably severely punished. A few months ago we instanced the case of the Oldham Gold Co., from which amalgam and plates to the value of \$700 were stolen and where the thieves were sent to the penitentiary for three years. A year ago a highly sensational case of

gold stealing was disclosed in the United States, but this has been eclipsed in Australia by an example of thieving almost without a parallel in the history of this industry. The victims have been the shareholders of the Mount Morgan mine, which owing to the extraordinary character of the gold formation, the sensational yields, and the immense sums spent on experiments have rendered it famous all the world over.

For a long time the directors of the company entertained suspicion that gold was being stolen, but they had nothing more tangible to go upon than the fact that for many months a number of men in the employment of the company, who were earning wages of from £2 to £3 per week, were known to spend regularly sums considerably in excess of that amount. For months the directors made every effort to discover the thieves, and quite three months ago they had facts in their possession which pointed very directly to one or two of the men who have since been arrested, but the essential links were wanting. Until these were found it was thought highly injudicious to attempt any arrests. Gold was stolen in many forms, but all from the one department. Charcoal was stolen from filters, as also the residuum as it fell from the turning off, amalgam was likewise stolen. A number of estimates have been made as to the extent of the total loss, but these are more or less conjectures. The latest, and probably the one most likely, puts the amount down at between \$100,000 and \$150,000. All big parcels of gold were sent away, some to Sydney, some to Charters Towers, some to Clermont, in fact to every goldfield in the country where there was a possibility of disposing of it without detection. Very considerable ingenuity and skill were shown in disguising the gold. It was alloyed with base metals, and by some particular process in which salt and water are largely used was so changed that it was made to appear like alluvial gold, and was sold as such.

The story of the detection of the robbery is full of interest. It shows how detectives were got up from Brisbane, and how they failed to discover anything. When these men came to the mine they were given situations by the principal officials who were aware of their true mission; but although nothing was found that would warrant public proceedings being taken, the directors bit by bit gathered information of great value, and two or three months ago they knew that some of the men now in custody were systematically stealing gold, and receiving it knowing it to have been stolen. They then resolved to proceed with much greater secrecy, and inquiries were made respecting detectives in the southern colonies, and as a result the case was placed in the hands of a Sydney man. This was done without a single officer on Mount Morgan being made aware of it. The detective duly arrived, and was placed in possession of all the information in possession of the directors. The first difficulty was to get him employed in the mine. The officers there

were quite in ignorance of his purpose, and if he went out to ask for employment in the usual way there was very little chance that he would get it. However, he managed to obtain a job with one of the contractors. Actually, he was not in the service of the company at all, though working on their property. He was set to bore slabs for tunneling work—a job that fell very heavily on one quite unaccustomed to manual work, and who had moreover to work tirelessly with brain and eye after his day's work was done. He made remarkably fine use of his opportunities, giving himself airs of a devil-may-care fellow, and pretending to be a finished scamp who particularly distinguished himself on the Cape gold and diamond fields, while he confidently told some he had stolen more gold and diamonds than any man who had ever set foot in South Africa. He thus gained the full confidence of the whole of the gang, and the men comprising it told him everything, and he was delighted to find himself among a lot of fellows so distinctly after his own heart. He joined with them hand and glove, he stole gold, assisted to disguise it, carried it to Rockhampton and sold it, and afterwards spent the proceeds in the most open-handed fashion. All the time he was planning the capture of the gang, and the information then obtained implicated a number of men, nine of whom were ultimately arrested.

The sampling of iron ores was the subject of discussion at a recent meeting of the Iron and Steel Institute when Mr. Thomas Clarkson, in a paper, described a machine devised by himself for cutting out a portion of the running stream of ore, in sampling, claiming that if the ore is of an average class and sufficiently fine, this system enabled a reduction of fifty or one hundred times—that is a 2 per cent. or 1 per cent. sample—to be effected safely at one operation. When the ore is very irregular in composition and of necessarily large size, a larger percentage, in some cases twenty, may be desirable at the first cut. The duplicates are then put together and reduced in fineness before cutting on a smaller machine. This appeared to be the first machine that had succeeded in cutting out a definitely required percentage of accuracy. The improvements claimed were (1) reducing the labor and expense, (2) eliminating the personal equation and dispensing with care in the operator, (3) shortening the time.

For producing additional economies in the construction of pumping engines, attention must be turned to the steam end of the apparatus, as pump resistances have already been reduced almost to a minimum. "The greatest field," according to Mr. F. W. Dean, from whose paper, read at a recent meeting of the New England Waterworks Association, we quote, "is in preventing cylinder condensation, and while the triple expansion engine has done much when intelligently designed, it would seem that the quadruple engine is justifiable where coal is not cheap, and this with pressure easily and safely carried. It would seem that the use of super-



heated steam offers the most promising field for the future in the prevention of condensation. In the past a durable superheater has not been produced, but at present I am of the opinion that it can be. The next difficulty is to furnish sufficiently high temperature waste gases for superheating from the boiler without injuring the boiler performance, so as to counterbalance the gain from superheating. Recent experiments that I have made with boilers of the locomotive type burning from 16 lb. to 70 lb. of coal per square foot of grate per hour show plainly that evaporation of over 13 lb. of water from and at 212 per lb. of combustible can be obtained when gases are escaping at 600° Fahr. This is sufficient for considerable superheating, and such a boiler performance can be obtained with induced artificial draught. The remainder of the field for economy is chiefly to utilize all waste heat from the engine and boiler for heating feed-water."

The most economical steam plant of the future, he considered, will be designed as follows:—The boiler will be of the locomotive type, having a ratio of heating to grate surface of 75 or 80 to 1, working with over 200 lb. of steam, having artificial draught and burning 30 lb. or 40 lb. of coal per square foot of grate per hour. This type of boiler is selected because it is the most economical of all boilers, either when forced or not; will stand the highest pressures, extreme forcing and general abuse without harm for many years. It is the pioneer of high pressures throughout the world, and its success under the most trying conditions shows it to be perfectly safe. The engine used will be a moderately fast running vertical quadruple expansion, furnished with steam superheated by the waste gases of the boiler. The cylinders will be steam jacketed, and the initial steam in the high-pressure cylinder may be wire-drawn considerably below the boiler pressure. There will be reheaters between the cylinders, the condensation from the working steam side of which will be passed through evaporators in the smoke flue of the boiler.

In the last British consular report from Tientsin are described the works for the manufacture of Portland cement, which are situated at Tongshan, 80 miles from Tientsin, and were erected three years ago. The plant is of the most modern description. The raw materials used are mountain limestone, fireclay, marl, and a rough kind of china clay, all of which are found in the immediate neighborhood of the works. The fuel used is hard furnace coke made on the premises, from the local bituminous coal. The limestone and clays have first of all to be reduced to an almost impalpable powder, which is then passed through the brush mill, whence it is pumped into the "backs," to be eventually moulded into bricks for burning into cement in the kilns. The greatest possible watchfulness has to be exercised at the "washing" part of the process, by reason of the limestones and clay being so variable in quality as they are delivered into the works, an analysis of the slip being necessary

every half-hour or so. By paying close attention to this "slurry" of uniform analysis is obtained. Owing, however, to the different densities of the raw materials used, they settle down in the "backs" in their distinctive strata, and before the brick moulding can be done it is necessary to thoroughly turn over the "slurry" with the shovel and tread it well under foot in order to obtain a uniform mixture. The bricks are then transferred to the drying ovens, and in due time taken to the kilns for conversion into Portland cement clinker. Nothing but true clinker is ground at the Tongshan works. The resulting Portland cement is of great density—viz., 158 lbs. per bushel. The present output is 300 tons per week, and that is the limit of the capacity of the works. The cement is guaranteed to stand a tensile strain of 400 lbs. per square inch after having been immersed in water for seven days. In fact, it invariably tests much higher.

An exhaustive report of the British Vice-Consul at Palermo on the production of and trade in Sicilian sulphur has recently been issued by the Foreign office. Sulphur has, it appears, been extracted in Sicily to some extent for centuries, but it is only within the last 60 or 70 years that the industry has come into general and active operation. The quantity of ore extracted in 1891 was more than 2,500,000 tons; and the mineral obtained from this was 347,568 tons, of which 310,272 tons were exported. When compared with the production and exportation of 1830, which was 38,461 tons, it will be seen that the development attained was very great, but it must be remembered that Sicily is really the only sulphur producing country in the world, the few thousand tons exported by Japan not affecting Sicily, in any way. The number of mines in 1891 was 818, of which 581 were working and 237 closed. The men finding work in and about the mines were 32,269, not including carters, drivers, carriers, storekeepers, &c., who are all directly or indirectly engaged in the trade. The total is roughly given at 50,000. Refining is carried on at Catania. There are seven refineries. The largest is capable of turning out 48 tons of refined sulphur in 24 hours, 2,000 tons of flour of sulphur during a season, and of milling 3,000 half-hundredweight bags of sulphur per day. The refining season commences in October and terminates in June.

The Vice-Consul concludes by describing the working of one of the most important and best managed of the mines, viz., Grotta-calda, situated at about seven kiloms. from the town of Valguarnera, and 2 kiloms. from the nearest railway station at Assaro. It belongs to Prince Sant'Elia, and is at present leased to and worked by Messrs. J. Trewhella & Co. It produces about 15,000 tons of sulphur yearly, of which 22 per cent. is made over to the proprietor as rent. The extreme depth is 140 metres. There are three shafts, besides various "scale" or stairs leading into the mine. At the main shaft the ore is drawn to the surface by a 60-horse-power hori-

zontal winding-engine, the cage containing a tram wagon with about 15 cwt. of ore at a time. The ore is extracted from the two smaller shafts by modern steam winches of 8 to 10 horse-power. There are three horizontal Lancashire boilers, each having thirty square metres of superficial heating surface, and two vertical boilers for driving the steam winches. The amount of water is about 1,000 cubic metres in 24 hours, and is extracted by a double-acting vertical beam pump (Cornish pattern) working in three lifts. The length of stroke is three metres, diameter of plunger 30 centims., speed of pump six strokes per minute; besides this there are three Worthington pumps in reserve in case of accidents. The quantity of ore brought to the surface in 24 hours is about 300 tons. The ore yields about 3½ cwt. of fused sulphur per ton. There are about 150 miners and 250 boys employed underground, divided into three shifts, besides an underground engineer and several foremen. The sulphur, when fused, is taken to the railway station by carts, 50 of which are regularly employed, and at times these are increased to 100; each cart takes about 14 cwt. of sulphur.

Commenting upon Sir Lowthian Bell's recent paper on "The Waste of Fuel involved in the Smelting of Ores of Iron," between the Iron and Steel Institute, the *Iron and Coal Trades Review* says:

"One of the questions which have from time to time formed the subject of discussion by ironmasters and engineers, is that of whether we are likely to witness any considerable increase of efficiency in the blast-furnaces in reference to fuel consumption. The reasoning and calculations submitted from time to time by blast-furnace experts appear to render it probable that if we have not absolutely reached finality of economy, with 18 cwt. of coke to the ton of pig, we are not very far from the attainment of that stage. It is, of course, possible that some other method of producing iron may ultimately displace existing methods, and that the newer method may involve economies that are not now dreamt of, but at the present time we have to face the conditions that actually exist, and not those that are theoretical and visionary; and taking things as we find them, it appears to be improbable that any considerable reduction on the best practice now current in making pig-iron, is likely to be effected. The great progress made in fuel economy during the last twenty years has been mainly due to four items, all of which have now been pretty fully discounted in practice. The first of these is the substitution of the hot blast for the cold blast, and on this point experts believe that practicable finality has been attained—in other words, that it is not commercially profitable to work blast-furnaces with a higher temperature than 1,500° to 1,600° Fahr. This consideration, therefore, limits the scope of any possible economy due to the increased temperature of blast. There is still, however, a difference of opinion as to what the future may produce in the way of changes due to the adoption of larger furnaces, constructed on different lines. It is well known that hardly any two works in existence build furnaces that are in all respects alike. Each blast-furnace engineer, and each ironmaster has his own theory and his own practice as to the form best adapted for the blast-furnace, and there is as much diversity of shapes, forms, and dimensions in blast-furnaces as there is in the construction of private dwellings. This, to a large extent, is no doubt necessarily the case, inasmuch as practice has proved that the form and dimensions suited to the smelting of iron under one set of conditions will not be found equally applicable to the same operation under conditions that are more or less different. The time, therefore, ap-

pears to be still distant when we may expect to see blast-furnaces erected after a uniform and stereotyped pattern, and that being so, the question of what further economies may be possible in the smelting of pig-iron must remain more or less an open one. The subject in all its bearings is one that is specially well adapted for the discussion of practical ironmasters, and although it does not present at the present moment any very exciting aspect, nor hold out any great hope of that relief which the trade is so anxiously seeking, there is no doubt whatever that it is a movement in the right direction."

The shipments of nickel matte and asbestos from Montreal, consigned to Europe, up to 18th ulto. were:

NICKEL MATTE.

Canadian Copper Co.....	259 barrels.....	Hamburg.
C. P. R. ....	26 casks.....	Avonmouth.
" .....	26 " .....	" .....
" .....	22 " .....	" .....
" .....	43 packages.....	" .....
" .....	44 " .....	" .....

ASBESTOS.

Grand Trunk Railway....	760 bags.....	Hamburg.
" .....	560 " .....	" .....
O. M. Harris.....	889 " .....	" .....
Grand Trunk Railway....	20 " .....	London.
Irwin & Hopper.....	58 " .....	Hamburg.
O. M. Harris.....	915 " .....	London.
Grand Trunk Railway....	400 " .....	Hamburg.
" .....	400 " .....	London.
" .....	1200 " .....	Hamburg.
" .....	400 " .....	" .....
Irwin & Hopper.....	300 " .....	" .....
Grand Trunk Railway....	400 " .....	" .....
" .....	1024 " .....	" .....
American Asbestos Co ..	400 " .....	" .....
Irwin & Hopper.....	3 barrels.....	" .....
Johnson's Asbestos Co....	2 bags.....	" .....
G. T. R.....	600 " .....	London.
" .....	500 " .....	Hamburg.
O. M. Harris.....	38 tons.....	Antwerp.
" .....	100 bags.....	Rouen.
G. T. R.....	600 " .....	Hamburg.

A syndicate with a capital of £35,000 has been registered in England to purchase British or foreign patents, conferring rights in connection with the use of peat, or any product that can be obtained from peat and to carry on the business of bleachers, general dealers, manufacturers, exporters and importers, especially any articles which are the product of peat. The concern has been registered by W. L. Cooper, 5 Queen Victoria Street, London, E.C.

The next quarterly general meeting of the Mining Society of Nova Scotia will be held on Thursday, 7th December next in the rooms of the Society, Halifax. Three sessions will be held. Among the papers to be presented the following are announced: "The Asbestos Fields of Port-au-Port, Newfoundland," by Mr. C. E. Willis; "Early Iron Smelting in Pictou County," by Mr. H. S. Poole, M.A., F.G.S.; "Cast Iron Tubbing in Shafts at Sydney Mines," by R. H. Brown; "The Newbery-Vautin Chlorination Process, with results of experiments on some Nova Scotian Concentrates," by F. H. Mason, F.C.S. Other features will be the discussions on the papers read at last meeting, while the afternoon session will be devoted to the

discussion on the method of introducing new mining legislation in the local legislature as advised by the Premier on the 25th ulto. We trust every member of the Society who can do so will be present and participate in the proceedings.

Arrangements are being made by the General Mining Association of Quebec for an unusually interesting series of meetings in January. Among others who will contribute papers are: Dr. F. D. Adams and W. A. Carlyle, B.A. Sc., of McGill University; Mr. J. Burley Smith, M.E., Glen Almond; Mr. F. Cirkel, M.E., Ottawa; Mr. Geo. E. Drummond, Montreal; Mr. J. Obalski, M.E., Quebec. The meetings will open on the second Wednesday of the New Year. The *Journal* of the Association, a somewhat bulky volume, containing the proceedings for the past three years is now in the press and will be ready, it is hoped, for distribution at the annual general meeting.

In the Annual Report of the Department of Crown Lands, Quebec, Mr. J. Obalski, M.E., Inspector of Mines, contributes much useful and valuable information respecting the mineral industry of that province during the year ended 30th June, 1893. The Mining Law, which was substituted by the Hon. E. J. Flynn in place of the obnoxious legislation enacted by the Mercier administration, has been found to work smoothly. During the year 132 prospecting permits were applied for and 102 granted, comprising an area of 19,743 acres in surveyed, and 130 square miles of unsurveyed territory. The revenue from this source amounted to \$1,675. The sale of mining lands was much greater than the previous year, and the receipts exceeded those of 1892 by \$3,594.75. An economy worthy of congratulation is the saving that has been effected by the reduction in the staff of the so-called mining inspectors of the Mercier régime, the expenditure of the Department having fallen from \$16,296.71 in 1892 to \$4,736.43 in 1893.

From the tabulated returns of the mineral production of the Province of Quebec during that period, given by Mr. Obalski, we glean the following:—

Bog Iron Ore.....	26,539½ Tons.	Asbestos.....	7,248½ Tons.
Magnetic " ..	1,550	Serpentine.....	300
Ochre.....	950	Phosphates.....	3,177
Copper(pyrites) 58,001	50	Mica (rough and dressed).....	1,164
Lead.....	100	Feldspar.....	1,000
Gold.....	355½ Ounces.	Granite.....	100,000
Graphite.....	326 Tons.	Slate.....	4,785 Tons.

Taking 4,153 as the total hands employed in the industry it appears, says Mr. Obalski that the proportion of fatal accidents during the year was 1 in 1,034, and one injured for every 378 persons employed.

Every one we have met who visited the Canadian section at the Chicago Fair is disappointed at the very poor representation Nova Scotia made there. The exhibit as to coal was unworthy of an office display, and the two exhibits

of gold, one of nuggets from Moose River, and the other of quartz from Caribou, were not representative at all of the quality and class of quartz from which the bulk of Nova Scotia gold is obtained. So long as Nova Scotians are content to have their mineral resources thus appear, so long will they lack the introduction of that new capital they so ardently desire.

Our last issue was completely sold out immediately after publication and we regret to have been unable to furnish many of our readers with the extra copies they required. A large portion of the surplus issue of the current number has also been purchased in advance of publication and readers desiring copies are requested to send in their orders early in order to avoid disappointment.

As customary the only official reports of the proceedings of the Mining Society of Nova Scotia, to be held on 7th proximo, will be published in the REVIEW. Our numerous asbestos readers will be particularly interested in the report on the new asbestos-bearing district now being opened up at Port au Port Bay, Newfoundland, to be presented in the paper by Mr. C. E. Willis, M.E.

A car-load containing 20,000 ore sacks has been shipped by the Canada Jute Company, Montreal, to their agent, Mr. R. E. Lemon, at Nelson. When it is considered that these will be placed in addition to the 18,500 already delivered to his customers, it is evident that notwithstanding the low price of silver the miners of Kootenay mean business.

For many years it has been known that the bars on many of our British Columbia rivers contain an immense quantity of flour-gold. Many and various have been the schemes devised to recover this gold, all more or less unsuccessful. During the past season the stimulus to the search for gold has resulted in an unusual number of these fine gold-saving machines. The *Mining and Scientific Press* refers to the latest appliance as follows: A prospector named Taylor, of Idaho, thinks he has solved the flour-gold problem, so vexatious to placer miners. He has invented an appliance, consisting chiefly of a sluice-box, in the bottom of which is a row of over-lapping boards. These boards, prior to being placed in the sluice, are smeared with white lead and then sprinkled with sand. Over this surface the water runs in a low stream. The gravel reaches the sluice through a grizzly. The gold and sand settle to the bottom and are caught on the sanded boards. After the sand and gold has accumulated it is taken up and amalgamated in a quicksilver bath. This device, it is said, can be worked at a cost of about \$10 per day, and, while not perfect, it is credited with the best work yet done on the Snake River placers, where the amount of flour-gold is very large. It is said that Taylor's machine has been in use all summer, and cleaned up from \$30 to \$50 per day.

### The Jeffrey Asbestos Mine.

Just as we go to press we learn that this well known property is on the eve of being transferred to a joint stock enterprise with a capital of \$350,000. The mine is situated a short distance from Danville Station on the main line of the Grand Trunk Railway, midway between Montreal and Quebec, and has been worked continuously for many years, recently under the ownership of Mr. W. H. Jeffrey, of Richmond. The annual output has been in the neighborhood of 1,500 tons of all grades but this year we understand 2,000 tons will be produced. It has been carefully and systematically opened up, is equipped with ample accommodation for a good force of miners and a suitable working plant, while the product owing to its fine fibre has gained a high reputation among manufacturers of asbestos goods. We understand that the reason for this step is largely the great age of the owner who is now close upon eighty-six years of age. The property, which contains 75 acres, has proved a highly remunerative investment to the present owner and there is no reason why it should not continue to be so if operated by a syndicate properly administered on a reasonable capitalisation.

### The Montagu and Waverley Gold Districts.

The districts of Montagu and Waverley present many points of interest to both the stranger and the mining man.

On the eastern side of Halifax Harbor lies the town of Dartmouth, from which a drive of seven miles, five of which lie along the wooded shores of a lovely chain of lakes, brings the traveller to the mining district of Montagu. The first discoveries here were made in the summer of 1863, in which year 140 tons of stuff were milled yielding 336 ozs. 14 dwts, an average of 2 oz. 16 dwts. per ton, which average has been pretty well kept up, the general average from the beginning in 1863, to the end of 1892, being 1 oz. 18½ dwts or about \$38.00 per ton. This is the highest average value per ton of any of the gold districts of the Province\*, but is also an index of the character of the district when taken in connection with the total number of tons milled, viz. 18,771 in 30 years.

The inference from these figures, that the district hitherto has been one of rich streaks or pockets, is borne out by examination of the workings, but from the character of the work carried on during the past year by Mr. Thomas and others there is ground for believing that the lower grades of quartz will be found workable at a profit.

As we enter the district by the branch road from the main highway, one sees to the right and extending westerly the old mine buildings and rock dumps of the once famous "Lawson" property, now owned by "The Nova Scotia Gold

Mines, Ltd.," an English corporation controlling the major part of the district. The "Lawson" lode was worked to a depth of about 360 feet many years ago, and has since been idle. West of this property, and at the western end of the district so far as yet worked, is the "Symon-Kay Syndicate, Ltd.," also an English corporation, now under the management of Mr. Alfred Woodhouse, resident director. Some years ago the property produced quite largely. Since the transfer to the Syndicate in 1892 attention has been chiefly directed towards the prospecting and developing of the property. A ten-stamp mill has been built and pumping and hoisting works erected. From the specimens on view in the office it would seem probable that pay ore is close at hand, when the equipment which is yet rudimentary, will be increased.

Returning easterly through the Lawson ground the next property traversed is the "Annand," once known in London as "The New Albion." These claims for the last ten years have been the chief producers in the camp. Sold in London about the beginning of 1884, the mine has



W. R. Thomas, F.G.S., Nova Scotia Gold Mines, Ltd., Montagu, N. S.

had alternate periods of large and small production, and has endured all sorts and kinds of management in that period. In October, 1892, Mr. W. R. Thomas came out from England and took charge of the property. By him many changes and reforms have been inaugurated, work systematized and economies practised. It is no flattery to that gentleman to say that he has accomplished with credit the herculean task he had before him. Many contemplated improvements remain to be completed. The property has a ten-stamp mill with combined pumping and winding gear, also an independent winding engine. New buildings and boiler equipment are in process of construction, and we were glad to note an assay office that was apparently in daily use. Developments are confined to two veins, the "Twin Lode" and the "De Wolfe." The former is worked by crosscuts 80 feet in length from the De Wolfe lode. The latter has one shaft well on to 300 feet deep, with levels therefrom. This De Wolfe lode is known far beyond the boundaries of Nova Scotia for the magnificent nuggets and

specimens obtained from time to time. Where these rich pockets are found the lode is large, often 15 to 16 inches, in other places it is smaller, sometimes running to 5 or 6 inches.

Just south of these works and extending westerly over 1000 feet lies the property of the Salisbury Gold Mining Co. an excellent "prospect," badly equipped with mill and machinery, Several very promising lodes on this property await development.

To reach Waverley from Montagu one traverses the two miles of branch road to the main post road, and thence drives five miles along the picturesque shores of the lakes, whose variegated foliage at this season completes a picture of surpassing beauty.

It is not going too far to say that Waverley is one of the most picturesque and charming mining villages to be found in this or any other country. For variety of mountain, forest and lake scenery it is famous. Two large lakes end to end, the one flowing into the other, divide the district into East and West Waverley. With the steep precipitous hills on the one side, gently rolling slopes on the other, and comely houses nestling among the trees along the shores of the lakes and borders of the road a picture is photographed on the retina which will be long remembered for its beauty, and which does not suggest the digging and delving, the smoke and dirt invariably associated in one's mind with mining villages and operations.

In the total amount of gold produced Waverley stands the second district in the Province, its total yield to January 1st, 1893, being in excess of one million of dollars. Discovered in September, 1861, from its accessibility and proximity to Halifax a large number of people were quickly on the ground, and many claims applied for, the Government returns showing 46,800 days labor performed in 1862.

For the years 1864-65-66, there was a total production of nearly \$600,000, but following the exhaustion of the surface streaks came a partial depression, followed in 1871 by a revival which lasted until 1877. From 1878 until the fall of 1889 Waverley lay quiet, in the hands of prospectors and tributors only, and for these twelve years the average annual product was only 180 ounces.

The good genius of the place has been and is still Mr. B. C. Wilson, who has been a continuous resident of Waverley since 1862. Through his efforts, in 1889 a strong American company, with a share capital of \$500,000, acquired a large property in West Waverley, known as the "American Hill" claims. The services of a man well known in Nova Scotia were secured, and the company proposed to erect a model plant and treat the low grade ores of Waverley on a large scale.

This announcement was pleasing to everybody, as the district had an unimpeachable record and the success of this enterprise meant the introduction of capital to the gold mines of the province.

Work was prosecuted for nearly three years; large underground developments were made; an

\* The highest individual yields, per ton are from Oldham district where recently several tons yielding 100 ozs. per ton were crushed, and in 1891 eight tons yielded the rate of over 80 ozs. per ton.

extensive and expensive surface plant was erected, embracing a powerful hoist capable of handling 1,000 tons a day, a large air drill plant with accessories, a thirty-stamp mill with magnificent Corliss engine, Frue vanners, &c., and a laboratory for assay and analytical work. In all a sum total of \$150,000 was expended, but in April, 1892, the big bass whistle ceased to blow, and work stopped. The immensity of the equipment precluded all hope of dividends from the commencement.

Meantime others have been stimulated and in 1891 there were five companies operating. The English company ceased work when its property was transferred to another syndicate, and now there are but two working mines in the district.

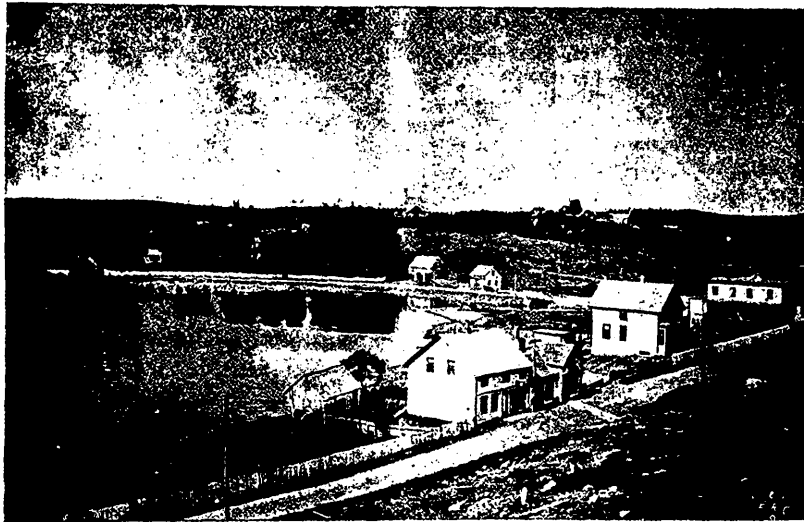
The first of these, in East Waverley, is managed by Mr. Wilson, who has driven a cross-cut tunnel into Laidlaw's Hill a distance of 635 feet, cutting at that point the Barrel quartz lode, at a distance of something like 200 feet on the

comprises a 20 stamp mill of most modern pattern, with a duty of 60 tons per 24 hours, equipped with rock breaker, automatic feeders and concentrators, operated by a small tandem compound condensing engine. The air compressor is a Rand duplex compound condensing machine, of 10 drill capacity. The steam is generated in one nest of boilers for the whole plant and is successfully carried 500 feet up the hill to the hoisting engine which is of the double drum, friction, double cylindered type. The mine water is handled by a single action pump operated by compressed air, and the water supply for the works is pumped from the lake also by compressed air. All stopping is done by single hand work, and hoisting is done on day shift only. The company is now handling 1000 tons of quartz per month from veins averaging from 10 to 16 inches in width, and worth about 5 dwts. per ton. We are not in a position to state what dividends are being paid as the com-

pany is a close corporation. The mine adjoins the Lake View Company on the west and has a length on the veins of 900 feet.

certain scientists upon the geological formation of the country, for in no single instance, where properties were opened out and partially developed in the early days, did it ever occur that the operations ceased because of the pinching out or poverty of the ores. I might mention in this connection the Opibir, the Winnipeg Consolidated, the Pine Portage and a number of other locations upon which work was commenced some decade ago and afterwards abandoned because of financial difficulties and partnership squabbles; but which are well known locally to be rich beyond calculation in beautiful free milling ore. The locations, however, which we have at present to deal with are those now in actual operation, the acquirement and working of which by the companies interested marks the new stage and era in the development of Western Algoma.

Of the Sultana your readers have no doubt heard, as frequent notice of proceedings in that quarter appear in the local and Winnipeg press. The mine is owned and worked by Mr. J. F. Caldwell of Winnipeg. A ten stamp mill is operated on the property which is being run ten hours daily. Bullion is being produced at present at the rate of about one thousand dollars per week, with an unlimited amount of ore in sight. The mill and mine are open for inspection, and any intelligent visitor would I am sure be courteously received and given any information he might desire by the gentlemen in charge of the works. Mr. Justice Street, who has been here during the past week holding Assize, paid the Sultana a visit in company with a number of legal gentlemen all of whom were very much impressed with what they saw. If, therefore, any of your readers doubt the accuracy of any of your correspondent's statements let them follow the example of Mr. Justice Street and come and see for themselves.



General View of the District of Waverley, N. S., showing Mining Buildings in distance.

incline below the outcrop. The vein has been opened systematically by levels and upraise and everywhere shows a large body of quartz, the vein running from 10 inches to 20 inches in thickness. Only one small lot has been milled, yielding about 8 dwts. per ton, but the mine is now ready for its milling equipment and will undoubtedly give a good account of itself.

The "Newest Child" is the West Waverley Gold-Co., Ltd., which began work in February, 1891, milling in April 1892, and has been working continuously since. From its inception the West Waverley Company has been under the management of Mr. John E. Hardman, also manager of the mines at Oldham. We publish in this issue an illustration showing an exterior view of the new mill, which has been pronounced by those competent to judge the most economical and best adapted plant for its capacity ever erected upon a mine in Nova Scotia. The plant

pany is a close corporation. The mine adjoins the Lake View Company on the west and has a length on the veins of 900 feet.

## CORRESPONDENCE.

### Gold Mining at the Lake of the Woods.

To the Editor of the Review:

SIR,—The mining industry of the Lake of the Woods district is decidedly settling down upon a firm and sure foundation. Businesslike and legitimate development is now going on upon, at least, four distinct locations, in the light of which operations the ancient bugaboo which has for so long a period been dangled before the timid eyes of our infant enterprise is rapidly being relegated to the limbo of exploded fads and superstitions. I refer to the opinion so frequently heard in the past, that the ore deposits of this wonderfully rich country possess neither depth nor permanence. This altogether groundless assumption has been so frequently and generously exploited in our behalf that a great many mining men have been induced to accept the statement as being perfectly true and in accordance with the results of careful and practical experiment; and this much to the disadvantage and injury of our good name and reputation. No doubt this fallacious idea had its birth in the half-expressed opinions of

I should require several columns of your valuable space to clear the ground for a proper understanding of the situation here; the tale shall, therefore, for the present remain untold. Among other companies interested is what is now known as the Rat Portage Reduction and Mining Company, a rich and powerful concern representative of American capital. These people have secured a number of locations, some of which will undoubtedly turn out good. Among others they own what is called the Bull Dog or Black Jack mine and though their first intentions were to enter into operations on a very extensive scale, the mines troubles over the time have induced them to confine themselves, up to the present, to the development of this one property. The work here will be watched with no small degree of anticipation by those who have an interest in the country, as it is the intention of the company to demonstrate beyond cavil the thorough reliability of our ore deposits in the matters of both quality and depth. This work will be prosecuted not from any philanthropic motives, but because the company have invested largely in the district and it suits their purpose best that the local mining industry shall be placed in a flourishing condition as speedily as possible. One reason for this is that they will have a large and fully equipped custom's mill ready for work early next summer and as of course they desire to make this a profitable and paying institution, and as all locations now operating possess their own mills and plant, they wish to induce others to come in who might decide upon favoring the custom's mill with the treatment of their ores. Nothing, they think, will further their very reasonable desires in this connection more than the success of the test which is now going on upon

their Black Jack property. Steady sinking will therefore go on there until a depth of at least two hundred feet is reached when drifting will be commenced so as to cross-cut two other veins on the location, upon which work will be carried on simultaneously. Air drills will supplant hand drills in the work of mining. These arrived the other day from Sherbrooke and are now being placed in position under the able superintendence of Messrs. Payne and Brent. The shaft at present is between eighty and ninety feet deep.

On the Gold Hill location a new mill is just commencing to run under the supervision of a mining engineer from Colorado. The mining operations here are under the management of Captain William, late of the Beaver mine, a practical miner well-known throughout the entire district of Algoma. Mr. Dan Burdette is the local head and front of this syndicate, the capital interested being American from the neighborhood of St. Paul and Minneapolis. Bullion is expected in from this mine in the course of a few days.

The Bad mine has been purchased by Mr. Semple of Hoskosh, and a contract let for the sinking of a fifty feet shaft. This mine is located in the vicinity of Rossland and the indications are most excellent.

A number of other locations are being opened by prospectors and next summer will surely see the district making rapid strides along the lines of progress.

In conclusion we have been visited during the past summer by many eminent experts all of whom expressed their great satisfaction with the indications held out. A great English authority, Mr. Pasco, of London, Eng., who was out for old country capitalists was much pleased with what he saw and returns in the spring for further and more extensive examination. Much has been said and written for and against the country. Many absurd and wilful exaggerations have been spread abroad in regard to it, but we who have resided in the locality for a considerable period and without being interested to the extent of a single cent directly or indirectly in any of the mining properties; cannot resist the impression that Algoma district is bound in the very near future to assert itself as one of the richest mining centres of the continent.

Rat Portage, 29th Nov. 1893.

H. H.

#### Dr. Hoepfner's Electrolytic Process for Extracting Copper, Silver, Gold, etc., direct from Ores.

To the Editor of the Review:

SIR,—It may be interesting for a number of readers of the MINING REVIEW, whose time does not permit them to study the current and voluminous productions of the literature of electro-metallurgy, to hear something about a process, which although not quite new, deserves a wide publicity on account of its important innovation on existing methods in reducing copper and silver ores.

If we look at our bookshelves and see the great number of stately folios on metallurgy, and let pass in our minds the many hours of hard study and practical trials of tedious smelting and subtle-leaching processes, and think what a relief came over us, when electricity commenced "to take a hand" in it, and when men like Elkington, Marchese, or Siemens and Halske, substituted the electrolytic deposition of copper from matte—what a simplicity compared with that wonderful complicated work of repeated roasting, smelting and leaching of ores and mattes. After a number of years of trials, failures and improvements, this primordial work of electricity did not quite fulfil to satisfaction what the *pater familias* expected. In the first place, the casting of the matte to such thin plates, as were necessary for the anodes, was attended with a number of difficulties; second, these anodes after hanging for some time in the baths, became unevenly dissolved, and at last so soft that they often fell from the connection and the process was interrupted; third, the electrolyte became after a short time so saturated with all kinds of impurities which existed in so concentrated an amount in the matte, that if great care were not taken, either the deposition of the copper was partially interrupted or other metals were deposited with the copper and consequently the latter lost in quality. Matte anodes need a tension up to 1.5 volts, and besides a large portion of the current is wasted by doing extra work, dissolving other metals in the matte which are not wanted. Therefore electro-metallurgists tried for a number of years to establish a method by which the above mentioned defects would be avoided and a saving in cost of treatment produced, but at the same time a product obtained which could be pronounced chemically pure.

It was however not until 1886, when Siemens & Halske took out a patent on an electro-chemical process "for the production of metallic copper directly from its ores by electrolysis." It was a great improvement upon the foregoing, yes I might say something quite different and much superior to the other. I will give here a short description of this process, which is based on the solubility of monosulphide of copper (Cu S), of subsulphide (Cu<sub>2</sub> S), of oxyd (Cu O), and metallic copper in a solution of ferric sulphate [Fe<sub>2</sub> (SO<sub>4</sub>)<sub>3</sub>], and consists of two parts: first, a chemical, and second, an electrolytic.

First part: the matte, or the ore whose copper contents must be in a chemical combination as above stated, is ground to a fineness of 90 meshes, preferable in a Krupp ball mill, and transferred into leaching vats. In case the copper is in a different chemical composition in the ore as just mentioned, for instance, chalcocopyrite (copperpyrite), which is a double sulphide, it is first partially roasted and the copper formed into a subsulphide, while the iron into

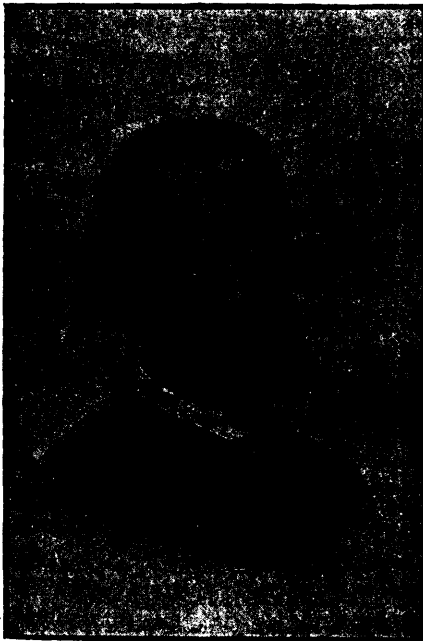
an oxyd and rendered insoluble. The leaching solution is now brought in contact with the ore and under continuous stirring and heating to about 90° Celsius so long left in contact with it until all the copper is leached out, which will take about 10 hours. The tailings are then sent to a filter press and any remaining solution pressed out, after which the residue will show by analysis not more than 0.1 or at the most 0.5% copper. The liquor is then run into the settling vats from which the clear solution flows into the electric vats.

This brings us to part second. The lixivium before entering the leaching vats consisted of ferric sulphate [Fe<sub>2</sub> (SO<sub>4</sub>)<sub>3</sub>], as above stated, but after finishing leaching it has changed and leaves the vats as a ferrous sulphate (Fe SO<sub>4</sub>), because it gave two molecules of acid to the copper, which is dissolved out of the ore. This action may be understood by the following equation:

$$\text{Cu}_2\text{S} + 2\text{Fe}_2(\text{SO}_4)_3 = 2\text{CuSO}_4 + 4\text{FeSO}_4 + \text{S}$$

and in this composition it flows with the cupric sulphate through the electric baths. The latter loses its copper in depositing it on the cathodes which consist of sheet copper, then the liquor flows down from the cathodes to the anodes, the ferrous sulphate is oxydized and combines here again with the two molecules of sulphuric acid, set free through the decomposition of the cupric sulphate and is restored to its original form into ferric sulphate. Owing to its greater specific gravity it settles on the bottom of the bath, is drawn off from here and is then ready to perform its work as a lixivium over again.

We see by what I have just said that the whole process forms a cycle, and if we consider it from a practical and



Mr. John E. Hardman, S.B., Managing Director, West Waverley Gold Co. Ltd.

economical standpoint, its advantage over all earlier methods of reducing copper are so important that it is only a question of time that we shall substitute for all pyro-technical, these electro-chemical processes.

However, this process has one disadvantage, *i.e.*, in applying it to ores containing precious metals. Heater ferric sulphate with free sulphuric acid will not dissolve metallic silver or gold and only to a small extent, if they are present as sulphides or chemically combined in the ore, but are at once precipitated by the action of ferrous sulphate and will then remain in the slimes; nor does it develop, as an electrolyte a very high electromotive power even not with the presence of free sulphuric acid. The deposition of copper at the cathodes is only about 1.18 grammes per ampere-hour; while for instance a solution of cuprous chloride and an analogous salt are able to deposit double the amount, consequently the process is not so economical as where an electrolyte of the latter composition is used and consequently also the installation of the electric plant has to be of double the size.

This brings us to a process patented by Dr. Hoepfner "for treating ores containing copper, silver, gold, lead, nickel, cobalt, etc., by electrolysis."

The principal of this process is about the same as the above described Siemens & Halske, with the exception that the lixivium is applicable to all copper ores roasted or not roasted, and that the electric baths and lixiviation vats are a little differently arranged and that there are besides some precipitating vats.

The dissolvent used is here a cupric chloride saturated with chloride of calcium, which is brought together with the ore in revolving leaching drums and heated by steam from the exhaust pipe of the engine to a certain degree. It depends on the nature of the ore how long the liquor has to stay in contact with the former, two to six hours sometimes more. The lixiviation is done in two stages, the new liquor, as it comes from the electric baths, is first used on ore, which has been leached before and then brought in contact with fresh ore, to secure a complete extraction of all the the economic metals. Seldom will the tailings show more than 0.05 per cent. copper, almost

no silver and no lead. If the ore contains also gold and it should be extracted simultaneously with the other metals, the dissolvent has to be saturated with chlorine by electrolysis, or the tailings are roasted and charged electrolytically with chlorine and the gold leached out in the usual way. Should there be water power in the neighborhood to produce cheap power for the dynamos, the manufacture of chlorine, by the patented process of Dr. Hoepfner would be so cheap, that the extra cost for roasting would be not very much increased especially as the volume of the tailings is considerably reduced through the leaching out of the different metals formerly in the ore. But following again the circulation of the liquor now charged with the various metals, it is conveyed or drawn off from the leaching drums into settling vats, where on cooling all the lead falls out, iron, arsenic, antimony, nickel, bismuth, etc., should such metals be present, are precipitated, and if the silver is not to be freed from the solution by electro-deposition, it is run over copper plates and precipitated in the well known form. The liquor which contains now only the copper, eventually also gold and platinum yet, flows in two separate streams through the baths, one passes the anodes and the other the cathodes, which consists of copper sheets. On the latter it is where the copper in the solution is precipitated, adhering to it so solid that it can be brought in this shape to the market, and if the process is conducted rightly and carefully, there should be only traces of impurities in the precipitated copper, how, analysis, made by Prof. Dr. Fresenius, the well known chemist, readily will show, although the ore used was of a very impure character:

Sulphur, 0.0004 per cent.; Iron, trace; Arsenic, little trace; Antimony, little trace; Lead, very little trace; Nickel and Cobalt, 0.0012 per cent.; Molybdenum, 0.0025 per cent.; Copper, 99.9961 per cent.

After the copper is precipitated out of this part of the solution which flows along the cathodes, it unites with the solution which comes from the anodes and is restored again into the same chemical composition as it was before entering the leaching vats, and therefore ready to perform its work over again. To make this more clear, we have to consider that the solution before entering the leaching drums, consisted of cupric chloride (Cu<sub>2</sub> Cl<sub>2</sub>) and after leaching it was changed into cuprous chloride (Cu<sub>2</sub> Cl<sub>2</sub>). (=Cu Cl<sub>2</sub> + Cu = Cu<sub>2</sub> Cl<sub>2</sub>). This solution enters the electric baths in two separate streams, one at the cathodes and the other at the anodes. The first one loses its copper in its passage through the baths and sets chlorine free, while the latter retains its copper, but is changed at the anodes from cuprous chloride into cupric chloride taking up the two atoms of free chlorine

= Cu<sub>2</sub> Cl<sub>2</sub> + 2 Cl = 2 Cu Cl<sub>2</sub>. and mixes in this combination after leaving the bath, with the solution coming from the cathodes and the liquor is therefore restored to its original form; in other words the cupric chloride solution which had 60 grammes of copper in the litre, when it was brought into the leaching drums, had 120 Grammes, when it left them and had 60 grammes again after leaving the baths. Through this it will be easily understood that the whole process constitutes a cycle, and when I said above that the Liemens and Halske process had been a great improvement on all earlier copper reducing methods, so is Dr. Hoepfner's process of still greater importance, not only that the latter has the advantage of being more economical, but also enables us to extract silver and other metals from the ores, so to say free of cost and as a mere by product.

There are already quite a number of works in operation in Europe and also some in the course of erection, which not only proved the great superiority over old smelting processes, but verified also the figures which Dr. Hoepfner gives us in regard to the production of the copper. Dr. Hoepfner tells me that in producing two metric tons 4,408 lbs of copper in 24 hours from an ore containing 10 per cent. of copper, silver, etc., the ton would cost \$36.63 or 1.56c. per pound, the silver would be free of cost. Of course these figures are taken from European works, and based on a yearly working expense of \$26,380; but if we adapt his figures to our conditions, we would arrive at a sum of nearly \$40,000; this would increase the cost of production to 2.8c. per pound. Also these figures do not include the cost of mining, by which the price of the copper would increase to perhaps 3.7c., and if the ore should first be concentrated, before giving it to the grinding and leaching department, the cost would further rise, but would be balanced again through the reduction of the grinding, leaching, precipitating, and in case gold is present, also in the gold extracting plant.

If we consider the present low market price of copper and the high production price of Lake Arizona copper, we have here a process, which will enable us in this part of North America, with our immense deposits of auriferous and argentiferous copper sulphurets, and with our almost ubiquitous great water powers, to compete with any part of the world. What a saving would it be alone for the mine owners in British Columbia, with their highly argentiferous and partly also auriferous copper ores, compared with their present conditions in being obliged to send the ore to Tacoma, or any other United States smelter, and paying as high as \$100—expenses for reducing and shipping one ton of ore—and that which they ship is principally hand picked ore, the milling ore, perhaps the bulk, goes to the dump and there is another loss on interest in money invested. Perhaps most of these milling ores could be treated directly by Hoepfner's process, or if a concentration should be of more advantage, it should be treated by the right milling machinery, with which it could be classified and separated into its different

constituents. What kind of machines for this purpose would be the best, I shall speak of in another article, if the MINING REVIEW kindly will allow me space for it.

F. HILLE, M.E. & Ch.

Port Arthur, November, 1893.

**MINING NOTES.**

[FROM OUR OWN CORRESPONDENTS.]

**Nova Scotia.**

**Caribou.**

Little news comes from this district, Messrs Dixon and Co. continue working with usual results, and Mr. Sandley, who is operating the old Lake Lode property under a lease or a bond, is also keeping his force at work. Rumor says, he recently brought 67 ozs. to Halifax, as the result of his first clean up.

Owing to internal troubles the property of the Truro Gold Co. still lies idle, a fact which every one cognizant of the property deeply deplures.

**Darrs Hill.**

Such returns from this mine as appear in the Mines Office, show a continuous falling off in the quantity of quartz raised and milled. As the vein at present runs from 6 to 10 feet wide, the tonnage seems inexplicable unless it is "estimated," in which case the average per ton is of no value.

**Killag.**

Mr. H. S. McKay, one of the owners of the old Provincial Co., paid this property a visit in the early part of the month. The shaft is still sinking, but no stopping is doing. Expectations as to the production of this mine, from the reserves opened up, have not been realized for the reason that the policy has been not to remove the reserves.

**Sherbrooke.**

There is nothing to record from this camp. The big deal mentioned in the Halifax Critic with characteristic mendacity is denied by the parties interested.

**Stormont.**

The Richardson mine promises to be the "Banner" mine of the Province for this year. The lode fully maintains its average yield, and runs from 6 to 13 feet in width. The twenty stamp mill is kept fully occupied and has a capacity of between 500 and 600 tons per month. The yield for October was 263 ounces.

Reports from the Antigonish mine at Country Harbor are favourable. The quartz maintains its average, and the new machinery works smoothly and gives great satisfaction. The changes in the plant were made by the Truro Foundry Co.

**Oldham.**

The Rhode Island Co. have decided to sink their shaft (now 200 feet deep) an additional 150 feet. Quartz taken from the slopes to the westward were poor and small. A portable boiler with engine attached is to be shipped from Rhode Island for use at the mine.

The Concord Co. has had a streak of luck. Crushings from the Galena lode, 2 feet thick, yielded 6 dwts. per ton. The lode is persistent in size and promises well.

**Molega Barrens.**

A rumor, which lacks confirmation says that Mr. Ballou of the Boston Gold Mining Co. recently milled 78 tons from a new lode which returned 111 ounces or about 1 1/2 ounces per ton. This new discovery is said to be 5 feet wide. If this is true, the district will receive a much needed impetus, and its production may be enlarged.

**North Brookfield.**

The patented process (a modification of the cyanide process) which has been on trial here with Mr. John McGuire, has not given satisfactory results. The extraction has not been so large as was expected, and the recovery of the gold has been more difficult.

**Montagu.**

The results for October work at the Nova Scotia Gold Mines Ltd. have been very satisfactory. The clean up reported was 30 ozs.

Mr. Woodhouse reports that the Symon Kaye group is looking well, and that a recent crushing was more than satisfactory.

**Quebec.**

The Canada Paint Co. and the St. Maurice Metallic Paint Co. employ close upon 50 men in the production of ochre. The works of the latter are at St. Malo, in Champlain County, and the company reports itself as being satisfied with the quantity and quality of the mineral being obtained.

Reports from the Gold district of the Chaudiere indicate the prospect of an increased activity in the near future.

Mr. Fernando Wadsworth who has been conducting exploratory work for the American Gold Company, on Lot 11 of St. Charles, and 14 and 18 of DeLery, reports satisfactorily on the occurrence of gold on the property, and that his company will extend their operations next season.

Mr. E. B. Haycock has his small mill running on ore, but returns are not available. Quartz ledges of considerable promise have been uncovered during the year. Mr. Haycock is also prosecuting alluvial operations in the bed of the Du Loup.

Mr. W. H. Walker, of the Walker Mining Company, operating in the Township of Buckingham, writes that the new machinery for the mill is now on the way, and that he expects to be mining and milling in January. The property will be taken over by a joint stock enterprise in the near future. The exhibit made by this company was one of the most complete in the Canadian Court at the World's Fair.

The outlook for asbestos shows signs of improvement. While there has been with one or two exceptions, no notable activity in production, a large quantity of the stock on hand has been sold and shipped. Most of the mines have now shut down for the winter, the Bell's and American companies being notable exceptions.

It is reported that some rich deposits of mica have been uncovered recently at the Lake Girard mine.

During the season satisfactory development work was carried on at the Beaver Lake mica mines in Little Bergeronnes, owned by Messrs. P. P. Hall and others of Quebec. The mica bearing vein, carries a width of 50 to 100 feet, and has been traced for fully a mile, showing numerous crystals of good size and merchantable quality.

The mica produced from the McGie mine at Escumains, in the Sagueny region, is being dressed in the factory of the owners at Quebec.

In the Gaspé district the Petroleum Oil Trusts continue the borings in and around Gaspé Basin. Up to the present time eight wells have been sunk, and another is given. A light green oil, of fine quality, analogous to that of Pennsylvania, has been struck in several of these wells, in small quantity, it is true, but sufficient in volume to encourage further researches and efforts. There can be no doubt that petroleum exists in this district, but of course the difficulties attendant upon operating in this line in an unknown district, comparatively, confront the management; however let us hope that the company having displayed such enterprise will eventually succeed in striking the oil in paying quantity.

Messrs. Clemow & Powell have about 25 men mining mica on their mine in the Township of Hincks. The product is reported to be of large size and in quantity. About 150 tons have been mined, a third of which will cut 4 x 6 and upward.

The extension of S. W. drift, 30 ft. level, at the Crystal pit of the British Phosphate Company, Glen Almond, has uncovered one of the three fine deposits of phosphate pierced by the diamond drill, corroborating fully the accuracy of the test holes recently made by the company. The value of the drill in mining Canadian phosphates and similar irregular mineral deposits will form the subject of an interesting paper to be given by Mr. J. Burley Smith, the manager, at the next meeting of the General Mining Association of this Province.

**Ontario.**

The mill at the Ophir mine is running on quartz and reports from the mine speak very highly of the results, the returns being about \$5,000 per week. Supt. Wallace has gone for a well merited vacation at date of writing.

Two shifts are working at the Creighton Gold Mining Company's property in the Sudbury district. The main shaft is down 100 feet and is still sinking, but no milling has been done yet.

**British Columbia.**

**Slocan District.**

Winter set in regularly towards the end of October at the mines, driving in the prospectors and closing those mines which were not protected from the severe weather; but at about 25 of the mines men are at work, intending to continue throughout the winter.

The road has been practically impassable for the ore wagons during the last three weeks; a few tons have come down on mule back, but most of the mines are holding back, waiting for the sleighing.

A few sleighs went out this morning (Nov. 16th), but there is not sufficient snow to make a good road as yet.

The Washington has 40 men at work, and 300 tons of ore ready waiting for the sleighing. The Slocan Star has 14 men engaged chiefly in erecting ore sheds, etc., and they are winning some ore. At the Noble Five 16 men are employed, and at the D. Janelles, Northern Belle, Blue Bird, Freddie Lee and several others, from 10 to 20 men are being kept at work, and from 5 to 10 to be working in the other mines during the winter.

A fair estimate places the number of miners at work at about 250, and it is estimated that as soon as sleighing commences more than \$100,000 worth of ore will be shipped monthly from Kaslo.

The following table is an accurate list of the ore shipments that have been made from Kaslo since the first of August:

Date Shipped	Name of Mine.	No. of Sacks	Gross Weight. lbs.	Valued at
Aug. 4	No. 1	.....	74,000	\$3,700
7	Wellington	.....	36,720	3,672
14	Hon Ton	.....	86	9,000
30	Wellington	.....	297	3,165
Sept. 6	Blue Bird	.....	591	80,000
8	No. 1	.....	921	66,000
12	Dardanelles	.....	265	25,262
12	Idaho	.....	223	40,947
16	Mountain Chief	.....	225	41,091
18	"	.....	1006	109,061
20	Freddie Lee	.....	731	98,000
23	Wellington	.....	289	34,247
25	Dardanelles	.....	319	34,787
25	Noble Five	.....	1933	211,126
25	Blue Bird	.....	454	60,173
28	Washington	.....	570	80,000
30	Idaho	.....	310	39,679
Oct. 5	"	.....	304	39,500
9	Miner Boy	.....	128	7,448
9	Idaho	.....	554	63,400
9	Sampler	.....	16	1,570
9	Northern Belle	.....	3	330
11	Mountain Chief	.....	280	40,000
14	Dardanelles	.....	264	25,627
21	Idaho	.....	369	40,000
21	Mountain Chief	.....	395	40,000
23	No. 1	.....	392	26,000
28	Idaho	.....	310	36,000
30	Washington	.....	754	110,000
Nov. 1	Dardanelles	.....	404 1/2	40,000
1	Alamo	.....	299	33,700
			1,570,852	\$121,238

The above list is taken from the records of the customs collector at this port. The value annexed is undoubtedly at the very lowest figure, as the duty charges are estimated according to the value of the ore.

The surveys for the Kaslo-Slocan Railway from Kaslo up the south fork of Carpenter Creek are completed and the contracts for clearing the right of way calling for the completion of the work by January 1st have been let and the men are hard at work.

The re-commencement of work on this railway it was thought would again boon Kaslo into something of the excitement which reigned here last winter. But Kaslo seems proof against excitement for some time to come. It is working away steadily paying little attention to the price of silver or to railway schemes or to anything in fact except its output of ore.

Kaslo is now a city—the seventh city in British Columbia—and is now settling down quietly to the management of its own affairs, and though for less than two years the habitation of man, she holds herself high, conscious of a history and a name.

The C. P. R. has been making strenuous efforts to reach the mines from the other side—from the north-west. The surveys for a line from Nakusp, an Upper Arrow Lake, to the head of Slocan Lake and then on to New Denver and up to Three Forks have been completed and the clearing of the right-of-way and the grading are nearly finished, while some ten miles or more of rails have been laid from the Nakusp end.

A short line from Kei Istoke down the Columbia some 10 miles, now nearly finished brings the railway to deep water thus establishing connection via Nakusp throughout the winter.

Next summer will see two lines of railway to the heart of the mining district.

The big boulder of galena is to be broken up this month and thus one of the most unique of mining curiosities will be destroyed.

It is expected that it will realize in the neighborhood of \$20,000.



(From the Miner.)

Most of those holding claims in the Toud Mountain district, assert that now that the Hall Mines Company have taken hold of their work in earnest, it will be far less difficult to secure development capital for other properties near the big mine. Some forty or fifty men are busy in and around the Silver King. The trial shipment is nearly ready, and will go out in a few days. The train line, which will be four and a half miles in length, according to the present surveys, has been located and the preliminary surveys run out. The construction work on the tram line will begin at the earliest possible period in the spring.

Mining men who have lately come in from the Slovan, say that it is difficult to estimate just what the winter output will be, as many of the mines are simply lying the ore up on the dumps. This is done to await the cheaper winter transportation. With the completion of railroads, not only will all of this be shipped out, but a considerable quantity of second hand ore that will not stand the present rates will be shipped. With competing lines of railroads to force the output to its highest capacity, the mines of the Slovan should send out several hundred tons of ore daily.

A force of men are at work on the Sloan Star, and the company figures on taking out 400 or 500 tons of ore this winter. According to present arrangements this ore will be stored at New Denver until the completion of the railroad.

(From the Kasko-Slovan Lumberer.)

The total export of ore from Kasko since the first of August aggregates 840 tons, valued at over \$155,000. The major portion of this was shipped to the smelters at Tacoma and San Francisco.

J. M. Harris is down from the Rico mine, and is positive that with a force of fifteen men he can take out \$150,000 worth of ore, with silver at 70 cents per ounce, in the next five months. At present the Rico shows up in splendid shape. There is a continuous ledge for over a thousand feet, of nearly fifteen feet of concentrating ore, 8 feet 3 inches of which will average over 200 ounces to the ton. Below the surface, showing 150 feet a 200-foot tunnel has been run in on the ledge which shows the ore body to be continuous.

The owners of the Black Diamond and Little Phil claims, in Answorth district, are running a joint tunnel to develop the two properties. The Black Diamond is owned by Chief Engineer Stevens of the Great Northern Railway, and the Little Phil by Captain Hayward and "Tom" McGovern.

The Mile Point claim below Answorth is developing into a mine, and G. R. Wright is correspondingly elated. The ore body is fully three feet wide, and the grade almost equal to the average from Slovan District. A shipment will be made to Tacoma this fall.

**Miscellaneous.**

The miners at the pits of the New Vancouver Coal Co. have acceded to the terms of the company and have returned to work.

The men at East Wellington Colliery are out on strike, demanding the same rate of wages as the miners in the employ of the N. V. C. Co.

The Strathgery Gold Mining Co. is reported to be getting a satisfactory yield from their stamps at Fairview.

Owing to severe frosts diminishing the supply of water the Van Winkle Consolidated Hydraulic Company have shut down work on their claim near Lytton.

Hon. Col. Baker, provincial minister of mines, is expected home from China Creek on Sunday, when the latest information in regard to the rich Allern gold fields, will be obtainable from an official source. Word has been received from Nanaimo, that a company has been formed there with a capital of \$100,000, in 55 shares, to operate the Sandy and Gem claims, eight miles west of the Golden Eagle mine, on China Creek. Col. Baker, it is understood, has announced that an electric tramway will be built from the Golden Eagle to the head of the creek, where it joins the canal. A smelter will be erected at the terminus and the ore brought there over the tramway for treatment. Coal will be taken in from Union, and iron ore abundance on the canal banks.

**CANADIAN COMPANIES.**

The Similkameen Gold Gravel and Exploration Company, Ltd., held their first general meeting at the office of the company, last month. The reports of the prospector and engineer were read and are most satisfactory. The ground comprising 480 acres with 2 miles frontage on Similkameen River, is entirely free from boulders, clay or cement, and best of all the bedrock shows up for over a mile on the river bank, 40 feet above the river. The gravel is of a very good average throughout, in one shaft going as high as 35 feet per yard, and being well distributed throughout. The bedrock was struck in two of the prospect shafts. The engineer's report and estimate show the cost of laying on the water to be about \$20,000, which was much less than expected. Not the least pleasing feature was the Secretary's report, which showed the cost of prospecting to be rather less than the estimated amount thus leaving a small balance in hand, a most unusual thing in mining ventures as several shareholders remarked. It is the intention of the company to push the work with all possible speed, as the extent and richness of the ground should make this one of the most valuable properties in the Province.

Siwash Creek Gold Mining Company.—This company was formed at Victoria, B.C., on 10th instant, to take over the benefits of three mining leases, dated respectively the 9th day of December, 1891, between George Christie Tunstall, Gold Commissioner, of the one part, and John P. Roddick, of the other part, recorded the 11th December, 1891, 26th January, 1893, and made between G. C. Tunstall, Gold Commissioner, of the one part, and Charles T. Dunbar of the other part, recorded 22nd March, 1893, and the 25th day of January, 1893, and made between G. C. Tunstall, Gold Commissioner, of the one part, and J. C. Keith, recorded 22nd March, 1893; all now vested in William Farrell, E. Lindsay Phillips, and Charles T. Dunbar, subject to an agreement dated the 18th day of September, 1893, between the said William Farrell, E. Lindsay Phillips, and Charles T. Dunbar, and Mr. August Pearce, and Mount Stuart William Elphinstone, to carry on the business of mining in all that remains thereto, and to procure, by purchase or otherwise, mine and work ores, minerals, and metallic substances, and compounds of all kinds, etc. Head office, Vancouver, B.C. Authorized Capital, \$500,000, in shares of \$10. The Trustees are: Chas. T. Dunbar, E. L. Phillips, B. T. Rogers, Chas. J. Lowman, C. St. A. Pearce, M. W. Elphinstone.

The Josephine Mining Company, Ltd.—This company has been registered with headquarters at Nelson, B.C., and an authorized capital of \$600,000. The objects for which the company is established are: "to carry on the business of mining, milling, smelting, and the production of ores of all kinds; to buy, sell, lease, or bond mines and minerals of every description within the United States and British Columbia; to erect and maintain mills, smelters, and all appliances for the reduction or handling of metal and minerals, and to do all things necessary or proper in connection with the foregoing objects as aforesaid."

Eureka Mining Company gives notice of application for charter of incorporation. Capital, \$290,000, in shares of \$1.00. The Directors are: James Heyden, James Stock, N.B.; Frederick H. Hall, Grafton, N.B.; Woods Carr, Woodstock, N.B. Head office—Woodstock, N.B. The object for which the incorporation of the company is sought is: "To purchase, take over, own and control the real estate, mining leases, rights, privileges, plant, machinery and property lately owned by the Britton Mining Company of New Brunswick, and to prospect, open up, develop, operate and mine the property for gold and silver, or other of said metals, and to purchase and acquire such other real estate, mining leases, plant and machinery, as may be necessary for the prospecting, opening up, developing, operating and mining the same, or any part thereof, for gold and silver, or either of said metals, and to do such other acts and things as are incident thereto; and, if desired, after purchasing said property, or so much thereof as may be deemed advisable, to sell and convey the same, or any portion of the same, and to do such other acts and things as are incident thereto. The amount of the capital stock actually subscribed is two hundred and forty thousand dollars, and the stock so subscribed is to be paid for to the company by the transfer by the subscribers, of all their right and title in and to the said real estate, mining leases, rights, privileges, plant, machinery and property lately owned by the Britton Mining Company of New Brunswick."

International Asbestos Mining & Manufacturing Company has been organized under the laws of the State of New Jersey, to work an asbestos-bearing property of 150 acres, in the Township of Denholm, County of Otsego, New York, containing \$200,000 in shares of \$100. Head office: John B. Armitage, Treasurer, (P.O. Box 928) Newark N.J. Officers: Herman Schalk, President; Otto H. Heinz, Vice-President; Frederick C. Preisel, Secretary.

The Drury Nickel Company, Ltd.—A meeting of the shareholders of this company will be held in the office of the company, Township of Drury, District of Algoma, on Wednesday 6th December next, for the purpose of appointing a liquidator with a view to the winding up of the company.

The Ridgeway Citizens' Gas Company, Ltd., is seeking incorporation. Its objects are to sink and work artesian well, to explore for and procure natural gas or petroleum, and to supply the same for fuel and light to consumers, and generally to deal with the same, and for such purposes, with the consent of the parties interested, to lay down and work pipe lines for carrying and conveying such gas or petroleum or the product thereof, etc. The operations of the company are to be carried on in the County of Kent, in Ontario, and the chief place of business is to be in the Town of Ridgeway. Authorized capital, \$24,000, in shares of \$25. Henry Porter, Jas. McMaster, Jas. Henry Melton, Zenas Watson, R. Clinton Young, Richard Renwick Lothian, John L. Wallace, all of Ridgeway, are to be the first or provisional directors.

**General Phosphate Corporation**

Meeting of Creditors—Directors Guilty of Gross Negligence—The Review's Pronouncements Fully Borne Out.

The meeting of the creditors of this company was held on Friday, the 21st ult., at Carey Street, W.C., before Mr. G. Stappilton Barnes, Official Receiver, the business being to appoint a liquidator and committee of inspection to act under the winding-up order made against the company in August last.

The accounts filed under the proceedings show total liabilities £130,682, of which £78,358 are expected to rank against assets, which are valued at £53,324, but are absorbed by the claims of the debenture bondholders. The amount of the contributions shows a deficiency of £26,974.

The Chairman, in commenting upon the present position of the Company, dealing first with the original purchase of the properties, observed that, with a paid up capital of £39,000 the directors entered into bargains entailing an expenditure of £96,000, and left themselves without a single farthing for working capital, besides being very heavily in debt. There was very little doubt but that the prices of the properties were very much larger than ought to have been the case, having regard to the fact that phosphates had fallen to a very considerable extent. No valuation of the properties had been made, and the only two experts who were instructed to report as to value were gentlemen who had previously been employed by the vendors. Under these circumstances it was not too much to say that the experts' reports were not perhaps quite so independent as they ought to have been. In December, 1890, there was an attempt to issue further capital, with the result that £300,000 of shares was taken by the public. Then came the issue of debentures, which, in his opinion, seemed the most extraordinary piece of finance he had ever seen. There was a mortgage on the High Falls group of £30,000, subsequently reduced to £20,000, running to Oct. 31st, 1895. Upon the "Ross Mountain" group there was a mortgage of £27,500, also running to October, 1895. Although there was no necessity whatever to pay off those mortgages, which could have been running at the present time at the same rate of interest as charged on the debentures, the fact remains that £200,000 was raised, and a sum of £15,000 was paid to the Anglo-American Debenture Corporation (Limited), as commission. In respect of those debentures, the company only received in ready cash a sum of £5,410, but it was fair to add that they had derived other advantages, such as the payment of current interest, etc. A peculiar fact in connection with the debentures was that a further sum of £396 was paid out for law charges. Immediately following the issue of the debentures came a further borrowing of £200,000, although there were alternative courses by which money could have been raised on the uncalled capital, etc. They came next to the phase of the Company that might be termed the "North Star." When the Company was in great straits for money, and before they made their debenture issue, at a time that they were clogged up with their own properties and unable to develop them, they went and entered into an entirely new scheme which was commonly called the North Star scheme. That was an arrangement by which the Company agreed to combine with another company and purchase properties, with a view to reselling them to a company to be formed in the future. The result of that arrangement was the expenditure of nearly £8,000 by the Company, of which sum it was not likely that anything whatever would be recovered.

A few questions having been put and answered, resolutions were passed for the Official Receiver to act as liquidator and wind up the Company, with the assistance of a committee of inspection. Mr. F. J. Leslie, solicitor [J. and H. Gregory, Leslie & Henry], Liverpool, was appointed a member of the committee to represent the interests of the creditors thereon.

**MEETING OF SHAREHOLDERS.**

The shareholders met later in the day at the Innis of Court Hotel, Mr. G. Stappilton Barnes again presiding.

The Chairman having repeated the information already given to the creditors, Mr. D. Johnson, a director who joined the Board so late as June, 1893, moved that Mr. W. O. Clough, chartered accountant, Gresham Street, E.C., should be the office liquidator. In moving the resolution, he criticised at great length the action and policy of the directors generally, and expressed the opinion that they had been guilty of negligence in the conduct of the Board's affairs, and that a searching inquiry was not only desirable, but absolutely necessary.

Mr. Smallman, a shareholder, seconded the nomination, and further commented upon the past history of the Company and the conduct of the business by the directors and officers.

Lord Stralbridge next addressed the meeting, and defended the action of the directors generally. He contended that throughout they had acted in the interests of the shareholders, and that their only object in raising money upon debentures was to prevent the properties in Canada being sacrificed by a forced sale. His lordship pointed out that although a statement had been made that the price of phosphate had dropped to 93¢. per unit per ton, he was informed that the price was 11d. at the present time. After dealing in detail with the points raised by Messrs. Johnson and Smallman, his lordship concluded by saying that the directors had acted throughout to the best of their ability, and that all their actions had been directed by the wish to avoid the sacrifice of the properties by a forced sale.

Other speakers having addressed the meeting, a vote was taken on the question, and ultimately it was announced that as Mr. Clough had the majority of the votes of those present and the Official Receiver held proxies instructing him to retain the office of liquidator, the matter should be taken to the High Court later to be decided by the judge.

### The Practical Treatment of Ores.

(Lecture at the Ballarat School of Mines.)

Much of our national wealth and general prosperity depends upon the production of our gold mines. It is therefore desirable that when the ore has been raised every care should be taken to extract the whole of its contents, and to do so in the best possible manner. To this end it is necessary that the various operations should possess some technical, as well as practical, knowledge of all the best known methods of treating the various substances submitted to them. A knowledge of the technical part of the work can be acquired in the laboratories connected with the School of Mines, but the practical work must be obtained by actual manipulation at the mines or reducing works, as the case may be, where the products are prepared for the market; and the individual who possesses some previous elementary knowledge of metallurgy and the principles of mechanics will progress more rapidly and surely in his profession than his neighbor who is deficient of that knowledge, however skillful he may otherwise be as a workman. In England the extraction of metals from their ores is a work of chemical science, and every reducing establishment with any pretensions to importance has its staff of chemists and assayers constantly at work to determine the best and most economical methods of treatment for the extraction of all the products an ore may contain, and to discover in what manner these products may be applied to equipment or to supersede more costly substances employed in existing manufactures, and to open up new industries for consuming the products won; and so keen is the research that scarcely a rock or pebble clay or ore that is not made to yield up its minute treasures to the crucible and the flask. And this is the way I want to see the unbounded mineral treasures of this great country treated by the students of this Ballarat School of Mines. Very little need be said about the methods of extracting gold from alluvial mines. The whole treatment is based upon the principle of gravitation. Gold is nineteen and a half times heavier than water. It is, therefore, only necessary to reduce the clay portions of the debris with which it is associated to a state of solution to wash it away, leaving the gold deposited at the bottom of the tub or machine in which the reduction was made. The heavier and larger waste may be separated by screens or be removed with a fork, while the remainder is washed by panning, cradling, or sluicing, as may be most convenient. In Western Australia, where water is scarce, dry blowing is resorted to, but much fine gold is lost in this process. Mr. Theophilus Huxy, a former student of this school, and now manager of some important gold mines in the Murchison district, informs me there are large accumulations of dry blowings on that field which would pay well if water could be procured for washing them, and I suppose the same may be said of the Coolgardie field. There is one peculiarity about some alluvial gold which it may be important to notice. It is that which has rusty looking spots or splashes on it, apparently oxide of iron. It is in reality an oxide of manganese, and so far as I have noticed this peculiarity is seen only on gold found or immediately adjacent to the older pliocene marine drifts, or, as miners term it, reef wash. The reefs are usually found in isolated patches, high up on the banks of the leads, and hence they are called reef washes. Sometimes, as at Rokewood, the White Hills of Bendigo, and elsewhere in Victoria, they are not near any channel at all; and I may also mention that I have never seen nor heard of an instance in which gold marked with oxide of manganese has been found in auriferous quartz veins, and consequently I think we may fairly conclude gold so

marked has not been derived from the breaking down of the quartz leads. Of late years our output of alluvial gold has greatly fallen off, and we are consequently told these deposits are coming to exhaustion; but there are hundreds of thousands of acres of this older pliocene marine drift entirely unexplored on the Victorian gold-fields; and in many places where they have been worked here in Ballarat, such as the Red Hill, the Gum Tree Flat, Sir William Don, and elsewhere, they have produced more gold fathom for fathom than the best of our deep leads. It is this old reef wash which has turned out the biggest nuggets, and there are plenty more waiting to be unearthed as soon as the Mining Department can be made to understand the importance of mapping their field. Gold is found in lodes and veins associated with ores of lead, silver, zinc, antimony, iron, sulphur, arsenic, and other substances of a retractor character, all classed under the name of pyrites, its principal matrix being quartz. To separate the gold from these more complicated treatment is required than in the case of alluvial gold. The process is first to reduce the ore by crushing; and notwithstanding the numerous patents which have been introduced of late years, the old stampers have not been successfully super-seded. The battery, as it is termed, usually consists of five stamps in one box, and each number of stamps is of different weight, ranging from 7 to 8 cwt. and be driven at from 70 to 80 blows per minute with a drop of 8 inches. The grates should be pierced at from 100 to 200 holes to the square inch, according as the gold in the stone may be coarse or fine. Each stamper will require a water supply of from six to 8 gallons per minute, or, say, from 600 to 800 gallons per ton of ore passed through. The false bottoms should be bedded in talings up to within 1 inch of the bottom of the grates, so that the crushed debris can get away as quickly as possible when it is sufficiently reduced to pass through the grating. Immediately in front of the grate suitably dressed copper plates should be laid down the full length of the stamper-box—say 6 ft. long by 3 ft. wide—and having a pitch of three-quarters of an inch to the foot. After passing over this plate the debris should drop into a well or trough (the full length of the plate) 3 in. wide by 2 in. deep, and having a baitle slip or board on edge close down on the surface of the quicksilver, with which the well is to be filled, to within half an inch of the top. This baitle slip should be so placed that the flow of the water from the quicksilver being passing on to a second copper plate and well, similar to the first. After this second plate and well, there should be about 12 ft. in length of blanket strikes, having a pitch of one inch and a half to the foot. I have tried every description of fabric for the purpose, and find gunny bags to be the cheapest and most effective. Lay them down without cutting just as you get them, with the mouth toward the low or discharge end of the table. These should be taken up and washed out every two hours. While the crushing is going on it will be found advantageous to put a 2 oz. of quicksilver into the stamper-boxes with the feed every three or four hours. I have tried various methods of dressing copper plates, including electroplating with pure silver. The dressing I prefer is as follows—First, clean the plate thoroughly with a hot solution of caustic soda or American potash, (do it with a swab, don't put your hands in it); then make up a dressing (say for a plate 6 ft. x 3 ft.) composed of 2 lbs of quicksilver, 4 oz. of sodium amalgam, 3 oz. fine gold amalgam, and 1/2 oz. cyanide of potassium—the latter two of this quantity, it is only another means for producing a dull, a daily one—place the whole in an enameled basin, pour on to it nitric acid, gradually stirring with a glass rod (a boiler gauge glass will do) until the whole assumes a thick creamy consistency; then fasten a strip of leather or india rubber about 2 in. wide over the rounded end of a piece of wood, which use as a rubber to distribute the dressing all over the face of the plate. It will adhere readily like a coat of paint, and will now be ready for use. The fine gold from the stampers will accumulate quite freely in an amalgam, and may be removed as required with a scraper; the plate should not be scraped bare, it will need redressing. After about six months' use the plate, should be sealed to remove the accumulated gold, which cannot be collected with a scraper in the ordinary way of collecting the amalgam. There are different ways of sealing the plate. One way is to lay a close cover, about 6 in. deep, over the plate, weight it down with four or five false bottoms, then turn on a strong jet of steam through a hole in the cover, which will have the effect of driving off the quicksilver and blistering the gold scale, so that it can be stripped from the face of the cover as it rises. Another plan is to heat the plate over the fire until the mercury begins to volatilize, and then remove as much as possible with a steel scraper. I do not like this process—it is decidedly dangerous to the operator. I have seen men suffer great prostration and salivation, which made all their teeth loose for days. The process I prefer is as follows—Place the plate, supported by a few bricks, over an open fire until it assumes a dull red heat; by this time all the mercury used in the dressing, and accumulated from the battery, will have fumed off. Then remove the plate from the fire, and wash it with a brush in a tub with dilute sulphuric acid. Let it stand over night. Then place it on the open fire again, until it assumes a rather brighter heat than on the first occasion; and, now, while it is on the fire, cover the whole surface of the plate, over 1/4 in. deep, with a half-and-half mixture of sal ammoniac and common salt. Let it fize until it ceases, then remove the plate from the fire, and when cool the gold scale can be easily removed like a sheet of brown paper. This roasting answers the plate, which must be

again re-dressed, as in the first instance. I have taken as much as 70 oz. of gold scales from a single plate in a way after it had been in use only six months. This scale, of course, contains several ounces (per 10 oz.) of copper. To test that copper out on the melting pot requires some hours' work. I find the best way is to boil the scales with nitric acid in an evaporating pan over a sand bath. My sand bath is an old frying-pan filled with sand placed over an open fire in the retorting chimney, or on the top of the melting furnace. I like the chimney best, because of the resulting fumes, which makes one feel like influenza. Place the evaporating dish (china is best, but an ordinary yellow crockery one from the Lal Lal pottery will do) in the sand, throw in the gold scales, and cover with nitric acid. When the copper fumes cease to rise the scale will be ready for the melting-pot. I mentioned sodium amalgam as being one of component parts of the plate dressing. There are two ways of making sodium amalgam. One is to place, say, 2 oz. of the metal sodium, together with 7 lb. of mercury, in an ordinary iron retort, put on the fire, and as soon as the mercury shows indications of coming over, remove retort from the fire, and let it cool before opening—the result will be sodium amalgam. I prefer the following plan: Place the mercury in an iron basin, over a dull fire, and as soon as it begins to warm, add the sodium in small chips, a little at a time, until the mercury is covered. When the required sodium has been added, remove the dish from the fire, and let it cool—the result will be a good firm sodium amalgam. The debris collected on the blanket-tables is usually treated with mercury, in a revolving barrel. The charge should not exceed one-third of the capacity of the barrel, and the mercury should not exceed one-third of the capacity of the barrel, and mercury should be equal to about one-fourth of the weight of the debris, which should be mixed with water to the consistency of thick-cray for the mortar, and in this state for about an hour and a half. During this stage the barrel should revolve from seven to nine revolutions per minute; after which, half fill it with water (warm water, if convenient), add 2 or 3 lb. of slacked lime. Then work it again for about two hours, driving the barrel twelve revolutions per minute; after which, wash off in a shaking table, cradle or other available appliance. A chamois leather is generally used for squeezing the mercury out from the amalgam, but a double fold of unbleached calico will do just as well, and is less costly.

### Sir George Elliot's Projected Coal Trust.

A scheme for the consolidation and common working of all the coal interests of the United Kingdom has, after years of consideration and consultation between coal experts and other eminent authorities, been laid before the public. The name of Sir George Elliot, who is the promoter and originator of the scheme, is too well known to call for comment. There is perhaps no one in Great Britain who is better qualified by practical experience to take the position of leader in the movement which he has initiated. He claims that the object of the great scheme which his scheme seeks to encompass is in no way the creation of a monopoly or trust for the sole benefit of the proprietors, but a combination which shall be a benefit not only to the coal-owners, lessees, workmen, and consumers, but to the nation at large. It is on this level that the scheme challenges consideration, and in so far as it makes good its right to this high ground, it ranks for judgment among the great political and commercial conceptions of the day. It requires no political sanction for its formation. The co-operation which it needs for success is in the first instance solely the co-operation of the coal lessees of the United Kingdom, who are invited to exchange their interest in the properties at present worked by them for shares and debentures in a United Coal Company. This company shall then undertake the working of the entire coal deposit of the country, with all the attendant responsibilities involved by the employment of so vast a body of labor, and the sole command of the home supply of fuel. The scheme works out in ably devised detail the conditions under which it is proposed that such an amalgamation of competing interests should be accomplished.

The present yearly output of the coalfields of Great Britain is 182,000,000 tons, which, at an average selling price of 7s. 3d. a ton, represents a gross value to the coal-owners and lessees of £65,975,000 per annum. From this £24,460,000 must be deducted to cover the average cost price of 6s. per ton at the pit bank. The remaining £41,515,000 represents roughly the profits which may be made under the present system of working by the coal lessees. About 20 per cent. of the quantity of coal now produced is consumed in the working of ironstone and in the manufacture of iron and steel. As a great deal of this is raised and worked by the ironmasters themselves, who would evidently have nothing to gain in joining a scheme based on any general principle of profit-making, it has been left out of consideration, and the calculation is based on the present annual output of 150,000,000 tons, estimating that the sum required to represent the whole capitalized interest of the lessees would be slightly under £110,000,000. This figure does not greatly exceed the share value of the London and North-Western or even of the Midland railway, and, in view of the fact that the amalgamated value of the railways of Great Britain would come to nearly £900,000,000, it will probably be a matter of surprise to many people to learn that the capitalized

value of the amalgamated coalfields would be so relatively small. The capital sum to be dealt with, although considerable, is not therefore of such unmanageable magnitude as the first thought of a consolidation of the coal interests of the United Kingdom would suggest. The basis of co-operation on which it is proposed to carry out the scheme dispenses with the necessity to raise any greater portion of this sum in cash than may be required to free the collieries from present obligations. For this purpose it is proposed, probably with some foreknowledge of the chances of carrying out such a proposal with success, that a body of bankers shall be formed who shall agree to take debentures, at a price to be agreed upon, from any colliery proprietor, to an amount not exceeding one-third of those allotted to him. It is a further detail of this proposal that anyone so applying for the exchange of his debentures into cash should set aside an equal amount of his shares, giving to the bankers the option of 12 months to take the same at par. The total amount of cash required will not, it has been estimated, be likely to exceed the provisions thus made for it.

The figures disclose nothing impracticable in this part of the scheme. The question of its working feasibility turns mainly upon the advantages which the coal lessees might hope to gain in return for their co-operation. Many of these advantages are obvious. In the first place, as a united body owning the whole coal wealth of the country, they would—paradoxical as the statement may at first sight seem—have a larger mass of available coal in their possession than any added computation of their individual properties would now give. A lessee under existing conditions is obliged to leave on the boundary of his royalty a solid rib of coal varying in width from 40 to 100 yards, which is a total loss alike to himself and to the nation. A consolidation of royalties, doing away with the necessity of boundaries for any but engineering purposes, would bring nearly the whole of this coal into the market, and, together with the facilities which a different method of working would give for the hauling of small coal now allowed to go to waste, would, it has been estimated, add fully ten per cent. to the annual output. This would mean, if all other conditions remain as they are, an increase of 10 per cent. upon the existing collective profits of the coal trade. But the saving in coal itself is only one of the economies which the substitution of co-operation for the present system of competitive development might be expected to introduce. The expenses of pumping, ventilation, and underground haulage are among the most considerable items of cost in process of raising coal. All of these might, it is claimed, be much reduced if the area to be treated were regarded only in the light of the physical peculiarities, and dealt with without consideration of arbitrary divisions. Briefly, the effect of amalgamation, it is contended, would be to remove all the artificial factors which now stand for so much in the sum of the coal mining industry, and to leave science and nature face to face.

With regard to management, it is proposed to create a central representative council, the unit of representation being a given number of tons of coal. Under this central council it is proposed to create about 30 district committees, which would be immediately concerned with the working of the collieries and local business of their respective districts. These committees would also be elective, and would consist of representatives chosen in a fixed proportion by the shareholders and the miners. The district committee would absorb and take over the duties of numerous existing boards of directors, and thus cause a considerable ultimate saving.

The appraisal of existing values in coal properties has been looked upon as in some respects one of the most practical of the difficulties to be met. It has, however, to be borne in mind, that such appraisal is at the present time constantly made for purposes of sale or for division rendered necessary by the death of a colliery proprietor. It is believed that a fair estimate or annual output calculated at 15s. a ton will be found to represent the capital value of the entire coal beds of the United Kingdom.

The labour which is directly employed upon the coal properties of Great Britain amounts to something not far short of a million of men. The interests of a million of human beings, who with their wives and families dependent upon them, may be estimated to form nearly an eighth part of the population of the kingdom, have a weight and importance which the dislocation of industry that has followed on successive strikes does not allow any of us to forget. Sir George Elliot has studied the coal industry on every essential side; he has a right to speak with authority upon the needs, the aspirations, and the fair requirements of the great body of English miners, and it is from the point of view of the enlightened pitman that the proposals which affect the workman's share in the new scheme have been conceived. They are put forward with a confident assurance that their adoption will relegate strikes to a closed chapter of the history of the coal trade.

The principle of admitting the claims of labor to share with capital in the profit-earning power of industrial enterprise is accepted wholly in a clause of the scheme which includes a certain limited interest upon capital as part of the working expenses, and provides that the workmen shall share equally with the coal lessees in any further profit that is made. Nothing in the scheme is more interesting and novel than the section which deals with the division of profits. The interests of the public are more directly safeguarded by a clause which admits the consumer to immediate participation in the benefits of the economy which is contemplated. The scheme accepts in

its entirety the principle of the limitation of interest, and one of its essential conditions is the provision that the price of coal shall never be raised above the figure which is required to give an interest of 5 per cent. upon the debentures, and to reach a *maximum* of 15 per cent. upon the stock, without the sanction of the Board of Trade. It has been estimated that an average selling price at the pit bank of 7s. 3d. a ton at the present annual rate of output would suffice to give the interest required. The purchaser, it is claimed, would thus be protected from the possibility of extortionate prices in the future, and in order to give full effect to this guarantee, it is proposed to invest the Board of Trade, either in the articles of association of the company or, if necessary, with Parliamentary sanction, with all functions essential to the exercise of its arbitrating powers. It is believed that, when there is but one salesman for coal throughout the country and the prices of that salesman are regulated by a decision of the Board of Trade, the fluctuations of retail price must be greatly checked, and the creation of agencies of distribution where coal could be obtained at a fixed published rate would be, like the distribution of water, a mere question of subsequent organization.

**Fan-testing Gauges**—Some notes on fan gauges in connection with fan-testing and the adaptation of fans to mines, and also a comparison of the fan and furnace at Silver Hill colliery, are given by the Rev. G. N. Capell (Transactions of the Federated Institution of Mining Engineers, vol. iii, pp. 196-200). It is considered that the most satisfactory position for taking the gauge is 6 to 10 feet away from the inlet in the larger part of the fan-drift. The German practice of deducting the works of the air due to its velocity is not considered fair. After many observations, the author advises that the end of the gauge should be plugged with cotton-wool and wrapped with soft flannel; but definite rules for the position and use of water-gauges ought to be drawn up and adhered to in all fan-tests. Where fans have taken the place of furnaces, some curious results have been observed, and this may arise from the fact that the gauge in furnace ventilation does not account for the shaft friction in the up-cast and down-cast shafts. Direct calculations probably give too high results for these factors. The author then proceeds to give the results of some tests with furnace and with fan ventilation to illustrate the difference in the gauges obtained by the two methods.

**The Ventilation of Lignite Mines**—C. Balling (Über das zur Ventilation von Grubenbauen erforderliche Luftquantum, &c., by C. Balling, Teplitz, 1891; Oesterreichische Zeitschrift für Berg- und Huttenwesen, vol. xl, pp. 101-104) discusses in detail the question of colliery ventilation, referring more especially to lignite mines. He refers in the first place to the quantity of air required at different temperatures for breathing, both by men and horses, then to that used for lamp combustion, to the absorption of oxygen by the coal, and by various animal and vegetable matters existing in the colliery. Next the question of hydrocarbons, sulphurous anhydride, ammonia, carbonic oxide and carbonic anhydride of the colliery atmosphere is considered. The influence of the temperature of the workings on the power of the workmen to perform labor is stated to be as follows:—

Rise of Temperature.	Diminution of Work done.
From 20° C. to 25° C. ....	5 to 10 per cent.
" 25° C. to 30° C. ....	10 to 15 "
" 30° C. to 35° C. ....	15 to 30 "
" 35° C. to 40° C. ....	30 to 50 "

At a depth of about 15½ fathoms there is an equal temperature all the year round, and for every 15½ fathoms increased depth there is a rise of 1° C. Even a very rapid current of air will not diminish this temperature to any marked degree. The temperature of the workings is also dependent to a considerable extent on the body heat of the men and horses in the mine, and on the combustion of the oil used in the lamps for lighting purposes. By doubling the quantity of air used, in an example given the temperature was only reduced from 24.7° to 23.7°, and then the velocity of the air current had become so great that a further reduction of temperature by this means had become impossible.

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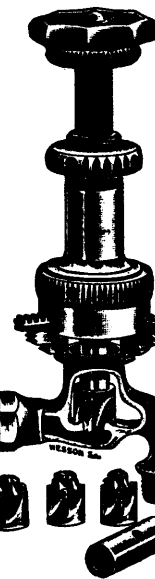
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Under the provisions of chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one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

Licenses are issued to owners of quartz crushing mills who are required to pay

Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at \$19 an ounce, and on smelted gold valued at \$18 an ounce.

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

### MINES OTHER THAN GOLD AND SILVER.

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

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

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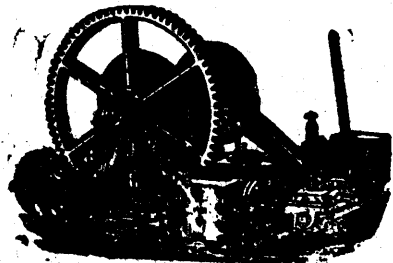
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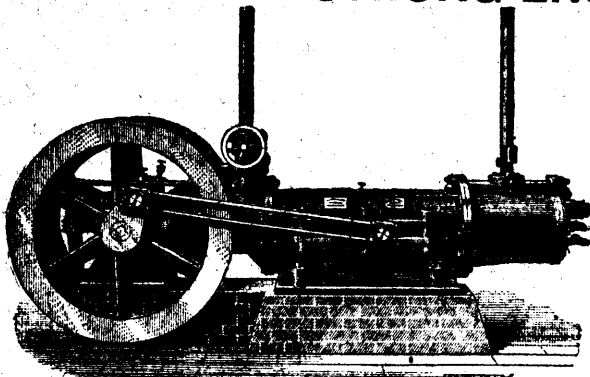
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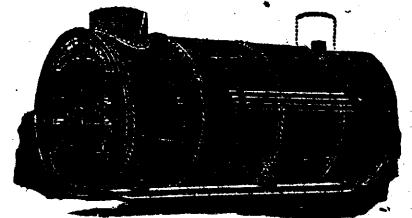
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