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Vol. X.—No. 7. 1891—OTTAWA, JULY—1891. Vol. X.—No. 7.

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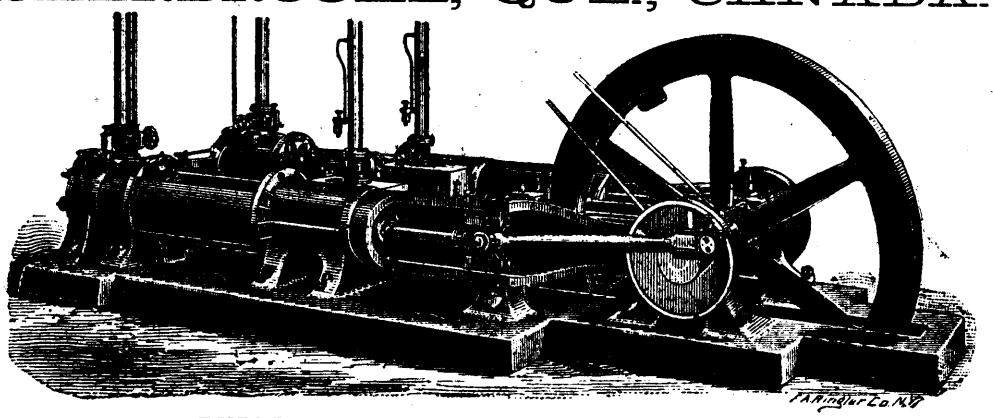

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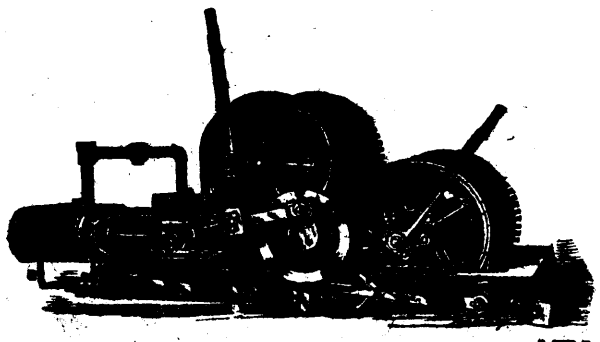

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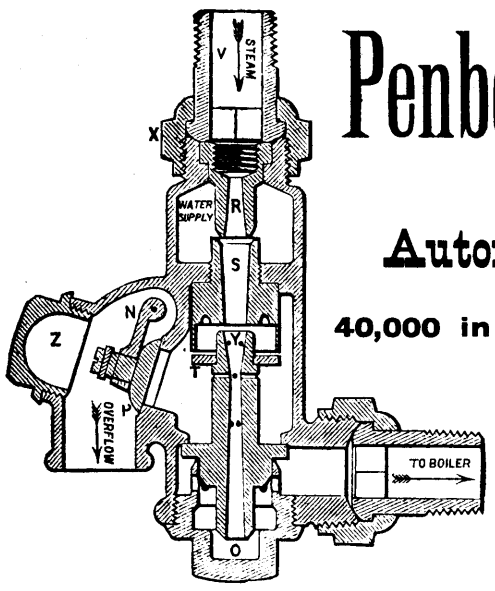

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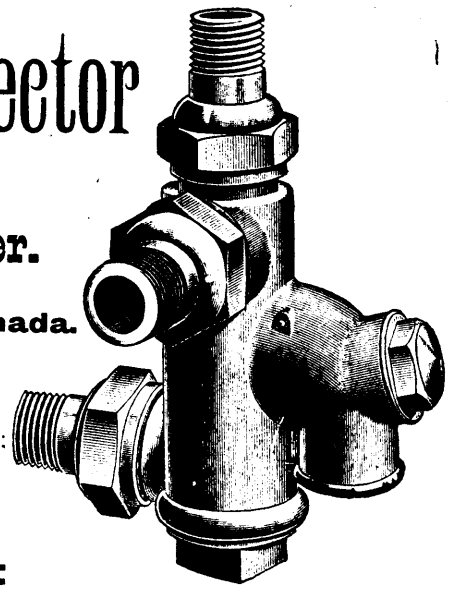

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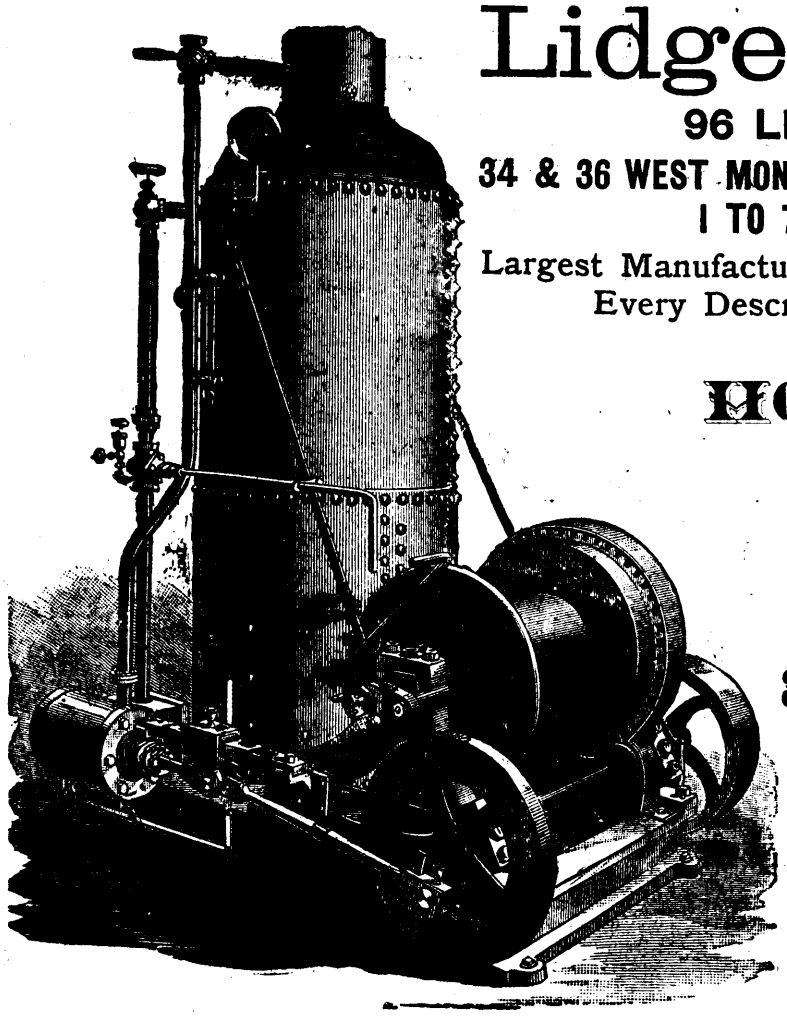

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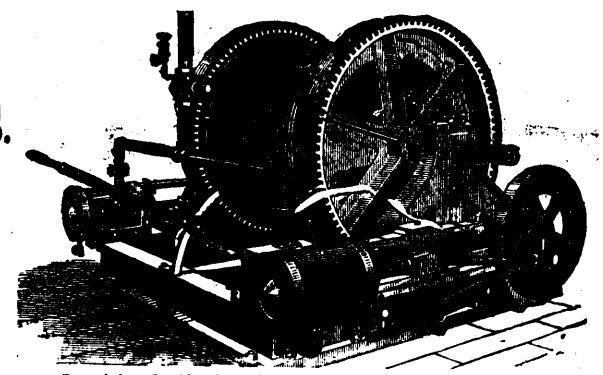

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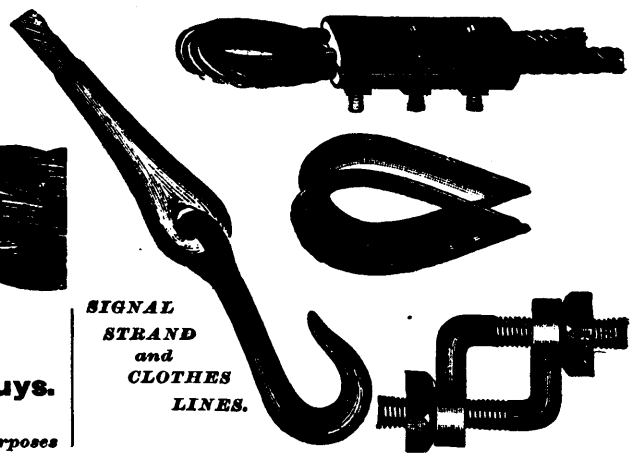

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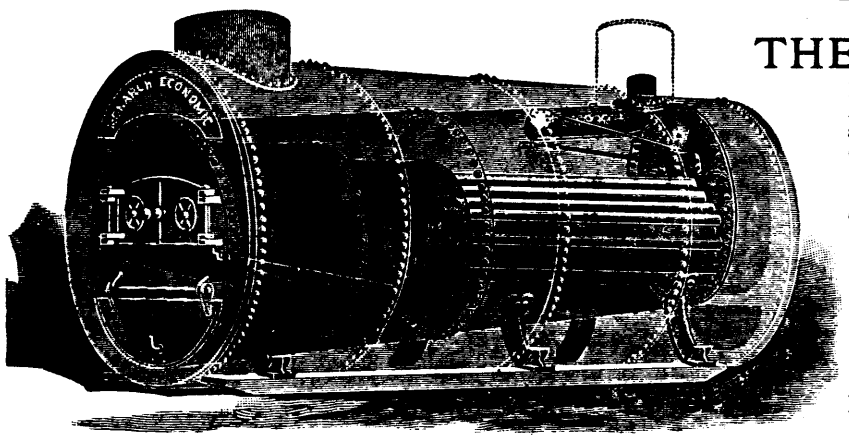

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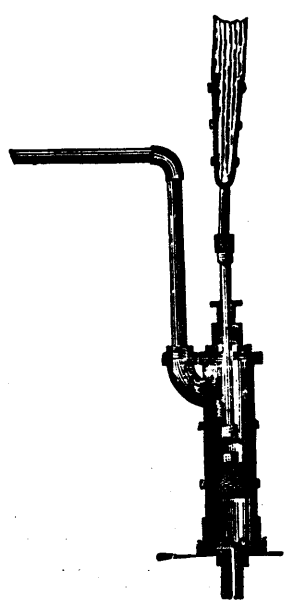

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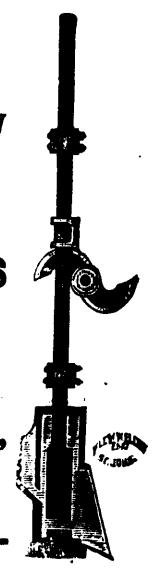

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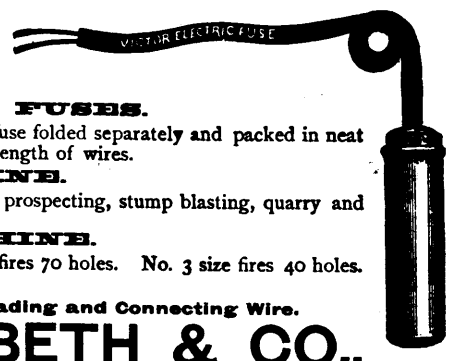

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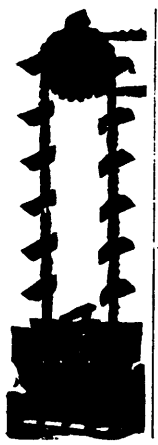

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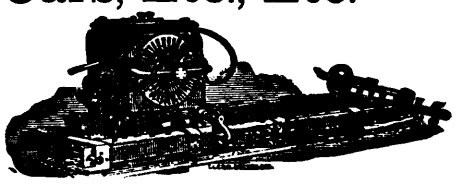

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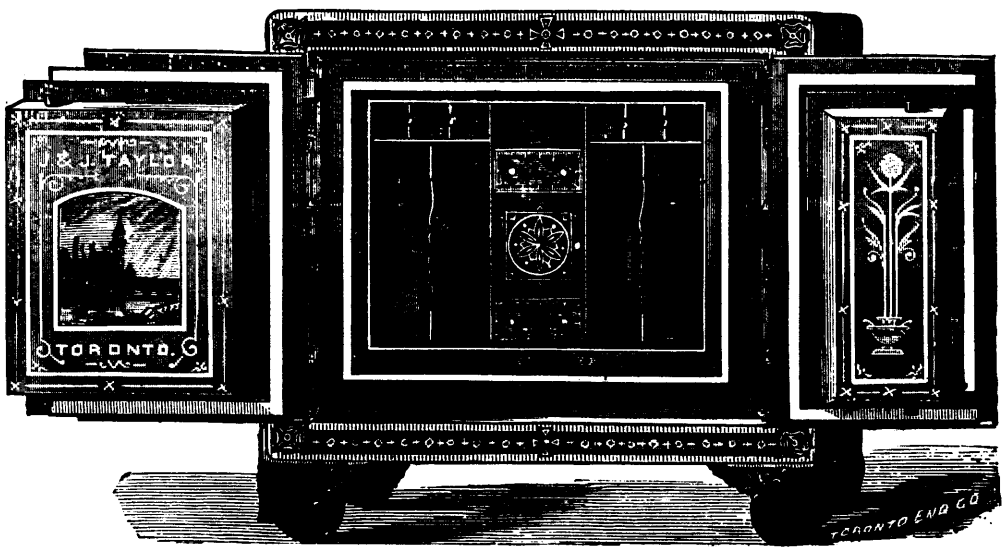

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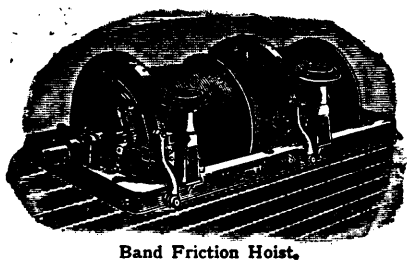

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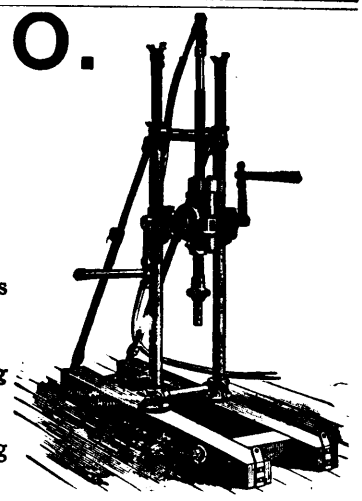

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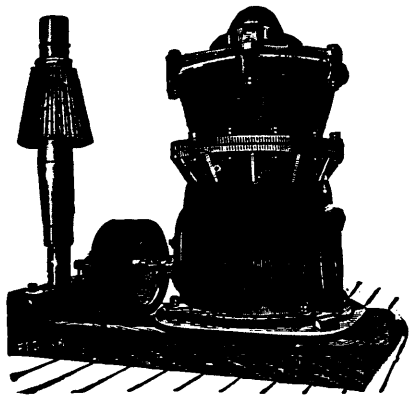

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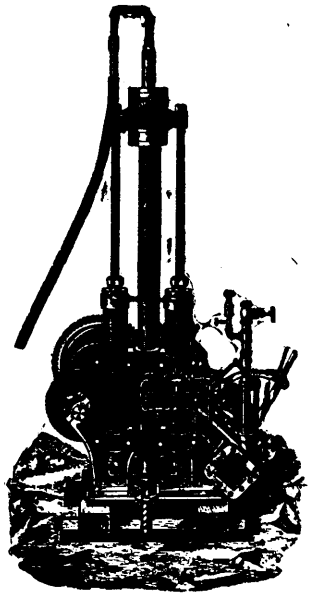

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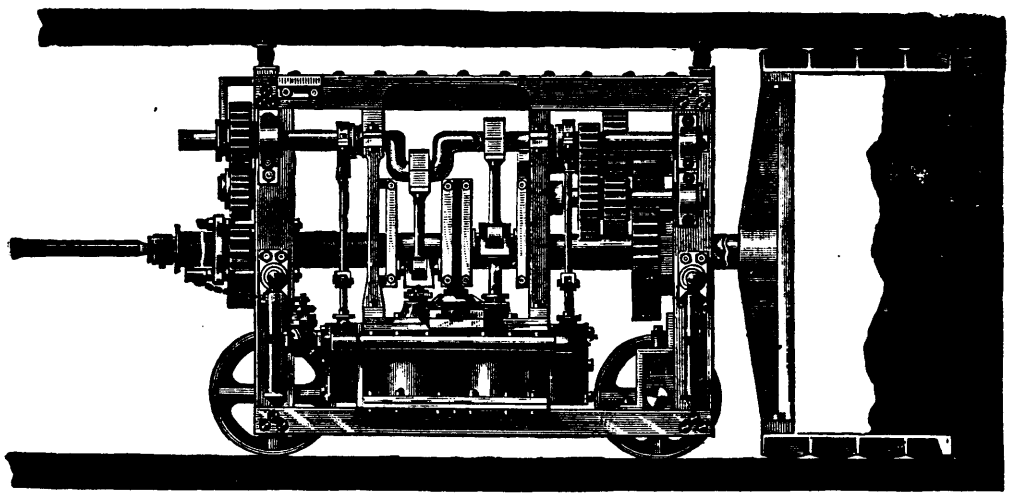

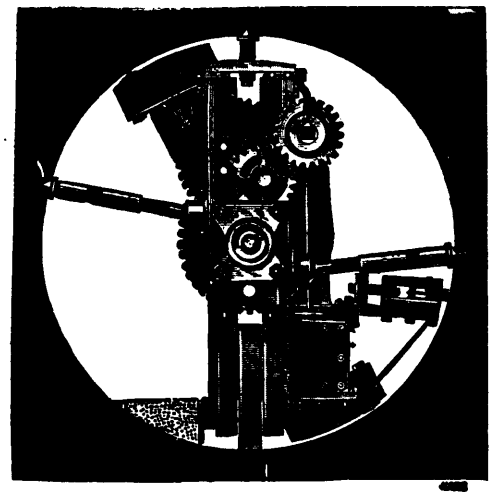

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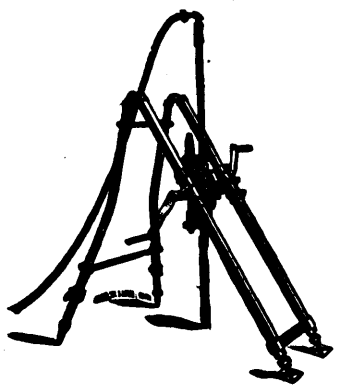

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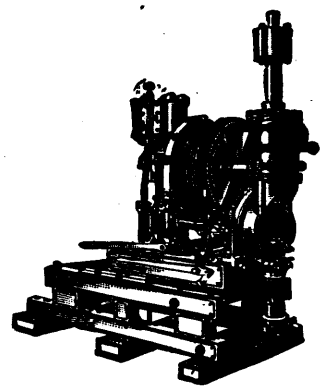

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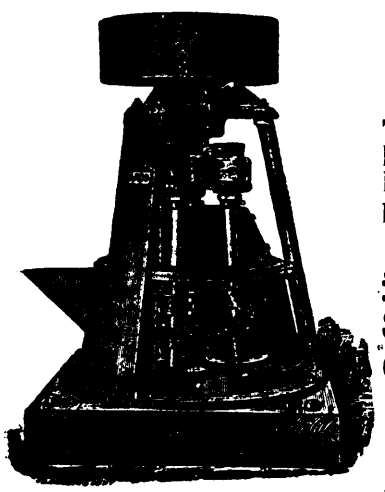

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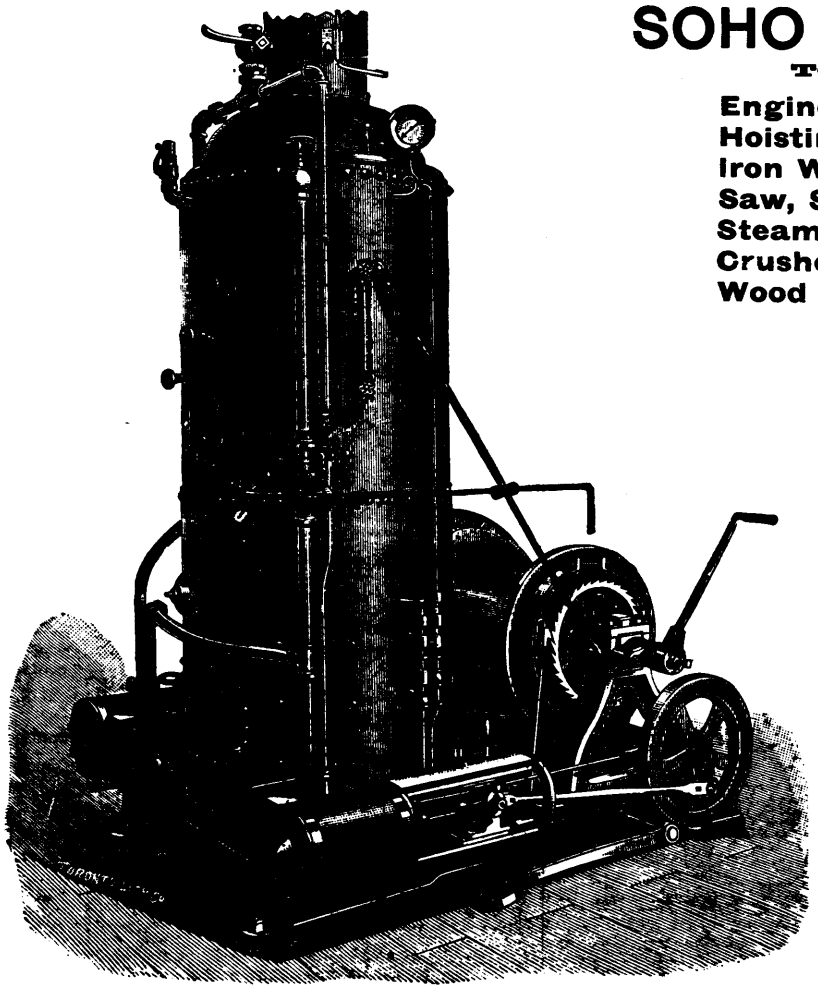

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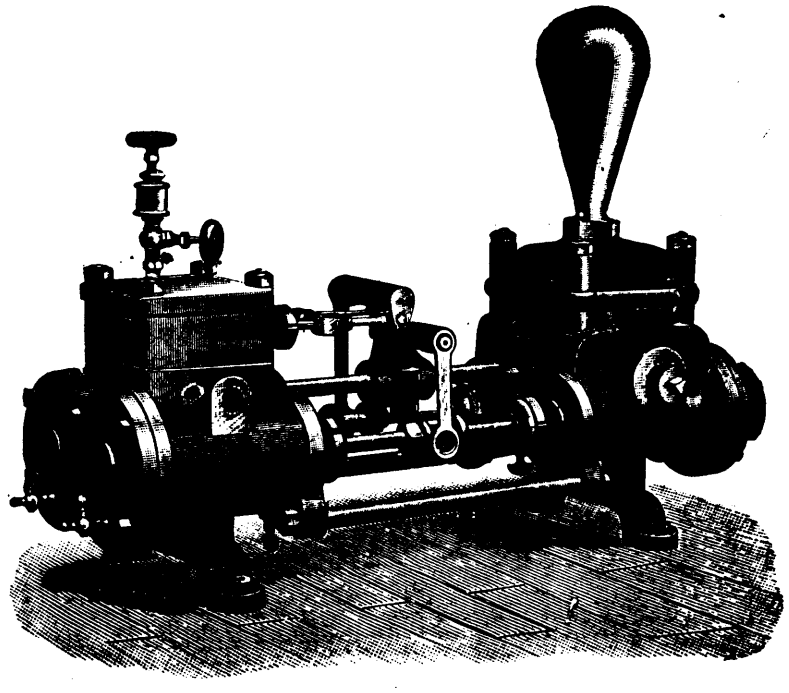

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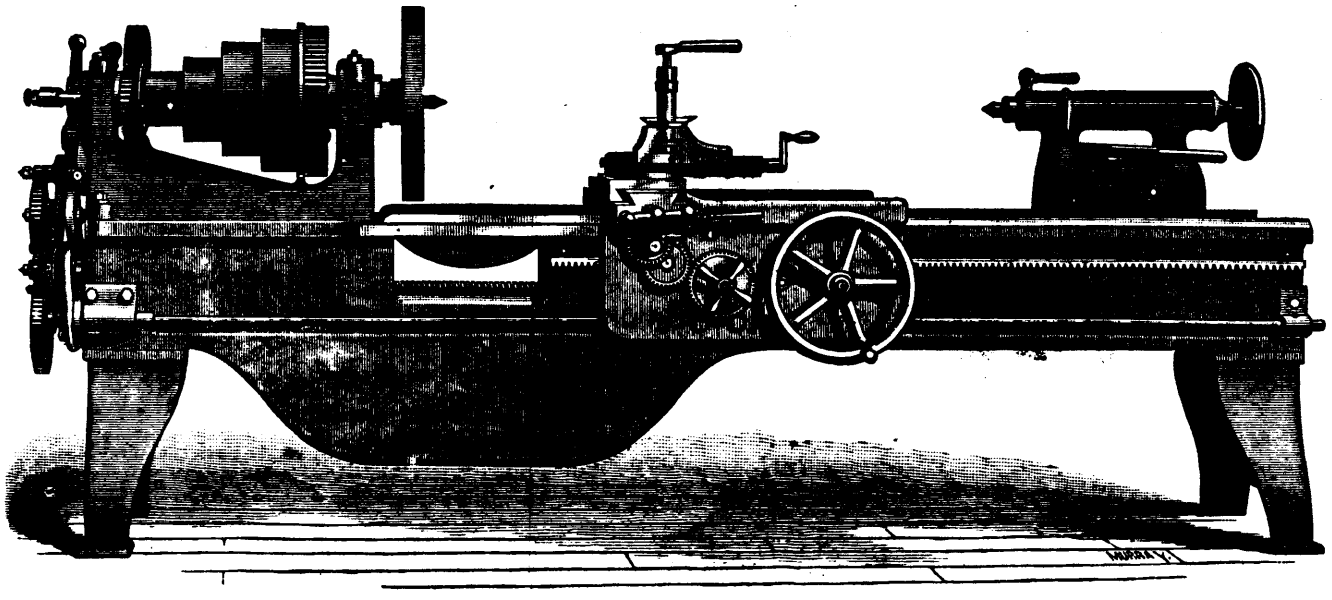

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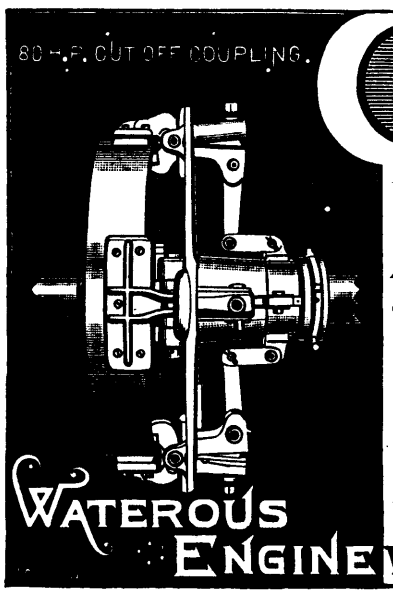

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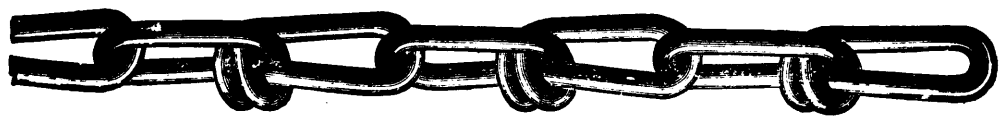

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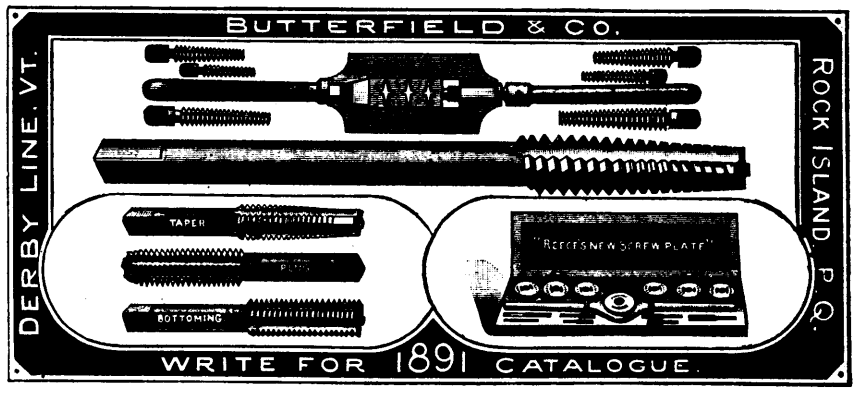

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Applications for Licenses or Leases are receivable at the office of the Commissioner of public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according 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 twelve months are issued, at a cost of twenty dollars, for minerals other than Gold and Silver, out of which one square mile can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

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

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

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

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

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

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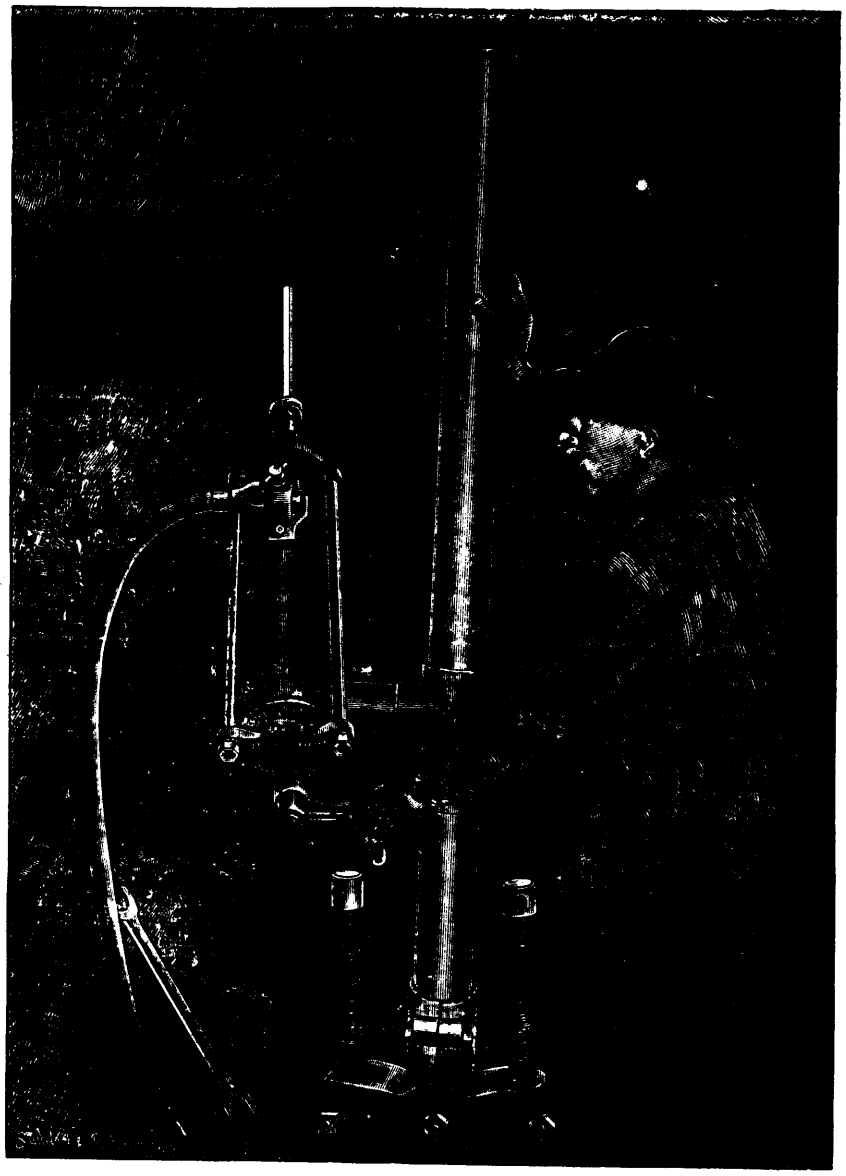

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1. In Algoma, Thunder Bay, Rainy River and that part of Nipissing north of Lake Nipissing and the French and Mattawa Rivers, the price per acre of mining lands sold after the 4th day of May, 1891, is $4.50 in a surveyed township, and $4 in an unsurveyed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

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

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

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

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

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

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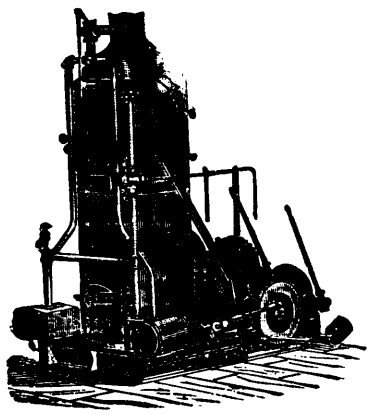

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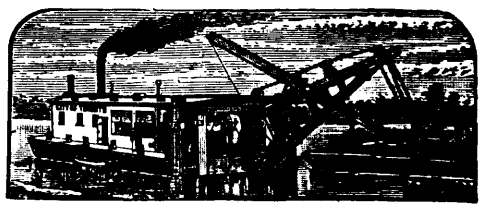

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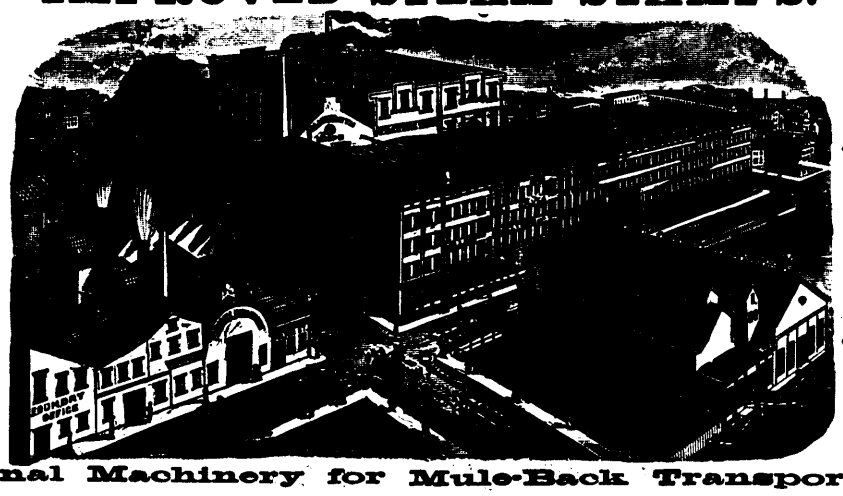

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CANADIAN MINING & MECHANICAL REVIEW

CONDUCTED BY . . . . . B. T. A. BELL.

OFFICES:

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To Our Readers and Contributors.

Owing to family bereavement our Mr. Bell has been suddenly called to the Old Country; during his absence all correspondence should be addressed to the publishers. Mr. Bell hopes to be back again by the 15th of September.

Modern Explosives.

During the past quarter of a century science pure and applied has come to the aid of almost every industrial occupation. The principles laid down by the mathematician and scientist in the cabinet have been applied in the workshop by the mechanic and chemist until the fact has become clearly known that no rule of thumb work can compete with that produced in accord with the economics of proved laws and their proper application. The cry of the miner has always been for more light. Right royal would be his road to fortune, could he tell from the inspection of an outcrop where lay the coveted pay streak, or how much per fathom the lode would yield when his shaft was deep in the ground—what would he care for faults, heaves, and cross courses, if he knew their extent and effect? However, if science has not yet been able to grant him these boons, she has placed at his disposal the modern metallurgist and assayist, electricity, and last, but not least, the high explosive, without whose aid many mines would be workable only at a loss, and many feats, such as the removal of Hell Gate and Flood Rocks, would be impossible; before dynamite and the patent drill yield rocks which were unassailable by powder and hand drilling.

Experience has so modified this benefactor, which first appeared as the enormously powerful but dangerous nitroglycerine that now it aids the miner in blasting the soft coal as well in rending the hardest stones.

Nitroglycerine at present finds its principal use in torpedoing gas or oil wells, but is familiar to the mining world under the disguise of dynamite, which contains about 75 per cent. of this explosive, associated with a material, such as wood pulp, capable of absorbing it, and thereby rendering it comparatively safe to handle if a little less powerful. This forms the earliest compound of nitroglycerine, its inclusion with an inert or non-explosive body. Much attention has been paid for a number of years to the problem of finding the best substance, in itself more or less explosive, which would, when added to nitroglycerine, render the resulting compound almost, if not quite as powerful, but much safer to handle.

Some years ago Mr. Alfred Nobel observed that the lower orders of nitrocellulose were soluble, or rather gelatinisable in nitroglycerine; experiments led to the production of blasting gelatine, gelatine dynamite, gelignite, etc. Blasting gelatine is an extremely powerful explosive, containing frequently 93 per cent. of nitroglycerine, and 7 of nitrocellulose, in itself a substance possessing explosive properties.

By varying the substances incorporated with the nitroglycerine, and increasing their proportions, the resulting explosive can be produced of almost any required degree of strength. It has been found on experiment that when a certain point is reached in the dilution of nitroglycerine by inert substances the results obtained on explosion are not always satisfactory or uniform. As remarked by Major Majendie, Chief Inspector of Explosives in England, dynamite becomes more inert when frozen, and blasting gelatine becomes more sensitive to explosion by percussion, while gelatine dynamite occupies about an intermediate position. One of the great advantages possessed by blasting gelatine over ordinary dynamite is that of not parting with its nitroglycerine when exposed to water. At present it appears probable that this compound, viewed from the standpoint of its more correct theoretical composition and more stable physical character, will gradually supplant the Kieselguhr dynamite, as that in its day supplanted the crude nitroglycerine.

Much need not be said here about gun-cotton, which excellent explosive has been adopted rather by the military than by the civil engineer. It is formed by the action of strong pure nitric acid on cotton, while collodion cotton is made from the action of dilute nitric acid upon the same substance at a high temperature.

Among the best known of the dynamite compounds the following may be mentioned: Lithofracteur contains nitroglycerine, 55 per cent.; kieselguhr, 21 per cent; charcoal, 6 per cent.; barum nitrate and sulphur respectively, 15 and 3 per cent. Ammonia powder is an excellent explosive, containing 80 parts of ammonium nitrate, 6 of sulphur, and 14 of nitroglycerine, the principal drawback being the ammonium nitrate which is hygroscopic. The explosives known as giant powders have nitrate of soda or potash as the principal admixture. Forcite is made up principally of blasting gelatine, with nitrate of soda, with sulphur or tar. It has been used extensively in the United States, and is described as safe to handle and very powerful. Hercules powder has carbonate of magnesia as the principal absorbent, and its fumes are said to be comparatively innocuous.

In 1871 a class of explosives possessing many valuable properties was brought to public notice by Dr. Sprengel. The essential principle of these compounds is the conjunction of two bodies, non-explosive when separate, one an inexplosive oxidising body, such as nitric acid, the other an inexplosive combustible agent, such as a solid or liquid hydrocarbon or its nitro-product.

As an example may be cited: One chemical equivalent of nitro-benzine to five equivalents of nitric acid, etc. These bodies, comparatively speaking, detonate by means of a fulminate with low temperatures, and of late years much attention has been devoted to their study in the hope that a substitute may be found to replace gunpowder in gassy or dusty mines. The best known of these compounds is Roburite, which has been used in the Nova Scotia coal mines to some extent. It is composed of chloro dinitro benzol, with nine times its weight of ammonium nitrate. The inventor, Dr. Roth, claims that its explosion evolves gases which so rapidly absorb the heat that the detonation becomes practically flameless. Bellite and Securite are other forms of this class. Rack-a-Rock, an explosive well known in the United States, consists of compressed cartridges of chlorate of potash impregnated before use with dead oils, or nitro-benzole, etc. The cartridges of potash chlorate are made up in cotton cartridges ready for immersion in the liquid. It will be remembered that a few years ago this explosive was successfully used in removing a large reef in New York harbor. The celebrated explosive Melinite, whose inventor, M. Turpin, is well known, has been largely used by the French government for military purposes. By agglomerating picric acid with an aqueous solution of gum arabic, etc., and by casting it when liquid into blocks, it will explode in a closed chamber such as a shell, etc., while it will resist a heavy detonator in the open air.

Experiments made in England with a mixture of equivalent proportions of ammonium picrate and saltpetre are said to claim for it explosive power equal to that of gun cotton and dynamite, readiness of preparation, and non-liability to explosion by percussion.

The report of the French government commission on explosives, shows that much attention was paid by it to the behaviour of dynamite and gun cotton mixed with substances hydrated but stable, such as ammonia alum, sal ammonica and nitrate of ammonia. As a result it appears that by mixing an explosive with substances which are non-explosive in themselves, or less explosive than the explosive itself, it is possible to diminish their power, and thus to make dual explosives which, while producing sufficient mechanical effects, do not cause, at least in the majority of cases, the ignition of fire damp. Dynamite, for instance, alone, when ignited produces heat enough to fire gas, but when mixed with about 80 parts of ammonium nitrate it is robbed of nearly all its danger, and the reduction of strength produced by the mixture still leaves it capable of blasting coal and the softer rocks. So much has now been done, and so many important principles have been authenticated by the European government commissions, that it is reasonable to anticipate in a few years the introduction of a safe, cheap explosive, readily detonated and flameless, and capable of use in all ordinary mining operations, especially coal blasting

EN PASSANT.

In another place our Quebec readers will find a *verbatim* report of the interview with the Minister of Justice, in respect of the petition anent the Quebec Mining Law.

We are pleased to state that next month we hope to give our readers an interesting sketch of the "Early History and Progress of Coal Mining in Nova Scotia," from the pen of Mr. John Rutherford, the first Inspector of Mines for the Province. Mr. Rutherford's intimate acquaintance with the coal trade makes him probably the best authority on the subject at the present time, and his article will undoubtedly be of unusual interest, not only to Nova Scotians, but to coal miners elsewhere.

The Department of Public Works has given notice to miners and others on the Lievres River, above Little Rapids, that navigation will be closed at that point on and after August 10th, in order to finish the dam now being built. The work will be conducted as far as possible without interfering with shipments, and when such becomes necessary, it will only require about a month to complete the undertaking, so that navigation should be open again about September 10th. In the meantime shippers will forward all the phosphate they can before the closing, and the temporary inconvenience will be far outweighed by the benefits to be derived in the future.

A serious case of alleged fraudulent valuation of mica shipped to the States has come to light in the past few days. A Mr. Ames, special agent of the U. S. Treasury Department for the districts of Vermont and Champlain, recently learned that a certain firm near this city, engaged extensively in the shipping of cut mica consigned to a Boston firm, who in turn forwarded part of it to Schenectady, was defrauding the Customs. He therefore had a loaded car, which had been rebilled at Boston, examined at Richford, Vt., when he found his suspicions verified, as the mica had been billed at about half of its real value. The car was seized at once, and the Canadian Customs Department in Montreal notified. It is believed that the United States Government has been defrauded of about $10,000. It is said that other seizures will shortly be made of shipments made by other firms, in order to find the length to which this system has gone.

The bill dealing with the mining of phosphate in navigable rivers in Florida, referred to some time ago in these columns, has been passed by the Legislature of that State, and has gone into force. It constitutes the Governor, Comptroller and Attorney-General a Board of Phosphate Commissioners to manage the phosphate interests of the State. Royalties are imposed as follows: On rock analyzing less than 55 per cent. phosphate of lime, 50 cents per ton; between 55 and 60 per cent., 75 cents; over 60 per cent., $1, accounts and payments to be rendered quarterly to the State Treasurer. Furthermore, the Board may grant the exclusive right to mine rock from the beds of navigable streams, within certain limits, not to exceed ten miles by course of stream, for a period not to exceed five years, preference being given to those who had begun operations in good faith before the passage of the Act. This law will doubtless give rise to much litigation between the State and many companies, which claim vested rights in the river phosphate deposits. The trouble in South Carolina between the State and the Coosaw Mining Company is still unsettled, and the river industry there is practically at a standstill, so that the output of phosphate from these two States is not likely to amount to large proportions this year.

Mr. T. Shaw of gas-tester fame again favors us with a letter on that thread-bare subject, which in accordance with his request we reproduce. The matter was thoroughly thrashed out in our last issue, and we really do not see the good of continuing a discussion that has degenerated from the main issue to fighting over the meaning of a chance phrase. As Mr. Shaw is so well versed in bygone persons and events, we might remind him of a much more recent character, that celebrated lawyer "who could distinguish and divide a hair 'twixt south and south-west side," mentioned by Samuel Butler—a comparison perhaps more apt than that of the Emperor Basilius and his preserver. To carry this study of ancient personages a little further, we would commend to Mr. Shaw's consideration the study of the sixth proposition put forth by one Euclid—which line of argument he seems to have tried to follow—when he will at once perceive that the *reductio ad absurdum* is to be practiced on the opponent's arguments and not on one's own—a fact he hardly seems to be aware of. Apart from this, we must deprecate any further "splitting of straws," which cannot but engender more ill-feeling, if either party has anything further to say on the main question we shall be happy to publish it, but we think that the wisest course is to let the matter drop. Each has let the other know the opinion he entertains of him, and if they argue until the day of judgment they can do no more; neither will either be convinced or put in the wrong.

The intended autumnal meeting of the American Association of Charcoal Iron Manufacturers at Niagara and Toronto early in September, will afford an opportunity for discussing estimates and considering the prospects for the erection of a charcoal furnace in the eastern section of Ontario. The Association has been invited by the Toronto City Council to visit that city on their usual excursion, and thence proceed to the Haliburton district and view the magnetic ore mines there. The members will extend their excursion eastward to Kingston and thence to the Chateauguay iron mines and forges in the Adirondacks. At Kingston they will be entertained by the Board of Trade. The Association aims at making these annual reunions profitable rather than merely pleasurable, by interchanging experiences and knowledge. Their labors have resulted in the improvement of charcoal furnace construction and management to a remarkable degree. This is no doubt mainly due to the zeal of Mr. John Pirkinbine, Secretary of the Association and President of the American Institute of Mining Engineers. The visit of the Association can scarcely fail to give birth to the construction of ore charcoal iron plant, and although Mr. Birkinbine has put himself on record against the erection of "blast furnaces as town attractions," no doubt any objections on that score will be eliminated from the discussions at Kingston and Toronto, and the superiority of town sites to those in the vicinity of wood and ore will be proved in the estimated expenses of management.

A discovery that may prove of vast importance to the nickel interests of Sudbury, is claimed to have been made, whereby iron and nickel can be produced by precipitation. The originators of the process appear to have been Messrs. Mond, Lang and Quincke, who have obtained nickel of a high quality by the action of carbonic acid upon very poor ores. A French scientist, Mr. Berthelot, has further advanced the discovery, and has effected a similar combination with iron. According to him, the process is not limited in its scope to any metal, and it is consequently of great value in the production of such rare metals as nickel. So far the success of the experiments has been complete, and from all appearances there is no reason to doubt that the results will be as satisfacrory when applied upon a commercial scale. The value of such a process to our nickel mines would be very great, and further developments will be awaited with interest.

The depression in the phosphate market still continues, the tendency of all phosphates being decidedly lower. Latest advices from England state that Florida 75 to 80 per cent., is being "hawked about" at 11d., last quotations give Canadian 80 per cent. at 1s. It is expected, however, that the Fall trade will bring about an improvement in the market.

The statistics of the British Iron Trade Association for 1890, compiled by the Secretary, Mr. James, show that the iron trade holds its own very fairly, notwithstanding the increased output of steel, and in some countries, notably Russia and Austria, is making greater progress. The total production of pig iron in Great Britain last year was 7,875,130 tons, or 1,327,573 tons less than the United States, and the consumption, 7,294,684 tons. The make of Bessemer steel ingots last year was 91,000 tons more than of puddled bars, the respective figures being 2,014,843 tons and 1,923,221 tons. The number of puddling furnaces in operation was 3,015, or 331 fewer than in the preceding year. The average production per furnace was 637 tons as compared with 673 tons in 1889.

Our August issue will be published on the 15th, a little earlier than usual. Will contributors kindly send in their matter before that date?

Our Portrait Gallery.

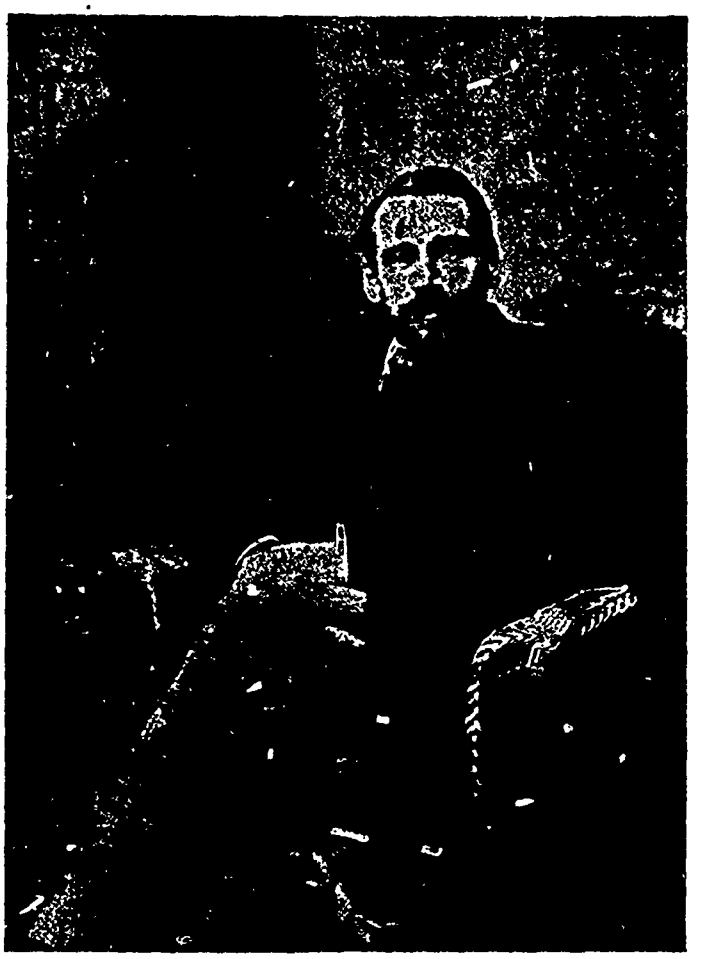
(A series of portraits and biographical sketches of Canadian mining engineers, mine managers, inspectors, geologists, explorers, etc.)

No. 13.

G. M. Dawson, LL.D., F.R.S., F.G.S., etc., Assistant Director of the Geological Survey of Canada.

Although yet but a comparatively young man, Dr. G. M. Dawson has earned an enviable reputation as a geologist and scientist, and in recognition of this he has lately been appointed to represent England, jointly with Sir George Baden-Powell on the Behring Sea Commission.

He was born in Pictou, Nova Scotia, on August 1st, 1849, and is the son of Sir William Dawson, Principal of McGill University, Montreal, whose researches in geology are well known. Dr. Dawson's technical education began at McGill College and was completed at the Royal School of Mines, at each of which he obtained his degree. At the latter he held the Duke of Cornwall's scholarship, given by the Prince of Wales; he also took the Edward Forbes medal in palæontology, and the Murchison medal in geology.



Yours very truly
Geo. M. Dawson

The first work of any importance in which he was engaged was in 1873, when in the capacity of geologist and naturalist to Her Majesty's North American Boundary Commission he investigated the country in the vicinity of the boundary line between Canada and the United States from the Lake of the Woods to the Rocky Mountains. The information thus gathered was, at the end of the Commission's work in 1875, published in the form of a report entitled "Geology and Resources of the Forty ninth Parallel," and this amongst other things gave the first detailed account of the Souris coal fields, though some of the sections along the Souris bed had previously been visited by Dr., afterwards Sir James, Hector. The economic results of this were important as setting at rest the question of a fuel supply for the prairie country. In July of the same year began his connection with the Geological Survey, with which he has ever since been identified. His first important trip in his new appointment was to British Columbia, where, until 1879, he was engaged in the exploration and geological survey of the Province. This has been the scene of his labors ever since, with very little exception, and the knowledge obtained of the geological structure, and the geological mapping of British Columbia, so far as it has gone, is almost entirely due to the energetic work of Dr. Dawson. From that time until 1882, he continued his labors in that Province and in the North-West Territories. In the latter year he went to Europe, where he travelled extensively, visiting mines, metallurgical works, museums, etc. His most arduous journey after his return was with the Yukon expedition, of which he was selected by the late Hon. Thos. White to take charge; a very complete report of which has recently been published by the Geological Survey. The route he chose for himself, although of a most difficult nature, was taken as that most likely to afford the most information regarding the geology of the vast and virtually unknown tract of country he was about to explore. His journey was 1,300 miles in length, from the mouth of the Stikeen River, by way of the Dean, Upper Liard, Pelly and Lewis Rivers back to the coast. Nearly the whole distance was traversed by following the rivers; some of these had in former years been used by the Hudson's Bay Company, but they had long been abandoned as a trade route, and were at the time of his expedition almost unknown geographically. The difficulties encountered were very great,—boats had to be built at several points, and one portage of fifty miles was made through the woods in crossing from the drainage-basin of the Liard to that of the Yukon,—but all were surmounted and the expedition successfully accomplished its work.

Details of Dr. Dawson's travels throughout British Columbia and the North West will be found in the Reports of the Geological Survey. He is the author of fifteen separate reports, of which the following may be referred to as of most importance: On the Queen Charlotte Islands, including as an appendix a monograph on the Haida Indians (1878). On an exploration from Port Simpson on the Pacific Coast to Edmonton on the Saskatchewan (1879). On the Region in the vicinity of the Bow and Belly Rivers (1882-4). On the Physical and Geological features of part of the Rocky Mountains (1885). Notes to accompany a geological map of the Northern portion of the Dominion of Canada (1886). Author (with Dr. Selwyn) of Descriptive Sketch of the Physical Geography and Geology of Canada (1884). Author (with Dr. W. F. Tolmie) of Comparative Vocabularies of the Indian Tribes of British Columbia, with an Ethnological Map (1884). It is unnecessary to particularize the numerous and valuable original scientific papers on the geological, geographical and ethnological observations made in the course of his explorations and contributed to various scientific journals; their value is well known and fully appreciated.

Dr. Dawson was last year granted the honorary degree of LL.D., by Queen's University, Kingston, and the Bigsby medal of the Geological Society (London) has lately been awarded him in recognition of his services to geology, but the chief distinction accorded him was his recent election as a Fellow of the Royal Society of England. If his success so far be taken as an earnest of his achievements in the future, it may well be expected that he will rise to a position yet more distinguished than his father, a prediction that implies a high place in the ranks of science.

A committee appointed some time ago by the Belgian government to draw up regulations for the control of explosives, has just presented its report. There are at present eight gunpowder factories and five works producing dynamite in the country, the output of the former being 2,500 tons, and of the latter 250 tons per annum. Under existing legislation anyone may purchase dangerous explosives, and even the miners buy their own dynamite for use in the coal mines. The government has adopted the report and will put into effect the provisions suggested. Special permission will have to be obtained in the future for the manufacture and sale of dynamite, and the licenses now issued will be of no value; the retailing of dynamite will be prohibited, and mine owners and managers will be obliged to supply the miners with dynamite as required; restrictions will also be placed on the sale of gunpowder. In order to keep a record of purchases, each dealer in explosives will have to keep a register containing the names of buyers. The enforcement of these regulations will, it is hoped, greatly reduce the number of accidents due to careless handling and indiscriminate sale.

CORRESPONDENCE.

Editor Canadian Mining and Mechanical Review.

SIR,—In your June number you insert considerable correspondence on the Shaw gas tester which is fair to all parties. Your editorial observations, however, are not warranted by any single feature in the correspondence. Mr. Poole's letter, page 149, centre column, makes mention of a proposition to remove a bulk of air and gas through a ¾ inch tube, when in reality, the full area of gangway is required for its removal. This is too ludicrous to make other answer to, further than refer him to his own problem, which, since it originated in his own brain and is one of those particular conundrums that others give up, it will be in order for him to explain.

In reference to the pent up gases, it is rather late in the day for Mr. Poole to give instructions in this well known feature, understood by every person who works in or about a mine.

In reference to the report on the Springhill disaster, I had nothing whatever to do with the report, and was not aware of its existence until I read it in the American papers which copied from the Canadian papers. The facts as I have learned from private sources, are, that the jury rendered a verdict, but before retiring made a written recommendation, which they had a perfect right to do, if, in their judgment, these horrible accidents from explosive gases could be in any wise prevented or lessened in the future.

Your readers may be curious enough to inquire what possible motive can actuate Mr. Poole to ventilate his grievances in public and to assail his personal friend, whose only offence consists, first, in advocating in strong language safety measures to protect life in mines; and secondly, in seeing danger where Mr. Poole rests in full confidence of safety, which makes such a wide difference of opinion between these gentlemen, that, time and circumstances alone can settle this question to Mr. Poole's satisfaction. Unfortunately Mr. Poole is grossly offended at his friend's impulsiveness, and he now gives a sort of public notice to friends and others, that if, in the future, they ever see him in any real or imagined danger, they must approach him in the most delicate and ceremonious manner, or suffer his eternal condemnation with possible public ventilation. In short, I believe that the friend who attempts anything of this kind with Mr. Poole may feel in as bad a plight as the gentleman who thought that his Emperor Basilius, was in danger, when his horse ran away dragging the unfortunate Emperor by the stirrup, which stirrup the citizen promptly cut with his sword, and for which unceremonious act the ungrateful Emperor promptly ordered his execution.

All I have claimed to have done in connection with this matter is to have solved one of the most important problems on the question of "dangerous gases," in providing an instrument that weighs and measures explosive gases as readily as a druggist's scale weighs solids, thus placing this important question of "dangerous gases in mines," beyond the pale of guesswork, and bringing the subject within the realm of exact science, in a manner so simple that it can be operated by the unskilled, to protect life and property in all the mining districts of the world.

Yours truly,

THOMAS SHAW, M.E.

P.S.—Your editorial observations and Mr. Poole's remarks necessitated a reply from me, which, in justice to all parties I trust you will insert in the columns of your next issue.

T. S.

PHILADELPHIA, July 7th, 1891.

Combustion of Coal.—As one practical result of his investigations into the combustion of coal, M. Scheurer-Kestner found that, while from eleven to thirteen per cent. of the heat is carried up the chimney, the heat absorbed and radiated by the brick work setting of steam boilers attains from 17 to 27 per cent. of the total amount produced. Starting from this, MM Mattieu Freres, of Mulhouse, have devised their "Gorgones Calorigenes" cast iron pipes enclosed in the masonry, and put into communication with a fan for utilizing the heated air. They claim to have arrived at such a regime for the air current as shall abstract the same amount of heat as that given off by the masonry, the latter giving off no less if the apparatus be not employed.

A Remarkable Run of Iron. The Mancelona (Michigan) *Herald* says. Stack No. 2, blast No. 1, of the Antrim Iron Furnace, completed the third year of its present blast April 15. Number of days in blast, 1050; and the total product during that time amounted to 66,347 tons of pig iron—a daily average of 63⅓ tons. A trifle over a year and a half of this run—or, to be exact, 582 days of it—the stack was blown with a small Weimer engine, with a product of 32,326 tons, a daily average of 55⅔ tons. The balance of the run—468 days—was made with a large engine of the same make, during which time the product amounted to 34,521 tons, a daily average of 72⅔ tons. To make this amount of iron, 115,410 tons of ore were used, and 146,000 cords of wood consumed. Had the stack been blown during the entire period with the large engine, the total product would, of course, have been much greater, but the record is a remarkable one, nevertheless, and it is believed that no charcoal stack in the United States has ever made so long a run or so large an amount of iron with a single lining.

The Quebec Mining Law.—An Influential Deputation from the General Mining Association Waits on the Minister of Justice and Asks for its Disallowance.

The Petition prepared by the General Mining Association of the Province of Quebec, having been presented to the Privy Council, and a hearing being granted by the Hon. Sir John Thompson, Minister of Justice, the following deputation attended at Ottawa on the morning of Friday, the 17th inst.: A. Desjardins, M.P., Montreal; W. B. Ives, Q.C., M.P., Sherbrooke; Hon. George Irvine, Q.C., Quebec, President of the Association; C. Magee, Managing Director Bristol Iron Co., Ottawa; J. Lainson-Wills, Manager General Phosphate Corporation; Capt. Robt. C. Adams, Managing Director Anglo-Canadian Phosphate Co., Montreal; Hector McRae, Ottawa, and B. T. A. Bell, Secretary General Mining Association. The members were received by Mr. Robt. Sedgewick, Q.C., Deputy of the Minister of Justice, at half past ten o'clock.

HON. GEO. IRVINE, Q.C., said: There are three grounds upon which we seek to have this Act disallowed. 1st. We claim that it is an unreasonable law because it deprives people of their vested rights in property for which they hold a title from the Crown itself. 2nd. That it is contrary to the general interests of the Dominion and to the policy of the Dominion Government. I presume that that would be a principle governing the disallowance of the Act, because it would produce chaos if the provinces were allowed to adopt Acts which nullify the policy of the Dominion Parliament and Government. 3rd. Because it tends to so impede, and in many cases to put a stop to the exercise of an industry which is of great importance to the whole Dominion. Now with reference to the claim that it takes away private property, that is most easy to understand and the simplest. In 1880, an Act was passed regulating Crown Lands generally, and having a particular reference to mining. Prior to the passing of that Act, it had been universally admitted and judicially decided, and the whole course of the jurisprudence of the country, as well as the management of the Crown Lands Department, and the regulations made by them, went to establish that where lands were granted without a reserve of minerals, all the baser metals—except gold and silver—became the property of the lessee. There is no doubt about that. Mr. Irvine here cited several important legal decisions in support of his contention.

MR. SEDGEWICK—If a seignior owns land in the Province of Quebec he may convey his interest and reserve the mines.

HON. MR. IRVINE—No; they cannot do that.

MR. SEDGEWICK—Well, they can do it here and in all the other provinces.

HON. MR. IRVINE—You have no seignorial tenants in the other provinces.

MR. SEDGEWICK—But if you own a piece of property in the Province of Quebec, can you not reserve for yourself—an easement we would call it—for the purpose of having something off it?

HON. MR. IRVINE—The holding of the seigniory under the Feudal Rights is different from the holding of lands under the Crown. The former were made with a view to settling the country, copying the old style which still exists in France, and they were bound, whenever an application was made by a settler to make a grant to him, subject to an annual rent. One of the questions put by the Crown to the Court in one of the cases I have referred to was, whether, if a seignior reserves the baser metals in making a grant, would that reserve be legal. The Court held that it would not; that the property of the baser metals would go to the tenant censataire.

MR. SEDGEWICK—That was in consequence of the original grant under the Feudal law to the seignior.

HON. MR. IRVINE—I refer to that for the purpose of showing that a long time back the jurisprudence of the country held that the property in the baser metals, where they were not reserved, went to the owner of the soil.

MR. SEDGEWICK—I suppose you are giving that particularly because the Act alleges that all the mines in the province belong to the Crown. Is there any authority with respect to the argument in the Act?

HON. MR. IRVINE—Not in the slightest. In the case of the Queen v. DeLery, the question was the ownership of gold. In the original grant to DeLery there was no reservation of the precious metal, and it was argued that gold was included in the grant to the seigniory and that it followed that it went to the censitaires when the land was conceded to them. Later on the DeLery family, who were the seigniors of that property, made application to the Crown for a grant of the gold, and letters-patent were made out and they have held possession of the gold deposit ever since, under that title.

MR. SEDGEWICK—Was this in Lower Canada?

HON. MR. IRVINE—Yes, in the district of Beauce. There is gold there, they are working at it now, and at one time there was a fairly large development. In that case (the DeLery) it was held that the ownership of the gold did not pass to the seignior, therefore it did not pass to the censitaire.

MR. SEDGEWICK—But the Court of Appeals held that that did not apply to the baser metals that belong to the land. I do not think there can be any doubt but that everything does pass, unless expressly reserved.

HON. MR. IRVINE—The Act of 1880, provided, "That all grants which were made subsequent to the passing of the Act shall not be necessary to make a reserve of minerals when they were held to be reserved, that being so stated." Well, that of course was perfectly legitimate legislation, because it did not affect any vested rights, and anybody taking a grant took it subject to that legislation. But there was an important provision in that Act, *i.e.*, that if a man took a grant from the Crown under ordinary circumstances, that is for agricultural purposes, in which, under the Act, the mines shall be reserved—if such a person afterwards discovered minerals on the lot, he would have the right to obtain title to them by paying the difference between the agricultural price and the mineral price.

MR. SEDGEWICK—Did the province fix the price?

HON. MR. IRVINE—It fixed the price of the mineral lands, but the agricultural price varies. So that you understand everyone who obtained a grant of land previously was owner of the minerals under the general principle, but that everyone who obtained land after 1880 were not owners; but they had the right to purchase at the price fixed by the province. They would have the right when they discovered minerals upon it, to purchase the land by paying the taxed price. This was done in a property in which I am interested. This old Act was not objectionable for it interfered with no vested rights which came into existence after 1880. You will see, therefore that there are several classes of persons to be considered. Those who hold land under old grants; the holders of land under old titles, in which titles the lands have not been reserved to the Crown——

MR. SEDGEWICK—I would like you to give me some evidence. You might, for instance, give evidence that you hold some lands under titles in which there is no reservation of that kind.

HON. MR. IRVINE—I can cite you a case of one of the best asbestos mines in the Townships, where the owners hold, and their predecessors held, their lands since 1802. The original grant was made in 1802, and descended by a regular chain of titles from the King family. They owned it for some twenty years before minerals were discovered, and they are now in the condition of persons holding land under a title direct from the Crown, in which the minerals were not reserved.

MR. MAGEE—I could cite another case where there is a very serious complication arising out of the operation of this new Act. Parties owning patented lands leased them to mining men at a certain rental per annum. These parties continued work for a number of years and the lands again pass into the third and fourth hands. I represent the Bristol Iron Co., and we are really the fourth purchasers—that is, we took an assignment of the original lease of the mining rights (a 99 year's lease), paying a rental. We erected machinery and plant and have considerably developed these mines, investing quite $150,000. We then got an opportunity of leasing, not only giving an assignment to all our rights in the mines, but of leasing our plant and machinery for a royalty of so much per ton, so that these last people have really to pay three rents, that is, if the new Act is held to be constitutional.

HON. MR. IRVINE.—That has reference to the tax.

MR. MAGEE—They pay a tax to the owner of the soil, the royalty to the owner of the mining rights, machinery and plant, and then they have to pay three per cent. under this new Act, to the Government, on the merchantable value of the quantity raised, before they can export their ores.

HON. MR. IRVINE—I should say that, although there is no difference otherwise, there is an exception in the case of phosphate lands, principally as regards the date from which the law of 1880 takes effect. There has been a change made with regard to these lands in 1878, so that as regards phosphates, 1878 is the date referred to instead of 1880, as in the case of the other minerals. In the interpretation clauses of this Act the definition of public and private lands is described as follows:—

"The words 'public lands' mean and designate all Crown lands or Ordnance lands transferred to the Province, etc., which have not been alienated by the Crown."

"The words 'private lands' designate all lands conceded or otherwise alienated by the Crown, other than mining concessions or lands conceded by the Crown as such, or which shall hereafter be conceded."

So that when private lands are used, it does not in any way affect lands granted as mining lands. Now clause 1425 says:—

"As it is admitted that mines, whether upon public or private lands, belong to the Crown, and any person discovering a mine may purchase the same, by complying with the provisions of this law."

Now private lands mean all lands which are not conceded as mining lands, that is to say, an ordinary grant for agricultural purposes is called "private lands," and the Government now declare that all these lands belong to the Crown.

MR. SEDGEWICK—Of course, you have to give that a limited meaning. That may mean all mines upon public or private lands belong to the Crown where the Crown has not already parted with the title.

HON. MR. IRVINE—They define "private lands" to mean all lands which are not granted with mining

privileges. Then this clause goes on following up this provision. "Upon private lands, however, the occupant of the surface has the first right to purchase such mine, upon the conditions imposed by law and the regulations.' Before coming to that, however, the next clause provides :—

"From the first day of May, 1891, a royalty shall be levied in favour of the Crown, upon every mine which is now, or may hereafter be sold, conceded or otherwise alienated. Such royalty shall, unless otherwise determined by letters-patent already granted, consist of a percentage of three per cent. of the merchantable value of the products of all mines and minerals."

Now the meaning of that is that on all minerals taken from the Province of Quebec, there is a royalty of three per cent. whether, the lands were sold as mining lands or otherwise.

MR. SEDGEWICK—Now, wherein do you say that this is unjust—any more unjust than a tax—say an income tax?

HON. MR. IRVINE—An income tax would not be a particular industry.

MR. SEDGEWICK—In what respect is it different from a license?

HON. MR. IRVINE—It is greatly different. You have to pay license fees besides this.

MR. SEDGEWICK—I mean a license to carry on a business or profession. It is a general tax upon a particular industry, it is true, but does it differ in any moral sense from any particular tax which a province may impose, for instance, they say an insurance company shall pay a certain tax?

HON. MR. IRVINE—The Privy Council decided that these commercial taxes were constitutional. Therefore, the question as to the legality of the law relating to one particular industry in face of that decision has been settled.

MR. SEDGEWICK—I agree with you that we ought to look askance at an Act which professes to interfere with vested rights- to take one's property without compensation and give it to the State.

HON. MR. IRVINE—I only mention this fact now—that they use the word "royalty," implying on the part of the person, the Crown or individual who levies that right by statute, or otherwise, ownership in the property from which royalty is paid.

MR. SEDGEWICK—It does not make any difference what they call it. You say the Act infringes upon private rights in some other way.

HON. MR. IRVINE—I say I have a right to assume that all rights upon private lands conceded previous to 1880 belong to the grantee, and that all granted since 1880 belong to the grantee, subjected to the payment of certain sums of money. I will show you how the carrying out of this Act infringes upon private rights. You will observe it says that the Crown may sell mines on private lands subject to certain regulations. Section 1455 says: "Every person firm or company may explore and prospect for the discovery of mines and minerals upon public lands not already occupied as mining concessions or otherwise."

And section 1461 says: "Any person may obtain from the Commissioner the sale of one or more mining concessions upon the following conditions :—

1 Upon private lands, after the owners thereof have been placed *in mora* to take a sale thereof, if they refuse to avail themselves of such rights; the whole in conformity with this law."

MR. SEDGEWICK—Do you not think a limited construction must be given to that, and apply it only to those lands which contain a reservation of minerals.

HON. MR. IRVINE—Take the lands since 1880, they have been by law reserved and subject to the right to purchase them.

MR. SEDGEWICK—Then may not that section only apply to those lands?

HON. MR. IRVINE—If that would be the construction the courts would give it; but I think it very doubtful. Now you see the effect of that legislation is that any person may go to the Crown and obtain a permit for exploration of private lands. He has the right to go on private lands and examine the lot, and he may take 50 acres of this lot, measure it out, go to the Commissioner of the Crown Lands and deposit the price which he considers this property is worth. There is a minimum price fixed by the Act but no maximum price. He must deposit at least $5 per acre. We will take a man who has held a mining property for years. He believes by law that it belongs to him. Another man may go and obtain a permit from the Crown, go on to his property and measure out 50 acres, he offers $100,000, which this man must take or lose his property. That is a most outrageous invasion of private rights. The next point I spoke of is whether this tax (assuming it to be a tax), is of such a nature as to be unreasonable and against the public policy of the Dominion. As regards some mines it may be said that it is not although a very heavy tax, but of course as its being reasonable or unreasonable, that is within the right of the legislature that has power to pass the law to say.

MR. SEDGEWICK—Is the 3 per cent. royalty on the gross value of the output at the pit's mouth?

HON. MR. IRVINE—Yes. If you get a large quantity of minerals and for one reason or another you cannot sell them, you have got to pay this 3 per cent. not only on the minerals themselves but on the cost of producing them.

MR. SEDGEWICK—Who determines the value?

HON. MR. IRVINE—They have inspectors who tax the value.

MR. SEDGEWICK—Have they principle upon which to fix the value?

HON. MR. IRVINE—No; there is no principle. There is no doubt that this tax weighs very heavily upon a large number of the mining industries of the country, and more particularly with regard to those industries where the marginal profit is very small, and the quantity produced very large and a great number of men employed. Of course the fact of a number of men employed is included the small margin of profits. Supposing a man is working a mine and he with difficulty makes a very small profit. If you bring in a tax of 3 per cent. on the gross output of that mine you may walk off with all his profits and make the Government pay something out of his capital. Now, the effect of this will be to put a stop to a large number of mining industries in which the Dominion has a very important interest. It is in the interest of the whole country that these industrial enterprises should succeed, and if the Provincial Government kills that by putting on a tax, it appears to me that the Act is one which the Dominion Government ought to disallow.

MR. SEDGEWICK—If it was perfectly clear that the object of this Provincial Act was to kill a particular industry, the Government would perhaps have good grounds to do so. We could not disallow an act because it affects a particular industry unless clearly shown that the intention of the act was bad and was aimed at the policy of the Government as a whole. For instance, the Legislature of Quebec has taxed the banking business very seriously, so as to prejudicially affect the banking interests, but we could not disallow that act.

HON. MR. IRVINE—They put a heavy tax upon banks, but they did not put anything to seriously affect banking commerce.

MR. SEDGEWICK—They have compelled insurance companies to take out licenses in every town in which established. However, it seems to me that the imposition of a 3 per cent. tax would not be sufficient to justify the disallowance of the Act.

HON. MR. IRVINE—But suppose it were shown that in certain branches of the mining industry the effect of this would be to stop them altogether?

MR. SEDGEWICK—Well, I think that is a matter for the province to look after. While the Dominion Government has a general interest in the whole of the trade and industries of the country, I do not think it can interfere here.

HON. MR. IRVINE—At the last session of the Dominion Parliament all machinery imported for mining purposes was put on the free list—all not manufactured in Canada. Well now, that of course was of great assistance, but if the Province of Quebec comes in and takes off the benefit of that by levying a tax, they are certainly defeating the object which the Dominion tried to attain by taking off that import tax.

MR. SEDGEWICK—They may do the same thing by coming into the market and borrowing a lot of money. The point is where shall we draw the line.

HON. MR. IRVINE—I think that the Government are bound to disallow the Act for the first reason given—the interference with private rights.

After some further talk on the part of Messrs. Magee, Capt. Adams and Mr. McRae, the deputation thanked the Deputy for his courteous hearing and withdrew. It is understood that the Hon. Mr. Irvine will submit a written statement of his pleading in the matter.

New Electrical Chlorination Process.

The first practical demonstration of the extraction of gold by means of chlorine, is, it is believed, due to the late Professor Plattner, upon whose discovery all subsequent improvements are based. The most noteworthy modifications and improvements are those of Calver, Jackson, Ott, Mears, Deeken, Patra, Roesner, Hauck, Newbery, and others of less note. The introduction of electricity in the extraction of gold is of more recent date, and the leading names of those who first adopted this method are Pichenor, Ancel and Marie, and Cassel.

Mr. Th. Ranft, M.E., of Sydney, has just introduced an electric-chlorination process, says the *Australian Mining Standard*, in which he claims to have overcome the vital defects before experienced in electrical chlorination, viz., the getting rid of the sequent hydrogen and sodium as they are formed by the electric current when passing through the electrolyte. In all processes where the hydrogen cannot be kept separate from the chlorine gas, the two will combine and form hydrochloric acid which combination does not solve gold and is in every way most injurious to the process. The inventor does not claim or patent any new law, but an apparatus by means of which the laws observed are complied with. The apparatus consists of two cylinders, one within the other. The inner cylinder, made of a porous material, serves four functions, viz., 1st, as a filter; 2nd, as the negative pole or cathode; 3rd, it acts as a burrette to allow the precipitated gold to escape along with the caustic soda, and lastly, it allows the formed hydrogen gas to escape at the top. The outer cylinder, which is air tight (except at the places where it is required periodically to discharge) serves three purposes; firstly, it forms the positive pole or anode of the battery, next it acts as a chlorine gas generator and store, and lastly as the chlorinating vessel.

The process performed in the apparatus is described as follows: The ore to be treated (free of sulphur arsenic, lead, zinc, or bismuth) is mixed in certain proportions with common salt. It is then fed into the outer chamber, where the anode is, and the electric currents enter. Water is then added, which dissolves the salt in the ore, and this combined with the saline liquor forms the electrolyte. An electric current from a dynamo is then led into it by the anode, and passing through the solution into the inner chamber or cathode, is discharged back to the dynamo. The chemical action produced by the passage of the electricity is to decompose the electrolyte into its elements. Hydrogen and oxygen are the products of water, chlorine and sodium those of the salt. Hydrogen being a positive substance, deposits on the negative pole; oxygen, on the other hand, being negative, deposits on the positive pole. Chlorine and sodium deposit respectively on the positive and negative poles. In order to prevent the accumulation of oxygen and hydrogen, contrivances are provided, which continually wash the surfaces of the anodes to prevent polarisation, which would stop the whole process. With regard to chlorine, it has been established by Beguerel that chlorine in its nascent state is more active than afterwards, so that if in the ore under treatment any gold is present, it would now be most readily attacked by the chlorine and form itself into chloride of gold (salt of gold) which again is soluble in water.

The gold now being in solution is readily acted upon by the electric current. The molecules, as established by Grotthus, 1805, are under the same condition as any other molecules, which in their transit to the negative zone become split up into their elements, the chlorine parting and returning to the positive zone, whilst the gold is deposited on the negative pole in a fine metallic condition in the inner chamber. From this it is washed and drawn off in the contracted part of the inner chamber in conjunction with the caustic soda and passed through a filter. The powder is then calcined and the gold remains.

The gold having been extracted from the ore, the latter is drawn off at the bottom of the outer cell and an equal amount entering simultaneously at the top from a hopper, to which it has been mixed with the salt, makes the action continuous. In a working plant every ton of ore will be virtually from 20 to 24 hours under the chlorinating and electrical influence, and travel about 20 feet, which will give sufficient time for effective treatment.

As to the cost, adds the *Mining Standard*, it is estimated to be about one ninth of the present cost of chlorination, or that 3s. 5d. per ton, should cover the cost of supervision and sinking fund for capital. The inventor estimates the outlay for a complete plant to be £250, exclusive of an engine to drive the dynamo.

Improvement in the Manufacture of Mineral Wool.

A very important step in advance in the manufacture of mineral wool was taken some time since by the Western Mineral Wool Company. The production of mineral wool by the method long in vogue is to utilise the molten slag as taken from a blast furnace in the usual course of furnace work. This plan necessarily depends upon the operation of the blast furnace and when for any reason the blast furnace fails to supply the molten slag the manufacture of the mineral wool must stop. Another objection is that only a single carload of slag can be done from one run or flush of the furnace, which fact shows that the supply of material is necessarily limited. A third objection is the unevenness of the slag as it comes from the blast furnace. Much of the slag drawn fails entirely to make mineral wool or results in a product of inferior quality. The suitability of the molten slag can be determined ofttimes only by the results of the blowing and when the operations have been defective it can only be disposed of as waste Accordingly, the run of the furnace is lost and time and labor are expended in disposing of the useless slag. Again, the entire slag product of some blast furnace, by reason of the nature of the ore used, is wholly unfit for the manufacture of mineral wool. And a fourth objection is that even where the slag is of correct quality, a large portion of each carload becomes cool before it can be used and the cool portion is lost. The inventor of the improvement mentioned that by mixing lime or silica, or silica-bearing stone, with the ordinary slag and fusing the mixture in a cupola, a constant supply of re-melted slag could be obtained from which a mineral wool may be produced of better and more uniform quality than is produced by the slag drawn direct from a blast furnace. At the same time each of the several objections above recited is overcome. Whether silica or lime, or both, shall be used depends entirely upon the nature of the slag. This, he explains, is readily determined by one or two inexpensive trials, and accordingly, it is in the power of the manufacturer to arrange this mixture to produce a perfect article at all times. At the works of the Western Mineral Wool Company, Cleveland, two cupolas are at present in use. It is found, by trial, that about twelve hours' run could be obtained from a cupola before the lining gives out. With two cupolas working alternately night and day a continuous run is obtained, and upon this plan the company are at present proceeding. In 1885, the first year of the company's business, 300,000 lbs. of mineral wool were produced and sold. In 1890 no less than 9,000,000 were manufactured and sold, while for the current year the output will be considerably greater.

A New Process for the Treatment of Ores.

(Mining Journal.)

A demonstration was given recently at Hutching's wharf, West Ferry Road, Millwall, London, E., under the auspices of the Atkins Amalgamator Syndicate, (Ltd.), of a new process for the treatment of gold and other metalliferous ores by electrolysis, which has a number of important advantages claimed on its behalf, and which, if the results stated hitherto to have been obtained may be taken as an average, would seem to have a future before it. The process, broadly speaking, is the same in the early part of the treatment of the ore as that generally adopted, the novel feature being introduced when amalgamation takes place. For this purpose a machine of somewhat original type is employed, and is, we understand, the invention of Mr. G. J. Atkins, under whose management the proceedings were conducted. At the works of the syndicate at Millwall, a complete installation of plant for the treatment of ores has been laid down, and samples of not less than a ton of ore may, we understand, be sent here for a trial treatment by mining companies who wish for visible proof of what the process will do. The ore is first put through an ordinary stone-breaker, and is thence conveyed to a five stamp battery to be further pulverised—these two items in the plant being made by the Chatteris Ironworks Co., of Chatteris, Cambs.

The material is next conveyed to the Atkins patent amalgamator. This apparatus consists of a vertical cylinder or depositing chamber, which, to use an electrical term, might be described as a large decomposition cell, in which electrolysis takes place. The crushed material, as taken from the stamps, is conveyed into the upper end of this chamber by elevators, and is fed on to a revolving broad-bladed carbon screw-conveyor about 7 feet long, which is placed vertically in the cylinder. While the exterior casing forms the negative pole of what we have for convenience sake described as a cell, this upright conveyor may be spoken of as the positive pole, which, it might be added, is constructed so as to be insoluble. The ore automatically passes down this screw by its own gravity, and in the course of its downward progress the refractory elements are electrically attacked by the elements oxygen, chlorine, or cyanogen according to the solution used, and the metals deposited upon the cylinder in a pulverent form, being thus put into a condition so as to readily amalgamate. The amalgamating part of the apparatus is situated at the bottom of the upright cylinder, but, before going on to deal with this in detail, it may be noted that during the process which takes place in the cylinder chlorine, oxygen, cyanogen and other elements are liberated by the chemical solution used in the cylinder and appear at the positive pole or carbon screw. This solution or electrolyte is not a costly one to produce. In some cases it is water only, and is adapted to the class of ore under treatment. Ordinarily a weak solution of common salt is, we understand, sufficient, and may be used continuously; it should also be noted that no previous roasting of the ore is necessary. The whole of the process hitherto described is quite distinct from, and takes place before the ore reaches the amalgamating part of the apparatus, the only condition necessary for its successful treatment being that it must be pulverized to a sufficient degree of fineness, the object of the inventor being to either dissolve all the gold or, in case of it being coarse, to cleanse it, so that it may be in a condition to be picked up in the amalgamating chamber. The gold that is dissolved is deposited upon the casing in a pulverized form, falls down to be picked up by the mercury, and is separated from the ore as it passes out of the machine.

The amalgamating part of the apparatus is, as we have said, situated at the bottom of the machine. It consists of a horizontal cylinder containing a finely corrugated revolving drum fitting close to its sides, into which the ore is carried direct from the vertical cylinder, under great pressure, and here meets a large quantity of clean mercury (forming part of the negative pole). Here it is revolved round the cylinder, still in its finely divided condition, and mixed up with the mercury until it reaches the outlet, the ore being eventually separated from the mercury, and forced out at the side of the cylinder, while the mercury with the gold it has picked up, passes out at the bottom, thence through a strainer, where the gold and silver is recovered, the clean mercury returning to the machine. Thus, as will be observed, the mercury is kept clean, and is constantly picking up the metals and parting with them in the strainer. The inventor further states that this machine will treat ores either by the chlorination, oxidation or the cyanogen processes, and is very economical inasmuch as the cyanogen or chlorine is recovered and can be used again. As will be seen it is extremely simple, and nearly automatic, gravity playing a great part in carrying the ore through the machine; and as the reagents are all recovered, with the exception of the small amount of solution actually soaked up by the ore, the cost is but small, and the wear and tear very little.

Several advantages may be enumerated as ranking among the most important of the many claimed for this process. The inventor claims that oxidation is sufficient in many cases to free the gold before amalgamation. This he claims to bring about in the vertical cylinder. When chlorination is required to dissolve the gold, this is also effected in the vertical cylinder and the gold deposited to be picked up by the amalgamator, thus dispensing with the ordinary method and plant used for chlorination, and also recovering the chlorine for further use. Filtration, etc., so fatal to ordinary chlorination plants, is also dispensed with. Where cyanogen is used for the recovery of both gold and silver the metals are deposited out of the solution in the vertical cylinder, thus recovering the cyanogen for further use, and making this rather costly salt come within the bounds of economy in practice. What the inventor claims is that he has a machine that can be adapted to any class of ore. Refractory ores can be treated without the heavy expense and delay involved in concentrating, roasting and smelting; free milling ores can be treated, it is urged, at much less expense and with greater certainty and better results than under the present system of amalgamation; float gold is recovered with practically no loss; the ore in all cases passes direct from the stamps to the machine, no other treatment being previously required; the machine being automatic in its action no delays are necessary for cleaning up; no portion of the precious metals can be abstracted without the knowledge of the person in charge, the amalgam being under lock and key. The amalgam can be removed without stopping the machinery. The process is specially adapted for situations where water is scarce, as a very small quantity is sufficient, and that can be used over and over again, and for use at mines where fuel is scarce or expensive, fuel only being required for steam power. Where water is available even at a distance no fuel is necessary, as all the machinery can be driven by electric motors. The plant can be taken to pieces and carried on the backs of mules, no portion weighing more than about 250 lbs. No expensive staff to work the plant is needed, and the cost of treatment is small per ton, even for the most refractory ores, whilst the advantages over processes requiring roasting are manifest both as regards labour and expense. Finally it is claimed that by this system low grade ores and tailings can be profitably treated. The machine, it is further stated, can be adapted to run entirely by water power, and the inventor will undertake to fit up a plant to run with electric motors, if water power is available within a reasonable distance. The following are stated to be a few of the results hitherto attained by the process of different samples of a great variety of ores: No. 1, refractory, ground 60 mesh, recovered 93 per cent.; No. 2, free milling, ground 30 mesh, recovered 92 per cent.; No. 3, free milling, ground 40 mesh, recovered 90 per cent.; No. 4, very refractory (Black Jack), ground 50 mesh, recovered 85 per cent.; No. 5 refractory, ground 50 mesh, recovered 91 per cent.; No. 6, tailings (N.Z.), assayed gold 11 dwts., recovered 8 dwts.; No. 7, tailings (U.S.A.), assayed gold 6 dwts., silver 7 ounces, recovered gold 3 dwts, silver 5½ ounces.

A Simple Method for the Analysis of Coal or Coke.

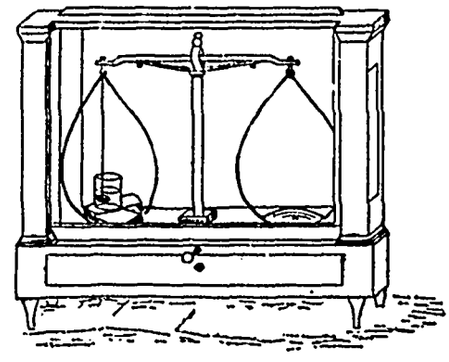
The following method has been used by a large British firm of coal consumers, and has been found to give results of quite sufficient accuracy for ordinary purposes, without taking an unreasonable time to perform We shall describe it in simple, every-day language, so that mining engineers and coal users may, with the necessary apparatus, perform approximate analyses for themselves.

Sampling.—This is a most important part of the operation, for, if a sample is taken which does not fairly represent the bulk, the subsequent analysis is of very little use. To obtain a true sample, take a shovelful from different parts of the heap, load, or consignment, say from opposite ends and sides, and from the middle. If the coal contains lumps of hard, slaty shale, as sometimes happens, see that a due proportion of this is included in the sample. The coal or coke thus sampled is next broken upon a cleanly-swept iron plate, or floor, and the whole mixed thoroughly; it should now be quartered, to reduce the sample to the required size.

Keep a few pieces for the determination of specific gravity, and pound the remainder in a mortar, with pestle, or on an iron plate, with a flat-faced hammer, to the state of a fine powder, and place a sufficient quantity in a clean, dry, corked bottle for analysis.

Specific Gravity.—This is not always required, but, as it is sometimes an advantage to know the specific gravity of coal (*i.e.*, its weight as compared with an equal bulk of water), we shall briefly describe the method of determination. This brings us to the consideration of a balance, suitable for the weighings required in finding the specific gravity and in performing the general analysis. In a case, such as that named above, where a mining engineer desires to make occasional reports on samples of coal, a cheap balance, which we have tried and can recommend, is that made by Becker's Sons, Rotterdam, and numbered 28 and 29 in their 1886 price list. It is mounted in a French-polished mahogany glass case, with counterpoised front sliding frame, movable pans, may be charged up to 50 grams in each pan, and is sensible to ½ milligram, with its full charge. Such a balance, provided with set screws and level, and fitted with agate knife edges, may be had for about £4 8s. (equals about $22). This price includes the extra charge made for agate knife edges, it will pay to get these as the cheaper steel edges are very liable to rust after exposure and use. The cheap set of gram weights, No. 28, in Beckers' catalogue, containing 50 gram piece down to 1 milligram, may be recommended, as of sufficient accuracy. They are supplied in a mahogany box, lined with cloth, each piece is fitted separately and the fractions of the gram are made of aluminum. The price of this set is 13s. (equals about $3).

To determine the specific gravity take a representative piece of the coal or coke of convenient size, say a piece of the shape of a rough cube, the sides of which are about half an inch. To the hook of one balance pan, attach a piece of thin thread, horse-hair, or platinum wire, of suitable length for suspending the piece of coal. The thread or wire must be counterpoised by a piece of the same size, or by weights, on the opposite pan. Now suspend the coal, find and note its weight in air.



Secondly, introduce the small beaker of cold distilled water (the temperature of which should be 60° Fahrenheit or thereabout), and find the weight of the coal as suspended in water. This method of determining specific gravities is based on the principle, discovered by Archimedes, that when a body is plunged beneath the surface of a liquid, it displaces a bulk of such liquid equal to itself, and is pressed upon or supported in the liquid with a force equal to that with which the particles of the displaced liquid were supported; the solid will consequently appear to have lost weight equivalent to that of the bulk of liquid which it occupies.

Having weighed a solid in air, as described, we find a weight which we shall call W, the second weighing in water gives us a weight W^1, and, from the above principle, the specific gravity will be the ratio of W to $W-W^1$.

Putting this in a simple formula, we get:—

$$\text{Specific gravity} = \frac{W}{W-W^1}$$

To take an actual case, where a piece of coal weighed in air, 3·628 grams and in water ·788 grams:—

$$\frac{3\cdot628}{3\cdot628-\cdot788} = \frac{3\cdot628}{2\cdot840} = 1\ 278 \text{ specific gravity of the coal.}$$

Moisture.—This is determined by heating 5 grams of the pounded sample (placed in a tarred watch glass) for half an hour, at a temperature of about 212° Fahrenheit, in an air bath. The portion should be allowed to cool and then re-weighed. The loss of weight multiplied by 20 will then give the percentage of moisture. If a sample of coal is heated for much longer than half an hour, at the above temperature, it gains weight, owing to oxidation. As some of our non-chemical readers may not understand the method of using an air bath, we had better, perhaps, explain that it is a small oven, made of japanned iron or copper, fitted with a hinged door in front. Through the top of this oven are two tubular holes, one for the exit and inlet of air during heating and cooling; the other holds a thermometer, fixed in, usually by a piece of cork The oven rests on a four-legged stand of wrought iron, and is heated by a Bunsen burner placed under the centre.

Ash (Silica, etc.)—Weigh out 2 grams of the powdered coal, place in a crucible, preferably of platinum, or, if this is considered too expensive, nickel makes a fair substitute. Porcelain crucibles may be used, but soon crack with the heating, and hence are most costly in the end. Heat over the flame of a Bunsen burner till all the carbon and volatile matters are burned or driven off, and the residual ash is of a gray or white color. A clean wire may be used, occasionally, for stirring during the ignition. The weight of the ash multiplied by 50 gives its percentage proportion.

Volatile Matters (Hydrocarbons).—Weigh two grams of the sample in a tarred crucible (with cover), close the cover down and see that it is a fairly good fit, but not too tight. Heat over a Bunsen flame; in the course of a few seconds it will be noticed that the hydrocarbons, in being volatilized, impart a luminous flame to the upper portion. As soon as this luminous flame disappears, it may be considered that the volatile hydrocarbons are evolved, and the gas should then be at once turned off. Allow the covered crucible with its contents to cool, and then weigh. The loss of weight multiplied by 50 minus the moisture per cent. equals volatile matters per cent.

Fixed Carbon.—This is usually put in by difference. The percentage of volatile matters (including moisture) plus that of ash are deducted from 100·00, the difference then represents the percentage of carbon.

Sulphur.—The sulphur in coal exists in two forms, as iron pyrites (or ferric sulphide), and as calcium sulphate. The sulphur existing as pyrites, may be regarded as volatile on combustion of the coal, whereas that existing as calcium sulphate is fixed; but, for most purposes, it suffices to estimate the total sulphur, the percentage of which may be placed underneath the statement of analysis. The following method yields satisfactory results:

Take 4 grams of the pounded coal and mix in a platinum capsule (or other shallow crucible), with twice its bulk of pure calcium hydrate (slacked lime), by stirring

with a glass rod and adding water sufficient to *damp*, without *wetting*, the mixture. Dry in the air bath, then burn off the carbon and volatile matters over the flame of a Bunsen burner. The sulphur in the coal is oxidized and combines with the lime, forming calcium sulphate, sulphite, etc. Now wash from the capsule into a beaker, and as oxidizing agent, add a saturated solution of bleaching powder in excess, or a solution of potassium permanganate, excess of the latter being denoted by the pink color remaining permanent after agitation. Boil the liquid for a few minutes, add pure hydrochloric acid in slight excess and continue the boiling till all soluble matter appears to have been dissolved, filter to separate ash, etc., wash, boil the filtrate, add a solution of pure barium chloride in excess. This point is indicated by boiling, and allowing the precipitate to settle, by removing the flame; if addition of more barium chloride solution cause no further precipitate, it is safe to conclude that an excess of the reagent is present. Having boiled for about five minutes, allow the precipitate of barium sulphate about an hour to settle out, in a warm place; filter through double filter papers, wash the precipitate till free from barium chloride (this may be shown by testing a few drops of the washings with silver nitrate solution, when no precipitate should form), now transfer the filter paper with precipitate into a platinum crucible, burn off over Bunsen till only the white precipitate of barium sulphate remains, weigh this: the weight × 25 × ·1373 (the factor to give sulphur, having found barium sulphate), = sulphur per cent.

Statement of Analysis.—The results are generally stated in the following form:

Sample of....Tons....Cwts. Coal from.....Colliery.
Date.....

Fixed Carbon	65·80
Volatile Matter	23·55
Ash	9·00
Moisture	1·65
	100·00
Total Sulphur	1·25%
Specific Gravity	1·278

Sampling Ores without Use of Machinery.*

By William Glenn, Baltimore, Md.

The taking of proper samples of crude ores seems to be less thoroughly understood, or less carefully practiced, than its importance requires. We all know how often we encounter the reports of very accurate assays and analyses, the weight of which as evidence wholly depends on the method of obtaining the sample, and is very probably *nil*, because there has been no proper sampling. Passages may be cited from technical books, and from current technical literature (all the work of writers whom we delight to honor), to show that even among high scientific authorities there is too little acquaintance with the practical art of the sampler. There is no metallurgical or chemical establishment which does not frequently receive samples truly representing nothing. They consist usually of bits of ore, or what not, selected because they are worse or better than the average of what they are meant to represent. And they are worthless, no matter who made the selection. Where conscious choice is permitted to enter into the operation, a fair sample will not result, unless by a miracle.

The work of sampling is often looked upon as within the realm of boys and of pensioners only. At least, though the manual labor be left to subordinates, the principles on which it is conducted and the safeguards with which it is surrounded are not unworthy of the study of experts; and experts should be ready to teach these principles and enforce them in practice. For exact sampling is the indispensable first step towards learning the value of any boxful, carload or shipload of ore.

I propose to give a simple account of the method of sampling by hand, such as I have always pursued. There is nothing new about it. So far as I know, it is the immemorial old method, as old at least as Cornish copper mining. Perhaps my fellow members in the Institute may suggest improvements in it. If not, it will constitute a record in our *Transactions* to which laymen and beginners may be referred.

There are two principal processes to be considered: first, how to take the gross sample of the lot of ore; second, how to proceed with that sample. Really, there is no iron-bound rule governing the first step; each may have a way of his own; yet most samplers proceed in much the same way. But once having the rough sample, there is no question as to what shall be done with it. It is to be worked down after the orthodox fashion. It must be broken and mixed and quartered until only a few ounces remain. The sampler bottles this residue; the chemist does the rest.

Assume that we have a rough sample, weighing a ton, of any ore with its gangue. Assume that by some manner of magic we can at once reduce the whole of it to dust. Evidently, if we could mix it long enough and well enough upon a clean, tight floor, it would finally become homogeneous. In that case, we could fill half a dozen small bottles from any part of the pile, and they would be fair samples. But the work would have to be admirably done; so well done that a single gramme taken from the pile would properly represent the entire ton of sample. Really, this would entail a great deal of labor. And if the rough sample weighed 15 tons or more, as it would if taken from a shipload, the bare labor of mixing that quantity of dust until homogeneous is wearying even to think of. We cannot proceed upon the proposition that a final sample may be obtained in any such a way. Yet upon a rock similar to this many are wrecked.

To take, for illustration, a definite case, let us assume that we have to sample a 10-ton pile of 10 per cent. copper ore, prepared for market. It will consist of masses generally the size of one's fist, but of all smaller masses and even of dust. We shall require for the work a clean, tight floor or pavement, an iron mortar and pestle, a shovel, a small hammer, a piece of iron for an anvil and, lastly, a broom. Besides these, we shall find convenient a wheelbarrow or a barrel or box of some kind.

For convenience and force I will put my description into the form of homely directions, such as I might give to my workman.

Begin by shovelling the pile roughly into the form of a flattened cone or a flattened pyramid; say we choose the pyramid. Now make a trench straight through the pile, cutting it into two nearly equal parts. And again by a trench (at right angles to the first) divide these halves into four nearly equal quarters. A part of the ore taken from these trenches will form the sample required. Proceed as follows:

Having the wheelbarrow ready, begin at the middle of any side of the made up pile and cut the first trench. Cast the first shovelful to the right, the second to the left, the third into the wheelbarrow. Repeat this order of shovelling until the barrow is full, then empty it upon the well swept floor intended to receive the sample. Continue in the same way until the trench has passed through the pile, when there will result two rather long and narrow piles. Begin the second trench, extending it across the middle of the two piles, casting the first shovelful right, the second left, the third into the barrow. Proceed in the same way as with the first trench. When done, you will have shovelled about 6,000 pounds of ore. As every third shovelful was thrown into the barrow, there will result about 2,000 pounds of sample upon the floor. That this is a fair sample of the original pile is based upon the assumption that each third shovelful thrown into the barrow was like the first and second ones cast into the piles. The hypothesis is reasonable and freely to be trusted.

Having the sample, proceed with it after the regulation method, as follows:

Spread it thinly upon the floor; now examine it. If there be any lumps which look larger than the general run, place the anvil upon the pile, and between that and the hammer break those lumps. The next step is to thoroughly well mix the sample. Begin at one edge of it and shovel the ore over upon itself. Move around to the opposite side of the pile, and from that side shovel the ore again upon itself and back to its original place upon the floor. Having it well mixed, form it into a flattened cone and sweep all the dust upon and around the pile. You have now to halve and quarter the sample as follows:

Commence at any point and shovel a road through the center of the pile, casting the shovelfuls alternately right and left as you proceed. This movement will result in cutting the pile into two elongated nearly equal ones. Beginning at the middle of one of them, shovel a road through it in the same way as was done before. And in precisely the same way cut the other pile in two; sweep upon each pile the dust belonging to it. These movements will result in four piles, A, B, C and D.

If the sample were well mixed, when and as directed in these notes, then will each of the quarters, A, B, C and D, have the same composition as have all the others. But if, upon inspecting them, you judge one or another to be poorer or richer than the others, you will have then sufficient evidence that the work has been badly performed. In that condition of affairs, mix well together all the piles, and once more halve and quarter them. Having made all the quarters of the same composition, it follows that any two of them may safely be accepted as representing the original 2,000 pounds of the rough sample. This opens a road leading in the right direction, since it enables us finally to get rid of half the sample. We may cast out two of the quarters and retain the other two for the sample. It is a matter of indifference which two are retained, say A and B. Remove from the floor C and D, together with the dust belonging to them.

We have again to break the larger stones, until there remain none larger than walnuts. Place the anvil between the piles, within easy reach of them. Take a stone from A, break it; take one from B, break that. Continue in this way, taking stones alternately from each pile, until all are reduced to the size stated. By proceeding in this way, the sample is more or less mixed while being broken. Complete the mixing as before, by shovelling all of the sample forth and back over the floor. Form it once more into a flattened cone, and sweep the dust up and around it. Divide the cone into two halves, and those into four quarters, precisely as you before did. You have now to reject two of these quarters. The unwritten law of the sampler says that it must be those holding the positions A and B, because those were retained in the last quartering. Remove A and B from the floor, retaining C and D for the sample. These would now weigh about 500 pounds.

Proceeding as before, break down the lumps of ore until none are left larger than say 1-inch cubes. Again mix well the sample, make it into a pile, sweep up the dust, halve and quarter the pile. Reject two quarters (C and D, of course), retain two, precisely as in former quarterings.

Once more break the lumps, this time down to half-inch cubes. Mix well the sample, make it into a pile, sweep up the dust, halve and quarter, reject two quarters. The two quarters retained would weigh about 125 pounds. Break it down until comparable to fine gravel and coarse sand. Mix and quarter once more.

The two quarters this time retained would weigh about 60 pounds. With the mortar and pestle break this to something approaching coarse sand. Again mix and quarter. The quarters this time retained are to be ground yet finer, mixed and quartered.

If you have no mortar and pestle, the hammer and anvil may be substituted throughout. After getting the material into the form of coarse sand, it is best to mix and quarter it upon a sheet of paper, even an old newspaper.

At this point the sample would weigh about 15 pounds, its larger grains would be in size like coarse sand. It would be safe now, without further breaking, to mix and quarter it twice, or until its weight did not exceed 4 pounds. Run this through the mortar and then mix and quarter it twice, or down to 1 pound weight. Grind this to something approaching approaching powder, and, for the last time, mix and quarter it. Have ready 6 wide-mouth 1-ounce bottles. Place them in a line, side by side, upon a sheet of paper. From the other paper pour the ground sample in a small stream, forth and back across the mouths of the bottles, until they are all full up to their shoulders. Cork, seal and label them, and the sampling is done, and properly done.

If there should lurk in your mind a suspicion that this half-pound residue of dust may not, after all, properly represent the rough sample with which you began, go back over the work, and try to decide precisely where in the quarterings the sample retained ceased to be a sample. If you can decide upon that point exactly, then you will know just where you failed to do your work properly. The error will be with you and not in the method.

It does not, in the slightest, matter of what solid a sample may consist, or how much or how little it may be, it should be worked down in the manner just detailed. Whether a sample consist of 20 tons or of 1 ounce, it matters not, except as to breaking and grinding.

A word may be added as to larger and rougher ore-piles than have as yet been mentioned. It is not unusual for one to have a pile of 100 tons, or 200 tons, which one would like to sample. Such piles are apt to consist of lumps larger than a man's head, together with masses of all smaller sizes. Where a pile is formed by dumping ore uniformly upon its top, the likelihood is that the pile is homogeneous. In such a case, it is safe to make short cuts into it at several points around its base, and to consider as sample the ore so gotten. It is safer to make one cut through the pile, retaining as sample each third shovelful, as in the case of the copper ore we have just considered. In forming ore piles of the weights given, it is a good custom to put upon a separate platform each tenth or twentieth barrow load coming from the mine; the small pile will prove a fairly good sample of the large one. But no matter how it may be gotten, the rough sample is to be broken and mixed and proceeded with after the regulation method.

No account is here taken of moisture-samples, or of sampling train loads or ship loads. This paper is meant to help beginners, but it would be, in the writer's judgment, a benefit to others also, if our members who are practically acquainted with sampling would present their own methods with regard to the various branches of the art. The precautions specially required in sampling rich silver-ores, for instance, might well be made the subject of comparison and discussion.

DISCUSSION.

R. W. RAYMOND, New York City.—I am glad that this subject has been brought to the attention of the Institute. Mr. Glenn has by no means over-stated its importance; and yet, with the exception of the paper of Mr. D. W. Brunton (*Trans.*, xiii., 639) describing a mechanical ore-sampler, I can recall little or nothing in our *Transactions* concerning it. The practice in the West, with regard to silver ores, etc., is affected by various considerations. As a general rule, such ores are either already fine or are crushed before treatment. I think it is now generally admitted that a good mechanical sampler connected with the crushing machinery takes a fairer average sample (usually one-fifth or one-tenth of the total lot of ore, according to the richness and the consequent importance of exact determination of values as a basis of payment to the miner) than can be got by throwing aside the fifth or tenth shovelful in unloading. At all events, the mechanical sampler cannot be suspected of bias, conscious or unconscious, provided it is so constructed as to deliver impartially the coarser and finer particles of the stream of ore passing through it. Disputes are therefore avoided by using it.

But for many classes of ore, the sample is still taken with the shovel; and it is after this has been done, whether mechanically or by hand, that the process begins, which can properly be compared with that described by Mr. Glenn. The differences between this process and his are required by the following principal considerations:—

1. The material, namely, ores carrying, besides lead or copper, more or less silver and gold, is so much more valuable that small errors in determining its contents may be the source of large loss to the buyer or seller.

2. It is almost always finer than the crude material contemplated by Mr. Glenn. Either it has been crushed before the sampling begins, or it is so generally fine when received that the preliminary stages of sampling may be, in the judgment of the manager, performed without

* Transactions of the American Institute of Mining Engineers.

crushing. This, however, always involves a risk, the assumption of which by a prudent manager is justified only when the conditions are favorable; for instance, when the character of the ore is well known; when its grade is not too high; when the difference in richness between coarser and finer pieces is not great; when careful experiment has shown that sampling without a preliminary crushing is sufficiently accurate; when avoiding the extra cost of crushing would be an important saving, or when the crushing machinery of the establishment is fully occupied with material which must be reduced before sampling. The nature of the contract between the smelter and the miner is another element to be taken into account. Perhaps the ore is not to be paid for strictly according to sample assay (a thing which now and then happens, though not often, in the purchase of large dumps at a round price, or the treatment of ores on joint account, to be settled by the net results, instead of the preliminary assays, or under special contracts, in which the loan of money or other inducement to the miner has secured special terms). Perhaps, again, the smelter owns the mine, and can thus afford to save current expense by taking some risks in sampling his own ore which he would not take with ore for which he had to pay according to the sample assay.

I think it may be said, however, that the sampling works proper, that is, those which are not parts of smelting-works, but stand between the smelter and the miner, as agents for the latter in the sale of ore, warranting to the purchaser the accuracy of their determination of its contents, always crush everything they receive. And I think it may be said, also, that when the capacity of crushing and sampling-apparatus is adequate, and the arrangements for receiving and handling ore are so perfect as to avoid both demurrage on railway cars and rehandling of material, the crushing and mechanical sampling of all lots received is not only better, but cheaper, than shovel-sampling of crude cargoes. The matter may indeed be left to the discretion of a competent manager; but the most competent managers are not anxious to multiply the matters which are left even to their own discretion, still less to the discretion of subordinates. There are innumerable things which have to be watched daily and hourly around great smelting works; and it is a relief when any one department can be placed in the category of comparative routine, calling for fidelity rather than discretion. Moreover, the exact determination of all the elements of an ore of the class here contemplated is as important on technical as on commercial grounds. Without it, the metallurgist can neither calculate his charges successfully nor be held responsible if he fails to do so. And the sample taken of each new lot of ore received is not only assayed for its valuable contents, such as lead, copper, silver and gold, and for sulphur, iron, silica and zinc (which may affect the price to be paid for it), but also analyzed for all its earthy bases, so that it may be properly mixed for smelting with other ores or fluxes. Now it is quite likely that the gangue minerals of an ore may break very differently, according to their natural hardness or cleavage, in the ordinary processes of mining and shipment. Moreover, the same car load from a given mine may contain ores from different stopes, varying so greatly in character and condition that even if the average of gold or silver were reasonably uniform, the average of silica, lime, magnesia, baryta, etc., would not be so, and the lumps might be entirely different in these particulars from the finer stuff.

With these digressions and explanations, I repeat the general statement that the ore to be sampled in the West is generally fine. But for the rough sampling of ore at the mine, or in localities where proper crushing cannot be done, the procedure described by Mr. Glenn seems to be a good one for the preliminary stages.

3. Notwithstanding the general fineness of the crude pile, and no matter to what degree it may have been reduced by crushing (short of the final reduction to impalpable powder), there is still a distinction between coarser and finer particles, and in the majority of cases this distinction is one of value as well as size. Many of our western ores carry silver, for instance, not only as an accessory ingredient of galena, but also in the form of finely-disseminated "true silver ores" accompanying the galena. These are usually not only in fine crystals or specks to begin with (often not distinguishable to the naked eye), but brittle besides, so that the shocks and abrasion of mining, transportation, crushing and handling reduce them to still smaller size. In the stamp mill they make "slimes." In concentration they are very likely to escape and leave the headings impoverished, though clean from gangue—"poor but honest," so to speak. In sampling, they present the greatest danger of error.

Something similar might be said concerning the tenor of gold in many ores. Although true gold ores are not common, yet in a lot of ore consisting largely of auriferous pyrites, for instance, there will certainly be more or less oxidized material, in which there is fine, free gold. I confess, however, that so far as my observation goes, this is not the source of as serious difficulty in sampling as are the brittle ores of silver. That is a point on which I hope some of our members who have had wider practical experience with the sampling of gold bearing ores will throw further light. My own knowledge comprises more particularly the practice of lead smelters; and in that practice the gold in the ores purchased, though it is determined and paid for, has not been hitherto a point raising special questions of difficulty. Or rather, the precautions taken as to the fine dust of silver ores cover the question of gold also, so that this has not called for separate consideration. Moreover, almost all the distinctively gold bearing ore of the country, as well as a great part of the silver ore, is reduced by wet crushing for amalgamation or other subsequent treatment, and consequently sampled by battery assays—a process which is not here under consideration, and which does not encounter the precise difficulty just described. I am inclined to think that in lots of crude fine ore, or of ore dry crushed for sampling, oxidized material containing gold would not present as much difficulty as silver ore, because it is less likely to form fine flying or sifting or rolling dust. The iron oxide tends rather to pack or adhere—at least to lie where it falls—unless it has been artificially dried and pulverized.

But the difference of value between coarse and fine particles may be due to other minerals than those already mentioned. And there may even be cases in which the greater value is in the coarser material. I need not however, enlarge further under this head.

4. Obviously such a difference would have no effect, if the whole mass to be sampled were so thoroughly mixed that the proportions of different sizes were uniform throughout. But this is not practicable, because the coarse and fine particles behave differently as to rolling and sifting over or through the pile upon which they are shovelled. Consequently, it becomes necessary, in order to secure a correct final average, to make the distribution of sizes in each pile formed *symmetrical*, since it cannot be made truly *uniform*. At a later stage, as will be seen, the whole of the sample thus secured is reduced to powder. Yet still the precaution of making symmetrical piles for quartering is continued to the last.

With these explanations I will describe the quartering of a sample of ore (say one-fifth or one-tenth of a gross lot), as practiced at some of the leading works in the West.

The mass is first shovelled into a ring on the sampling floor, and this ring is then shovelled toward the center, each shovelful being carefully delivered upon the summit of the pile in the center, so that they shall roll equally in all directions. A conical heap having thus been formed, it is pulled down and spread out. The workmen walk round and round the pile, pulling with the shovel, as it were, the ore towards them, so that it rolls outward. The lower six inches of the pile is not disturbed, and when this process is finished, the conical heap has become a truncated cone of larger base area and six inches height. This flat heap is now quartered by pressing a stick or a board held edgewise into it so as to mark the diametrical divisions. Two opposite quarters are cut out with the shovel and removed. The other two are again mixed, formed into a conical heap, and flattened out as before. This procedure is repeated until the quantity has been reduced to one or two wheelbarrow loads, when, if the material has never been mechanically crushed, it is crushed in the rolls to say half-inch maximum size. The quartering is then continued till the sample has been reduced to a panful. This is ground say to 60-mesh size (after a partial preliminary drying, if necessary to facilitate the grinding in a rotary fine crusher), and then taken to the assay laboratory, where it is thoroughly dried (say for twenty-four hours at 212° F.), and rubbed fine until the whole will pass through an 80-mesh sieve Quartering is then resumed and continued until the sample is only sufficient to fill three bottles, one of which is for the assay of the works, one for the customer, and the third for the umpire assay, if such should be required.

The details of this practice may vary in different works, and I trust our members, many of whom are engaged in such work, will give us, in the way of criticism or suggestion, the benefit of their experience. It is perfectly evident, as Mr. Glenn says, that a vast amount of skill and precision is daily wasted by our chemists in the delicate analysis of samples that mean nothing. To cite a single instance, I have recently studied with much interest the various papers in our *Transactions* concerning the practical results of the magnetic concentration of iron ores. In Mr. Birkinbine's paper, presented at the New York meeting, there is a simple formula, by which he calculates from the percentages of iron in the crude ore, the concentrates, and the tailings the quantity of crude ore required to furnish a ton of concentrates; and he applies this formula in testing the comparative economy of different magnetic concentrators. But in several instances the actual quantities of crude ore, concentrates, and tailings have been reported, and they do not agree with the results of calculation by this formula. Now the formula is mathematically accurate, and there is no reason to doubt the accuracy of the chemical work. It follows that the samples, either of the crude ore, of the concentrates, or of the tailings, could not have been accurate. It is certainly to be desired that future tests of such work should include more thorough sampling, and that future accounts of such tests should include descriptions of the method of sampling employed. In the absence of certainty as to the fundamental data, the application of mathematics to the discussion of results seems to be labor thrown away.

Shipment of American Charcoal Iron to Europe.—In its review of the iron market under date of 17th July inst., the New York *Engineering and Mining Journal* says: "The news bureaus have reported the shipment of 400 tons of iron from Detroit, Mich., to Liverpool, as the first contract ever recorded for the carriage of American pig iron to Europe. This is erroneous. As a matter of fact there is nothing new in this shipment, several lots having gone from this port in the past two or three years. The iron shipped is a charcoal iron of superior grade, used by an English manufacturer near Liverpool for special purposes." The price of Swedish charcoal pig iron, of which there is a yearly consumption of some 30 to 40,000 tons in Great Britain, has been put very high by the great increase in the cost of charcoal during the past two years.

The Miner.

Where nature's crucible, long years ago,
Wrought the black miracle called anthracite,
Beneath earth's crust a thousand feet or so,
The miner delves in everlasting night,
A dim and flickering flame his only light:
And though, in many a guise, grim death is near,
Unseen and terrible, alert to smite,
The patient worker gives no heed to fear;
His heart is thrilled with thoughts of wife and children dear.

The scars of toil are on his manly face,
And show the marks of powder and of coal
That robbed his visage of its youthful grace,
But cannot leave their impress on the soul.
He may not write his name on hist'ry's scroll,
Yet he is none the less a perfect man,
Who acts his part in life, from start to goal;
Who does the work he finds, as best he can,
And leaves behind a record, earth and heaven may scan.

His modest shanty on the bleak hillside
Is rugged virtue's home. Within its walls
Domestic peace and happiness abide,
And discord's baleful shadow never falls.
The cares that often kill in palace halls,
The gilded miseries that smite and slay,
The greed for gold and grandeur which enthralls
So many hearts, o'er his exert no sway.
He envies none; his home is like a summer's day.

Yet, though his simple home is free from strife,
And at his hearth tranquility is guest,
The perils that beset the miner's life
Might fill with dark dismay the stoutest breast,
As the long lists of "fatal accidents" attest.
The dismal workshop where, amid the gloom,
He toils at stern necessity's behest,
Within a twinkling may become his tomb;
And every sturdy blow he strikes may sound his doom.

A spark some ambushed terror may awake
And set the fire-damp's fearful breath ablaze
With wrath that makes the busy valley shake,
And mocks the thunder of midsummer days
Which round the mountain's cloud-capped summit plays.
It snaps the stalwart pillars, and in piles
The slain are heaped among the winding ways;
Along the blighted corridors, for miles,
The fiery tempest sweeps the subterranean aisles.

Then, through the mining hamlets, white-faced fear,
Like some fierce simoom of the desert, flies,
Speeding the grief that cannot shed a tear—
Piercing the air with stricken women's cries
For those on whom they'll never feast their eyes.
And, while the sorrow-laden voices swell
Upon the breeze, and lamentations rise,
The panic-stricken people rush pell-mell
To that dread pit whose mouth is like the mouth of hell.

Who, in that dreadful moment, will essay
To risk his life and all that life endears
For those who feel the palsy of dismay?
Aye! there are scores of hardy volunteers,
Who bravely fling aside all human fears,
And down the yawning gulf, whence Hope has fled—
Where naught but certain, stern-faced Death appears
In all his hideous livery of dread—
They go to save the living or to join the dead.

Heroes who risk their lives in glory's blaze
Become immortal 'mid the world's applause;
And grateful nations sing the ceaseless praise
Of those who die to serve a noble cause,
And shed their blood to blot a tyrant's laws:
But the brave miner, heedless of renown,
Scorning a fate would give the bravest pause,
Descends the deadly pit where dangers frown,
And for his fellow-man his precious life lays down.

O cruel mines, that maim and crush and kill!
The dazzling wealth ye yield cannot atone
For all the pain ye give; the souls ye fill
With grief; the orphan's and the widow's moan,
The loving mother's deep despairing groan,
And all the untold misery ye make.
But God is ever mindful of His own,
And heeds each loving heart the coal mines break,
And all the precious lives their grim disasters take.

John E. Barrett in Belford's Magazine.

An Electric Power Hammer.—An electric power hammer has been devised which represents a radically new application of electro-magnetic principles. The novelty of the apparatus lies in the substitution of electro-magnetic power for steam, by a slight and very simple modification of the mechanism. The piston is of magnetic material, and the cylinder is composed of a series of coils, through each of which an electric current may be passed separately.

MINING NOTES.

[From Our Own Correspondents.]

Nova Scotia.

Pictou County.

The six foot seam at the Vale colliery is in trouble from the large increase in water struck some months ago.

Our correspondent writes: "The Foord pit has to-day the finest pit bottom in Nova Scotia. The management has completed the brick arches, which extend several hundred feet on each side of pit bottom, supported by heavy steel rails curved to shape of arch and built in with brick. Now that bottom has been completed, the management has started construction of a new pit head, chiefly to be built of iron and steel. Surveys are being made to start the stone drifts. These new workings when completed will unquestionably make the Foord pit the best mine in the province. Your readers will understand that the Foord pit is over 3,000 feet from crop, or say 1,000 feet vertical. A slope is driven from crop of Cage pit seam some 1,800 feet; this seam underlies the Foord pit seam."

The management is preparing to sink this slope, and in the Foord pit drive across the measures and catch the Cage pit seam, then drive up and meet the sinkers. This will give them a very large body of good coal. It will take considerable time to make connection, but when made the Cage pit seam can be worked without steam, all the water running to big pump at bottom of Foord shaft.

The Douglas slope which is connected with the Cage pit further west than where the connection will be made with the Foord pit, is also connected with a four foot seam of superior coal. It is reported to be the intention to work this by long wall.

The MacGregor pit is working along with little or no variation.

At the Drummond colliery the principal work is drawing pillars, except in the 4,000 feet lift, where levels are driving east and west. The manager is having considerable trouble to get his pillars along the old "crush," which inclines to throw over on the new coal. The new large hoisting engine has not started up yet for reasons only known to the manager and builders.

The Acadia is idle for a week or so shifting plant down to 3,600 feet level. The new engine here is working very well.

It is reported that the Acadia Coal Company has acquired the Black Diamond property, principally owned by New Glasgow people.

The outlook for the Londonderry iron mines is not bright. It is said that the rolling mill is to be shut down for an indefinite period very shortly, and that 90 miners—nearly half—were discharged from the new mines lately. The known supply of hematite seems to have been exhausted; inferior ores from other parts of the province are being substituted; orders for iron are scarce, and a great deal of dead work in prospecting seems to be necessary.

Cumberland County.

Work is brisk at Springhill. The management has developed some new workings this summer with good results; they have sunk on another seam south, and it has proved of superior quality.

The management of the Joggins continue long wall working with success. A diamond drill has lately been put in to test some of their property at Maccan station.

The Lawson mine is now working some 20 men; this property is well situated, and yields coal of an excellent quality.

Beaver Dam.

Mr. Turnbull is reported to have sold his interests in this district to New York parties. On this account work in the mine has been suspended, but it is likely to be resumed again as soon as the reorganization is perfected.

Darrs Hill.

The management of the Dufferin Co. have under consideration the matter of equipping their mine with an air drill plant, to be operated by water power. As is worthy the biggest gold mine in the province, the matter is being considered in all its *pros* and *cons* before any conclusion will be reached.

Gay's River.

The Coldstream Co. is very quiet; no reports of dividends being declared have reached our ears yet.

The momentary excitement caused by the reported discovery of silver ore at Carroll's Corner has decidedly abated since assays refuse to show the presence of any silver.

One of the best arguments that can be used in favor of the establishment of technical schools, are these occasional flurries of excitement which are raised by people absolutely ignorant of mineralogy.

Lake Catcha.

The Oxford Co. is working steadily away, and have nothing but words of praise for the air compressing plant put in by the Canadian Rand Drill Co. last winter. The narrowness of the lodes, and the badly faulted character of the same, give the management plenty of problems to solve.

The ten stamp mill erected in Chezzetcook by Mr. John H. Anderson, for crushing quartz from his own property and from tributers, is nearly completed and will start up in a few days.

Malaga.

The Parker-Douglass Co., the Molega Co., and the Boston Mining Co. are all running steadily and with a good product.

The district has recovered somewhat from the disastrous boom of the last two years, and has settled down to steady and regular work. The district is a good one, and needs only legitimate work to make it second to none.

Oldham.

Dominion Day was celebrated here by the starting of the first Standard Pelton Water Wheel that ever came into the Dominion. The wheel referred to is a standard 6 ft. wheel operating under a head of 76 ft. 8 inches, with an average quantity of about 365 cubic feet of water per minute. Under these conditions the wheel develops 40 h. p., and is used for prime mover in the new stamp mill of the Oldham Gold Co. The water is carried in a ditch for 1,000 feet, and thence to the wheel by 500 feet of 16-inch sheet iron pipe. The results have been extremely satisfactory, the power developed being far in excess of present requirements. This mill (of which we hope to present a full account in a future issue), has another novel feature for Nova Scotia in the shape of a Foster Rock Breaker.

Renfrew.

This district promises to be a little livelier this year. Preparations are making for the thorough examination of the old workings of the north and south Ophir lodes, which in times past were the heaviest producers in Renfrew.

Waverley.

Capt. McDuff, of the Nova Scotia syndicate, reports a strike of good ore in the Dominion lode at a depth of about 80 feet. The mill has been refitted and alterations made in engine and boiler, whereby a saving of 50 per cent. is made in the fuel. The shaft in the Union lode is still sinking.

The Lake View Co. announce that their ore is too lean to pay, and contemplate closing down. Over $120,000 has been expended on the property.

GOLD MINING SUPPLIES.

The principal depot in Nova Scotia, carrying the most complete assortment of first-class goods, is

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Our line comprises Explosives, Fuse, American and English Mill and Hammer Steel, Bar and Bolt Iron, Steel Wire Hoisting Rope, Hemp and Manilla Rope, Rubber and Leather Belting, Miners' Candles, Oils and Lamps, Miners' Tools, Machinists' Tools, Blacksmiths' Tools, and every requisite for the gold miner.

H. H. FULLER & CO.,

Halifax, N.S.

The Sophia Mining Co. have abandoned all work except that of pumping on the Tudor lode. Progress has been reported good until the last month, when owing to increased depth or other causes the progress has been slower.

The West Waverley Gold Co. have completed foundations and have commenced the superstructures of their mill and other buildings. The whole plant has been designed and arranged with a view to fuel economy, the ores being of so low a grade as to demand strict economy in every department. The mill engine will be a tandem compound condensing. The air compressor is a duplex compound condensing one, and is building by the Canadian Rand Drill Co. from designs by Mr. F. A. Halsey. The Jenckes Machine Co. furnish the mine outfit of hoist, skips, cars, &c., and Matheson, of New Glasgow, furnishes the boilers, which are to carry 125 lbs. to the square inch.

Quebec.

Lievres River.

Complete surveys of all the properties of the General Phosphate Corporation have been made by Mr. E. Rainboth, and topographical maps are now being prepared with a view to obtaining estimates for laying in a permanent plant at High Falls and Ross Mountain. Whether the motive power will be steam transmitted by air pipes or utilized and applied by electric transmission is now under consideration. This is rendered urgent by insufficient water for the boiler power on Ross Mountain. The output has been low of late, partly on account of this, but the exploratory works so far done have proved the deposits to be extensive and permanent. It remains therefore, to work them on a large scale in order to arrive at a reduction in the working cost.

The output from the mines at High Rock, operated by the Phosphate of Lime Company, continues highly satisfactory. During June, the quantity shipped was close on 600 tons, while this month it promises to be quite as large if not larger.

We understand that the sale of the High Rock property to the General Phosphate Corporation is very nearly completed. If it is made, being adjacent to the High Falls and Ross Mountain properties, it will furnish valuable water power.

Mr. Twidell is opening up some valuable pits to the north west of Cap Rock pit, which are evidently a continuation of the main deposit. The present output, by this discovery, is raised quite to the average although the old No. 11 pit shows a temporary falling off.

It is regrettable that the Bell Telephone Co. have abandoned their project of putting in telephone connection this year up the Lievres River, on account of their not having received as many signatures as was anticipated.

Eastern Townships.

At the Leeds copper mine (the old Harvey Hill), the 20 fathom level driving west of shaft is being pushed on as fast as possible; the vein continues good, 3 ft. 6 in. wide, producing 2½ tons of 15 per cent. ore per fathom. No. 1 Slope in the back of the 20 fathom west continues in bed vein 2 feet 6 inches wide producing 2 tons 15 per cent. ore per fathom. No. 2 stope in the back of the 20 fathom level continues in bed vein 6 feet wide producing 3 tons 20 per cent. ore per fathom. Henwood's stope in the bottom of 20 fathom level west is in a splendid vein of ore 2 feet wide producing 2½ tons 40 per cent. ore per fathom. The 15 fathom level driving west of shaft is in bed vein 3 feet wide producing 1½ tons 15 per cent. ore per fathom. No. 1 stope in the back of the 15 fathom level is in bed vein 4 feet wide producing 2 tons of 15 per cent. ore per fathom. No. 2 stope in the back of this level is in bed vein 2 feet 6 inches wide producing 2 tons 15 per cent. ore per fathom. No. 3 stope is suspended. The drift in McGee's shaft is without change; still meeting good bunches of ore; a good quality of ore is being sent up from No. 1 stope in this part. In the adit, a party of men have been started on No. 2 bed. These are producing some good ore, but the bed is irregular. Two men have been started on a place known as Kent's bed. On the surface all work is being rapidly pushed forward and the crusher is about completed.

Templeton District.

Mr. Lomer has shipped during the present month from "The Big Mine" 700 tons No. 1 phosphate by barge, and about 400 tons by rail. The former to Montreal for the German market, and the latter to the Buckingham mill.

The Netherlands Co.'s two principal pits are developing unusually well during the past four or five weeks. Their prospects for a good season's output are encouraging.

SEE THE INGERSOLL ROCK DRILL COMPANY'S ADVERTISEMENT ON BACK COVER.

Mr. C. Koenig sails for London in a few days. Mr. Cirkel remains in charge of the asbestos mine. The output of the main shaft has been very good so far this season. In drift No. 3 the first good vein was struck last week.

Mr. Thomas Fee has shipped eight cars No. 1 phosphate to Liverpool this month, through Messrs. Wilson & Green, Montreal.

The old Templeton and North Ottawa Mining Co.'s "Fidelity Mine," lot 12, in 11th Range, has been acquired by Messrs. McRae & Co. Ten men have been employed since the 15th. On the "disputed show" a steam boiler with hoist and drill will be installed shortly.

It is reported that Messrs. Mutchmor & Gordon have purchased three lots on McGregor Lake, for the O. M. Co. Consideration, $6,000.

About 300 tons phosphate were taken out from the big show at McRae & Co.'s mine, lot 11, in 5th Range, during July. The diamond drill is again at work on that property, and in a few days an electric drill, hoist and lighting plant will be running. The wires are strung and all the plant, with the exception of the hoist, is now installed. Mr. O. S. Wheeler, of the Edison Co., has charge of construction.

Mr. Lewis McLaurin is reported to have struck "something big" recently on lot 11, in 12th Range.

Owing to flooding of the big pit on the property of the McLaurin Phosphate Syndicate, undeveloped shows on other portions of the property are now being opened up. One hundred tons or more were shipped during July.

The Mining Inspector for the County of Ottawa, intends prosecuting all parties not complying with the provisions of the new law respecting abandoned pits. The Government are bound to protect the poor farmers' cattle and the inspector likewise. ($25 in each abandoned pit to the inspector and $25 for the Court.)

Mr. J. Obalski, M.E., Government Engineer of the Province of Quebec, a few days ago visited the asbestos mines of this district.

The MacGregor Lake Phosphate Company have shut down on the Benson Lot, and intend shortly to transfer their plant to the Gore, arrangements having been about concluded to work on some of Mr. W. A. Allan's properties there.

Branches of the telephone to the McRae and to the Templeton Asbestos mines are now being put in. The Bell Company will have their line through Buckingham and Templeton completed in three or four weeks, when mining men may talk with Ottawa and Montreal.

Messrs. Fissault & Lepage are working about 22 men on their lots in the 4th Range. Their winter output is still unsold.

The Canada Industrial Company has commenced drawing their output, some 125 tons, to the Templeton Station, C.P.R.

Wakefield District.

Mr. A. T. MacIntyre has purchased lots 5, 6 and 7 in the 2nd Range of Masham from Mr. John Hyde. Seven men, under Prospector Holmes, are employed stripping and testing the shows.

Mr. Thos. Poston, Inspector of Revenue, Quebec, in company with Mr. Sims, of Aylmer, local collector, visited all the working mines in the County of Ottawa about the middle of the month. The Provincial Government intend exacting the license fee of $150 per annum from all works carrying more than 25 lbs. of explosives. A movement is on foot for the establishment of two central magazines in the Township of Templeton, from which miners in the vicinity may be supplied daily with their requirements, and thus escape this odious and objectionable tax.

Pontiac County.

The Bristol iron mines have been shut down for the present, as some 10,000 tons of ore have been got out, and there is no room left to store any more. Considerable additions to the plant are being made in the shape of two roasters, crushers, and an elevator. This will, when completed, have a capacity of about 100 tons per day. The intended output of the mines will be from 2,750 to 3,000 tons per month.

Ontario.

Port Arthur.

A rich find of silver ore is reported to have been made near Port Arthur by an old farmer named Henry Parsons, living in the township of Paipoonge, some ten miles west of here. A year ago Parsons bought the then owner's free grant claim of lot 19, 2nd concession, for $100, and after a while raised the money to pay the necessary $2 per acre for a patent as a mining location. His explorations soon bore fruit, for a short time ago he came to Port Arthur with some very rich samples of native and black silver, equal to anything ever found in the district. He has, it is said, been already offered $100,000 for his claim. The previous owners bitterly regret their lost opportunities, and the whole neighborhood is taking mining rights.

Sudbury.

The Canadian Copper Co. are now shipping a very large order of matte to the Oxford Copper Company of New York, to be refined, after which the nickel will be used in the manufacture of nickel-steel armour plate for the United States Government. The contract calls for 4,000 tons, equal to about 3,200,000 lbs. of fine copper and nickel, valued at about $300,000. This will clean out all but about 3,000 tons of matte in the company's yard, and brings this year's shipments to over 5,000 tons so far. Before long the new Bessemerizing plant will be at work, the three convertors now being put in position, and the boilers, cupola furnace, hydraulic cranes and accumulators being already in place.

British Columbia.

Kootenai.

The owners of the Wild Cat, a gold claim about half a mile southwest of the Poorman, packed 18 tons of ore for a trial run to the Poorman mill recently. The result of the clean-up was so satisfactory that a contract was made immediately for extending the tunnel another 50 feet. Later on a shaft will be sunk on the ground and if the result of this additional development work prove satisfactory, machinery will be placed on the mine and a mill erected near the mouth of Sandy Creek.

The Boulder hydraulic claim on 49 Creek has been purchased by Messrs. H. F. Keefer, D. McGillivray, R. G. Tatlow and R. C. Ferguson, from Messrs. A. L. Davenport, M. C. Monaghan, Barker Bros., N. Riopelle and J. P. Lamotte. The price is said to have been $2,000. The claim is believed to be a good one, and will no doubt give good returns if systematically worked. The ditches are being cleaned out and operations will shortly begin in earnest.

Superintendent Cronin has been taking a look at the Davenport-Henry properties in Toad Mountain and Hot Springs before beginning work on any of them. Some delay has been occasioned in beginning work on the Poorman by the desire of neighboring claim owners to make trial runs of ore at the Poorman mill. Mr. Cronin is of opinion that the people in this vicinity place too low an estimate on the benefit that the country will derive from the building and operation of the Columbia and Kootenai railway. He said, judging from the results in the Cœur d'Alene country, that the railway will not only make the profitable working of many of the mines possible, but that hundreds of people will now visit the camps on the lake who would never think of doing so had they to travel over wagon roads and trails.

Three assays of samples of ore from a claim discovered by C. C. Sproule and George Long, in the Goat River district, gave returns of over $100 to the ton in silver, besides large percentages of lead and some copper.

About three miles south of Nelson, Fred Sutter is at work on a strong outcrop of mineralized rock. The ledge is from four to sixteen feet wide, and apparently runs east and west, the vein matter being quartz carrying gold, silver and lead. The ground is favorably located for working. The west end stake is within a few feet of Giveout creek, the claim running up the side of a mountain, whose slope is not less than 65 degrees. Marks & Van Ness have an interest in the ground, and they intend spending money on it to prove its wealth.

CANADIAN COMPANIES.

Bell's Asbestos Company, (Ltd).—The directors have declared an interim dividend of 2s. 6d. per share, free of income tax, for the half-year ended June 30, being at the rate of 5 per cent. per annum, payable by warrant on and after the 31st ult., to the shareholders on the register on the 25th ult. Last year 10 per cent. was paid.

The LeRoi Mining and Smelting Company.—This company has been registered under the British Columbia Act relative to foreign companies, for the purpose of carrying on the business of mining, smelting, milling and reduction of ores of all kinds; to buy, sell and deal in mines; to work same, and to erect plant of all descriptions for the above purposes. Head office, Trail, B.C. Capital stock, $2,500,000, in 500,000 shares of $5 each.

The Provincial Chemical Fertilizer Company, (Ltd).—Application will be made by the above company for incorporation under New Brunswick laws, for the purpose of carrying on the business of manufacturing fertilizers, the buying and selling of the same, with all other matters incident thereto. Head office, St. John, N.B. Capital stock, $50,000, in 500 shares of $100 each. Applicants, R. W. Patterson, New York; De B. Carritte, St. John; S. G. Olive, St. John; W. W. McLauchlan, St. John; and C. A. Stockton, St. John, of whom the first three are to be the first directors. Solicitor, C. A. Stockton, St. John.

The Canadian Natural Gas Company. (Ltd).—Application will be made to the Federal Parliament for the incorporation of the above company for the purpose of acquiring and dealing in lands in the Dominion; the boring for, and obtaining in any way natural gas, oil, salt or any other natural commodity; to construct pipe lines; to erect plant for refining, warehousing, etc., with all other customary powers. Head office, Sherkston, Welland Co., Ontario. Capital stock, $100,000, in 5,000 shares of $20. Applicants, S. Carroll, Sherkston; W. E. Carroll, G. Bork, G. Lang, J. Binz, A. W. Hickman, and E. G. S. Miller, all of Buffalo, N.Y.; and H. Cornmiller, Port Colborne, Ont., of whom S. Carroll, J. Binz, and H. Cronmiller are to be the first directors.

The Canada Company.—At the annual meeting of the Canada Company in London, on the 25th ult., Sir R. Gillespie presiding, a dividend of 17s. 6d. was declared for the current half year. In July 1890, 10s. was paid, and in January of this year £1. There were on hand £7,755, out of which dividends to the amount of £7,279 were paid, leaving a balance on hand of £476, which with unclaimed dividends, amounted to £1,433. In the period from the 1st of January to the 28th of May, 357½ acres of land were sold, at an average of 37s. 7d. per acre; while 4,599½ acres were leased (with the option of purchase) at an average price of 78s. 5d. In the same period of 1890, 425 acres were sold, at an average of 78s. 4d., and 1,503 acres were leased, at an average of 69s.

Sydney and Louisburg Coal and Railway Company, (Ltd).—The annual general meeting of the shareholders of this company was held in London on the 30th ult., Mr. G. W. Medley presiding. In 1890, 155,900 tons of coal were mined, against 121,600 tons in 1889, and 124,050 tons in 1888. The increase in the business of the company necessitated considerable outlays. Mining rights have been acquired over a large area; the Emery mine has been opened up; dwelling houses have been erected; an engine and fifty coal cars bought; and the whole plant put in good repair. This cost altogether £7,810. Owing to these disbursements, of which a large part has been debited to revenue, only £1,715 9s. 6d., has been carried to profit and loss account against £3,618 18s. 2d. in 1889. The balance of profit and loss account brought forward on 31st December, 1889, after payment of a dividend of 12s. per share on the 5,000 first preference shares, was £1,836 5s. 2d., which added to £1,715 9s. 6d. as above, leaves an available balance of £3,554 14s. 8d. Out of this sum, a dividend of 12s. per share—equal to 10 per cent. on the first preference shares, was recommended and carried, leaving a balance of £554 14s. 8d. to be brought forward. The outlook for the current year is remarkably good and the directors expect to present a still better report next year. The directorate is unchanged, the retiring directors being re-elected.

The Cookshire Machine Works Company—This company is applying for incorporation to the Quebec Legislature, for the purpose of manufacturing machinery and carrying on a foundry and general business. Head office, Cookshire, Compton Co. Capital stock, $30,000, in 600 shares of $50. Applicants, H. Sawyer, W. W. Bailey, L. J. D. Gauthier, R. H. Pope, Township of Eaton; and F. H. Sleeper, Township of Compton, all of whom are to be the first directors.

The Beauce Asbestos Company.—Application will be made to the Quebec Legislature by the above company for incorporation, in order to deal in asbestos in the region of Beauce, and elsewhere in the Province of Quebec. Head office, Parish of St. Francis, Beauce County. Capital stock, $10,000, in 100 shares of $100 each.. Applicants, J. Godbout, St. Francis; Hon. J. E. Robidoux, Quebec. Hon. C. E. Langelier, Quebec; Hon. L. P. Pelletier, Quebec; W. H. B. C. de Lery, T. Fortier, P. Angus, C. Fortin, P. F. Renault, L. Mathieu, all of St. Francis; all of whom, except L. Mathieu, are to be the first directors.

The Ontario Mining Stock Exchange (Ltd).—This company will apply for incorporation under Ontario laws, for the purpose of maintaining a Mining Stock Exchange for the mutual convenience of those engaged in the business of dealing in mining and other stocks and securities; and for the promotion of just and equitable principles of trade, etc. Business to be carried on in the County of York. Head office, Toronto. Capital stock $50,000 in 500 shares of $100 each. Applicants, J. A. McAndrew, M. McConnell, S. F. Kilgour, W. B. Stephens, C. E. Burns, F. M. Holland, E. Porter and T. G. Clark, all of Toronto; all of whom are to be first directors.

General Phosphate Corporation (Ltd.)—Reports current on this side say that the company has succeeded in placing its debentures. Mr. Wills, the manager, states that while he has received no specific information on the subject, the company is well in funds, which argues the success of the issue.

Templeton Asbestos Mining Company (Ltd.)—The first ordinary general meeting of this company was held a short time ago at Winchester House, London, E.C. Mr. R. Wissman, who presided, after stating the progress made in the exploring work of the property, which was taken over in April, said that their policy was to spend as little money as possible before a mature plan of working could be formed, and only machinery absolutely necessary had been ordered. All their expenses in Canada, including machinery, rails, trucks, and two large boilers, amounted up to date to about £1,200, while the London expenses were practically *nil*. The asbestos raised has

been described as magnificent, and the serpentine on the property was of a specially pure character, and it was estimated that there would be a profit of £3 per ton on this after paying for grinding, packing, and freight to London. Mr. Cirkel, their engineer, said in his report that he would not commit himself to the statement that asbestos existed in paying quantities, but they had received a cable from him which was of a satisfactory nature. They now awaited his detailed report before sanctioning the further expenditure of £2,000 on machinery. Replying to shareholders, the chairman said they had a good deal more than sufficient money to buy the machinery. All the purchase money had been paid, and they had money safe in the bank in Montreal.

H. W. McNeill & Co., (Ltd).—Application will be made by the above company for incorporation under Dominion laws, for the purpose of mining and extracting coal, especially anthracite coal, in the Dominion of Canada, and generally to carry on the business of colliery proprietors, miners, and engineers, in all branches; to mine, quarry, raise and treat, smelt and reduce, coal, coke, lignite, sandstone, granite, iron, gold, silver, copper, and other minerals, with all other customary powers. Head office, Anthracite, N.W.T. Capital stock, $50,000, in 500 shares of $100 each. Applicants, H. W. McNeill, Anthracite; F. A. Hill, Seattle, Wash.; D. R. Reeve, Anthracite; W. A. McNeill, Oklahoma, Ia.; Archelaus Pugh, St. Paul, Minn.; J. M. Platt, Island of Anacortes, Wash.; of whom the first three are to be the first directors.

The Peterborough and Frontenac Mining Company (Ltd.)—Application will be made for incorporation by the above company, under Ontario laws, to acquire and deal in mining claims and lands in Ontario; to work the same, to smelt and refine minerals, and generally to carry on a mining business in all its branches. Head office, Peterborough. Capital stock, $10,000,0·0, in 500,000 shares of $20 each. Applicants, J. W. Taylor, T. Brooks, G. Stevenson, W. H. Manning, A. E. Dixon, F. J. Bell, C. A. Weller, A. P. Poussette, G. W. Hatton, A. V. R. Young, T. E. Bradburn, A. Elliott, R. P. Boucher, H. Lebrun, J. W. Fairweather, W. Croft, J. E. McIntyre, E. A. McIntyre, all of Peterborough, Ont., of whom the first twelve are to be the first directors.

The Montreal and Kootenay Mining Company (Ltd.)—Application will be made by this company for incorporation under Federal laws, to purchase and develope gold, silver, copper, lead, asbestos, phosphate, mica and other mines throughout the Dominion, and to carry on the business of dealers in minerals generally. Head office, Montreal. Capital stock, $20,000 in 20,000 shares of $1 each. Applicants, E. B. Greenshields, P. A. Peterson, R. W. Smith, F. Fairman, W. H. Irwin, G. Hanson, and R. T. Hopper, all of Montreal; all of whom are to be the first directors.

The Reid & Currie Iron Works Company (Ltd.) - The above company is applying for incorporation under British Columbia laws to purchase and acquire from Messrs. Reid & Currie the foundry, blacksmith, machine and iron works and agency business carried on by them in New Westminster, B.C., together with all the plant, contracts and assets and liabilities, etc., to manufacture all kinds of machinery, steam and other fittings, and generally to do a machine and foundry business in all its branches. Head office, New Westminster, B.C. Capital stock, $100,000 in 1,000 shares of $100 each. Applicants, J. Reid, W. Currie, H. H. Newington, D. S. Hennesey, H. J. A. Burnett, and L. P. Eckstein, all of New Westminster, B.C., all of whom are to be the first directors.

The Nanaimo Coal Trimmers' Protective and Benevolent Association—Application will be made by the above society for incorporation under the "Benevolent Societies Act of 1891" of British Columbia, for the purpose of making provision by means of contributions, subscriptions and donations against sickness, unavoidable misfortune or death, and providing means of social intercourse, mutual helpfulness and mental and moral improvement. The number of trustees shall be six, viz.: J. Durken, J. Lloyd, J. Wilson, W. Meyers, G. Maunder and H. Striethorst, who are to manage the affairs of the society for the first three months.

The Mimico Natural Gas Company (Ltd.)—Will apply for incorporation under Ontario laws to sink, bore, operate, etc., artesian wells, and to produce petroleum, natural gas, and other mineral and volatile substances; and to erect the necessary plant. Operations to be carried on in the County of York. Head office, Toronto. Capital Stock, $100,000 in 1,000 shares of $100 each. Applicants, A. Nelson, J. Currie, W. Parsons, M. Rountree, L. G. Harris, J. Wright, J. Barret, F. Que, W. J. H. Emory, A. Keith, E. J. Clark, all of Toronto; all of whom are to be the first directors.

Sydney Land and Improvement Company (Ltd.)—Application will be made to the British Columbia Legislature for the incorporation of the above company to acquire, lease, sell, and in any way deal in lands, buildings, fore-shore rights, etc., in the British Colonies; to develop and turn to account the same in any manner; to construct, equip, maintain, develop, control, etc., wharves, docks, water-works, gas-works, hotels, clubs, etc.; to carry on the business of builders and contractors, decorators, dealers in stone, sand, lime, bricks, timber, hardware, tile and terra cotta makers, etc., and forwarders, etc., with other powers. Head office, Victoria, B.C. Capital stock, $100,000, in 400 shares of $250 each. Applicants, J. Brethour, T. Norquay, R. Irving, J. White, W. C. Haywood, A. L. Belyea, Victoria, B.C., all of whom except the last are to be the first directors.

The Toronto Granite Company.—This company will apply for incorporation under the Ontario Act to manufacture and sell granite and marble. Head office, Toronto. Capital stock, $45,000 in 900 shares of $50 each. Applicants, A. W. Anderson, N. F. Anderson, Toronto; E. Van Zant, Flesherton, Grey Co.; A. Anderson, H. Anderson, Buffalo, N.Y. The first three to be the first directors.

The Western Canadian Ranching Company, Ltd. (English).—This company has been registered to do business in British Columbia. The objects for which the company is established are to purchase and acquire landed property or any interest therein in Canada or elsewhere, and in particular certain estates situate in British Columbia, briefly known as "Harpers' Ranches," together with the buildings, stock and mining rights appertaining thereto; to purchase, or in any wise deal in any lands, mines, minerals, vessels, etc.; to carry on among other businesses, that of miners, metallurgists, smelters, quarry-owners, brick-makers, etc.: to search for, prospect, and mine any sort of minerals, etc., together with numerous other powers incident to the business of the company. Head office in Canada, Victoria, B.C. Capital stock, £100,000 in 100 Founders' shares of £10 each, and 9,900 ordinary shares of £10 each.

The Guelich Silica Barytic Stone Company.—This company will apply for incorporation under Ontario laws to manufacture artificial stone for street paving, sidewalks, floors, building stone, decorating, etc. Head office, Ingersoll. Capital stock, $100,000 in 1,000 shares of $100 each. Applicants, O. E. C. Guelich, Detroit; C. E. Guelich, J. Podmore, J. A. Richardson, S. Noxon, all of Ingersoll; all of whom are to be the first directors.

Latest Stock Quotations of Canadian Companies in England.

	Price.	
Excelsior Copper, Limited, £410,738 fully-paid shares of £1	—	
Nicola, Limited, £35,000 fully-paid shares of £1	—	
Shuniah Weachu, Limited, £99,888 fully-paid shares of £1	—	
Silver Wolverine, Limited, £68,465 fully-paid shares of £1	—	
Tilt Cove Copper, Limited, £160,000 fully-paid shares of £2	—	
Ditto, £80,000 5½ per cent. debentures	—	
General Mining, Limited, £219,752 fully-paid shares of £8	3¼	3¾
Low Point, Barrasois and Lingan, £509,100 fully-paid shares of £100	—	
New Vancouver Coal Mining and Land, Limited, £185,000 fully-paid shares of £1	⅝	⅞
North-Western Coal and Navigation, Limited, £160,500 6 per cent. debenture coupons, June 30 and December 31; principal 1904	—	
Ditto, £149,500 fully-paid ordinary shares of £10	—	
Ditto, £900 fully-paid deferred shares of £100	—	
Sydney and Louisburg Coal and Railway, Limited, £50,000 cumulative 10 per cent. first preference shares of £10, £6 paid	7½	8½
Ditto, £14,560 fully-paid non-cumulative 6 per cent. second preference of £10	3	5
Ditto, £250,000 fully-paid ordinary shares of £10	¼	¾
Anglo-Canadian Asbestos, Limited, £11,500 fully-paid shares of £1	—	
Anglo-Canadian Phosphate, Limited, £46,510 fully-paid preference shares of £10	—	
Ditto, £25,000 fully-paid deferred shares of £10	—	
White's Asbestos, Limited, £20,000 fully-paid shares of £1	—	
Ditto, £15,000 shares of £1, with 15s. paid	—	
Bell's Asbestos, Limited, £140,000 fully-paid shares of £5	8⅛	8⅜
Ditto, £68,400 debentures, 5 per cent.; interest January 1 and July 1	—	
Canadian Phosphate, Limited, £100,000 fully-paid shares of £1	—	
General Phosphate, Limited, 5 per cent. ordinary shares of £10, £2 paid	—	
Ditto, £5,000 fully-paid founders' shares of £10	—	
Western of Canada Oil, Limited, £200,000 fully-paid shares of £100	—	
Ditto, £99,850 fully-paid shares of £50	—	
Western of Canada Oil, Limited, £199,700 12 per cent. debentures of £100	—	

Excelsior Copper.—Registered September 26, 1888. Accounts to December 31 submitted in April. No dividend yet. Liquidation and reconstruction have been decided upon.

Nicola.—Accounts to December 30 submitted in November. No dividend yet.

Shuniah Weachu.—Accounts to November 20 submitted in February. No dividend yet. Shares for £12,870 held by the Company.

Silver Wolverine.—Registered October 19, 1888. No report of meeting received yet.

Tilt Cove.—In March, 1890, the properties were leased for 99 years to the Cape Copper Company, Limited, at a rent of £4,400. The Cape Copper Company advance £15,000 at 5 per cent. interest, and when this is repaid out of profits; surplus profits are to be divided equally between the Cape Copper Company and the Tilt Cove Company. The lease may be determined by the Cape Copper Company at any time on twelve months' notice. Accounts annually to March 31 submitted in November.

Phosphate Shipments.

The following are the official returns of the quantities of Canadian phosphates shipped to Europe from the port of Montreal from June 23 to date:—

Date	Name of Ship.	Destination.	Shippers.	Tons.
Jne 26	SS. Federation.	London.	Lomer Rohr & Co.	400
July 4	" Esther Roy.	Liverpool.	Millar & Co.	250
7	" Oregon.	do	Lomer Rohr & Co.	100
8	" Norse King.	London.	do	100
9	" Warwick.	Glasgow.	do	150
10	" Cremon.	Hamburg.	do	200
10	do	do	Millar & Co.	100
18	" Canopus.	Liverpool.	Wilson & Green.	560
20	" Feliciana.	do	Lomer Rohr & Co.	150
21	" Alcides.	Glasgow.	Anglo-Can. P. Co.	240
				2250

SHIPPERS' RECAPITULATION.

	Tons.
Lomer Rohr & Co.	1100
Wilson & Green	500
Millar & Co.	350
Anglo-Canadian Phosphate Co.	240
Total shipments to date	2250

RECAPITULATION OF EXPORTS.

	Tons.
Liverpool	1060
London	500
Glasgow	390
Hamburg	300
Total tons exported	2250

Meeting of the Gold Miners' Association of Nova Scotia at Waverley.

The usual order of the regular monthly meeting of the Gold Miners' Association of Nova Scotia, was pleasantly varied this month in being held at Waverley instead of, as customary, at the Halifax Hotel. The day being the "Glorious Fourth," the trip was more in the nature of an excursion than a business meeting, and the Americans of the party in particular, amply observed the festive nature of the day. At 10 a.m. a four-horse team left Dartmouth for Waverley, in which were Messrs. J. M. Reid, of the Oxford gold mines, president of the association; T. R. Gue, president of the Acadia Powder company; John H. Anderson, of the Anderson gold mine; Councillor J. H. Austen of Dartmouth; E. R. Faribault, of Quebec, in charge of the geological surveying party now in Nova Scotia; E. L. Jennings, of Boston; A. E. Bradley, of Boston; C. E. Willis, and representatives of the Press. The drive was a very pleasant one, and the party had no little fun on their way out.

Arrived at Waverley, they were met by Mr. B. C. Wilson, ex-president of the Association, and Mr. G. MacDuff, manager of the deWolfe property, and after the usual introductions, etc., the party adjourned to Laidlaw's Hill, where a large tent had been put up in charge of a staff of waiters, the caterers being the Halifax Hotel. A large contingent arrived by train at Windsor Junction, among whom were Messrs. John E. Hardman, of Lowell, Mass., who is interested in mines in Oldham and West Waverley; Fred. Taylor, also of Lowell, who is associated with Mr. Hardman; Duncan McDonald, of the Truro Foundry company, and Dean S. Turnbull, an American, formerly of the Black Hill mines, but who is now one of the Beaver Dam Mining Company. An informal discussion of mining matters was held for a short time and was then abandoned for a series of impromptu games until 1.30 p.m., when with appetites whetted by exercise, twenty-five members and their friends sat down to a capital lunch. Mr. J. M. Reid, president of the Association took the head of the tables. The toast list was a lengthy one, including Her Majesty the Queen, the President of the United States, Mr. Wilson's health, the guests, the married men, the bachelors, the Press, the host and several others. All were ably responded to, some of the speeches being remarkably good; every one made one or more speeches, and Mr. Jennings rendered a couple of songs in excellent style. After lunch the remainder of the day was spent in visiting the adjacent mines and discussing mining matters. Already much good has come from these meetings, mining being carried on in a much more economical and scientific manner than formerly, and as was remarked by Mr. Wilson in the course of his speech at lunch, they use now a 10 horse power engine and one man to do work for which formerly one hundred men were employed. In the early evening the meeting broke up, very much pleased with their day's outing.

MACHINERY MECHANICS & INVENTIONS

Improved Bosh Plate for Blast Furnaces.

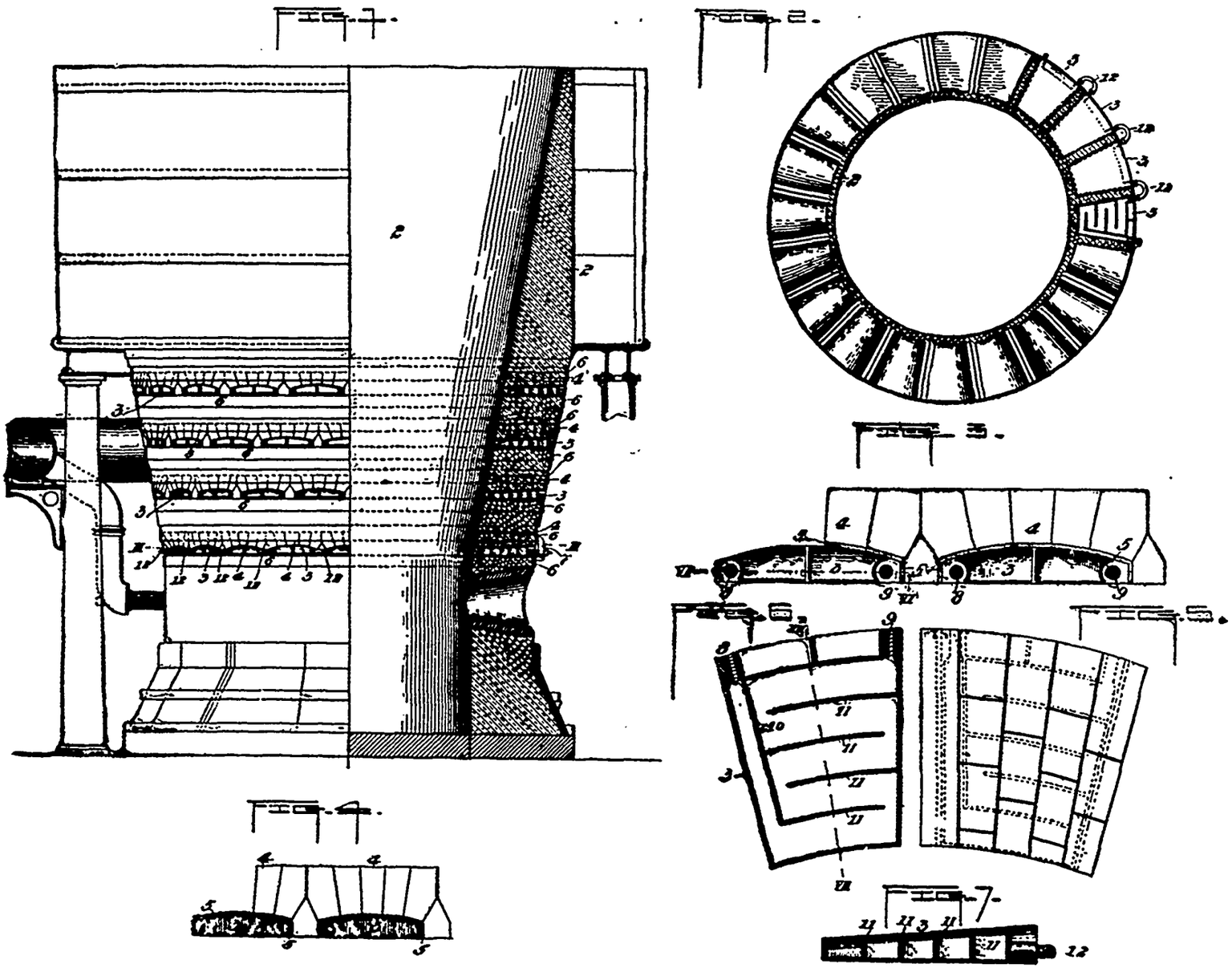
The trouble experienced in the operation of blast furnaces from broken and leaking bosh plates is too well known to furnace managers to need special comment here, more than it has been generally supposed to be, mainly, if not entirely, due to burning out from the intense heat of the bosh The difficulty of removing a bosh plate when it has been known to have become defective, to say nothing of the difficulty of *locating* the particular one at fault, may likewise be passed without detailed notice. One thing is certain, that the fault and the circumstances under which a furnace has to be run during its correction are the most potent factors in the deterioration of blast furnace linings, and consequent increase of "maintenance" charges in the year's balance sheet.

To avoid the troubles mentioned above, the furnace bosh plate illustrated and described below has been devised by Mr. James Scott, manager of the Lucy furnaces of Carnegie, Phipps & Co., Pittsburg, and which, it is believed, possesses the desired elements of durability and freedom from trouble and expense in use. Mr. Scott bases the claim to merit in the design upon the fact which he has observed, that the breaking of bosh plates in use has not been due so much to burning as to the manner in which they have been set in the furnace wall. It has been the practice to build them directly in the wall, with the bricks bearing on them from above and at the sides and at the intermediate spaces, so that when the brickwork expands and moves by reason of the heat of the furnace it strains the bosh plates and breaks them, even when they themselves have not been injured by the heat.

Referring to the drawings, Fig. 1 is a side elevation, partly in vertical section, showing the bosh of a furnace with plates of the improved form; Fig. 2 is a sectional plan view on the line II. II. of Fig. 1; Fig. 3 is an elevation of two of the bosh plates set in position in the blast furnace wall; Fig. 4, an elevation of the inner end of the bosh plates; Fig. 5 is a plan view of one of the bosh plate arches; Fig. 6, a horizontal section of one of the bosh plates on the line VI. VI. of Fig. 3, and Fig. 7 is a vertical section on the line VII. VII. of Fig. 6. The plates, as will be noted from the drawings, are made tapering in width and in thickness, and are curved transversely on their upper surfaces, so as to form a general wedge shape, and are set in arched recesses in the furnace wall. The arches are built preferably of especially shaped bricks, arranged so as to conform in shape to the bosh plates. The function of the arches is to support the furnace wall over the recesses when the plates are removed, and so that the plates may be taken out and replaced easily without other rebuilding than luting the intervening space with clay. The plates are of slightly less dimensions than the recesses, and in construction the surrounding space is luted with clay, as shown at 5. The bosh is strengthened by bands, 6, encircling the furnace above and below the bosh plates. The preferred internal construction of these plates is as shown in Figs. 6 and 7. Each consists of a hollow plate having water inlet and outlet openings, 8 and 9, a partition forming a passage leading to the rear of the plate from the opening, 8, and baffle plates, 11, which cause the water to travel in a circuitous course between the back of the plate and the opening, 9, and thus affording a very efficient cooling action on the furnace walls.

The removal of the plate, the ease of which is one of the notable and meritorious features of the invention, is accomplished simply by uncoupling the inlet and outlet water pipes, and then, by means of a clamp-bar and bolt adapted to be attached to the plate, the plate may be easily withdrawn. The replacement is as easily effected. It will be readily seen that on account of the ease of removal and replacement of these plates the location and stoppage of leaks, when they do occur, are very easily and cheaply done.

Mr. Scott, the inventor of this bosh plate, has recently been granted a patent thereon, and it is believed they will meet with a favorable reception from blast furnace engineers and managers. They are manufactured exclusively by Messrs. Best, Fox & Co., of Pittsburg, who make a specialty of blast furnace castings and machinery.



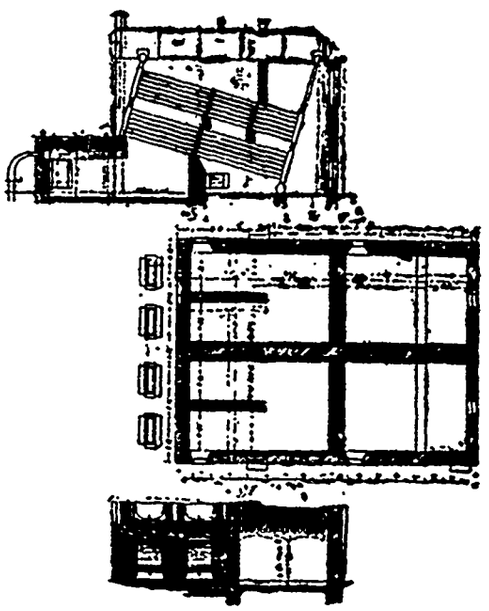
IMPROVED BLAST FURNACE BOSH PLATE.

Gas Burning Device for Blast-Furnace Boilers.

The problem of how to utilize blast-furnace gases to the best advantage under steam boilers has been one that has been only second to the problem of their most advantageous use in the hot-blast stove, but it can hardly be said to have reached so nearly a generally accepted solution as the second named. As an instance of what has proven a remarkably successful practice, we think the following description of a device in use at the Isabella Furnaces at Etna, near New York, will be of interest. While shown as applied to the Babcock & Wilcox, it is equally applicable to other types of boilers, and in fact was, as noted below, used on a different battery of boilers before the present equipment was put in.

The apparatus now used consists essentially of a valve operated on the same principle as the Spearman—being in fact the Spearman valve applied to boiler practice—connected directly with an elbow which differs from that used in introducing gas to the hot-blast stoves in being flattened out so that the mouth of the burner in section is wide and narrow, together with a roomy combustion chamber in front of the boiler setting proper.

Of the drawings, Fig. 1 is a longitudinal vertical section of the setting, showing the valve and combustion chamber; Fig. 2 a plan, and Fig. 3 a portion of the front elevation and vertical cross section through the combustion chamber.



GAS BURNING DEVICE FOR BLAST-FURNACE BOILERS.

As originally applied to the ordinary two-flue boilers at the furnaces there was no combustion chamber, as shown in the drawing, but suitable openings were cut in the boiler fronts and the gas submitted directly under the boilers. Even with this crude application the working of the apparatus was satisfactory, but when the company decided to put in two Babcock & Wilcox boilers, it was decided to have the appointments as favorable as possible. So that all the improvements which had suggested themselves in the first trials were embodied in the new construction.

That which is most important and interesting is just what cannot be shown in a drawing or described in words—that is, the practical working of the burner—how the waste gases from the blast furnace, being introduced into the combustion chamber, become ignited, and forming a hot flame which passes through the tubes and along the whole length of boilers until, when the entrance to the draft stack is reached, the flame seems to have completely spent itself and utilized all its energy. All this can only be appreciated by being seen, but so far as the mechanical construction is concerned it may be described as follows: The Spearman style of valve is built as referred to above, with a wide and narrow mouth, being in section from 30 to 36 inches by 2½ inches. This mouth enters the combustion chamber through an opening about 2½ inches larger all around, the claim being made by the inventor that the gas, going through an opening slightly larger than the mouth of the valve, draws in enough air to assist combustion, and the gas expanding makes a mechanical mixture of the air and gas. By this expansion also the dust carried with the gas is released and deposited at the bottom of the combustion chamber, from which it readily can be removed when it accumulates.

The combustion chamber is designed to be about 4 feet 3½ inches by 8 feet 3 inches. The boilers are fired entirely with blast-furnace gas, a small quantity of coal being thrown into the furnace when the blast is off, so that the gas will ignite when it is turned on again.

This type of burner was adopted by the Monongahela Furnace Company, which had previously burned coal and experienced difficulty in keeping up steam to the required pressure. Since the change, the gases from the furnace are used entirely, and the steam is blowing-off almost continuously.

The Thomson-Houston Lighting Installation at Hammerfest, Norway.

Hammerfest, the most northern city of the world, is the first city in Norway which has introduced the lighting of streets by electricity and which in the near future will light houses by electricity. The station is about one mile from the city; it was built there, as a tremendous water power could be utilized. The turbine plant consists of two radial turbines of different sizes with horizontal water wheel, which make 400 revolutions; the smaller one drives a Thomson-Houston arc dynamo, type H, which is able to feed 18 lamps in series, the current being 6.8 amperes. The larger turbine drives an alternating machine, which carries 650 lights of 16 c.p. On account of the extremely numerous and terrible storms which take place in this latitude, it was necessary to pay the greatest attention to the line. During the last half of the past winter the arc lights burned to the greatest satisfaction, and a native of Hammerfest has taken charge of the plant.

Carbon Brushes for Dynamos and Motors.

The carbon brushes, which Prof. Elihu Thompson has used for some time, offer remarkable advantages, principally when dynamos or motors are submitted to very variable currents and when, consequently, their commutator is liable to wear. In fact when carbon brushes are used, the commutator will be less worn, for the sparks will burn the carbon instead of spoiling the commutator. These advantages are of special importance for railway motors as the use of these carbons allows the change of rotation of the armature without implying the change of the position of the brushes and avoids any abnormal wear of the commutator. A great many of our readers have asked, when carbon brushes were used first in France and we give herewith the information available about this subject.

In France the first experiments were made with charcoal and with carbons in arc lamps. The results of these experiments were the stopping of sparking (of course the carbons had to make a good contact) and a more even wear of the commutators, that is the latter were not furrowed as it is the case when metallic brushes and thick wire brushes were used; moreover the carbon brush wore off only a little. On the other hand, the results showed that the commutators wore out very soon and that the formation of the fine and sticky carbon dust resulted in making them greasy, and the carbon dust, settling in the insulated parts, produced also short circuits, which in more or less time resulted in the spoiling of the commutator. Under these conditions the results were far from being satisfactory; therefore, the carbon brushes, which were made of charcoal plates and of graphite, were abandoned and efforts were made to find a special carbon which would do away with all these inconveniences. The problem to solve was to obtain carbon which would not produce furrows on the commutator, would not wear the latter too quickly and would not cause the settling of the carbon dust in the insulated parts of the commutator, which finally would result in the destruction of the machine. This problem has been solved now and excellent carbon brushes are manufactured. Lacombe & Co., have studied this problem carefully and their carbon brushes are equally as good as thos. of foreign countries. We had the opportunity to examine lately a commutator of an Edison dynamo which has run now over a year and where Lacombe brushes are used. The commutator is absolutely smooth and looks as if it was polished; the brushes themselves look like polished ebonite at the contact points. This carbon of special composition, is very stable and is extremely soft. The wearing of the brushes is therefore of no account and no trace of carbon dust is found on the machine.

The Colorado Mineral Palace.

(Special correspondence of the REVIEW).

Pueblo was *en fete* on the Fourth, not only because it was "the glorious Fourth," but also on account of the opening of the Colorado Mineral Palace, a building which has been in course of erection for the last two years, and which is described in the local papers in the usual exaggerated style of Western praise as the "eighth wonder of the world." Making due allowance for this ultra superlative description, it must be admitted that the Mineral Palace is something of which Pueblo, and not only Pueblo but the whole of Colorado, may well be proud. It is unique of its kind, for I believe I am right in stating that nothing like it has ever been attempted before.

According to the original plans the Palace was to have been constructed of the lovely native red sandstone, but the immense sum necessary to carry out this plan was too much for even Colorado munificence, and in the end it was built of brick and wood. The architect was Mr. O. Bulow. It is modernized Egyptian in style, painted on the outside in terra cotta with trimmings of olive green, and surrounded on three sides by a wide colonnade, supported by massive pillars. Each of the four corners of the roof rests on an enormous globe. Within the Palace the color is very beautiful, all in soft shades of terra cotta and gold. The building is 243 feet in length and 142 in width, and the domed ceiling is supported by 24 piilars. Around the base of each pillar as well as between the pilasters projecting from the walls, are the mineral exhibits, to give, I suppose, the impression of the whole structure resting upon the mineral wealth of Colorado. There are 24 domes, the largest being 210 feet in circumference, and all have been exquisitely decorated by D. R. Fay, of New York. Each one is different, and all are painted in Colorado wild flowers, than which no more beautiful models could well have been chosen, except the four corner ones, which are done in tropical flowers. It may interest some people and give some idea of the extent of the work to know that the artist received ten dollars an hour for his services. There is a large fixed stage representing the interior of a mine, lined with minerals of every description and hung with glittering stalactites, besides which there are all the usual appurtenances of a western mine visible, burros, jack mules, etc. The effect, when lighted at night, is very good. By the way, the building is well supplied in the matter of light, there being 22,000 electric lights within the walls. The decorations throughout the whole building are in very good taste.

To the right and left of the stage, above and overlooking the main hall, are two good sized art galleries in which the first picture placed was a large Colorado scene from the brush of the well known artist, Mr. Joseph Hitchens, formerly of Montreal.

The mineral display is magnificent, representing every kind of ore, marbles, granites, all kinds of clay and kaolin, galena, coal, etc., and speaking volumes for the mineral wealth of Colorado. One of the most valuable exhibits is a $75,000 collection of native crystallized gold. To the right of the stage is the exhibit from the Pueblo Smelting and Refining Co. It takes the form of a large pipe organ, and is most ingeniously planned to show off the different products of the works. The pipes are lengths of lead pipe made in the establishment, and the panels are made of smaller lead pipes, the white keys of small bars of lead, the black keys of small copper ingots, the pedals of full sized pigs of lead, the half notes being of full sized copper ingots; the stops are of antimonial lead. It may interest Canadian readers to know that this exhibit was designed by Mr. E. P. Matthewson, the superintendent of the smelter, a son of James Adams Matthewson, of Montreal; the lead pipes were made by John MacDonnell, also formerly of Montreal. During the summer a course of lectures by eminent men, among them Talmage, is to be given in the Palace under the management of Mr. Francis A. McKeown, of Toronto.

L. B. COLSON.

PUEBLO, COLO., July 6th, 1891.

A Remarkable Scandal in German Iron Works.

A law suit is now proceeding at Essen, Germany, against a journalist, Herr Fusangel, who has published long and circumstantial accounts of the manner in which certain alleged frauds were practiced by the Bochum Union, the greatest steel making establishment in Germany. This trial has now taken a startling turn. Mr. Wm. Baare, the director general of the Bochum Union, and one of the greatest industrial princes of Germany, holding the highest official and honorary positions, has, in conjunction with others connected with these steel works, been accused of having for many years systematically and purposely defrauded the national, as well as the municipal revenues by manipulating their income tax estimates in such a way as to avoid paying taxes on almost nine-tenths of their incomes. Nine out of ten, after thorough cross examination, confessed having never paid by half or even as much as one-tenth the income tax they should have paid, and so proved the justice of the accusations, but Mr. Wm. Baare refused to acknowledge his guilt, and challenged his accusers to produce proofs. His accusers were not slow to accept the challenge, and brought forward new accusations of the most startling nature; moreover, of such a character that, if true, they will become of almost international importance. The Bochum Steel Works supply most German and a vast number of foreign and colonial railway administrations and companies with steel rails, sleepers, axles, etc., steel requisites for railways and railway carriages, and have always been looked upon as A 1 in every respect. But now the director general and the board of directors of these great works are accused of having systematically and purposely practiced, at all events connived at the practice of the most audacious frauds possible for manufacturers and contractors. The accuser says "that during the last 16 years the Bochum Steel Works have systematically practiced stamping forgeries of the worst kind, on German, foreign and colonial railway administrations and companies; that such stamping forgeries were carried out in such a way that the official stamps of the government or railway inspectors and comptrollers were systematically imitated, and that after the inspection, those rails, etc., which had been rejected, were stamped with the forged stamp, which had during the inspection and examination been prepared by an engraver, specially retained by the Bochum Steel Works for this purpose." The accuser further says "that the Bochum Steel Works in order to be able to get rid of their inferior steel manufactures, practiced another fraud, namely, substituted for the rails, axles, etc., which had been chosen by the official examiner for being tested for their tensile strength, similar rails, axles, etc., which they had specially made from the very finest 'testing' steel that could be manufactured. The officially stamped rails, axles, etc., were surreptitiously removed, viz., replaced by rails, axles, etc., of much superior material, which had meanwhile been stamped with the fraudulent stamps of the Bochum Works." The tests were made, and invariably proved highly satisfactory. The accuser produced at once in substantiation of his accusation, a quantity of stamps, of which in all some 57 were in use during the last 16 years; moreover, he produced orders to and receipts from the maker of such

stamps; he also gave a number of railway accidents, etc., which he alleges have been caused by breakdowns in consequence of the fraudulent practices of the Bochum Union. The public prosecutor at once stepped in and entered a separate action for wholesale commercial forgeries and defraudations alleged against Mr. Baare, his co-directors, and the Bochum Union.

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J. W. BRAKENRIDGE, B.C.L.,
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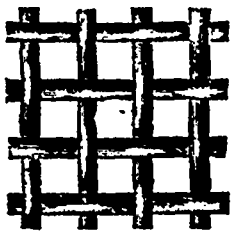

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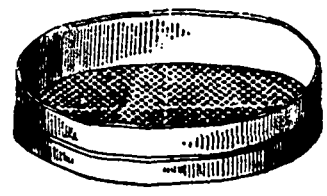

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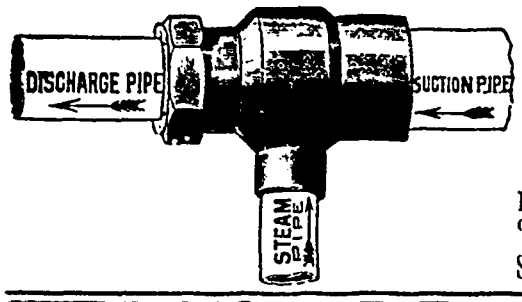

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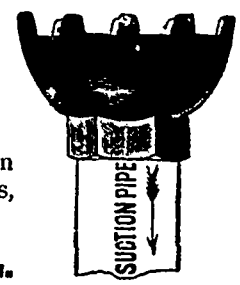

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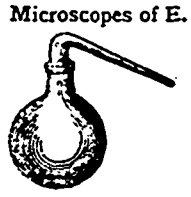

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Applicants may be engaged at the Immigration office, Winnipeg, Manitoba; or at the Headquarters of the Force Regina N. W. T.

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	"	12,	13th	"	132 "
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					1142 acres.

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

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—§—

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

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

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LEASES.—On payment of $50 for one square mile, good for two years, and extended to three years by further payment of $25. The lands selected must be surveyed and returned to Crown Land Office. Leases are given for 20 years, and renewable to 80 years. The Surveyor General, if special circumstances warrant, may grant a Lease larger than one square mile, but not larger than two square miles.

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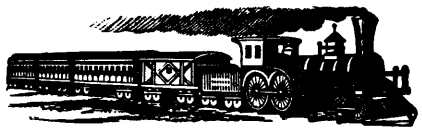

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Any person may explore vacant Dominion Lands not appropriated or reserved by Government for other purposes, and may search therein either by surface or subterranean prospecting for mineral deposits, with a view to obtaining under the Regulations a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

QUARTZ MINING.

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

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

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

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

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

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

IRON AND PETROLEUM.

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

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

PLACER MINING.

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

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

The Regulations apply also to

BED-ROCK FLUMES, DRAINAGE OF MINES AND DITCHES.

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

THE SCHEDULE OF MINING REGULATIONS

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

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

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

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

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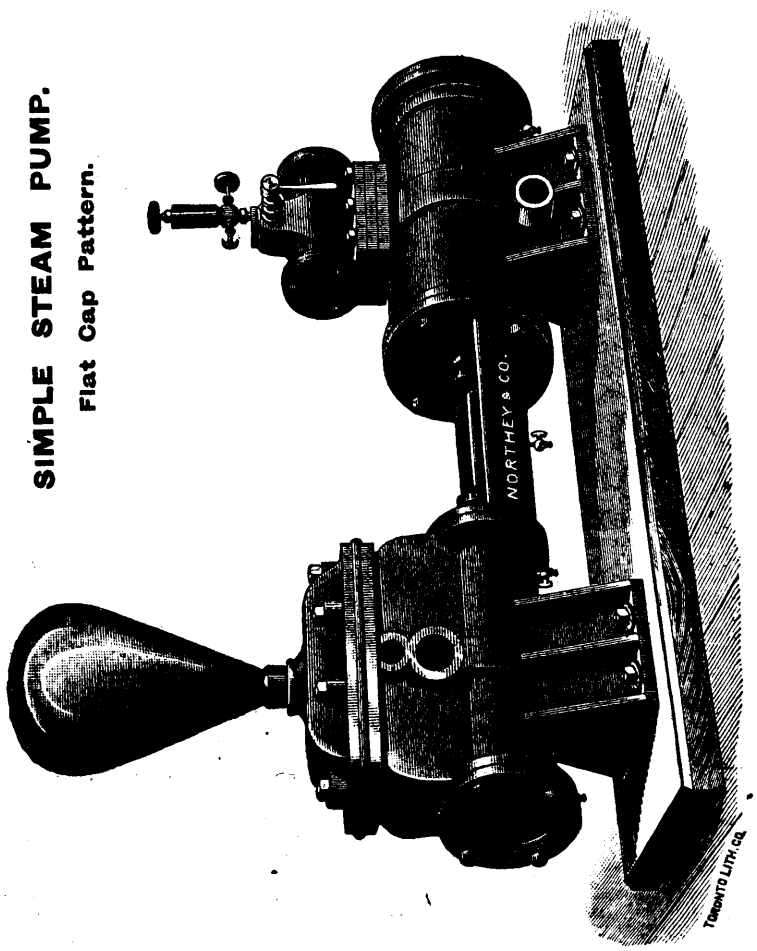

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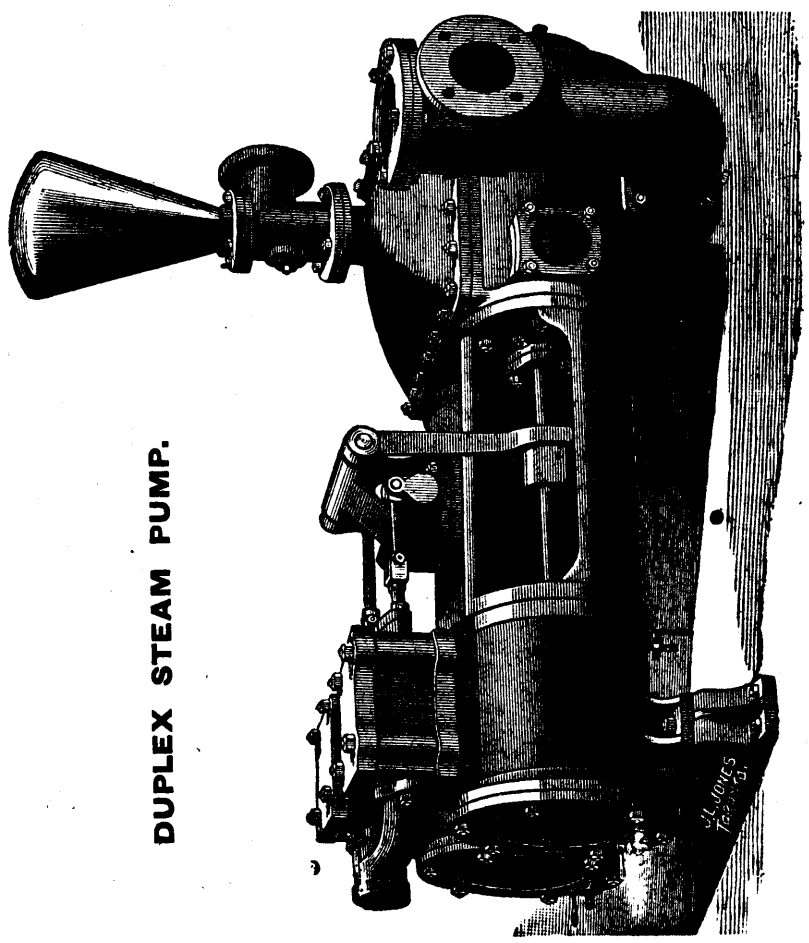

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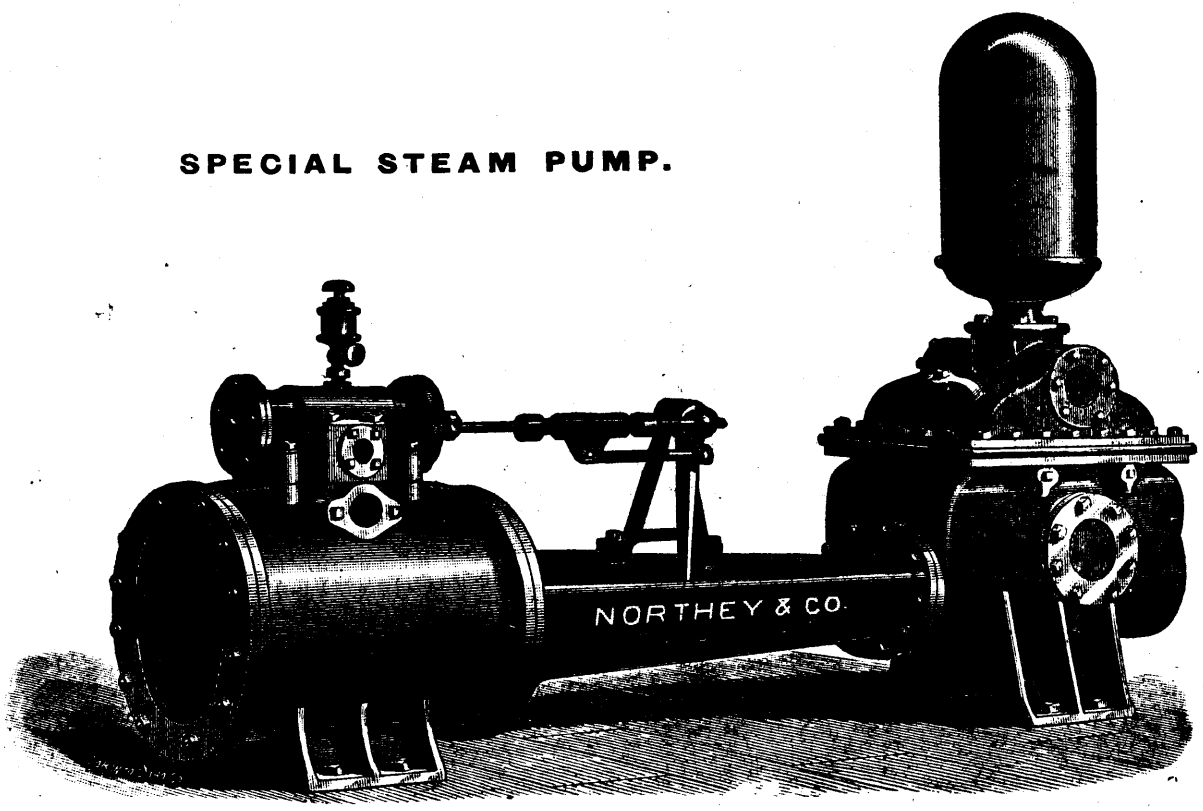

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